

Commission for Climatology

Abridged Final Report of the Seventeenth Session

Geneva

10–13 April 2018



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METEOROLOGICAL
ORGANIZATION

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GENERAL SUMMARY OF THE WORK OF THE SESSION

1. The president of the Commission for Climatology (CCI), Dr Thomas Carl Peterson, opened the seventeenth session of the Commission on 10 April 2018 at 9.30 a.m. at the World Meteorological Organization (WMO) Headquarters, Geneva, Switzerland. He welcomed the participants, and expressed his appreciation to the members of the Commission, particularly those who had served on CCI teams and bodies, who made outstanding contributions during the last intersessional period. He stressed the importance of the work of CCI in generating methodologies, guidance materials and climate information products needed for implementing climate services.

In her opening statement, Ms Elena Manaenkova, Deputy Secretary-General of WMO, welcomed the delegates and representatives of partner organizations on behalf of Mr Petteri Taalas, Secretary-General of WMO. She expressed her appreciation to the president of the Commission, Dr Thomas C. Peterson, for his tireless efforts in representing CCI in the WMO Executive Council and Congress sessions over the past eight years and his leadership in moving the Commission forward. She noted that the WMO future Strategic Plan, with a vision for 2030 aligned with the United Nations Sustainable Development Goals, highlights three overarching priorities on resilience to hazards, adaptation to climate change, and socioeconomic benefits from science-based information, and five long-term goals all requiring the Organization to work in an integrated, holistic manner.

2. The agenda of the session is provided in [Appendix 1](#).

3. The session adopted 11 resolutions (given in [Appendix 2](#)), two decisions (given in [Appendix 3](#)) and 12 recommendations (given in [Appendix 4](#)).

4. The Commission elected Ms Manola Brunet (Spain) as president and Ms Barbara Tapia Cortés (Chile) as vice-president.

5. The session was attended by representatives of 68 WMO Members and seven international organizations. Out of a total of 139 participants, 44 (32%) were women. The list of participants is given in [Appendix 5](#).

6. The Commission recognized the outstanding contributions and exceptional services of Dr Lisa Alexander (Australia) and Dr Simon Mason (United States of America) to the work of the Commission.

7. The Commission decided that its eighteenth session would be held in 2022.

8. The seventeenth session of CCI closed at 12.35 p.m. on 13 April 2018.

APPENDIX 1. AGENDA

1. ORGANIZATION OF THE SESSION

- 1.1 Opening of the session
- 1.2 Consideration of the report on credentials
- 1.3 Adoption of the agenda
- 1.4 Establishment of committees
- 1.5 Other organizational matters
- 1.6 Date and place of the eighteenth session
- 1.7 Closure of the session

2. REPORT OF THE PRESIDENT OF THE COMMISSION AND REVIEW OF PREVIOUS DECISIONS AND RESOLUTIONS

3. ELECTION OF OFFICERS

4. STRATEGIC CONTEXT

- 4.1 Strategic context
- 4.2 Relationship with other WMO activities

5. CONTRIBUTIONS BY THE COMMISSION TO CLIMATE-RELATED POLICY AND PRACTICE

- 5.1 Basic systems for climate services
- 5.2 Climate services delivery
- 5.3 Capacity development

6. WORKPLAN AND STRUCTURE

7. CERTIFICATES OF EXCELLENCE

8. ANY OTHER MATTERS

APPENDIX 2. RESOLUTIONS ADOPTED BY THE SESSION

Resolution 1 (CCI-17)

Approval of the report of the president of the Commission for Climatology

THE COMMISSION FOR CLIMATOLOGY,

Recalling Resolution 2 (CCI-16) – Working structure of the Commission for Climatology (2014–2018), including:

- (1) Annex 1 – Terms of reference of the president, vice-president, Management Group and Implementation Coordination Team,
- (2) Annex 2 – Open Panels of the Commission for Climatology Experts (OPACEs) and their substructures,

Noting WMO General Regulation 186 (2015 edition) on the duties of the president of the Commission,

Noting further the report of the president, which provides an overview of the progress of work in the Commission since its sixteenth session, covering the work of its Management Group, Implementation Coordination Team on the Climate Services Information System (ICT-CSIS) and five OPACEs,

Noting with satisfaction:

- (1) The extensive work of the five OPACEs, expert teams, task teams and rapporteurs,
- (2) The voluntary contributions of time and efforts of all the experts in their areas of expertise and knowledge,
- (3) That some CCI experts have been selected to be members of the Intergovernmental Panel on Climate Change (IPCC) Bureau during the current period, and/or will be contributing to or be lead authors on the IPCC Sixth Assessment Report, thereby sharing the experience and knowledge of the Commission globally,

Taking note that the president issued four circular letters during the intersessional period, through which he kept Commission members from National Meteorological and Hydrological Services and other bodies regularly informed on progress and related opportunities,

Noting with appreciation:

- (1) Facilitation by Members of the active participation of their experts in CCI activities,
- (2) Enhanced partnership and collaboration with other bodies and programmes, such as through the mechanism for WMO contributions to the Global Framework for Climate Services, contributing to increased synergy and improved delivery of guidance and support to Members,

Having examined:

- (1) Resolutions and decisions of the Seventeenth World Meteorological Congress (Cg-17),
- (2) Resolutions and decisions of the Executive Council, as contained in *Resolutions and Decisions of Congress and the Executive Council* (WMO-No. 508), updated in 2017,
- (3) Resolutions and recommendations of the Commission at its sixteenth session,

Having considered the guidelines, publications and other resources developed and issued under the auspices of the Commission during its sixteenth intersessional period, as listed in the annex to the present resolution, which effectively consolidate the volume of its work,

Having been informed of the activities of the five CCI OPACEs and ICT-CSIS,

Expressing appreciation for the dedicated efforts of the president, the vice-president, the OPACE co-chairpersons, the ICT-CSIS co-chairpersons, all the leads and members of expert teams and task teams, and rapporteurs supporting the working structure of the Commission, with respect to their individual contributions as well as collective achievements, as manifested in the outputs of the work of the Commission,

Satisfied with the accomplishments of the various teams, including many publications and guidelines, and that much of the work was well documented, including through peer-reviewed literature,

Decides to adopt the report of the president of the Commission submitted to its seventeenth session for inclusion in the final report,

Requests the Secretary-General to support wider dissemination and uptake of the CCI outputs, which are a fundamental contribution to the ability of WMO to provide high-quality technical and scientific support on climate matters to Members.

Annex to Resolution 1 (CCI-17)

List of guidelines and other publications of the Commission for Climatology produced during the sixteenth intersessional period

WMO Publications:

- (1) *Guidelines on Best Practices for Climate Data Rescue* (WMO-No. 1182, 2016);
- (2) *Climate Data Management System Specifications* (WMO-No. 1131, 2014);
- (3) *Guidelines for the Submission of the World Weather Records 2011+* (WMO-No. 1186, 2017);
- (4) *WMO Guidelines on Generating a Defined Set of National Climate Monitoring Products* (WMO-No. 1204, 2017);
- (5) *WMO Statement on the Status of the Global Climate in 2014* (WMO-No. 1152, 2015);
- (6) *WMO Statement on the Status of the Global Climate in 2015* (WMO-No. 1167, 2016);
- (7) *WMO Statement on the State of the Global Climate in 2016* (WMO-No. 1189, 2017);
- (8) *WMO Statement on the State of the Global Climate in 2017* (WMO-No. 1212, 2018);
- (9) *The Global Climate in 2011–2015* (WMO-No. 1179, 2016);
- (10) *WMO Guidelines on the Calculation of Climate Normals* (WMO-No. 1203, 2017);
- (11) *Challenges in the Transition from Conventional to Automatic Meteorological Observing Networks for Long-term Climate Records* (WMO-No. 1202, 2017);
- (12) *Heatwaves and Health: Guidance on Warning-System Development* (WMO-No. 1142, 2015), issued as a WMO/World Health Organization (WHO) joint publication;

- (13) Report on recommendations for the renovation of the WMO annual Statement on the State of the Global Climate (WCDMP-No. 84).

Other WMO Reports and Publications:

- (1) Guidelines on the definition, and monitoring of extreme weather and climate events (final draft);
- (2) Guidelines on homogenization (draft);
- (3) Guidelines on Data Quality Control (draft);
- (4) Guidance on Operational Seasonal Forecasting (in preparation);
- (5) Guidance on Verification of Operational Seasonal Climate Forecasts (final draft);
- (6) Guidance on Establishment and Operation of WMO Regional Climate Centres (draft);
- (7) WMO El Niño/La Niña updates 2014 (January, April, June, September, December);
- (8) WMO El Niño/La Niña updates 2015 (March, June, September, November);
- (9) WMO El Niño/La Niña updates 2016 (February, May, July, October);
- (10) WMO El Niño/La Niña updates 2017 (February, April, July, October, December);
- (11) Global Seasonal Climate Update (GSCU) (trial phase);
- (12) Concept Note on National Climate Outlook Forums (NCOFs) and National Climate Forums (NCFs);
- (13) CCI/CBS proposal for cataloguing high-impact events;
- (14) Conceptual Framework and Road map on a holistic approach for the User Interfaces for Climate Adaptation and Risk Management (draft);
- (15) Guidance on Good Practices for Climate Services User Engagement (final draft);
- (16) Guidelines for NMHSs to contribute to Climate Risk Management (CRM) (final draft);
- (17) Summary Report on Regional Climate Outlook Forums (RCOF) Worldwide (final draft);
- (18) Guidance on Regional Climate Outlook Forum (RCOF) operational practices (in preparation);
- (19) Contribution to the Guide to Integrated Urban Weather Environment Climate Services (in preparation);
- (20) Competencies for Provision of Climate Services – Resolution 5 (EC-68) and included in WMO *Technical Regulations* (WMO-No. 49), Volume I;
- (21) Guidelines for NMHSs on Capacity Development for Climate Services (draft);
- (22) Guidelines on Quality Management for Climate Services (final draft);
- (23) CCI Handbook on the Use of Communications and Social Media for Climate Services (draft);
- (24) Updated version of the third edition of the *Guide to Climatological Practices* (WMO-No. 100) (draft);

- (25) Climate Services Information System Technical Reference Document (final draft);
- (26) High Quality Global Data Management Framework for Climate, Concept of Operations;
- (27) Reference Manual on High Quality Global Data Management Framework for Climate (draft);
- (28) Data Rescue and Climate Data Management System resource plan;
- (29) Climate Data Management System User stories (draft);
- (30) Inventory of GFCS relevant data and products currently available from WMO global and regional centres and other major climate institutions.

Articles in Peer-Reviewed Journals:

- (1) Development of climate indices for sector-specific applications (submitted to *Weather and Climate Extremes*, 2017);
- (2) From urban meteorology, climate and environment research to integrated city services (*Urban Climate*, 2018);
- (3) Global and regional skill of the seasonal predictions by WMO Lead Centre for Long-Range Forecast Multi-Model Ensemble (*International Journal of Climatology*, 2015);
- (4) Evaluating Highest Temperature Extremes in the Antarctic (*Earth & Space Science News*, 2017);
- (5) Improving the use of climate information in decision-making (*Nature Climate Change*, 2017);
- (6) Towards a global land surface climate fiducial reference measurements network, (*International Journal of Climatology*, 2018);
- (7) International Climate Assessment & Dataset: Climate Services across Borders (*Bulletin of the American Meteorological Society*, January 2015, Vol. 96, No. 1);
- (8) Observed changes in temperature extremes over Asia and their attribution (*Climate Dynamics*, 2017);
- (9) WMO Assessment of Weather and Climate Mortality Extremes: Lightning, Tropical Cyclones, Tornadoes, and Hail (American Meteorological Society, 2017).

Web Portals and Online Support Materials:

- (1) International Climate Assessment and Dataset (ICA&D) web portal (<http://www.ecad.eu/icad.php>);
 - (2) International Data Rescue Portal (I-DARE) (<https://www.idare-portal.org/>);
 - (3) World Weather & Climate Extremes Archive web portal (<https://wmo.asu.edu/>);
 - (4) Software package CLIMPACT2 (<https://github.com/ARCCSS-extremes/climpact2>);
 - (5) Climate Services Toolkit (CST) (<http://www.wmo.int/cst/>);
 - (6) Repository of Quality Management Publications (http://qmc.mgm.gov.tr/useful_documents.aspx).
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Resolution 2 (CCI-17)

Strategic orientation of the Commission for Climatology

THE COMMISSION FOR CLIMATOLOGY,

Recalling:

- (1) Resolution 17 (Cg-XVI) – Implementation of the Climate Services Information System,
- (2) Resolution 1 (Cg-Ext.(2012)) – Implementation plan of the Global Framework for Climate Services,
- (3) Resolution 9 (Cg-17) – Identifiers for cataloguing extreme weather, water and climate events,
- (4) Resolution 15 (Cg-17) – World Climate Programme,
- (5) Resolution 16 (Cg-17) – Report of the sixteenth session of the Commission for Climatology,
- (6) Resolution 60 (Cg-17) – WMO policy for the international exchange of climate data and products to support the implementation of the Global Framework for Climate Services,
- (7) Resolution 64 (Cg-17) – Development of a results-based framework for WMO support to the implementation of the Global Framework for Climate Services,
- (8) Resolution 6 (EC-67) – A mechanism to advance WMO contribution to the Global Framework for Climate Services,
- (9) Resolution 1 (EC-68) – WMO support to the Paris Agreement,
- (10) Decision 16 (EC-68) – Country-focused results-based framework and mechanism for WMO contributions to the Global Framework for Climate Services,
- (11) Decision 27 (EC-68) – Exchange of data and products for the implementation of the Climate Services Information System,
- (12) Decision 7 (EC-69) – WMO support to implementation of the Paris Agreement,
- (13) Decision 10 (EC-69) – Climate Services Information System products to support United Nations system planning and WMO Members on seasonal to inter-annual timescales,
- (14) Decision 11 (EC-69) – Implementation of the country-focused results-based framework and mechanism for WMO contributions to the Global Framework for Climate Services,
- (15) Decision 13 (EC-69) – WMO support to implementation of Intergovernmental Panel on Climate Change activities,
- (16) Decision 15 (EC-69) – Strengthening regional- and global-scale Climate Services Information System operations,

Noting with satisfaction the enhanced relevance and impact of WMO involvement in the United Nations Framework Convention on Climate Change (UNFCCC) process, as seen most recently through the successful submissions of the WMO Greenhouse Gas Bulletin and statements on the State of the Global Climate to the UNFCCC Conference of the Parties at its twenty-second and twenty-third sessions,

Noting the interest expressed by the UNFCCC Subsidiary Body for Scientific and Technological Advice at its forty-seventh session (SBSTA-47) in the ongoing efforts by WMO and the Global

Climate Observing System programme (GCOS) to develop headline indicators of the state of the climate, as well as in the progress of GCOS and Global Framework for Climate Services (GFCS) implementation,

Noting also:

- (1) That SBSTA-47 appreciated the statements delivered by representatives of the Intergovernmental Panel on Climate Change (IPCC) and WMO at the opening ceremony of the twenty-third session of the Conference of the Parties (COP 23),
- (2) COP 23 Decision 5/CP.23 – Warsaw International Mechanism for Loss and Damage associated with Climate Change Impacts, which notes the concerns raised by Parties on the increasing frequency and severity of climate-related disasters that have affected many countries, and the urgent need to avert, minimize and address these impacts through comprehensive risk management approaches and early warning systems, and which invites United Nations and other relevant institutions to strengthen cooperation and collaboration, including through partnerships, in responding to Decision 5/CP.23 (operative paragraphs 1 and 15) related to the adverse effects of climate change, including extreme weather events and slow onset events,

Noting further:

- (1) That the Sendai Framework for Disaster Risk Reduction 2015–2030, adopted at the Third United Nations World Conference on Disaster Risk Reduction, held from 14 to 18 March 2015 in Sendai, Miyagi, Japan, recognizes that the achievement of the priorities for action under the Framework will require maintaining and strengthening in situ and remotely sensed Earth and climate observations; promoting the conduct of comprehensive surveys on multi-hazard disaster risks and the development of regional disaster risk assessments and maps, including climate change scenarios; and promoting the further development of and investment in effective, nationally compatible, regional multi-hazard early warning mechanisms, where relevant, in line with the GFCS; and that it calls on the United Nations and other international and regional organizations, international and regional financial institutions and donor agencies engaged in disaster risk reduction to support the implementation of the Framework, as well as to enhance the coordination of their strategies in this regard,
- (2) That the 2030 Agenda for Sustainable Development, adopted by the United Nations General Assembly on 25 September 2015, includes Sustainable Development Goals and targets which are highly sensitive to, and which in many cases make specific reference to, strengthening resilience to climate and related hydrometeorological phenomena,

Taking note of the increasing use by the United Nations system of products developed or enhanced through the work of the Commission, such as quarterly bulletins on the status of El Niño and the Southern Oscillation, and seasonal forecasts and monitoring and climate watch products from WMO Regional Climate Centres and Regional Climate Outlook Forums,

Having examined:

- (1) The priorities of WMO Members as expressed in their Nationally Determined Contributions to the UNFCCC Paris Agreement, which indicate a clear need for climate services support, including in the priority areas of the GFCS,
- (2) The status of Member capabilities for climate service delivery as documented by the mechanism for WMO contributions to the GFCS,

Having been informed that WMO and the UNFCCC Secretariat have signed a Memorandum of Understanding to provide a framework for (i) strategic collaboration in the areas of mitigation, adaptation and awareness-raising with respect to communication campaigns that improve understanding of, and motivate action on, climate change and sustainable development priorities, (ii) strengthened climate change leadership and engagement at the global, regional

and national levels, (iii) strengthened collaboration related to global and region-specific frameworks and mechanisms, including on capacity-building at the regional and national levels, (iv) research and evidence to support climate policymaking and climate-smart investment, through science, data, information and knowledge, and (v) technical cooperation related to data, tools and methods to improve climate products and services and their access for mitigation and adaptation action,

Having considered the emerging directions in the draft WMO Strategic and Operating Plans for the financial period 2020–2023, including a focus on climate services for climate-resilient development, through the expansion and broadening of the provision of policy- and decision-supporting climate information and services at all levels,

Convinced that the World Climate Programme (WCP), including the World Climate Services Programme (WCSP), which is guided by the Commission, as well as GCOS, the World Climate Research Programme (WCRP) and the Programme of Research on Climate Change Vulnerability, Impacts and Adaptation (PROVIA), can significantly contribute to the achievement of the goals and targets of the climate-related policies of the United Nations system, both in terms of support for climate-relevant policy processes and joint action as well as for the achievement of climate-relevant policy goals and targets by Members,

Satisfied that the Commission, through its work during its sixteenth intersessional period, has laid an appropriate foundation in this regard,

Mindful of the need to ensure coordinated and efficient support for climate-related understanding and decision-making both at the country level as well as in relevant high-level policy processes across the WCP, the GFCS and the IPCC,

Adopts a broad strategic direction for the Commission focused on the expansion and delivery of climate information and services at the national, regional and global levels to strengthen climate services for climate-resilient development, through making effective use of available resources;

Endorses a two-track approach: (i) of enhancing National Meteorological and Hydrological Services climate observations, data management and forecasting systems necessary to provide climate services, and developing methods, procedures, techniques, practices and products aimed at strengthening the climate services capabilities of Members, and (ii) for supporting climate-related joint action and high-level policy processes within the United Nations system, including the 2030 Agenda for Sustainable Development, the Paris Agreement on climate change, and the Sendai Framework for Disaster Risk Reduction 2015–2030;

Agrees:

- (1) To align its support to Members through the country-focused results-based framework and mechanism for WMO contributions to the GFCS efforts with that of other GFCS partner organizations;
 - (2) To guide WMO contributions to the WCSP, in alignment and coordination with those of the other WCP subprogrammes, to support the above-mentioned high-level policy processes of the United Nations system, including through complementary and consistent alignment with IPCC reports.
-

Resolution 3 (CCI-17)

Enhancing WMO Regional Climate Centre operations

THE COMMISSION FOR CLIMATOLOGY,

Recalling:

- (1) Resolution 4 (EC-LXI) – Establishment of Regional Climate Centres,
- (2) Resolution 7 (RA I-16), Decision 11 (RA II-16), Resolution 5 (RA III-16), Decision 11 (RA IV-17), Resolution 5 (RA V-16) and Decision RA VI-17/19 dealing with the implementation and coordination of Regional Climate Centres (RCCs) in the respective regions,
- (3) Decision 18 (EC-69) – Sub-seasonal and seasonal forecasting systems,

Noting the significant progress achieved during the last decade in the establishment and operation of RCCs in all regions through joint efforts of the Commission and the Commission for Basic Systems, in collaboration with the regional associations, to support and guide the establishment and designation of RCCs in all regions,

Noting further that the functions and criteria defined in the *Manual on the Global Data-processing and Forecasting System* (WMO-No. 485) have largely remained unchanged since their approval by the Executive Council at its sixty-first session in 2009,

Decides:

- (1) To revisit the mandatory and highly recommended functions of RCCs and the associated products and criteria as defined in the *Manual on the Global Data-processing and Forecasting System*, in close coordination with the Commission for Basic Systems and collaboration with the regional associations, and propose suitable updates and revisions, keeping in view the emerging requirements of the Climate Services Information System, research/operational advances and the needs and capabilities of the existing as well as proposed RCCs;
- (2) To finalize and publish technical guidance for the establishment and operation of RCCs and RCC Networks, as well as next-generation Regional Climate Outlook Forum (RCOF) operational practices, focusing on objective approaches to seasonal prediction;
- (3) To enhance the role of RCCs and WMO Regional Training Centres in the RCOF-associated training activities to make them more effective in capacity development at the national level.

Resolution 4 (CCI-17)

Climate data modernization

THE COMMISSION FOR CLIMATOLOGY,

Recalling:

- (1) Resolution 60 (Cg-17) – WMO policy for the international exchange of climate data and products to support the implementation of the Global Framework for Climate Services,

- (2) Resolution 34 (Cg-17) – Definition of standards for Climate Data Management Systems and their reference in the WMO Information System,

Recalling further that, according to the *Climate Data Management System Specifications* (WMO-No. 1131), climate data include not only Essential Climate Variable observations but also standard WMO products, gridded data, outputs from numerical models (for example, reanalysis, climate predictions and projections), and space-based and impact data,

Recognizing:

- (1) That the definitions of standards for climate data management should form an important building block of a long-term modernization process for climate data and related management practices and systems,
- (2) The importance of capacity development needs and provision of guidance to enable Members to fulfil their role in managing and exchanging the climate data that are required for the implementation of climate services,

Having been informed on the status of the implementation of the High Quality Global Data Management Framework for Climate (HQ-GDMFC),

Decides to endorse the Climate Data Management System strategy concept proposed by the Expert Team on Climate Data Management Systems, as outlined in the annex to the present resolution;

Agrees to explore the development of guidance on using volunteer observing networks, that is, observations made by individual volunteers outside the traditional WMO observing systems, in conjunction with the WMO Information System (WIS) and the WMO Integrated Global Observing System (WIGOS), in particular with respect to metadata and data management taking into account existing observing stations;

Further agrees that the reference Manual on HQ-GDMFC should be finalized, with a view to guiding Members on best practices in regard to climate data, including on terminology, definitions, dataset maturity assessment, data management operations, discovery and exchange, and that these aspects should be described appropriately in the WMO Technical Regulations, in particular those related to WIGOS and WIS.

Annex to Resolution 4 (CCI-17)

Climate data modernization

1. Climate Data Management System Strategy (Concept)

1.1 Summary of gap analysis

A CCI Expert Team on Climate Data Management Systems (ET-CDMS) survey revealed that WMO Members operate almost 100 different Climate Data Management Systems (CDMSs), developed in the absence of consistent WMO CDMS specifications. Based on this survey it is estimated that almost 50% of WMO Members face operational issues with their CDMS and almost 25% of Members do not use an electronic database to manage climate data.

1.2 Vision

The vision for Climate Data Management Systems (CDMSs) is to achieve a step-change in addressing capability required to respond to many questions of societal needs for climate

information and services; and acting nationally to implement and evolve interoperable and sustainable CDMSs that will address national requirements for climate data, and in addition help in addressing regional and global needs.

1.3 Concept of the Strategy

- (a) *Establishment of a sustained global framework for Climate Data Management including recommended practices and standards as well as CDMS related activities*

In view of the importance of well-managed climate data for almost all climate applications and services, ET-CDMS developed *Climate Data Management Specifications* (WMO-No. 1131) in alignment with WMO relevant technical regulations and the *Guide to Climatological Practices* (WMO-No. 100). Based on these, a framework is required that comprises a base collection of technologies, policies and institutional arrangements that facilitate the management of, and access to, consistent climate data, thereby establishing clear governance arrangements around CDMS activities; consistent community agreed formal data and process definitions; and metrics to measure CDMS improvements. Strengthened coordination to develop CDMS as an integral part of WMO overall information management will greatly facilitate the framework's evolution.

- (b) *CDMS rationalization*

It is considered very expensive and wasteful of resources to maintain and further develop a multitude of CDMSs worldwide, and to establish compliance to the above CDMS specifications. This element includes a revision of the current ways to develop and maintain CDMSs by establishing a coordinated close collaboration of partners involved including pooling resources to develop and maintain a single Reference open-source CDMS based on tested software practices.

- (c) *Coordination of CDMS deployment*

While CDMS implementation and maintenance in general constitutes a national responsibility of the NMHS, it is recognized as a basic element of capacity development for a number of developing countries. Coordination of CDMS deployment at global and regional levels will greatly improve efficiency by providing a supportive environment and facilitating the gradual transition to next-generation CDMSs.

- (d) *Development of a CDMS communications plan*

The communication plan should ensure that a coordinated message is delivered to all NMHSs, international data centres and partners, including the GFCS Partners Advisory Committee, explaining why work is required to upgrade CDMSs, and what work is expected over what time frame for delivering timely and high-quality data for international programmes; in particular the World Climate Programme and GFCS.

Resolution 5 (CCI-17)

Systematic approach to climate service delivery

THE COMMISSION FOR CLIMATOLOGY,

Recalling Decision 42 (EC-68) – Implementation of the WMO Strategy for Service Delivery,

Recognizing recent advances in development and delivery of climate products, with improved underpinning of climate science and user engagement mechanisms,

Decides:

- (1) To provide guidance to integrate well-defined service delivery practices systematically into the implementation and operational plans for the Climate Services Information System (CSIS) as a contribution of the Commission to the implementation of the WMO Strategy for Service Delivery;
- (2) To include service delivery emanating from all the CSIS core functions: (i) climate data rescue, management and mining; (ii) climate analysis and monitoring; (iii) climate prediction; and (iv) climate projection; into further development of the CSIS Technical Reference as well as the Climate Services Toolkit as appropriate;

Further decides to develop a communication strategy for climate services delivery, which clarifies the roles and responsibilities of the communicating entities, to guide and enhance communication to support effective utilization of climate information for societal benefits, and also to reinforce the role of WMO as the authoritative voice of the United Nations system on climate.

Resolution 6 (CCI-17)

Contribution to WMO support for multi-hazard early warning systems

THE COMMISSION FOR CLIMATOLOGY,

Recalling Resolution 10 (Cg-17) – Sendai Framework for Disaster Risk Reduction 2015–2030 and WMO participation in the International Network for Multi-hazard Early Warning Systems,

Noting the emphasis of Resolution 10 (Cg-17) on the role of the technical commissions, in particular, to assist with the development of science-based methodologies and tools to support Multi-hazard Early Warning Systems (MHEWS),

Decides to contribute to the WMO efforts in MHEWS in the following areas:

- (1) Implementation of a Climate Watch System using the existing WMO [Guidelines on Climate Watches](#) and through developing updated versions;
- (2) Guidance for cataloguing high-impact events at the regional and national levels in cooperation with the Inter-Programme Task Team on Cataloguing Extreme Weather, Water and Climate Events, taking into account regional characteristics.

Resolution 7 (CCI-17)

Enhancing the WMO Statement on the State of the Global Climate

THE COMMISSION FOR CLIMATOLOGY,

Recalling Decision 9 (EC-69) – Strengthening WMO Statement on the State of the Global Climate,

Recognizing:

- (1) That the annual WMO Statement on the State of the Global Climate constitutes the WMO authoritative global synthesis of best available analysis and scientific information, with indicators for tracking climate trends, variability, and extremes and their impacts,
- (2) The importance of the Statement in complementing the assessment reports of the Intergovernmental Panel on Climate Change, which are issued every five to seven years,
- (3) The importance for the Statement to meet the scientific and policy requirements that emerge from the high-level events and processes as described above,
- (4) The need to address difficulties and challenges due to knowledge and capability gaps in areas such as rapid attribution of individual extreme weather and climate events to climate drivers and anthropogenic factors, consistent data on impacts, defining common baselines used for referring climate variability and change,

Welcomes the recommendations of the expert meeting on the WMO Statement on the State of the Global Climate, held in Geneva on 20 and 21 February 2017, which provided a pathway for improving the content and process of the Statement;

Decides to strengthen the role of the Commission in leading the innovation of the WMO Statement on the State of the Global Climate, as reflected in the annex to the present resolution;

Requests the Secretary-General to make the necessary arrangements for improving the review process and feedback from Members in an effective and timely manner through their focal points.

Annex to Resolution 7 (CCI-17)**Role of the Commission for Climatology in leading the innovation of the WMO statements on the state of the global climate****1. Emerging needs and requirements**

The expert meeting on the WMO Statements on the State of the Global Climate, Geneva, 20–21 February 2017, provided a pathway towards addressing, inter alia, scientific questions as well as improving the content with inclusion of impact information from relevant United Nations Agencies authoritative sources. The meeting scoped an innovative approach in the provision of the WMO Statements on the State of the Global Climate (WCDMP-No. 84, February 2017), including:

- (a) Identification of policy-relevant climate indicators on which to focus in the Statement;
- (b) Harmonization of reference periods and baselines;
- (c) Approach for informing on attribution and open science issues;
- (d) Intersection of IPCC reports and multi-year Statements;
- (e) Associated impact information, United Nations agency input, country inputs and other sources;
- (f) New mechanism for authoring, contributing and reviewing the publication;
- (g) Citation and reference issues;

- (h) Liaison with IPCC on CCI expert involvement in IPCC reports and their collaboration with IPCC Working Groups for reviewing the Statement.

2. The role of the Commission for Climatology

In addressing the needs and requirements as summarized above, the Commission for Climatology will see its role expanding to include ensuring science adequacy and policy relevancy of the WMO Statements on the State of the Global Climate. The role will include:

- (a) Provide guidance, expert contribution and scientific coordination required for submitting the state of the global climate on a regular basis at sessions of SBSTA (reference invitation made by the UNFCCC to the WMO at the COP 22 held in Marrakech, 6–13 November 2016);
- (b) Strengthen the WMO Annual Statement on the State of the Global Climate by adding, when feasible, information which requires multi-year analysis, such as carbon and sea-level budgets and multi-year prolonged droughts, and to provide impacts information in partnership with United Nations and other relevant agencies (Decision 9 (EC-69));
- (c) Collaborate with the WMO Secretariat, GCOS, IPCC, JCOMM and WCRP on summarizing key findings on the headline climate indicators reflected in the WMO Statements and those reflected in the IPCC reports to ensure consistency and policy relevance;
- (d) Provide enhanced and timely guidance for Members' contributions and feedback.

Resolution 8 (CCI-17)

Climate information for policy processes and decision support

THE COMMISSION FOR CLIMATOLOGY,

Recalling:

- (1) Resolution 1 (EC-68) – WMO support to the Paris Agreement,
- (2) Decision 7 (EC-69) – WMO support to implementation of the Paris Agreement,

Decides to develop guidance material for Members on providing climate information for policy processes and decision support, on the past, present and future status of key climate features, such as headline indicators on the state of the climate system, sector-specific climate indices and extreme climate events.

Resolution 9 (CCI-17)

Tailored and seamless climate services

THE COMMISSION FOR CLIMATOLOGY,

Recalling:

- (1) Resolution 17 (EC-69) – Seamless Data-processing and Forecasting System,

(2) Decision 4 (EC-69) – Impact-based decision support services,

Noting that a number of National Meteorological and Hydrological Services have established user interface mechanisms to regularly deliver tailored climate services in support of decision-making,

Decides:

- (1) To examine needs and develop guidance for design and delivery of tailored products and services across all timescales (historical past, present, short-term, sub-seasonal, seasonal, decadal and multi-decadal to century scales), and explore development of generic tools for production and delivery of such products;
 - (2) To provide guidance and technical advice on producing tailored climate information, including sector-specific climate indices and downscaled products, based on the good practices reflected in the aforesaid guidance;
 - (3) To ensure improved climate services delivery at the regional and national scales by communicating tailored products and services for user-level decision-making as well as for weather and climate risk management, through regional and national user interface mechanisms, including regional and national climate forums.
-

Resolution 10 (CCI-17)

Working structure of the Commission for Climatology (2018–2022)

THE COMMISSION FOR CLIMATOLOGY,

Having considered the report of the president of the Commission,

Having decided on:

- (1) The strategic direction for the Commission and its relationship with other WMO activities,
- (2) The deliverables of the Commission for its seventeenth intersessional period,

Considering the ongoing WMO governance review including review of the constituent body constructs, and its relationship to the ongoing work and planned deliverables of the Commission,

Decides to constitute the working structure of the Commission, with immediate effect, as follows:

- (1) CCI Management Group;
- (2) Focus Area 1: Climate Monitoring, Data and Assessment;
- (3) Focus Area 2: Climate Services Information System (CSIS) Operations;
- (4) Focus Area 3: Climate Services for Societal Benefits;
- (5) Focus Area 4: Capacity Development for Climate Services;
- (6) Implementation Coordination Team for Climate Services Information System (ICT-CSIS);

- (7) Adviser on minimum requirements for specific climate applications on using non-NMHSs and volunteer networks;

Further decides:

- (1) To adopt the terms of reference for the president, vice-president, Management Group, focus area chairpersons, ICT-CSIS and substructures, as described in Annex 1 to the present resolution;
- (2) To establish expert teams, task teams and rapporteurs reporting to each of the respective focus areas and deliverables, as described in Annex 2 to the present resolution.

Note: This resolution replaces Resolution 2 (CCI-16), which is no longer in force.

Annex 1 to Resolution 10 (CCI-17)

Commission for Climatology structure for the seventeenth intersessional period (2018–2022)

1. TERMS OF REFERENCE OF THE PRESIDENT OF CCI

- (a) Undertake the duties required of a president of a WMO Technical Commission in accordance with WMO General Regulation 186;
- (b) Provide technical direction to the Commission's activities and ensure coordination of the deliverables of the Focus Areas and designate a substitute if any co-chairperson of the Focus Areas is unable to continue in that role, relying on General Regulation 33 for the appropriate guidance;
- (c) Ensure coordination and integration of the work of the Commission with that of other relevant WMO activities;
- (d) Promote the recognition of and increase awareness about the role of the Commission and WMO in climate, particularly with respect to the role of WMO in the World Climate Programme (WCP), Global Framework for Climate Services (GFCS) and Intergovernmental Panel on Climate Change (IPCC);
- (e) Provide input, presentations and reports, as required, to WMO constituent body sessions, particularly the Executive Council and Congress;
- (f) Maintain regular communication with the members of CCI in the activities of the Commission (e.g., through newsletters).

2. TERMS OF REFERENCE OF THE VICE-PRESIDENT OF CCI

- (a) Assist the president of the Commission and lead the activities assigned by the president as and when required;
- (b) Provide oversight and guidance to the ICT-CSIS, ensuring the alignment of all Focus Areas in this regard, and advise the president on the GFCS governance aspects relevant to the CSIS;
- (c) Ensure effective communications between the CCI Management Group and regional working groups and rapporteurs on their climate activities and priorities, especially before sessions of WMO constituent bodies addressing climate-related matters;

- (d) Liaise with the Focus Areas co-chairpersons in implementation of their workplans, seek solutions for and advise on overcoming problems in completion of the agreed tasks, in consultation with the president, the CCI MG and the Secretariat.

3. TERMS OF REFERENCE OF THE CCI MANAGEMENT GROUP (CCI MG)

- (a) Review and decide upon priorities for the tasks to be undertaken by the Focus Areas, endorse workplans, taking into account recommendations of the Commission at its seventeenth session and the resource implications; assess and evaluate the progress achieved and provide continuing guidance on timelines for their work and outputs;
- (b) Keep under review the internal structure and working methods of the Commission and make adjustments to the working structure in the intersessional period including the establishment, activation or disbanding of teams and rapporteurs as necessary, and refining/elaborating their terms of reference based on the core concepts provided in this resolution;
- (c) Advise the president of the Commission on the designation of expert team leaders, and on requirements arising between its sessions;
- (d) Advise the president of the Commission on matters related to cooperation with other technical commissions and support to other WMO and co-sponsored programmes;
- (e) Promote and maintain close linkages with other relevant WMO activities, as well as those of other organizations and their activities, on climate-related matters.

3.1 Composition of the Management Group

The CCI MG shall include the president, the vice-president, the co-chairpersons of Focus Areas 1 through 4 and the chairperson of ICT-CSIS. The following co-chairpersons of Focus Areas and the chairperson of ICT-CSIS, selected in accordance with WMO General Regulation 32, are deemed to be members of CCI MG:

Focus Area 1: Climate Monitoring, Data and Assessment

Co-chairperson: Mr William Wright (Australia)

Co-chairperson: Ms Fatima Driouech (Morocco)

Co-chairperson: Mr Jia Xiaolong (China)

Focus Area 2: Climate Services Information System (CSIS) Operations

Co-chairperson: Mr Jean-Pierre Céron (France)

Co-chairperson: Mr Akihiko Shimpo (Japan)

Focus Area 3: Climate Services for Societal Benefits

Co-chairperson: Mr Rodney Martinez (Ecuador)

Co-chairperson: Mr Andrew Tait (New Zealand)

Focus Area 4: Capacity Development for Climate Services

Co-chairperson: Ms Charlotte McBride (South Africa)

Co-chairperson: Ms Tanja Cegnar (Slovenia)

Implementation Coordination Team on Climate Services Information System (ICT-CSIS)

Chairperson: Mr Roger Pulwarty (United States of America)

Adviser on minimum requirements for specific climate applications on using non-NMHSs and volunteer networks

Mr Henry Reges (United States of America)

3.2 Mode of operation of the Management Group

- (a) The CCI MG, subject to available resources, should meet annually, or at least three times during the intersessional period, but should carry out most of its work by correspondence or by teleconference whenever possible;
- (b) In order to harmonize regional activities and priorities in climate matters and to ensure consideration of regional interests in the work of the Commission, the regional representatives would be invited to at least one session of the Management Group during the intersessional period, preferably the first meeting at which the priorities of the work programme are established. These regional experts may be from Regional Association (RA) working groups or subgroups on climate-related matters, or may be another climate expert appointed for this purpose by the president of the concerned RA;
- (c) The president may invite to its sessions individual Expert Team/group leaders or rapporteurs that report to the CCI Management Group, and/or experts on specific major issues, subject to the agenda and availability of funds.

Annex 2 to Resolution 10 (CCI-17)

Focus areas of the Commission for Climatology and their substructures

FOCUS AREA 1: CLIMATE MONITORING, DATA AND ASSESSMENT

1.1 Rapporteur on developing reference observing networks and long-term observing stations

Mission: *Provide guidance on requirements and criteria for developing reference observing networks for climate monitoring, assessment and services, with a special focus on climate change aspects*

Terms of Reference:

- (a) Review the current Status of observing networks and their suitability for climate science and applications;
- (b) Recommend ways for collaboration, as appropriate, with observation programmes (GCOS, WIGOS), for developing guidance on requirements and criteria for developing and sustaining reference observing networks (Special focus on climate change aspects);
- (c) Liaise with the Secretariat on the ad hoc mechanism for centennial observing stations.

Deliverables:

- (a) Guidance on developing and sustaining reference observing networks for climate monitoring, assessment and services;

- (b) Issuance of recommendations on proposed list of candidate stations to be adopted by the WMO centennial stations mechanism.

1.2 Expert Team on Data Development and Stewardship

Mission: *Provide guidance on quality control, homogeneity, uncertainty, traceability and maturity of climate data, and liaise with other programmes to pursue unified approaches to manage data for climate services*

Terms of Reference:

- (a) Review and provide guidance on good practices, tools and training on QC, homogenization, uncertainty, traceability and maturity of climate data (including in situ and remote sensed);
- (b) Develop, maintain and update a catalogue of maturity-assessed climate datasets;
- (c) Provide guidance on climate time-series maturity, including their homogenization requirements as a contribution to ongoing efforts for establishing global land surface climate fiducial reference network;
- (d) Provide guidance for and monitor the provision of global datasets that are required for international exchange (i.e. Climate Normals, WWRs, CLIMAT, Daily CLIMAT);
- (e) Review the result of a one-year trial phase for the international exchange of daily climate observations via new monthly CLIMAT message;
- (f) Collaborate with other programmes on unified approach for managing data in support of climate activities and services building on IPET-CDMP legacy and the emerging new WIS concepts (WIS2.0).

Deliverables:

- (a) Development, maintenance and update of a catalogue of maturity-assessed climate datasets;
- (b) Guidelines on climate time-series maturity, including their homogenization requirements;
- (c) Guidelines on homogenization methods and the requirements for their application;
- (d) Guidance on training modules and curriculums on climate data issues;
- (e) Finalization of the reference manual on High Quality Data Management Framework for Climate (HQ-GDMFC) and recommendations on WMO technical regulations through the WIS.

1.3 Expert Team on Data Rescue and Management

Mission: *Oversee and monitor Data Rescue and Climate Data Management Systems activities worldwide and provide guidance on related implementation aspects*

Terms of Reference:

- (a) Oversee the implementation of the WMO international Data Rescue initiative;
- (b) Maintain and update a pool of experts and develop guidelines on expertise to help in implementing Data Rescue and CDMS projects;
- (c) Maintain and update CDMS specs;

- (d) Develop innovative approaches for monitoring climate data management implementation and certifying compliance with CDMS specification.

Deliverables:

- (a) Evaluation and Monitoring of DARE using I-DARE portal;
- (b) Finalize CDMS Strategy and recommendations for collaboration with Members and the industry on the development of a WMO reference open-source CDMS;
- (c) Guidance and expertise for implementing data rescue and CDMS projects in the countries.

1.4 Working Group on Climate Data Exchange

Mission: *Support implementation of and compliance with Resolution 60 (Cg-17), including through review and definitions of data requirements as well as promotion of mechanisms and incentives*

Terms of Reference:

- (a) Review of requirements for data and products exchange for climate in collaboration with ICT-CSIS;
- (b) Promote mechanisms for and provide advice on incentives for sharing all types of data and products under Resolution 60 (Cg-17);
- (c) Collaborate with CBS on defining technical requirements for registering, coding and exchanging climate data using international standards and the WIS;
- (d) Promote international collaboration on data utilization and sharing between NMHSs and international data centres and initiatives.

Deliverables:

- (a) Provide statistics on progress made in the implementation of Resolution 60 (Cg-17);
- (b) Recommendations on accelerating compliance with Resolution 60 (Cg-17).

1.5 Expert Team on WMO Climate Statements

Mission: *Support regular and high-quality policy-relevant WMO Climate Statements, ensure synergy with IPCC and GCOS on climate indicators, lead assessments of world records on weather and climate extremes and guide use of climate and climate change information for policymakers*

Terms of Reference:

- (a) Oversee the further development and provision of the WMO Statements on the State of the Global climate with consideration of high-level policy requirements and assist the Secretariat for producing these statements;
- (b) Liaise with IPCC and GCOS on climate indicators;
- (c) Ensure leadership for assessing world records on weather and climate extremes;
- (d) Liaise with Focus area 4 and WMO Communication and Public Affairs Office on climate change communication aspects.

Deliverables:

- (a) Publication of high-quality climate statements;
- (b) Evaluation of World records on weather and climate extremes and maintain their database.

1.6 Expert Team on Operational Climate Monitoring

Mission: *Provide guidance to NMHSs and RCCs on tools, techniques and software for operational climate monitoring and assessment related products, including the promotion of the use of remote sensed data*

Terms of Reference:

- (a) Provide advice on the use of remote sensed data and products in climate monitoring and participate in designing related activities in close collaboration with the WMO Space Programme and GCOS;
- (b) Assess the progress made and challenges in operationalizing new daily CLIMAT, NCMPs, CCDI through CBS infrastructure (WIS and GDPFS);
- (c) Provide guidance to NMHS and RCCs on tools, techniques and software for generating datasets and products for supporting CSIS;
- (d) Liaise with CBS and Regional Associations on the implementation of climate watches and related systems such as for cataloguing high-impact weather, water and climate and related databases in support of WMO MHEWS;
- (e) Provide guidance to NMHSs and RCCs on emerging methods for rapid attribution.

Deliverables:

- (a) Guidance on the use of satellite and radar data and products for climate monitoring and assessment;
- (b) Operationalization and exchange of WWRs, ETCCDI-indices, NCMPs and Climatological Standard Normals, including through capacity-building workshops and software support;
- (c) Status report on the implementation of climate watches and cataloguing high-impact events and its submission to the WMO relevant bodies dealing with MHEWS.

FOCUS AREA 2: CLIMATE SERVICES INFORMATION SYSTEM (CSIS) OPERATIONS**2.1 Inter-Programme Expert Team on Regional Climate Activities (Joint CCI/CBS)**

Mission: *Support RCC and RCOF operations, including technical guidance and assessment for formal designation of RCCs, on the entire range of CSIS functions*

Terms of Reference:

- (a) Steer work to help implement, designate and make effective operation of RCCs and RCC Networks, including supporting RCCs to keep up to date on evolving or new research or operational developments and undertake additional highly recommended functions such as regional climate change projections;
- (b) Keep under review the technical guidance for establishment and operation of RCCs;
- (c) Revisit the mandatory and highly recommended functions of RCCs and the associated products in the Manual on the GDPFS and propose suitable updates and revisions keeping in view the emerging requirements of the CSIS;

- (d) Identify and promote training needed to develop and deliver RCC and RCOF products and services for the improvement of climate services at regional level and for improved use of these products at country scale including through National Climate Outlook Forums (NCOFs);
- (e) Promote, in collaboration with CBS, the use of GPC and RCC forecast products at regional and national levels, including through regional optimizations and verification, and development of objective approaches to produce seasonal outlooks at RCOFs;
- (f) Oversee, guide and advise on key implementation matters for RCCs; advise president on applications for RCC designation in consultation with the relevant bodies of the regional associations and CBS; review and update the designation and evaluation processes for RCCs, and advise on their incorporation into the Manual on the GDPFS;
- (g) Develop technical guidance for enhancing, strengthening and expanding of the RCOF process through improved and standardized methods, tools and operational practices as well as objective protocols for verification and assessments;
- (h) Support the implementation of Global RCOF Review 2017 recommendations leading to the next-generation of RCOFs (RCOF v2.0) through, inter alia, new operational practices and guide on the expansion of RCOF product portfolio, including regional climate change projections.

Deliverables:

- (a) Updates on Guidance on establishment and operation of RCCs;
- (b) Review of RCC functions and recommendations on updates/revision/additions;
- (c) Assessment of RCC operations and advice on reporting process and designation/evaluation matters;
- (d) Concept of a Global workshop on RCC Operations;
- (e) Guidance on RCOF Operational Practices including expansion of RCOF product portfolio;
- (f) Recommendations on RCC/RCOF related capacity development.

2.2 Inter-Programme Expert Team on Operational Prediction from Sub-seasonal to Longer-time Scales (Joint CBS/CCI)

Mission: *Provide guidance on operational climate prediction on global scale and their optimal utilization at regional and national scales*

Terms of Reference:

Same as specified in Decision 33 (CBS-16).¹

Deliverables (CCI-relevant):

- (a) Guidance on Operational Seasonal Forecasting;
- (b) Technical coordination of Workshop series on Operational Climate Prediction;
- (c) Operationalization and further development of the Global Seasonal Climate Update (GSCU) including development of guidance on the use of GSCU;

¹ *Commission for Basic Systems: Abridged Final Report of the Sixteenth Session (WMO-No. 1183), pp. 157–158.*

- (d) Recommendations on CSIS functionality of operational prediction and its integration with the GDPFS.

2.3 Task Team on Climate Services Toolkit and Downscaling

Mission: *Lead the development and deployment of the Climate Services Toolkit on regional and national scales and development of guidance on downscaling of climate predictions and projections*

Terms of Reference:

- (a) Review the contents of the Climate Services Toolkit (CST) and recommend on revisions/updates/additions keeping in view the CSIS functional requirements;
- (b) Guide the further development of the CST portal including the organization of the elements and user interface, keeping in view the needs and capacities of the developing countries to deploy the CST;
- (c) Facilitate inclusion of high-quality inputs into the CST including through liaison with the relevant developers and make proposals for suitable WMO accreditation procedures for quality assurance;
- (d) Collaborate with experts within and outside of the Commission to finalize and guide the customization and deployment of the Climate Services Toolkit;
- (e) Develop guidance on calibration of sub-seasonal to seasonal prediction for national-level operations;
- (f) Facilitate good practices and standards in the production, interpretation and usage of downscaled climate prediction and climate change projections, including characterization of uncertainties for applications and decision-making.

Deliverables:

- (a) Further development of CST Portal;
- (b) Inventory of potential candidates for inclusion in CST and proposals for accreditation procedures;
- (c) Workshop concept for CST training;
- (d) Guidance on customization and deployment of Climate Services Toolkit;
- (e) Guidance on good practices and standards for the production, interpretation and usage of regional and national climate information including climate prediction and climate change scenarios, including characterization of uncertainties for applications and decision-making.

2.4 Expert Team on Tailoring Climate Information

This team is joint with Focus Area 3; see ET 3.4 for details.

FOCUS AREA 3: CLIMATE SERVICES FOR SOCIETAL BENEFITS

3.1 Expert Team on Climate Risk Management

Mission: *Demonstrate regional approaches to climate risk management and effective user engagement, and provide guidance on national implementation*

Terms of Reference:

- (a) Promote the Climate Risk Management (CRM) at the regional and national levels;
- (b) Develop a Regional CRM regional workshop concept, built on the CCI Guidance on CRM, UICS and sector-specific climate indices, to consider region-specific issues and recommend on consistent CRM practices;
- (c) Provide technical guidance for implementation of these workshops, including liaison with partners;
- (d) Identify and describe examples of good practices in CRM already in use in different parts of the world, particularly in GFCS priority sectors;
- (e) Develop a strategy for systematically implementing the concept of CRM by WMO Members, through training workshops, educational materials, preferably for e-learning, and practical tools to apply CRM principles.

Deliverables:

- (a) Concept and Technical guidance for Regional CRM workshops;
- (b) Strategy for national implementation of CRM by WMO Members including user engagement aspects;
- (c) Inventory of training resources to support CRM.

3.2 Expert Team on Sector-specific Climate Indices

Mission: *Enhance software tool for sector-specific climate indices, and expand the community of developers and facilitate customization to meet region-specific needs*

Terms of Reference:

- (a) Further develop the standardized software ClimPACT to generate sector-specific climate indices to define simple and complex climate risks and support its integration into the Climate Services Toolkit;
- (b) Extend set of indices produced by ClimPACT to include indices derived from other climate variables that are relevant for sector impacts;
- (c) Further promote the use of sector-specific climate indices to bring out variability and trends in climate;
- (d) Develop the training materials needed to raise capacity and promote uniform approaches around the world in applying these techniques;
- (e) Further develop outreach material including videos and factsheets to promote the use of sector-specific indices in decision-making process;
- (f) Lead and guide regional workshops building on the experience gained and lessons learned from the previous workshops;
- (g) Initiate setting up a developers working group for further improvement and customization to address regional needs.

Deliverables:

- (a) Updated version of ClimPACT tool incorporating additional features and indices;

- (b) Working group with regional representation established with specific tasks defined;
- (c) Outreach material to promote the utilization of sector-specific indices;
- (d) Contribute to the guidance for design and delivery of tailored products and services across all time scales (historical past to climate change projections).

3.3 Expert Team on National Frameworks for Climate Services (NFCS)

Mission: *Provide guidance on establishing NFCS including NCOFs, accessing relevant global/regional products, linking to National/Regional/Global Strategies, and complementing National Platforms for DRR and climate change adaptation, and putting into place a mechanism to monitor the engagement of social scientists, in collaboration with Focus Area 2.*

Terms of Reference:

- (a) Promote and guide establishment and monitoring of the National Framework for Climate Services, in close liaison with the GFCS;
- (b) Identify good practices as well as needs and gaps in conducting National Climate Outlook Forums/ National Climate Forums (NCOFs/NCFs) to ensure delivery of climate services;
- (c) Develop Guidance on NCOFs/NCFs as platforms for the implementation of GFCS at the national level;
- (d) Provide guidance for the implementation of NCOFs/NCFs in relation to GFCS;
- (e) Provide technical guidance to Members for establishment, implementation and monitoring of the CSIS at country level (in collaboration with the CBS).

Deliverables:

- (a) Recommendations on NFCS implementation and monitoring;
- (b) Guidance on National Climate Outlook Forums/ National Climate Forums (NCOFs/NCFs) as platforms for the implementation of GFCS at the national level;
- (c) Guidance on providing climate information at the national level for policy processes and decision support, on the past, present and future status of key climate features.

3.4 Expert Team on Tailoring Climate Information (This team is joint with Focus Area 2 and is the same team as ET 2.4)

Mission: *Provide guidance on the tailoring of climate information for user-level decision-making, including good practices on the applications of climate information*

Terms of Reference:

- (a) Collect and identify good practices and lessons learned from failures on production, delivery/communication and application of tailored climate information and services;
- (b) Examine needs for design and delivery of tailored products and services across all time scales (historical past to climate change projections);
- (c) Explore development of generic tools for producing such products;
- (d) Consolidate and finalize the principles for moving from basic climate information to a value added tailored climate service;

- (e) Explore measures and develop a concept of a workshop aimed at promoting principles and strengthening capacities for development and delivery of tailored climate services at regional and national levels.

Deliverables:

- (a) Guidance and technical advice on good practices for producing tailored climate information, including examples of success stories and lessons learned from failures, building on the work done during CCI-16;
- (b) Guidance for communication and delivery of tailored products and services across all time scales for policy and decision-making processes;
- (c) A workshop concept on promoting principles and strengthening capacities for development and delivery of tailored climate services;
- (d) Guide on the integration of climate service delivery practices systematically into the implementation and operational plans for the Climate Services Information System.

FOCUS AREA 4: CAPACITY DEVELOPMENT FOR CLIMATE SERVICES

4.1 Expert Team on Capacity Development for Service Delivery including Quality Management

Mission: *Liaise with Focus Area 3 to advise on capacity development for delivery of climate services by NMHSs and contribute to GFCS pillar in this area. Provide training material to facilitate implementation of Quality Management (QM) in climate services in NMHSs and provide guidance to NMHS transitioning to the new standard of ISO9001:2015.*

Terms of Reference:

- (a) Provide guidance on capacity development to NMHSs of developing countries, making use of the guidelines for NMHSs on Capacity Development for Climate Services;
- (b) Coordinate with other Expert Teams related to capacity development, including advising on new materials, tools, software and training, and improve accessibility and use of already existing guiding/regulatory material, tools, software, etc.;
- (c) Collect and develop training material to facilitate implementation of QM and the WMO Service Delivery Strategy for climate services in NMHSs;
- (d) Support twinning activities and lessons learned to facilitate the implementation of a quality management system in NMHS relating to CSIS;
- (e) Ensure close coordination with WMO bodies relevant to Quality Management System (QMS);
- (f) Maintain and upgrade website on CCI-QM hosted by Turkish State Meteorological Service (TSMS).

Deliverables:

- (a) Workplan for integrated capacity development for CSIS implementation in NMHSs;
- (b) Guidance on specification of QMS processes and Manual on QM for climate services in NMHSs;
- (c) Guidance and examples for implementation of the WMO Service Delivery Strategy relating to CSIS in NMHSs (including adherence to standards of the data, information and systems used to generate the products and services);

- (d) Short guidance document specifically to help ensure that standards are adhered to, and quality is maintained, by climate service providers (including the adherence of standards to the underlying data and information underpinning the services).

4.2 Task Team on the *Guide to Climatological Practices* (WMO-No. 100)

Mission: *To keep WMO Mandatory Publication, the Guide to Climatological Practices (WMO-No. 100), up to date and incorporating the current state of the science in the Guide*

Terms of Reference:

- (a) Continue updating the *Guide to Climatological Practices* (WMO-No. 100) reflecting new developments and new requirements through interaction with all Focus Areas;
- (b) Develop further new/modern approach taking into account new technical tools to bring guide closer to the climatologists and users, and facilitate its use.

Deliverables:

- (a) Updated figures, tables, sections and chapters of the Guide (WMO-No. 100), as required during the seventeenth intersessional period;
- (b) Recommendations on further development of the Guide.

4.3 Expert Team on Human Resources Development

Mission: *Provide guidance on implementation of competencies and performance criteria for climate services. Advise on curriculum and training modules for climatology to be used by Regional Training Centres (RTCs) in coordination with WMO's Education and Training Programme (ETR)*

Terms of Reference:

- (a) Provide Guidelines for the Assessment of Competencies for the Provision of Climate Services;
- (b) Develop, in cooperation with RTCs, a Basic Instructional Package for Climate Services (BIP-CS) based on the approved Competency Framework and the associated learning outcomes, in a way that is practical for a general qualification and a University Curriculum;
- (c) Liaise with other focus areas to enhance training materials in the context of existing competencies taking account of NMHSs requirements;
- (d) Advise on implementation of competencies, collect and share information about verifications and acknowledgements of competencies (like Seal of Approval, Chartered meteorologists/climatologists);
- (e) Increase accessibility and facilitate the choice of existing training materials in cooperation with training centres, COMET, EUMETCAL, WMO Global Campus and WMO Learn, Copernicus Training;
- (f) Investigate the existing mentoring options for climatologists and advise on the potential development of one under the WMO umbrella.

Deliverables:

- (a) To develop a Basic Instructional Package for Climate Services (BIP-CS) to guide curriculum development and assist in standardizing the education and training on climate services, within the WMO RTC network and at other training centres;

- (b) To finalize the CCI Guidelines for the Assessment of Competencies for Provision of Climate Services, with a focus on learning outcomes, to complement the WMO *Guide to Competency* (WMO-No. 1205, 2018) climate services area;
- (c) Collect input for an open-access repository of climate training course materials and e-courses.

4.4 Expert Team on Communication and Outreach

Mission: *Advise on the best communication skills and policy on climate information in coordination with the WMO Secretariat and its co-sponsored bodies (e.g. IPCC, GCOS, GFCS and WCRP)*

Terms of Reference:

- (a) Develop a concept of promotional material to improve visibility of CCI products and services;
- (b) Finalize the CCI Guidelines on communication for climate services including collection of examples of good practice for communication, information on training, mentoring, and screening opportunities;
- (c) Liaise with complementary institutions (e.g. IPCC, DRR, GCOS, Adaptation groups, GFCS, CBS OPAG-PWS) on communication and outreach activities related to climate and climate change;
- (d) Administer the already operating CCI FaceBook account under supervision of the WMO Secretariat and advise on the future of CCI Social Media account;
- (e) Work together with NHMSs to enhance use of new communication technologies to improve visibility and outreach of climate services.

Deliverable: Communication Strategy for Climate Services Delivery to guide and enhance communication to support effective utilization of climate information for societal benefits.

5. IMPLEMENTATION COORDINATION TEAM ON CLIMATE SERVICES INFORMATION SYSTEM (ICT-CSIS)

(Note: The membership of ICT-CSIS will be mainly composed of not more than two relevant Leads from each of the four CCI Focus Areas, and if needed, from other WMO Technical Commissions/co-sponsored bodies of WMO)

Mission: *Advise and coordinate across CCI, ensuring the involvement of all the Focus Areas, on developments and contributions to the CSIS in close liaison with GFCS implementation projects*

Terms of Reference:

- (a) Keep under review the features of the Climate Services Information System (CSIS) within the implementation plan of the GFCS, and identify potential CCI contributions thereto;
- (b) Advise and coordinate across CCI, involving all of the Focus Areas, on the further development, implementation and operation of the CSIS;
- (c) Keep under review and facilitate the exchange of climate data and products for service delivery that are expected of the CSIS at the global, regional and national levels;
- (d) Finalize the CSIS Technical Reference and liaise closely with CBS, WCRP and other relevant bodies, establishing additional formal structures as required, to ensure its integration into the GDPFS and WIS;

- (e) Provide guidance on user interface and capacity development aspects of CSIS to ensure effective integration of CSIS implementation within the overall GFCS implementation;
- (f) Coordinate National Climate Services Focal Points to facilitate communication of CSIS developments and assess needs and capacities for CSIS implementation at the national level;
- (g) Liaise closely with WMO Commissions and activities including the CHy, CAgM, and the GFCS to ensure integration with CSIS activities.

Deliverables:

- (a) CSIS Technical Reference;
- (b) Recommendations on CSIS integration into the GDPFS and WIS;
- (c) Guidance on user interface and capacity development for CSIS operations;
- (d) Report on needs and capacities for CSIS implementation at the national level;
- (e) Brochure on CCI contributions to CSIS.

6. ADVISER ON MINIMUM REQUIREMENTS FOR SPECIFIC CLIMATE APPLICATIONS ON USING NON-NMHSs AND VOLUNTEER NETWORKS

Mission: *Provide advice on the utility and requirements for implementing volunteer networks in support of climate products and services*

Terms of Reference:

- (a) Review the status of volunteer observing networks (VON) worldwide and their expansion;
- (b) Collaborate with other Focus areas and ICT-CSIS, on developing minimum data and metadata requirements for specific climate applications on using non-NMHSs and volunteer networks;
- (c) Liaise with observation programmes (GCOS, WIGOS, others as appropriate) and communicate CCI perspective on these networks.

Deliverable: WMO vision and policy statement on the utility, usability, sustainability and maintenance of VON and non-NMHSs observing networks.

Resolution 11 (CCI-17)

**Review of previous resolutions and recommendations of the
Commission for Climatology**

THE COMMISSION FOR CLIMATOLOGY,

Noting the previous resolutions and recommendations of the Commission and the actions taken thereon,

Decides to keep in force Resolution 1 (CCI-16);

Further decides:

- (1) Not to keep in force Resolutions 2 (CCI-16) and 3 (CCI-16);
- (2) Not to keep in force Recommendations 1 (CCI-16), 2 (CCI-16), 3 (CCI-16), 4 (CCI-16), 5 (CCI-16) and 6 (CCI-16).

Note: This resolution replaces Resolution 3 (CCI-16), which is no longer in force.

APPENDIX 3. DECISIONS ADOPTED BY THE SESSION

Decision 1 (CCI-17)

Organization of the session

THE COMMISSION FOR CLIMATOLOGY,

Having considered the provisional agenda proposed by the president of the Commission,

Approves the provisional agenda;

Further approves the report of the representative of the Secretary-General on credentials in accordance with WMO General Regulations 21 to 24 (2015 edition);

Adopts the establishment of committees for the duration of the session as follows:

(1) Coordination Committee:

Chairperson: President

Members: Chairperson of plenaries, representative of the Secretary-General, Secretariat staff, representative of local organizing committee

(2) Nomination Committee:

Co-Chairpersons: Mr Lianchun Song (China)

Ms Agata Imielska (Australia)

(3) Selection Committee:

Co-Chairpersons: Mr Serhat Sensoy (Turkey)

Mr Ardhasena Sopaheluwakan (Indonesia)

Members: Mr Mohamed Hajjej (Tunisia)

Mr Alphonse Kanga (Congo)

Mr Tsz-cheung Lee (Hong Kong, China)

Mr Ravi Shankar Nanjundiah (India)

Ms Madeleine Renom (Uruguay)

Mr Reinaldo Bomfim Da Silveira (Brazil)

Mr Adrian Trotman (British Caribbean Territories)

Ms Marjorie Shepherd (Canada)

Ms Agata Imielska (Australia)

Ms Valentina Khan (Russian Federation)

Agrees to the programme of work of the session:

(1) Working hours of the meetings: 9.30 a.m.–12.30 p.m. and 2.30 p.m.–5.30 p.m.;

(2) Arrangements and allocation of agenda items for the session;

Decides to suspend General Regulation 110 for the whole duration of the session to permit rapid processing of documents in accordance with General Regulation 3;

Decides that in conformance with General Regulation 112 summarized minutes are not required for the session.

Decision 2 (CCI-17)**Composition and terms of reference of the Selection Committee**

THE COMMISSION FOR CLIMATOLOGY,

Having reviewed WMO General Regulations 23 to 32 (2015 edition) and in particular Regulations 25, 31 and 32,

Decides that the Selection Committee will consist of up to two delegates from each WMO regional association, nominated through consultation among the members of the Commission from each regional association, with the terms of reference as described in the annex to the present decision.

Annex to Decision 2 (CCI-17)**Selection Committee****TERMS OF REFERENCE**

- (1) Elect a chairperson and co-chairperson;
 - (2) Review the qualifications of experts nominated to be experts of the Commission by Permanent Representatives with WMO in light of the draft working structures of the Commission;
 - (a) Propose Management Group members for adoption by the Commission;
 - (b) Propose experts for the working structures for further consideration by the Management Group when the working structures decided by the Commission are convened;
 - (3) Ensure regional and gender balance among the proposed Management Group members and other experts.
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APPENDIX 4. RECOMMENDATIONS ADOPTED BY THE SESSION

Recommendation 1 (CCI-17)

Review of Executive Council resolutions and decisions concerning the Commission for Climatology

THE COMMISSION FOR CLIMATOLOGY,

Having examined the Executive Council decisions and resolutions of the past sessions,

Recommends:

- (1) To keep in force the following Executive Council resolutions and decisions concerning the Commission for Climatology:
 - (a) Resolution 6 (EC-XXXVI) – International collection and publication of radiation data;
 - (b) Resolution 4 (EC-LX) – Role and terms of reference of the Meetings of Presidents of Technical Commissions;
 - (c) Resolution 4 (EC-LXI) – Establishment of Regional Climate Centres;
 - (d) Resolution 3 (EC-66) – Coordination between regional associations and technical commissions;
 - (e) Resolution 1 (EC-68) – WMO support to the Paris Agreement;
 - (f) Resolution 5 (EC-68) – Competencies for provision of climate services;
 - (g) Decision 4 (EC-68) – Systematic characterization and cataloguing of extreme weather, water and climate events and standardization of respective hazard information;
 - (h) Decision 16 (EC-68) – Country-focused results-based framework and mechanism for WMO contributions to the Global Framework for Climate Services;
 - (i) Decision 23 (EC-68) – Development of a Climate Service Toolkit;
 - (j) Decision 24 (EC-68) – National Climate Outlook Forums and National Climate Forums;
 - (k) Decision 28 (EC-68) – Operational implementation of a Global Seasonal Climate Update;
 - (l) Decision 39 (EC-68) – Climate Data Management Systems and data rescue resource plan;
 - (m) Decision 40 (EC-68) – WMO mechanism for the recognition of long-term observing stations;
 - (n) Decision 6 (EC-69) – Monitoring extreme weather and climate events from space;
 - (o) Decision 7 (EC-69) – WMO support to implementation of the Paris Agreement;
 - (p) Decision 9 (EC-69) – Strengthening WMO statement on the state of the global climate;
 - (q) Decision 10 (EC-69) – Climate Services Information System products to support United Nations system planning and WMO Members on seasonal to inter-annual timescales;

- (r) Decision 15 (EC-69) – Strengthening regional- and local-scale Climate Services Information System operations;
 - (s) Decision 16 (EC-69) – Deployment of the Climate Services Toolkit;
 - (t) Decision 17 (EC-69) – National implementation of the Climate Services Information System;
 - (u) Decision 18 (EC-69) – Sub-seasonal and seasonal forecasting systems;
 - (v) Decision 19 (EC-69) – International Data-rescue Initiative;
 - (w) Decision 20 (EC-69) – Clarification on the future of PROVIA and WMO participation in the United Nations Environment Programme–PROVIA Country-level Impacts of Climate Change project;
 - (x) Decision 46 (EC-69) – Development and implementation of the Arctic Polar Regional Climate Centre Network and of Polar Regional Climate Outlook Forums;
- (2) Not to keep in force the following Executive Council decisions and resolutions concerning the Commission for Climatology:
- (a) Resolution 5 (EC-64) – Joint mechanism to support implementation of the Climate Services Information System;
 - (b) Resolution 6 (EC-65) – Restructuring of the World Climate Programme: inclusion of the Programme of Research on Climate Change Vulnerability, Impacts and Adaptation as an additional component;
 - (c) Decision 26 (EC-68) – Inclusion of updated text on climatological normals in the *Guide to Climatological Practices* (WMO-No. 100).

Note: This recommendation replaces Recommendation 6 (CCI-16), which is no longer in force.

Recommendation 2 (CCI-17)

Strengthening the integration and coordination of WMO contributions to the provision of policy- and decision-supporting climate information and services

THE COMMISSION FOR CLIMATOLOGY,

Recalling:

- (1) Resolution 4 (EC-XLI) – Global climate change,
- (2) Resolution 15 (Cg-17) – World Climate Programme,
- (3) Resolution 60 (Cg-17) – WMO policy for the international exchange of climate data and products to support the implementation of the Global Framework for Climate Services,
- (4) Resolution 62 (Cg-17) – Relationship and interaction between the Intergovernmental Board on Climate Services and WMO constituent bodies,
- (5) Resolution 64 (Cg-17) – Development of a results-based framework for WMO support to the implementation of the Global Framework for Climate Services,

- (6) Decision 16 (EC-68) – Country-focused results-based framework and mechanism for WMO contributions to the Global Framework for Climate Services,
- (7) Decision 17 (EC-68) – WMO support to the implementation of activities of the Intergovernmental Panel on Climate Change,
- (8) Decision 7 (EC-69) – WMO support to implementation of the Paris Agreement,
- (9) Decision 11 (EC-69) – Implementation of the country-focused results-based framework and mechanism for WMO contributions to the Global Framework for Climate Services,

Recalling further:

- (1) That Resolution 15 (Cg-17);
 - (a) Reconstitutes the World Climate Programme (WCP) to be composed of the Global Climate Observing System (GCOS), the World Climate Research Programme (WCRP), the World Climate Services Programme (WCSP) and the Global Programme of Research on Climate Change Vulnerability, Impacts and Adaptation (PROVIA),
 - (b) Invites the WCRP, GCOS and PROVIA co-sponsors to support the programme and requests the Commission, the WCRP Joint Scientific Committee and the GCOS Steering Committee to ensure close cooperation with each other for effective implementation,
 - (c) Requests the Intergovernmental Board on Climate Services of the Global Framework for Climate Services (GFCS) to ensure that WCP, including all its components, is a key programme in GFCS delivery,
 - (d) Requests the Executive Council to ensure effective coordination among all the bodies responsible for WCP implementation, including through setting up of appropriate mechanisms therefor,
- (2) That Resolution 4 (EC-XLI) requests the Intergovernmental Panel on Climate Change (IPCC), in its assessment of climate science, to recommend improvements and augmentations of systematic climate observations, taking into account projects planned by the Commission, WCRP and other programmes,

Recognizing that broadening the provision of policy- and decision-supporting climate information and services through the Climate Services Information System is a multi-stakeholder undertaking involving:

- (1) Operational exchange of data and products among WMO national, regional and global centres,
- (2) Ongoing enhancement of observations, datasets and forecast models,
- (3) Consolidation and authentication of existing knowledge and generation of new knowledge,
- (4) Synthesis and translation of the latest knowledge into policy- and decision/support relevant actions,
- (5) Establishment and strengthening of sustainable operational systems that generate and deliver products and services based on this knowledge to end users to achieve improved climate-related outcomes,

Recognizing also in this regard:

- (1) The essential contributions of all four components of the WCP,

- (2) The operational responsibilities of National Meteorological and Hydrological Services and regional and global centres, and the key roles of climate forums at the regional and national levels for convening these and other stakeholders and aligning their efforts,
- (3) The particular roles of:
 - (a) The GFCS, in securing the engagement of international partner organizations in support of improved country-level climate-related development outcomes,
 - (b) The IPCC, in organizing the efforts of the scientific community to provide scientific assessments into the United Nations Framework Convention on Climate Change and other climate-related policy processes,
- (4) The many contributions of WMO regional associations and other technical commissions,

Recognizing further continuing needs for:

- (1) Synchronizing the efforts of operational WMO centres, including Regional Climate Centres and Global Producing Centres, to support the delivery of services at the country level by Members,
- (2) Ensuring global coordination of key climate-related processes such as regional and national climate forums, exchange of data and products, translating research results into operations, and developing and assembling inputs for policy-related products and services,

Recommends to strengthen the integration and coordination of WMO contributions to the provision of policy- and decision-supporting climate information and services, including with respect to:

- (1) An enlarged scope which encompasses the provision of services to high-level climate-related policy processes in addition to supporting country-level service delivery by Members, taking into account the current mechanism for WMO contributions to the GFCS, and ensuring a focus on delivering to the agreed WMO Strategic Plan and priorities;
- (2) Formalization of roles and responsibilities for ensuring effective coordination among all the bodies responsible for WCP implementation;
- (3) Representation from the governance structures of the GFCS and IPCC;
- (4) Engagement of the operational WMO entities of the Climate Services Information System, including Regional Climate Centres and Global Producing Centres, and other relevant organizations, programmes and initiatives with whom cooperation and coordination are needed to strengthen WMO contributions to the provision of policy- and decision-supporting climate information and services.

Recommendation 3 (CCI-17)

Continuation and strengthening of the work of the Commission for Climatology

THE COMMISSION FOR CLIMATOLOGY,

Recalling:

- (1) That the Seventeenth World Meteorological Congress had requested the Executive Council to provide recommendations to the Eighteenth Congress on constituent body constructs,

- (2) Decision 84 (EC-68) – Governance review,
- (3) Decision 68 (EC-69) – WMO constituent body reform,

Recommends that the ongoing work and planned deliverables of the Commission for Climatology be taken into account in the ongoing governance review, and that all necessary arrangements to ensure their continuity be incorporated into the governance review outcomes.

Recommendation 4 (CCI-17)

Climate Services Information System technical reference

THE COMMISSION FOR CLIMATOLOGY,

Recalling Resolution 17 (Cg-XVI) – Implementation of the Climate Services Information System,

Recalling further:

- (1) That the Executive Council at its sixty-fourth session had requested the Commission to scope out the development of a Climate Services Information System (CSIS) Technical Reference Manual, building on the existing WMO manuals and guides that could provide, inter alia, definitions, product elements and standards, technical procedures and organizational structures for the generation and dissemination of climate products and services,
- (2) That Decision 15 (EC-69) – Strengthening regional- and global-scale Climate Services Information System operations requests the Commission, inter alia, to work closely with the Commission for Basic Systems to ensure close alignment of CSIS operations with the relevant aspects of the WMO Integrated Global Observing System (WIGOS), the WMO Information System (WIS) and the Global Data-processing and Forecasting System (GDPFS),

Noting that the CCI Implementation Coordination Team for Climate Services Information System (ICT-CSIS) developed a [CSIS Technical Reference Document](#) that reflects the CSIS elements and mechanisms as well as functions,

Decides to further develop the CSIS Technical Reference aligned with the evolving underpinning development processes and implementation of the GDPFS, WIS and WIGOS, consolidating the contributions of the Commission, in close collaboration with CBS and other bodies relevant to CSIS functions and operations;

Invites the Commission for Basic Systems to consider, in consultation with CCI, identifying activities relevant to CSIS functions that are not defined, but appropriate to be defined, in the *Manual on the Global Data-processing and Forecasting System* (WMO-No. 485) to provide authentic and well-coordinated sources of global information to Members;

Requests the Secretary-General to facilitate inputs from other climate information providers into the CSIS, including research institutions, academia, multilateral organizations and the private sector, that provide open access of their climate information products and services to Members.

Recommendation 5 (CCI-17)

Trial phase for the international exchange of daily climate observations

THE COMMISSION FOR CLIMATOLOGY,

Recalling Resolution 60 (Cg-17) – WMO policy for the international exchange of climate data and products to support the implementation of the Global Framework for Climate Services,

Noting the recommendation of the Global Climate Observing System Atmospheric Observation Panel for Climate in 2012 for including daily observations in the monthly CLIMAT messages,

Noting further that the National Centers for Environmental Information of the National Oceanic and Atmospheric Administration (NOAA), in cooperation with the WMO Inter-Programme Expert Team on Data Representation Maintenance and Monitoring and the NOAA National Centers for Environmental Prediction, developed a template for transmission of daily climate observations in BUFR format, which was approved by the Commission for Basic Systems and subsequently incorporated in the *Manual on Codes* (WMO-No. 306), Volume I.2 as 3 07 074 – Supplemental daily temperature and precipitation values for monthly climate report,

Taking note of the endorsement by the Commission at its sixteenth session of the initiative to consider submission of daily data in the newly proposed monthly CLIMAT-type message, as set out in the *Abridged Final Report with Resolutions and Recommendations of the Sixteenth Session of the Commission for Climatology* (WMO-No. 1137), general summary, paragraph 10.6,

Having considered successful testing of the newly proposed monthly CLIMAT-type message by the United States of America with the cooperation of the United Kingdom of Great Britain and Northern Ireland and South Africa,

Recognizing the limited usefulness of SYNOP messages for climate purposes, mainly due to methodological weaknesses in the reporting of temperature extremes,

Recommends that a one-year trial phase of the international exchange of daily climate data be carried out, on a voluntary basis, by using the BUFR template 3 07 074 – Supplemental daily temperature and precipitation values for monthly climate report including:

- (a) Time of observation for temperature;
- (b) Daily maximum temperature;
- (c) Daily minimum temperature;
- (d) Daily mean temperature (if it differs from $(T_{min}+T_{max})/2$);
- (e) Time of observation for precipitation;
- (f) Total daily precipitation;
- (g) Depth of new snowfall;
- (h) Depth of total snow on the ground;

Agrees to conduct a review process to evaluate whether the purpose of the trial phase is achieved, the purpose of the trial phase being (i) to collect experiences from the Members in encoding and decoding the new CLIMAT message with a view to finalizing the coding aspects by the Commission for Basic Systems and CCI and (ii) to assess the reliability and efficiency of new CLIMAT messages and prospect the use of future dissemination formats such as XML;

Invites the Commission for Basic Systems, in consultation with CCI, to assist for the operational implementation of the trial phase of the new monthly CLIMAT-type message including the provision of a handbook on reporting practices in close collaboration with CCI.

Recommendation 6 (CCI-17)

Good practices in the use and interpretation of climate change projections on regional and national scales

THE COMMISSION FOR CLIMATOLOGY,

Recalling:

- (1) Decision 17 (EC-69) – National implementation of the Climate Services Information System operations,
- (2) Decision 18 (EC-69) – Sub-seasonal and seasonal forecasting systems,

Noting:

- (1) The increased use of regional climate change projections in the development of adaptation policy and planning at the national level, and the potential risks of misuse in the absence of appropriate guidance,
- (2) The role of Regional Climate Centres (RCCs) and Regional Climate Outlook Forums in promoting wider use and collaborative interpretation of climate predictions,
- (3) The ongoing collaborative efforts of the Commission for Climatology and the Commission for Basic Systems, particularly through the Inter-Programme Expert Team on Operational Predictions on Sub-seasonal to Longer-time Scales, to develop guidance on operational climate prediction with particular focus on regional and national scales,

Recognizing that there exists a gap in addressing the need for Members to access the best possible and authentic climate change information that is consistent across their respective regions with common climate drivers,

Decides to develop guidance on good practices for the production of regional and national climate change projections and their usage;

Invites WMO RCCs and RCC Networks to take up the highly recommended function on regional climate change projections to promote these good practices and consistent approaches to produce, interpret and use climate change projections on regional and national scales;

Further invites the World Climate Research Programme to facilitate easy user access to and interpretation and use of climate change projections at the global and regional scales, including outputs of the Coupled Model Intercomparison Project and the Coordinated Regional Climate Downscaling Experiment project.

Recommendation 7 (CCI-17)

Enhancing operational climate monitoring using the WMO standard infrastructure and regulatory framework

THE COMMISSION FOR CLIMATOLOGY,

Recalling:

- (1) Resolution 9 (Cg-17) – Identifiers for cataloguing extreme weather, water and climate events,
- (2) Decision 4 (EC-68) – Systematic characterization and cataloguing of extreme weather, water and climate events and standardization of respective hazard information,
- (3) Resolution 8 (EC-69) – Strategy and governance for the WMO Information System,

Recognizing that the provision and exchange of information on weather and climate extremes on an operational basis would constitute an important WMO contribution to the Sendai Framework for Disaster Risk Reduction 2015–2030 and climate adaptation efforts,

Noting with satisfaction the publication in 2017 of the [WMO Guidelines on Generating a Defined Set of National Climate Monitoring Products](#) (WMO-No. 1204), and completion in 2018 of the [draft guidelines](#) on the definition and monitoring of extreme weather and climate events,

Noting the WMO Information System (WIS) 2.0 strategy endorsed by the Executive Council at its sixty-ninth session, and understanding how this will change the way climate data, products and information will be discovered, accessed and exchanged in the future,

Invites the Commission for Basic Systems to provide technical advice, as deems useful for the operational climate monitoring activities (for example, on coding, data representation and metadata, using the WMO Information System (WIS) Global Information System Centres and Data Collection or Production Centres as well as on the continued evolution of WIS), for collecting and exchanging climate extreme indices, National Climate Monitoring Products and managing information on extreme events on an operational basis,

Agrees to ensure that the WMO standard infrastructure and regulatory framework will be used in the delivery of WMO climate data, information and products,

Requests the president of the Commission to facilitate collaboration of CCI with the Commission for Basic Systems in the development and implementation of WIS 2.0, to ensure that the requirements from CCI are understood and addressed.

Recommendation 8 (CCI-17)

Global Seasonal Climate Update operationalization

THE COMMISSION FOR CLIMATOLOGY,

Recalling Decision 28 (EC-68) – Operational implementation of a Global Seasonal Climate Update,

Noting with satisfaction the successful implementation of a Global Seasonal Climate Update (GSCU) by the CCI Task Team on Global Seasonal Climate Updates through the trial phase in near-real time, with its content as well as operational schedule being stabilized,

Decides:

- (1) To refine and finalize the content, production and delivery process of the Update based on external peer review recommendations and taking into account the needs expressed by National Meteorological and Hydrological Services and other potential users, such as Regional Climate Centres, Regional Climate Outlook Forums and entities in the United Nations system;
- (2) To develop a user guide for GSCU in consultation with National Meteorological and Hydrological Services and other potential users as appropriate;
- (3) To launch the operational issue of the GSCU upon the completion of implementing the decisions described in (1) and (2) above;

Invites:

- (1) The Commission for Basic Systems (CBS) to consider that further development and operational coordination of the GSCU be taken up under the responsibility of the CBS/CCI Inter-Programme Expert Team on Operational Predictions on Sub-seasonal to Longer-time Scales;
- (2) The WMO Lead Centre for Long-range Forecast Multi-model Ensemble (LC-LRFMME) jointly coordinated by the Korea Meteorological Administration and the National Oceanic and Atmospheric Administration to integrate GSCU production and dissemination into the LC-LRFMME operational schedule, and ensure timely provision of all relevant products and supplementary information to be included therein, and provide a mechanism for collecting and considering feedback from GSCU users.

Recommendation 9 (CCI-17)**Integrated capacity development process for
the Climate Services Information System**

THE COMMISSION FOR CLIMATOLOGY,

Recalling Resolution 50 (Cg-17) – Capacity Development Programme,

Noting:

- (1) That capacity development for climate services should encompass all elements of the climate services value chain, from climate data management, climate monitoring and prediction, to service delivery and communication of relevant products to end users, in compliance with the highest quality management standards,
- (2) That capacity development is a major cross-cutting pillar of the Global Framework for Climate Services (GFCS) which explicitly addresses institutional, infrastructural, procedural and human resource capacities,
- (3) That capacity development of National Meteorological and Hydrological Services (NMHSs) in terms of improved infrastructure and qualified human resources for the provision of better climate services should consider the presence of development agencies and regional organizations at the country level and find synergies and coordination with them, in particular with respect to training and other related activities,

Noting further the ongoing work by the Commission on the High Quality Global Data Management Framework for Climate, which provides guidance and best practice on data management and related capacity-building aspects,

Recognizing that major gaps still exist in human resource competencies and that training events should be result-oriented and tailored to the needs of NMHSs for improved provision of climate services,

Decides to initiate and implement an integrated capacity development process to support further the GFCS Climate Services Information System (CSIS) operationalization, with elements to include:

- (1) Strengthened collaboration and coordination of training activities across Regional Training Centres, other centres contributing to capacity development for climate services, and ad hoc training as organized by non-governmental organizations and other entities to leverage common training objectives, complemented by distance learning and training of trainers, through the WMO Global Campus;
- (2) Use of Regional Climate Centres, Regional Climate Outlook Forums and National Climate Outlook Forums/National Climate Forums to systematically identify and address capacity development requirements;
- (3) Hands-on implementation assistance via twinning with NMHSs that provide training services, coupled with deployment of the Climate Services Toolkit and experts;
- (4) Application of quality management standards for climate services;
- (5) Use of the updated edition of the *Guide to Climatological Practices* (WMO-No. 100) as a basis for the development of training material and to support the development of competencies for the provision of climate services;

Further decides to develop a capacity development plan for CSIS implementation, including outreach;

Invites the Global Framework for Climate Services, and other WMO technical commissions, especially the Commission for Basic Systems, the Commission for Agricultural Meteorology and the Commission for Hydrology, to collaborate with CCI on the Climate Services Information System;

Requests the Secretary-General to monitor climate services capacity improvements via the WMO climate services checklist, through the WMO country profile database.

Recommendation 10 (CCI-17)

Human resource development through implementation of competencies for provision of climate services

THE COMMISSION FOR CLIMATOLOGY,

Recalling Resolution 5 (EC-68) – Competencies for provision of climate services, and the annex thereto,

Recognizing that successful development of competencies for provision of climate services requires human resource allocation for climate services within National Meteorological and Hydrological Services and the necessary institutional structure for prioritizing climate services,

Decides:

- (1) To develop a Basic Instructional Package for Climate Services (BIP-CS) to guide curriculum development and assist in standardizing the education and training on climate services, within the WMO Regional Training Centre (RTC) network and at other training centres;
- (2) To finalize the Commission Guidelines for the Assessment of Competencies for Provision of Climate Services, addressing the diversity of users' capacities and sector-specific needs, with a focus on learning outcomes, to complement the climate services area in the *Guide to Competency* (WMO-No. 1205);

Invites:

- (1) Regional Training Centres to contribute to the development and delivery of the BIP-CS;
- (2) Regional Climate Centres to coordinate their training functions with RTCs and establish regular dialogue to improve their training activities, using opportunities such as Regional Climate Outlook Forums, including sector-oriented forums, as a platform for the provision of climate services and building the competencies needed to address sector-specific requirements.

Recommendation 11 (CCI-17)**Approval of the updated version of the third edition of the
Guide to Climatological Practices (WMO-No. 100)**

THE COMMISSION FOR CLIMATOLOGY,

Endorses the updated text of the third edition of the *Guide to Climatological Practices* (WMO-No. 100);

Decides to continue the review and update of the Guide by reflecting the latest advances in climate-related technical tools and methodologies;

Recommends that the updated text be incorporated into a revised third edition of the *Guide to Climatological Practices*.

Note: This recommendation replaces Recommendation 2 (CCI-16), which is no longer in force.

Recommendation 12 (CCI-17)**National focal points of the Climate Services Information System**

THE COMMISSION FOR CLIMATOLOGY,

Recalling:

- (1) Resolution 16 (Cg-17) – Report of the sixteenth session of the Commission for Climatology and Recommendation 5 (CCI-16) – National focal points of the Climate Services Information System,

- (2) Decision 11 (EC-69) – Implementation of the country-focused results-based framework and mechanism for WMO contributions to the Global Framework for Climate Services,

Recommends that the terms of reference for national focal points of the Climate Services Information System, as set forth in the annex to the present recommendation, be adopted and communicated to all Members.

Annex to Recommendation 12 (CCI-17)

National focal points of the Climate Services Information System

TERMS OF REFERENCE

National Focal Points of the Climate Services Information System (CSIS) are closely engaged with technical aspects of climate services implementation at the national level. Their designation does not supersede other technical focal points working on other technical aspects.

Key functions include:

- (1) Facilitate the functioning of the mechanism for WMO contributions to the Global Framework for Climate Services (GFCS) and the activities including to:
 - (a) Engage with partner organizations seeking to support the implementation of climate services;
 - (b) Implement the activities and outputs of the country-focused results-based framework for WMO contributions to the GFCS Objective 1 (Institutional, technical, financial and human resources mobilized for climate services planning, implementation and results monitoring targeting climate-sensitive national priorities);
 - (c) Prepare products relevant for high-level climate-related policy processes and United Nations system joint action, such as catalogues of high-impact events for tracking associated losses and damage, preparation of National Adaptation Plans and Nationally Determined Contributions to the Paris Agreement, and National Climate Monitoring Products;
 - (d) Keep under review the emerging features of the Climate Services Information System (CSIS) within the implementation of the GFCS at the national level and regularly report on the status and priority needs through updates to the checklist for climate services and WMO surveys contained in the WMO Country Profile Database;
 - (e) Prepare short- and long-term action plans for national level implementation of the Climate Services Information System (CSIS);
 - (f) Monitor capacity needs for CSIS operationalization and identify, and coordinate access to, relevant capacity development resources to address those needs, including through staff training, twinning arrangements with advanced services and expert deployments, national deployment of the Climate Services Toolkit, and engagement with Regional Climate Centres (RCCs) and Regional Climate Forums (RCFs);
- (2) Act as the primary contact point for liaising with WMO entities engaged in supporting climate services implementation at the national level – e.g. WMO and co-sponsored programmes, technical commission focal points, regional association working groups and focal points on climate and the GFCS, RCCs, and Global Producing Centres (GPCs) – and promote the alignment of the contributions of these entities towards addressing national climate services related technical priorities and needs.

APPENDIX 5. LIST OF PARTICIPANTS

1. Officers of the session

Thomas PETERSON	President of CCI
Barbara TAPIA (Ms)	Vice-president of CCI

2. WMO Members represented in the technical commission

Argentina

María de los Milagros SKANSI (Ms)	Principal Delegate
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Armenia

David KARAPETYAN	Principal Delegate
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Australia

David JONES	Principal Delegate
William WRIGHT	Alternate
Agata IMIELSKA (Ms)	Delegate
Roger STONE	Delegate

Austria

Marc OLEFS	Principal Delegate
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Bahamas

Mary BUTLER (Ms)	Principal Delegate
Morgan A. FERNANDER (Ms)	Delegate

Belgium

Christian TRICOT	Principal Delegate
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Benin

Pierre Adjakobinon DAKO	Principal Delegate
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Brazil

Antonio Divino MOURA	Principal Delegate
Reinaldo Bomfim DA SILVEIRA	Delegate
Antonio Vicente PEREIRA NETO	Delegate

British Caribbean Territories

Adrian TROTMAN	Principal Delegate
Cedric VAN MEERBEECK	Delegate

Canada

Marjorie SHEPHERD (Ms)	Principal Delegate
Jamie SMITH	Delegate

Côte d'Ivoire

Kouakou Bernard DJE	Principal Delegate
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Chile

Barbara TAPIA (Ms)	Principal Delegate
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China

Lianchun SONG	Principal Delegate
Zhiqiang GONG	Alternate
Rong GAO	Delegate
Yuyu REN (Ms)	Delegate
Jun YU	Delegate

Congo

Alphonse KANGA	Principal Delegate
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Croatia	
Tanja LIKSO (Ms)	Principal Delegate
Ksenija KALIN (Ms)	Delegate
Czechia	
Radim TOLASZ	Principal Delegate
Egypt	
Nasser SALEM	Principal Delegate
Mohammad ELSHAHED	Delegate
Ethiopia	
Fetene TESHOME	Principal Delegate
Finland	
Sami NIEMELÄ	Principal Delegate
France	
Patrick JOSSE	Principal Delegate
Jean-Pierre CÉRON	Delegate
Denis STUBER	Delegate
Georgia	
Lia MEGRELIDZE (Ms)	Principal Delegate
Germany	
Paul BECKER	Principal Delegate
Klaus-Jürgen SCHREIBER	Delegate
Guinea-Bissau	
Joao LONA TCHEDNA	Principal Delegate
Hong Kong, China	
Tsz-cheung LEE	Principal Delegate
India	
Ravi Shankar NANJUNDIAH	Principal Delegate
Indonesia	
Urip HARYOKO	Principal Delegate
Ardhasena SOPAHELUWAKAN	Alternate
Eko HERIYANTO	Delegate
Ireland	
Seamus WALSH	Principal Delegate
Israel	
Avner FURSHPAN	Principal Delegate
Italy	
Franco DESIATO	Principal Delegate
Marina BALDI (Ms)	Delegate
Fabrizio CICIULLA	Delegate
Andrea MERLONE	Delegate
Japan	
Yoshiaki SATO	Principal Delegate
Atsushi GOTO	Delegate
Akihiko SHIMPO	Delegate
Kazakhstan	
Svetlana DOLGIKH (Ms)	Principal Delegate
Muldir YESKALIYEVA (Ms)	Delegate

Libya

Ali EDDENJAL Principal Delegate

Malaysia

Wan Azli WAN HASSAN Principal Delegate

Mexico

Jorge L. VAZQUEZ-AGUIRRE Principal Delegate
Francisco VILLALPANDO Delegate

Morocco

Fatima DRIQUECH (Ms) Principal Delegate
Rachid SEBBARI Delegate

Myanmar

KYAW SOE Principal Delegate

Netherlands

Gerard SCHRIER VAN DER Principal Delegate

New Zealand

Andrew TAIT Principal Delegate

Norway

Hans Olav Kvaal HYGEN Principal Delegate
Stein BELDRING Delegate

Peru

Grinia Jesus AVALOS ROLDAN (Ms) Principal Delegate
Teresa GARCIA VILCA (Ms) Delegate

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Vanda PIRES (Ms) Principal Delegate

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Abdulla Mohammed AL MANNAI Principal Delegate
Abdulrahman Saleh Alansari AL-ANSARI Delegate
Tala AL-NAAMA Delegate

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Seonyeong BAK (Ms) Delegate
Kuhhee CHO Delegate
Myungjin HYUN (Ms) Delegate
YuKyung HYUN (Ms) Delegate
Seong-Chan PARK Delegate
Jinho YOO Delegate

Romania

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Russian Federation

Sergey TASENKO Principal Delegate
Vladimir KATTSOV Delegate
Valentina KHAN (Ms) Delegate

Serbia

Jasminka SMILAGIC (Ms) Principal Delegate

Slovakia

Pavel STASTNY Principal Delegate
Katarína MIKULOVÁ (Ms) Delegate

Slovenia

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Songkran AGSORN Principal Delegate

The former Yugoslav Republic of Macedonia

Nina ALEKSOVSKA (Ms) Principal Delegate

Togo

Latifou ISSAOU Principal Delegate

Trinidad and Tobago

Kenneth KERR Principal Delegate

Tunisia

Mohamed HAJJEJ Principal Delegate

Turkey

Serhat SENSOY Principal Delegate

Ukraine

Tetiana ADAMENKO (Ms) Principal Delegate

United Kingdom of Great Britain and Northern Ireland

Chris HEWITT Principal Delegate

Jane WARDLE (Ms) Alternate

Jane STRACHAN (Ms) Delegate

United Republic of Tanzania

Agnes KIJAZI (Ms) Principal Delegate

Wilbert Timiza MURUKE Alternate

Abilah Hassani NAMWAMBE Delegate

Hashim NG'ONGOLO Delegate

United States of America

Roger PULWARTY Principal Delegate

Shanna PITTEY (Ms) Alternate

Simon MASON Delegate

Wassila THIAW Delegate

Marina TIMOFYEVA-LIVEZEY (Ms) Delegate

Uruguay

Madeleine RENOM (Ms) Principal Delegate

Agustina CAMILLI (Ms) Delegate

Marcelo BARREIRO Delegate

3. WMO Members not represented in the technical commission

Bosnia and Herzegovina

Lucija LJUBIC LEPINE (Ms)	Principal Delegate
Dzenan ZULUM	Delegate

Montenegro

Mirjana IVANOV (Ms)	Principal Delegate
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Panama

Rolando Luis PINZON FUENTES	Principal Delegate
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Suriname

Sukarni MITRO SALLONS (Ms)	Principal Delegate
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4. Invited experts

Michel NIKIEMA
Christina LIEF (Ms)
John KENNEDY

5. Representatives of international organizations and other bodies

ACMAD

Andre KAMGA FOAMOUHOUE	Observer
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HMEI

Ladislav GAÁL	Observer
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ISB

Pablo F. DE ARROYABE H.	Observer
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IUGG

Arthur ASKEW	Observer
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UNESCO

Abdulaziz ALMUZAINI	Observer
Bobir TUKHTABAYEV	Observer

WFEO

Massimiliano CAPEZZALI	Observer
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World Bank

Daniel KULL	Observer
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