

# World Meteorological Congress

Abridged Final Report of the Eighteenth Session

Geneva

3–14 June 2019



WORLD  
METEOROLOGICAL  
ORGANIZATION



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# CONTENTS

Page

<b>GENERAL SUMMARY OF THE WORK OF THE SESSION</b> .....	1
<b>APPENDIX 1. AGENDA</b> .....	4
<b>APPENDIX 2. RESOLUTIONS ADOPTED BY THE SESSION</b> .....	6
1 WMO Strategic Plan .....	6
2 Maximum expenditure for the eighteenth financial period (2020–2023).....	25
3 Use of cash surplus arising from the seventeenth financial period (2016–2019).....	27
4 Designation of acting Vice-Presidents in between sessions of Congress .....	27
5 WMO Executive Council .....	28
6 WMO regional associations .....	29
7 Establishment of WMO technical commissions for the eighteenth financial period...	33
8 Research Board .....	45
9 Joint World Meteorological Organization-Intergovernmental Oceanographic Commission Collaborative Board.....	50
10 Scientific Advisory Panel.....	53
11 WMO reform - next phase.....	55
12 WMO methodology for cataloguing hazardous weather, climate, water and space weather events .....	56
13 WMO Global Multi-hazard Alert System .....	61
14 Development of the initial concept for the WMO coordination mechanism to support the humanitarian activities of the United Nations and other organizations .....	67
15 Strengthening multi-hazard early warning services in areas prone to all flooding types and severe weather.....	72
16 Guide(s) on the support of National Meteorological and Hydrological Services to their national multi-hazard early warning procedures, coordination mechanisms, systems and services.....	76
17 Ensuring integration of drought risk management in WMO activities.....	78
18 WMO contributions to the provision of agricultural meteorology information and services .....	79
19 Enhancing cooperation for monitoring and forecasting sand and dust storms .....	80
20 WMO contributions to the provision of climate information and services in support of policy and decision-making.....	82
21 Implementation of the Global Framework for Climate Services .....	84
22 Manual on <i>High-quality Global Data Management Framework for Climate</i> .....	87
23 Recognition of long-term observing stations.....	89
24 Vision, strategy and organizational arrangements for hydrology and water resources in WMO.....	90
25 Major hydrological initiatives.....	95
26 Provision of impact-based forecast and warning services in an innovative and integrated way .....	97
27 Report of the sixteenth session of the Commission for Aeronautical Meteorology ...	99
28 Long-term plan for aeronautical meteorology .....	101
29 Strengthening marine and coastal services .....	102

30	Exploring costing options for marine services in the future.....	104
31	Amendments to the <i>Technical Regulations</i> (WMO-No. 49), Volume I, Part IV - Meteorological services for marine activities.....	105
32	Advancing integrated urban services.....	106
33	Advancing integrated health services .....	107
34	Global Basic Observing Network .....	112
35	WMO Integrated Global Observing System station identifiers .....	115
36	Amendments to the <i>Technical Regulations</i> (WMO-No. 49), Volume I, Part I – WMO Integrated Global Observing System, to the <i>Manual on the WMO Integrated Global Observing System</i> (WMO-No. 1160), and to the <i>WIGOS Metadata Standard</i> (WMO-No. 1192) .....	117
37	The WMO Integrated Global Observing System transition to operational status commencing in 2020 .....	119
38	Vision for the WMO Integrated Global Observing System in 2040 .....	129
39	Establishment of collaboration between the International Air Transport Association and WMO on the development and operation of the Aircraft Meteorological Data Relay Programme .....	130
40	Members’ contribution to the actions specified in the Implementation Plan for the Evolution of Global Observing Systems, in the context of the future WMO Integrated Global Observing System implementation plan.....	136
41	Use of the Observing Systems Capability Analysis and Review Tool surface component (OSCAR/Surface) for the collection and recording of the WMO Integrated Global Observing System metadata .....	138
42	Radio frequencies for meteorological and related environmental activities .....	139
43	Report of the seventeenth session of the Commission for Instruments and Methods of Observation.....	141
44	Joint World Meteorological Organization-Intergovernmental Oceanographic Commission of UNESCO Strategy for Marine Meteorological and Oceanographic Data Management (2018–2021) .....	144
45	Ensuring adequate marine meteorological and oceanographic observations and data coverage for the safety of navigation and the protection of life and property in coastal and offshore areas .....	146
46	Future collaboration between WMO and the Intergovernmental Oceanographic Commission on facilitating oceanographic observations in coastal regions in support of Earth system prediction and climate services .....	151
47	Ocean observations in support of Earth system prediction and WMO support to the Global Ocean Observing System Strategy 2030 (including Tropical Pacific Observing System 2020) .....	152
48	Key directions of the Polar and High-mountain Agenda for the next WMO financial period (2020–2023).....	154
49	Antarctic Observing Network.....	160
50	Pre-operational phase of the Global Cryosphere Watch .....	165
51	Implementation of the architecture for climate monitoring from space .....	169
52	Strategy for the Virtual Laboratory for Education and Training in Satellite Meteorology 2020–2024 .....	170
53	Four-year plan for WMO activities related to space weather 2020–2023 .....	176
54	Implementation plan of the regional operational subproject for space-based monitoring of weather and climate extremes in East Asia and the Western Pacific.....	177
55	Emerging data issues .....	178
56	Data policies and practices .....	181

57	WMO Information System: Amendments to the Technical Regulations and WIS 2.0 implementation approach .....	184
58	Future Integrated Seamless Global Data-processing and Forecasting System collaborative framework .....	185
59	Amendments to the <i>Manual on the Global Data-processing and Forecasting System</i> (WMO-No. 485) .....	191
60	Future WMO research and support activities .....	203
61	Integrated and coordinated WMO research to serve society .....	206
62	A seamless research structure for WMO .....	208
63	Seamless regional research for water.....	209
64	Creating an environment for innovation and its optimal resourcing .....	210
65	WMO and the ocean.....	213
66	United Nations Ocean Conference 2020 .....	215
67	WMO scientific and technological support to the Intergovernmental Panel on Climate Change and climate policy .....	216
68	Voluntary Cooperation Programme .....	219
69	Guidelines on the Role and Operations of WMO Regional and Representative Offices .....	224
70	Country Profile Database .....	226
71	The Education and Training Programme and delivery mechanism .....	227
72	The WMO Global Campus Initiative .....	229
73	Strengthening the capacity of Members in service delivery .....	231
74	Closing the capacity gap: Scaling up effective partnerships for investments in sustainable and cost-efficient infrastructure and service delivery.....	232
75	Amendments to the General Regulations of the World Meteorological Organization .....	238
76	Enhanced framework for the WMO Technical Regulations.....	242
77	Revisions of the Financial Regulations of the World Meteorological Organization .....	243
78	Amendments to the Staff Regulations .....	244
79	Open consultative platform "Partnership and Innovation for the Next Generation of Weather and Climate Intelligence" .....	245
80	Geneva Declaration – 2019: Building Community for Weather, Climate and Water Actions.....	246
81	WMO mandatory publications and distribution policy for the eighteenth financial period .....	251
82	Gender Action Plan .....	254
83	Joint Inspection Unit recommendations .....	273
84	Assessment of proportional contributions of Members for the eighteenth financial period (2020–2023) .....	273
85	The Working Capital Fund.....	280
86	Secretary-General's contract.....	281
87	Review of previous Congress resolutions .....	284
88	Appointment of the Secretary-General and elections of the President and Vice-Presidents of the Organization, members of the Executive Council and presidents and vice-presidents of technical commissions .....	285
89	Extraordinary session of Congress in 2021.....	287

**APPENDIX 3. LIST OF PARTICIPANTS**..... 288

BACKGROUND INFORMATION SUPPORTING THE WORK OF THE SESSION  
(PART II TO THE PRESENT REPORT)



## GENERAL SUMMARY OF THE WORK OF THE SESSION

1. The WMO President, Mr D. Grimes, opened the eighteenth session of the World Meteorological Congress on Monday, 3 June 2019 at 10 a.m. in the International Conference Centre Geneva. The President welcomed the WMO Members and other Congress participants extending a warm welcome to Andorra and Nauru for having acceded to the WMO Convention since the last Congress. The list of participants is given in the appendix to the present report. In reflecting on the last four years, the President noted that since the last Congress the urgency to address climate change and socioeconomic impacts of extreme weather, water and climate events has led to an unprecedented worldwide mobilization. The Paris Agreement, the Sendai Framework for Disaster Risk Reduction, and the 2030 Agenda for Sustainable Development have made environmental issues central to the Global Agenda. New and growing demands to support resilience to hazards and adaptation to climate change have led to a growing role and importance of WMO and its Members, which need to be prepared with a clear vision on the Organization's governance structure and proceed with efforts for continuous improvements of processes and procedures.

The Secretary-General, Professor P. Taalas, welcomed the participants to Geneva, also extending a warm welcome to the new Members Andorra and Nauru. He underlined that the session was taking place at a critical moment due to the increase in the number of impacts of climate change and extreme weather, expressing confidence that Members' National Meteorological and Hydrological Services (NMHSs) would play a key role in supporting their countries in fostering sustainable development. He emphasized that in light of the above-mentioned global processes, Congress had a great opportunity to set up a strong strategic vision through the new long-term Strategic Plan and forge a more efficient and effective Organization through the adoption of the reform of constituent bodies. In this regard, he encouraged Members to support the proposed Strategic Plan and Budget proposal for 2020–2023 together with the Operating Plan as enablers of a stronger role of WMO.

H.E. Mr Alain Berset, Head of the Federal Department of Home Affairs of the Swiss Confederation, welcomed all delegates on behalf of Switzerland, underlining the spirit of collaboration, dialogue and solidarity that has historically characterized Geneva. He emphasized that the need for sound scientific information and the sharing of it to address collectively the challenges of climate change and extreme weather make an institution like WMO highly relevant for the international community. He emphasized that Switzerland is committed to supporting international cooperation to address the imperative of climate adaptation, including through supporting projects. He also expressed the support of Switzerland to the WMO reform for a more agile and effective Organization. Finally, he paid homage to the President for his chairmanship during the last two financial periods.

2. Congress approved the agenda as provided in the [Appendix 1](#).

3. Congress established the following committees:

(1) Credentials Committee:

Chairperson: Mr Trevor Basden (Bahamas)

Members: principal delegates of Colombia, Cook Islands, Ethiopia, Italy, and Viet Nam

(2) Nomination Committee:

Chairperson: Michael Staudinger (Austria)

Members: principal delegates of Brazil, British Caribbean Territories, Côte d'Ivoire, Iceland, Gambia, Chile, Costa Rica, Sri Lanka, Tonga, New Zealand and United Arab Emirates

(3) Coordination Committee:

Chairperson: President of WMO

Members: Vice-President of WMO, Secretary-General or his representative, presidents of regional associations and chairpersons of the committees other than the Credentials and Nomination Committees have been invited, when necessary.

(4) Committee on budget 2020-2023:

Chairperson: J.-M. Lacave (France)

Members: open

(5) Committee on constituent body reform:

Chairperson: G. Adrian (Germany)

Members: open

(6) Committee on public-private engagement:

Chairperson: L. Uccellini (USA)

Members: open

(7) Committee on hydrology - "Hydrological Assembly":

Chairperson: J. Danhelka (Czech Republic)

Vice chairperson: J. A. Zuñiga Mora (Costa Rica)

Members: open

4. Congress agreed on the programme of work of the session: working hours of the meetings: 9 a.m.-12 p.m. and 3 p.m.-6 p.m. on 5-7 June and 9.30 a.m.-12.30 p.m. and 2.30 p.m.-5.30 p.m. on the other days, and noted General Regulation 112 concerning the approval of the minutes.

5. Congress congratulated and warmly welcomed the Principality of Andorra and Nauru that have become the 192nd and 193rd Members of WMO. The Government of the United States of America, in its capacity as Depositary for the WMO Convention, received instruments of accession to the WMO Convention, which, in accordance with Article 35 of the Convention, entered into force for Andorra on 16 November 2018 and for Nauru on 16 May 2019.

6. Congress noted the reports of the President of WMO, presidents of regional associations, technical commissions and the Secretary-General, highlighting progress in the implementation of the Congress decisions by constituent bodies of the Organization and the Secretariat since the last session of Congress. Congress also noted the reports of the External Auditor, the Chair of the WMO Audit Committee and the Internal Oversight Office.

7. Congress thanked Dr Antonio Divino Moura, laureate of the sixty-third IMO Prize, for his lecture, and requested the Secretary-General to arrange for the appropriate publication in the WMO *Bulletin* series.
  8. The session adopted 89 resolutions given in [Appendix 2](#).
  9. The list of participants is given in [Appendix 3](#). Out of a total of 801 participants, 221 were women, i.e. 28%.
  10. Congress agreed that the nineteenth regular session would be held from 22 May to 2 June 2023.
  11. Congress further agreed to hold an extraordinary session from 31 May to 4 June 2021 as specified in Resolution 89.
  12. The eighteenth session of Congress closed at 17:00 on 14 June 2019.
-

## **APPENDIX 1. AGENDA**

### **1. Agenda and organization of the session**

- 1.1 Opening of the session
- 1.2 Approval of the agenda
- 1.3 Establishment of committees
- 1.4 Programme of work
- 1.5 Records

### **2. Reports**

- 2.1 Report by the President of the Organization
- 2.2 Report by the Secretary-General
- 2.3 Reports by presidents of regional associations
- 2.4 Reports by presidents of technical commissions

### **3. Strategic Plan and Budget 2020-2023**

### **4. Governance review**

### **5. Weather, climate, hydrological and related environmental services**

- 5.1 Multi-hazard early warning systems
- 5.2 Climate information and services
- 5.3 Hydrological services and support of sustainable water management
- 5.4 Weather information and services
- 5.5 Integrated weather, climate, hydrological and environmental services

### **6. Earth system observations and predictions**

- 6.1 WMO Integrated Global Observing System
- 6.2 WMO Information System
- 6.3 WMO Global Data Processing and Forecasting System

### **7. Earth system research**

- 7.1 Scientific knowledge of the Earth system
- 7.2 Science for service and predictive capabilities
- 7.3 Science for policy

**8. Capacity development**

- 8.1 Capability to provide and utilize essential services
- 8.2 Core competencies and expertise
- 8.3 Scaling-up effective partnerships for investment

**9. Policy, legal, oversight, financial and staff matters**

- 9.1 Questions concerning the Convention
- 9.2 Membership of the Organization
- 9.3 Amendments to the General, Technical, Financial and Staff Regulations
- 9.4 Public-private engagement and other policy matters
- 9.5 Gender equality
- 9.6 Oversight
- 9.7 Financial matters
- 9.8 Staff matters
- 9.9 Review of previous resolutions of Congress

**10. Elections and appointments**

- 10.1 Appointment of the Secretary-General
- 10.2 Election of the President and Vice-Presidents of the Organization
- 10.3 Election of members of the Executive Council
- 10.4 Election of presidents and vice-presidents of technical commissions

**11. Date and place of next Congress****12. Closure of the session**

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## APPENDIX 2. RESOLUTIONS ADOPTED BY THE SESSION

### Resolution 1 (Cg-18)

#### WMO STRATEGIC PLAN

THE WORLD METEOROLOGICAL CONGRESS,

**Noting:**

- (1) Resolution 69 (Cg-17) – WMO Strategic Plan (2016–2019),
- (2) Resolution 71 (Cg-17) – Preparation of the Strategic and Operating Plans 2020–2023,
- (3) Decision 65 (EC-69) – Preparation of the WMO Strategic Plan 2020–2023,
- (4) Recommendation 20 (EC-70) – WMO Strategic Plan,

**Noting further** that the WMO strategic planning process for the period 2020–2023 and beyond is based on and comprises three interlinked key components, namely:

- (1) The WMO Strategic Plan, which provides a high-level vision and overarching priorities of the future direction of WMO, articulated in long-term goals and strategic objectives with focused implementation areas for the financial period 2020–2023 and related monitoring indicators,
- (2) The WMO Operating Plan, which presents outcomes in the form of benefits to Members, outputs, activities and related performance indicators to address the global societal needs and achieve the strategic objectives,
- (3) The WMO Results-based Budget, which identifies resources for implementing the Strategic Plan, including functioning of constituent bodies, the Secretariat and activities,

**Approves**, under the provision of Article 8 (a), (b) and (c) of the Convention of the World Meteorological Organization, the WMO Strategic Plan, as contained in the annex to the present resolution;

**Urges** Members:

- (1) To take the WMO Strategic Plan into account in developing and carrying out their national development, disaster risk reduction, climate services and other relevant strategies on programmes in meteorology, hydrology and related disciplines, as well as in their participation in the programme activities of the Organization;
- (2) To facilitate the effective monitoring of the Strategic Plan's implementation by providing timely, up-to-date data on the WMO Community Platform (reference to Resolution 70);

**Requests** the Executive Council, the regional associations, the technical commissions and the Secretary-General to adhere to the vision, overarching priorities, long-term goals and strategic objectives set forth in the Strategic Plan and to organize programme activities so as to achieve the expected outcomes;

**Requests** the Executive Council:

- (1) To use the Strategic Plan, complemented by the WMO Operating Plan, as a benchmark to monitor progress and performance in achieving the expected outcomes by implementing programmes and activities of the Organization and to submit a report to the Nineteenth World Meteorological Congress;
- (2) To review the Strategic Plan and update, as needed, the focus areas for 2024-2027 for consideration by the Nineteenth World Meteorological;

**Requests** technical commissions, regional associations and other bodies to use the monitoring indicators to inform the planning and prioritization of their activities;

**Requests** the Secretary-General:

- (1) To distribute the publication of the Strategic Plan to all Members and constituent bodies of WMO, to the United Nations system and other partner organizations, as appropriate;
- (2) To report to the Executive Council on the performance indicators;
- (3) To review, under the direction of the Executive Council, the relevance of the monitoring indicators to the focus areas of the Strategic Plan as well as develop approaches to capturing the long-term impacts of activities, including through qualitative data and assessments.

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Note: This resolution replaces Resolution 69 (Cg-17), which is no longer in force.

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**Annex to Resolution 1 (Cg-18)****WMO STRATEGIC PLAN**

# WMO STRATEGIC PLAN

WEATHER CLIMATE WATER



WORLD  
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ORGANIZATION



**World Meteorological Organization, 2018**

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This publication has been issued without formal editing.

## **Contents**

<b>Foreword [To be added after approval]</b> .....	
<b>Our Vision</b> .....	
<b>Our Mission</b> .....	
<b>Our Core Values</b> .....	
<b>Key Drivers</b> .....	
<b>Overarching Priorities</b> .....	
<b>Long-term Goals and Strategic Objectives</b> .....	
Goal 1 Better serve societal needs: delivering, authoritative, accessible, user-oriented and fit-for-purpose information and services .....	
Goal 2 Enhance Earth system observations and predictions: Strengthening the technical foundation for the future .....	
Goal 3 Advance targeted research: Leveraging leadership in science to improve understanding of the Earth system for enhanced services .....	
Goal 4 Close the capacity gap on weather, climate, hydrological and related environmental services: Enhancing service delivery capacity of developing countries to ensure availability of essential information and services needed by governments, economic sectors and citizens .....	
Goal 5 Strategic realignment of WMO structure and programmes for effective policy- and decision-making and implementation .....	
<b>Implementation of the Strategic Plan</b> .....	
<b>Annex. Monitoring indicators</b> .....	

## **Foreword**

[To be added after approval]

## Our Vision

*By 2030, we see a world where all nations, especially the most vulnerable, are more resilient to the socioeconomic consequences of extreme weather, climate, water and other environmental events;<sup>1</sup> and underpin their sustainable development through the best possible services, whether over land, at sea or in the air.*

## Our Mission

Our Mission is outlined under Article 2 of the WMO Convention as to facilitate worldwide cooperation on monitoring and predicting changes in weather, climate, water and other environmental conditions through the exchange of data, information and services, standardization, application, research and training.

### **WMO is a specialized agency and an authoritative voice of the United Nations**

WMO Member States and Member Territories (hereunder referred as “Members”) own and operate the scientific infrastructure required for providing the weather, climate, water and related environmental services, and primarily delivered through their national meteorological and hydrological organizations.

WMO enables the performance of its Members in the provision of their monitoring, forecasting and warning services, leads and informs the global agenda where it best serves their interest through provision of credible information, reports and assessment at global, regional scales, channels their scientific expertise to address emerging issues such as climate change, and fosters effective and strategic partnerships.

For more than a century, WMO has been providing the essential worldwide leadership and coordination in support of nations’ responsibilities to provide weather, climate, water and related environmental services that protect lives, property and livelihoods. The cross-border nature of the weather, water and climate phenomena requires close coordination among all WMO Members States and Territories in building highly standardized systems for their monitoring, analysis and prediction. WMO, through its various bodies and programmes, has established and facilitated an unprecedented global scientific and operational cooperation, encompassing Members’ National Meteorological and Hydrological Services (NMHSs), academic and research institutions, business partners, communities and individuals.

The role of WMO will remain to support the activities of its Members in understanding the past, monitoring the present and predicting the future state and interactions of the atmosphere, the hydrosphere and other vital elements of our planet, enabling adequate and effective preparedness, adaptation and response to related natural hazards and disasters. This will require further enhancement of coordinated and interoperable networks and systems for data collection and processing, improvement of predictive skill through advanced science and computational technologies, and finally highly innovative approaches of service delivery that will ensure that accurate, fit-for-purpose information will reach its users on time for making their weather-, water- and climate-informed decisions.

<sup>1</sup> In the context of this Strategic Plan, the term “**weather**” refers to short-term variations in the state of the atmosphere and their phenomena or effects, including wind, cloud, rain, snow, fog, cold spells, heat waves, drought, sand and dust storms and atmospheric composition, as well as tropical and extratropical cyclones, storms, gales, the state of the sea (e.g. wind-generated waves), sea ice, coastal storm surges etc. “**Climate**” refers to longer-term aspects of the atmosphere-ocean-land surface systems. “**Water**” includes freshwater above and below the land surfaces of the Earth, their occurrence, circulation and distribution, both in time and space. Related “**environmental**” issues refer to surrounding conditions affecting human beings and living resources, for example the quality of air, soil and water, as well as “space weather” - the physical and phenomenological state of the natural space environment, including the Sun and the interplanetary and planetary environments.

## Our Core Values

The WMO recognizes, above all, in fulfilling its mandate, the principles of striving to ensure that “no Member State or Territory should be left behind”, and to sustain the public trust and confidence in the science underpinnings and the authoritative voice of the Organization and its Members. As WMO works to translate its vision into results, the Organization will be guided by the following values:

- (1) **Accountability for results and transparency.** To serve as an authoritative voice and a global leader in its field of work, WMO decisions and actions must be characterized by adherence to the highest scientific and technical standards, integrity, professionalism, capacity to perform and effectiveness. WMO sets clearly defined objectives and assumes responsibility for delivering high-quality results. In so doing, the WMO remains mindful of the need for quality management and cost-effectiveness;
- (2) **Collaboration and partnership.** Collaboration lies at the foundation of WMO mandate. WMO recognizes the importance of partnerships among Members, multilateral and bilateral development partners and other relevant actors, including the private sector, academia and other non-state players, to leverage investment, enhance capability and performance of National Meteorological and Hydrological Services, and deliver improved outcomes for society. WMO would expect that any such partners uphold the highest standards of ethical behaviour;
- (3) **Inclusiveness and diversity.** WMO is committed to support all Members and narrow the capacity gaps among them in the delivery of services by sustaining government support, international cooperation, catalysing investment and targeted assistance. Based on the priorities identified by its regional bodies, WMO will ensure the coordination and implementation of its programmes, strategies and activities and facilitate the transfer of knowledge within and across regions to better serve the needs of its Members. WMO will also pursue gender equality and effective participation of women and men in governance, scientific cooperation and decision-making in the implementation of the WMO Gender Equality Policy and UN criteria. These developments contribute to achieving all relevant sustainable development goals.

The WMO Core Values also guide the behaviour of Secretariat staff. As custodians of the Organization’s image and reputation, they are expected to uphold a commitment to the highest standards of ethical behaviour as expressed in the WMO Code of Ethics and the Standards of Conduct for the International Civil Service.

## Key Drivers

*Global agenda creating unprecedented demand for actionable, accessible and authoritative science-based information*



The 2030 Agenda for Sustainable Development, the Paris Agreement on climate change, and the Sendai Framework for Disaster Risk Reduction serve as the centrepieces for national and international policymaking and action. And as a consequence, their implementation will increasingly demand actionable, accessible and authoritative information and services on the changing states of the entire Earth System.<sup>2</sup>

<sup>2</sup> In this context, the Earth is being considered as an integrated system of atmosphere, ocean, cryosphere, hydrosphere, biosphere and geosphere, which informs policies and decisions based on a deeper understanding of the physical, chemical, biological and human interactions that determine the past, current and future states of the Earth.

### Infographics

The meteorological and hydrological information and services provided through Members' institutions are essential to achieve the Sustainable Development Goals related to poverty, agriculture and food security, health, water, climate change, oceans, energy, settlements, consumption and production, and partnerships.

As governments, organizations and international bodies align their development activities within these frameworks, WMO and NMHSs in particular, have enormous roles to play in supporting implementation. The concomitant decisions at all levels will continue to be contingent upon a better understanding of the changing threat levels from natural hazards, weather, water and climate extremes and climate change. The measurements and reports of the WMO community in these areas currently serve as the backbone of Earth System monitoring and prediction services. Global Earth System observations will provide a basis for meeting the demand for increasing seamless prediction capability from weather to climate scales based on a unified modeling approach.

As new forms of measurements emerge, and new uses for these measurements become more sophisticated, the reliance on WMO through its Members for this authoritative information will only increase. Furthermore, advancing the global observation and numerical modeling system will provide a foundation for addressing the increasing requirements for impact decisions related to a wide range of applications from public safety, to agriculture, energy, health, and water resource management and relevance to climate change.

This means that the quality of these decisions will depend to a greater extent on the WMO ability to properly measure and report on changes in the climate, to assess and communicate weather, climate, water-related and air quality risks and to provide effective multi-hazard, extended range forecasts and early warnings. Governments, organizations, and international bodies would increasingly rely on information from WMO and NMHSs as they pursue their sustainable development goals on land, at sea and in the air.

The provision of climate services at global, regional and national levels for economic sectors in support of energy, water, health, and food production among others will be vital in building a low-carbon and climate-resilient economy. The Global Framework for Climate Services (GFCS) provides a basis to support international policies and actions, National Adaptation Plans and progress towards achieving Nationally Determined Contributions.

To address these growing demands for actionable scientific information, Members' NMHSs will need targeted investments, scientific and technical development and strategic partnerships.

#### ***Increasing threats of extreme weather and climate urge action for resilience, mitigation and adaptation***

High-impact weather, water and climate extremes have devastating consequences for the safety of people, national economies, urban and rural environments, and food and water security. Over the period 1998-2017, extreme hydrometeorological<sup>3</sup> events accounted for more than 90% of the world's disasters.<sup>4</sup> According to the Intergovernmental Panel on Climate Change, these extremes are expected to occur with greater frequency and intensity as greenhouse gas concentrations continue to rise. Sea levels rise, also linked to climate change, will further increase the threat to the world's population who are living in coastal regions.

(Box/Graph)

The World Economic Forum identified weather extremes, natural disasters, failure of climate change adaptation and mitigation, and water crises as the highest four global risks in 2019. According to Munich Re, the costs of natural catastrophes in 2017 spiralled upwards to US\$ 330 billion, less than half of which are insured, including the costliest hurricane season on record (US\$ 215 billion) and a major humanitarian disaster in South Asia due to floods.

<sup>3</sup> Hydrometeorological hazards are of atmospheric, hydrological or oceanographic origin.

<sup>4</sup> CRED-UNISDR, Economic losses, poverty and disasters 1998-2017, Geneva 2018

Society's exposure and vulnerabilities to these hazards will be further exacerbated due to: population growth, reaching more than 9 billion by 2050; the development of human settlements, further urbanization and growth of mega cities worldwide, particularly in flood plains and coastal zones; significant expansion of built environments and critical infrastructures to service human needs; and the relocation of vulnerable populations. To affect smart mitigation and adaptation policy development and decision-making by governments at all levels, international institutions, economic decision-makers and citizens, demand for increasingly useful, accessible, and authoritative meteorological and hydrological information and services is growing.

To support national agendas for disaster risk reduction and climate adaptation, WMO fosters the production and delivery of accessible and authoritative meteorological and hydrological information and services. This information is critical to strengthening resilience to the impacts of high impact weather, climate and water extremes. It provides an essential underpinning to support the development and implementation of National Adaptation Plans under the Paris Agreement and UN system needs on humanitarian and crisis management.

### ***Growing capacity gap threatens global infrastructure and services***

All WMO Members collectively contribute to the global meteorological and hydrological infrastructure and facilities. While this collective global system is a public good that benefits all, the contribution and service performance among the Members continues to be uneven. Many NMHSs are facing substantial development needs and capability gaps in providing the weather, climate, water and related environmental information and services to meet national, regional and global requirements. The typical challenges center around maintaining sustainable infrastructure, human resources, and the ability to benefit from the advances in science and technology.

Such deficiencies are often present in those countries that are particularly vulnerable to natural hazards. These could jeopardize effective protection of life and property and slow down socioeconomic recovery. Moreover, globalization and the interdependence of critical infrastructure may further contribute to widening capacity gaps among NMHSs and related agencies. Narrowing the capacity gaps by sustaining government support, international cooperation, catalyzing investment and targeted assistance is more important than ever in view of the increasing frequency and intensity of weather-, climate- and water-related extremes.

### ***Rapid advancements in science and technology and changing landscape of data and service delivery urge for innovative partnerships***

Rapid progress in science and technology provides the opportunity to greatly improve services and to make them more accessible. Advanced weather, climate and hydrological services contribute to timely and effective planning and decision-making, resulting in greater socioeconomic benefits. The contribution of science and technology is further enhanced by accelerating the research-to-operations cycle in all fields.

This poses challenges to WMO since the 21st century systems for monitoring, prediction and service delivery are of the highest complexity increasingly large datasets and sophisticated numerical models. Therefore, WMO plays a major role in the transfer of modern knowledge and technology from developed to developing countries to enable them to benefit from the new information era.

The increasing demand for more and more diverse services from increasingly sophisticated and capable users changes rapidly the service delivery and business models in many parts of the world. Trends like "big data", "crowd sourcing" and "open system", the appearance of commercial observing networks, data and service providers, the affordability of digital technology, the introduction of artificial intelligence and cognitive computing to rapidly extract useful information from "big data", all are game changers. The private sector, as well as academia and other players, contribute by accelerating the uptake of technological innovations, and assisting Members in offering more efficient, attractive and accessible services in support of their sustainable development goals. There are many opportunities for

optimization and efficiency through integration of networks, computing power and service delivery through use of social media.

Members must support their NMHSs to better and readily adapt to this dynamic changing environment, while WMO must elaborate the means to strengthen cooperation, mutual reinforcement and complementarity among state and non-state actors. It is important to advocate for the essential role of NMHSs in providing the critical infrastructure, competence and authoritative services for serving their governments' fundamental public good function for protecting life and property.

### Overarching Priorities

The Strategic Plan sets out long-term goals for 2030 horizon and strategic objectives, focused on addressing the most pressing developments and needs during the 2020-2023 planning cycle of the Organization. The Plan articulates expected outcomes expressing clear benefits to Members. As we translate these goals and objectives into detailed plans we will focus our resources in accordance with three overarching priorities:

- (1) Enhancing preparedness and reducing loss of life, critical infrastructure and livelihood from hydrometeorological extremes;
- (2) Supporting climate-smart decision making to build or enhance adaptive capacity or resilience to climate risk;
- (3) Enhancing socioeconomic value of weather, climate, hydrological and related environmental services.

Reflecting on these key priorities, there will be a need to involve a broad set of stakeholders and multidisciplinary expertise to address the current and future challenges facing society as a consequence of changing weather, climate and water patterns worldwide. To be effective, WMO fosters collaborative mechanisms to better align interests, build community and engage stakeholders and experts under weather, climate and water.

### Long-term Goals and Strategic Objectives

#### Goal 1 Better serve societal needs: delivering, authoritative, accessible, user-oriented and fit-for-purpose information and services

**Long-term outcome:** Enhanced capability of Members to develop, access and utilize accurate, reliable and fit-for-purpose weather, climate, water and related environmental impact-based services to best support the policy-making and actions that implement sustainable development and mitigate weather, climate and water-related risks.

(Box/illustration)

#### WMO authoritative flagship products

WMO Statement on the State of the Global Climate  
Greenhouse Gas Bulletin  
WMO Antarctic Ozone Bulletin  
El-Niño – La-Niña Update ...

#### Objective 1.1 Strengthen national multi-hazard early warning/alert systems and extend reach to better enable effective response to the associated risks

*Warnings on weather, climate, water and other environmental extreme events are essential for the safety of lives and livelihoods, recognized under UN Global Agenda and foundational to all governments' NMHSs' mandates. In many countries capacities to deliver warnings are lacking and will be addressed, particularly through focused action in the most vulnerable least developed countries.*

##### Focus in 2020-2023:

- Enhance impact- and risk-based extended forecast and warning products and services to enable better preparedness and response to hydrological and meteorological events.
- Strengthen national capacity in multi-hazard early warnings.
- Enhance access to official national meteorological and hydrological forecasts and warnings globally in support of regional and global requirements.



### **Objective 1.2 Broaden the provision of policy- and decision-supporting climate information and services**

*The Global Framework for Climate Services (GFCS) provides a unique platform for guiding and supporting activities across the value chain for climate services, which contribute to adaptation, mitigation and reduction of loss and damage. Availability and access to these products will be expanded and broadened to benefit all Members.*

#### **Focus in 2020-2023:**

- Advance a climate service information system enabling all Members to access, and add value to, the best available global and regional climate information products and methodologies through improved processing, exchange and enhancement of information on past, present and future climate.
- Support Members' production and delivery of authoritative national climate information products and services in GFCS priority areas to adapt and respond to climate variability and change, including through participation in National Adaptation Plans, and to avert loss or damage as well as to optimize benefits from climate-related opportunities.
- Refine WMO products containing key climate indicators, seasonal outlooks, and improved characterization of extremes and associated impact information recognized as key inputs for international climate-related policy implementation and UN system action.

### **Objective 1.3 Further develop services in support of sustainable water management**

*To reduce related risks and subsequent losses, improved access to reliable global and regional information on the current status and future conditions of water resources is critical, but stakeholders do not have a central source for this information. WMO will establish a system to enable easy access to essential water resources information to support informed decisions based on current and expected hydrological conditions.*

#### **Focus in 2020-2023:**

- Enable better access to improved hydrological services, forecasts and warnings for water resources, drought and flood risk management and planning.
- Facilitate exchange of transboundary data and products through the Global Hydrological Status and Outlook System to enhance understanding of current and future water resources.
- Regular reporting on the state of global water resources.

### **Objective 1.4 Enhance the value and innovate the provision of decision-supporting weather information and services**

*Weather-informed decision-making for all modes of transport (aviation, marine, land), energy, agriculture, health, tourism, urban and other sectors will be raised to new levels, resulting in substantial productivity gains and positive environmental impacts. Service delivery approaches will be innovated to build Members' capacity to provide modern, fit for purpose and high quality services.*

#### **Focus in 2020-2023:**

- Enhance and increase weather services through the uptake of modern technology in service delivery, providing service excellence and implementing quality systems.
- Design and implement new weather and water prediction services for the specific needs of megacities and other urban areas.
- Provide NMHSs with further guidance and assistance in the assessment and enhancement of socioeconomic benefits of their services.

- Establish principles and guidance for successful public-private engagement, and facilitate a continuous dialogue between players and stakeholders based on collaboration and mutual reinforcement.
- Develop and adopt international standards, quality control mechanisms and recommended practices in a holistic manner for all service areas based on best national practices.

## **Goal 2 Enhance Earth system observations and predictions: Strengthening the technical foundation for the future**

**Long-term outcome:** An integrated Earth system observational network increasingly automated and optimized to ensure effective global coverage. High quality fit-for-purpose traceable measurements feeding a continuous global data exchange underpinned by data management and data processing mechanisms.

(Box/illustrations)

### **WMO core global public good systems**

WIGOS and its component networks  
WIS schematics  
GDPFS global and specialized centres

### **Objective 2.1 Optimize the acquisition of Earth system observation data through the WMO Integrated Global Observing System (WIGOS)**

*All in-situ and space-based observing programmes of WMO are being consolidated in a single integrated system, the WIGOS, which will be operational in 2020. Worldwide implementation of WMO standards, principles and tools will enable Members to optimize their observing networks. It will allow Members to leverage observing systems operated by all relevant government agencies, research entities, non-profit organizations and private companies, including also non-traditional data acquisition vehicles such as crowd-sourcing and the Internet of Things.*

#### **Focus in 2020-2023:**

- Advance the implementation of WIGOS rapidly through coordinated global and regional plans, in particular further development and operational implementation of Global Basic Observing Network (GBON), electronic metadata inventories for all observing platforms, along with quantitative tools to monitor their data delivery and data quality.
- Increase compliance with regulations and standards, and identify critical gaps in observational data coverage and address that through the integrated design of observing networks.
- Develop additional regulatory and guidance material developed to facilitate integration of externally-sourced observations under the WIGOS umbrella.

### **Objective 2.2 Improve and increase access to, exchange and management of current and past Earth system observation data and derived products through the WMO Information System**

*The useful shelf life for observations accessed through the WIS is unlimited. Atmospheric composition, climate, hydrological and oceanographic observations from all times will need to be continuously available and accessible for research, climate monitoring, re-analysis and other applications. Therefore, WMO will streamline and coordinate all WMO data management systems.*

#### **Focus in 2020-2023:**

- Foster the continuous growth and evolution of WIS to accommodate and exploit the different technical capabilities of the Members and provide continued access to all observations acquired under WIGOS and all data generated under the Global Data Processing and Forecasting System for all Members.

- Further develop regulatory and guidance material governing international exchange of data, along with strengthened monitoring of compliance.
- Consolidate and further develop WMO data management systems and practices through WIS to help ensure that all observational data and key products are properly archived.

### **Objective 2.3 Enable access and use of numerical analysis and Earth system prediction products at all temporal and spatial scales from the WMO seamless Global Data Processing and Forecasting System**

*Major weather patterns are routinely predicted more than a week ahead, tropical cyclone landfalls are predicted accurately several days ahead, and even small-scale severe weather with high local impact is often forecasted with enough lead-time to mitigate its impact. WMO will further promote the development of Earth system Prediction, facilitate the use of cascading seamless system of numerical models<sup>5</sup> operated by centres around the world and coordinated through WMO to enhance national forecasting capabilities of all Members.*

#### **Focus in 2020-2023:**

- Advance the GDPFS to accommodate increased emphasis on probabilistic forecasting and coupled Earth system modelling to improve predictions over time scales ranging from long-term climate variability to seasonal/sub-seasonal to short-term weather events.
- Further develop regulatory and guidance material governing the functioning of the GDPFS.
- Enhance the GDPFS to enable all Members to develop and/or improve their own national predictive capabilities benefiting from advances in quantitative model- and impact-based forecasting products.

### **Goal 3 Advance targeted research: Leveraging leadership in science to improve understanding of the Earth system for enhanced services**

**Long-term outcome:** Leveraged global research community resulting in fundamental advances in the understanding of the Earth system, leading to improved policy-relevant advice and predictive skill at all time scales in a seamless context. This will result in the strengthened forecast and warning performance of all Members as research and operations coalesce to apply the best science to all components of the service value chain.

#### **Objective 3.1 Advance scientific knowledge of the Earth system**

*WMO is uniquely placed to step up to the challenges and opportunities associated with fundamental Earth system science questions and will lead a global research effort that draws on the best expertise within NMHSs, academia and research institutes.*

#### **Focus in 2020-2023:**

- Address overarching challenges in Earth system scientific research, modelling, analysis and observations, on topics such as atmospheric composition, the ocean/atmosphere/land coupling, cryosphere, clouds and circulation, water availability, droughts and flooding, regional sea level and coastal impacts, high-impact weather, and climate variability and change.

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<sup>5</sup> "In the context of WMO, seamless prediction considers not only all compartments of the Earth system, but also all disciplines of the weather-climate-water-environment value chain (monitoring and observation, models, forecasting, dissemination and communication, perception and interpretation, decision-making, end-user products) to deliver tailor-made weather, climate, water and environmental information covering minutes to centuries and local to global scales" (WMO/WWRP, Catalysing Innovation in Weather Science: WWRP Implementation Plan 2016-2023, 2016).

- Prioritize research implementation plans and mobilize broad scientific community to help leverage global research potential to generate enhanced knowledge and understanding of the Earth system and related weather, water and climate linkages.
- Support advancement of WMO-coordinated priority scientific assessments and services.

### **Objective 3.2 Enhance the science-for-service value chain ensuring scientific and technological advances improve predictive capabilities**

*WMO demonstrates the value of translating science into enhanced operational service delivery with societal benefits. Considering the exponential growth in the expectations of users and stakeholders in improved predictive capabilities and socioeconomic relevance, WMO will work to ensure an effective science-for-service transition by accelerated research to operations applications.*

#### **Focus in 2020-2023:**

- Improve predictive capabilities in high-impact weather forecasting, seasonal to sub-seasonal to decadal prediction, polar prediction, urban and environment prediction and water cycle prediction.
- Enhance relevance and utility of products and services through a broader engagement of social science expertise and users including the consideration of local wisdom and local knowledge and closer collaboration between physical and social scientific groups by appropriately addressing sociocultural aspects.

### **Objective 3.3 Advance policy-relevant science**

*In the next decade science is expected to provide tools and solutions for suitable use in the implementation of national and international policies and actions. WMO key research initiatives, working closely with its partners, will advance scientific assessments and climate projections, authoritative global reports on greenhouse gases and other atmospheric constituencies, and new technologies to better quantify the carbon, energy and water cycles.*

#### **Focus in 2020-2023:**

- Implement an integrated global greenhouse gas information system to enable Members to improve the quality and confidence in national greenhouse gas emission inventories.
- Enhance the body of scientific knowledge assessed by IPCC and other global scientific reports.
- Improve the basis of understanding for water resource management decisions drawing upon improved capabilities, especially in sub-seasonal to seasonal range.

## **Goal 4 Close the capacity gap on weather, climate, hydrological and related environmental services: Enhancing service delivery capacity of developing countries to ensure availability of essential information and services needed by governments, economic sectors and citizens**

**Long-term outcome:** Improved access to regional and global monitoring and prediction systems and utilization of weather, climate and water information and services bringing tangible benefits to developing Members, in particular least developed countries, small-island developing states and Member island territories. This will be achieved through strategic investments, technology transfer, knowledge and experience sharing, and by taking due account of social inclusion and gender factors.

**Objective 4.1 Address the needs of developing countries** to enable them to provide and utilize essential weather, climate, hydrological and related environmental services

*The increasing vulnerability of many societies and economies to natural hazards and extreme weather events and the gaps in the capabilities of NMHSs to deliver adequate services – particularly those of developing countries, least developed countries and small island developing States and Member island territories – require WMO to strengthen its capacity development efforts, building upon existing capacities in NMHSs, taking advantage of the capacity of developed country NMHSs in twinning and other arrangements, and leveraging the investments of the UN system and other development partners towards this goal.*

**Focus in 2020-2023:**

- Improve understanding of the specific capacity needs of each developing country with respect to technical, institutional and human resources, to enable them to provide adequate weather, climate, hydrological and related environmental services, in particular for protection of life, property and economic productivity.
- Mobilize strategic resources involving development partners and national governments and assisting NMHSs to develop long-term strategies and operational plans to address the identified capacity needs.
- Increase visibility and sustainability of NMHSs in LDCs and SIDS by demonstrating, promoting and communicating the societal-economic value of their weather, climate, water and related environmental observations, research and services.

**Objective 4.2 Develop and sustain core competencies and expertise**

*There is a growing deficit in the capability and numbers of adequately educated and trained staff needed to provide weather, climate, hydrological and related environmental services in many countries and territories. Additionally, rapid advances in scientific innovation and technological developments and means for public communication require corresponding and continuous training of NMHS personnel. WMO will increase its training and long-term education activities to help Members to obtain and maintain needed competencies.*

**Focus in 2020-2023:**

- Support Members in the recruitment and retention of staff with the appropriate qualifications and competencies required for effective service delivery through appropriate education and training programmes focused on WMO standards and recommendations.
- Support cooperation between developing and developed Members and full utilization of the WMO Regional Training Centres.

**Objective 4.3 Scale-up effective partnerships for investment in sustainable and cost-efficient infrastructure and service delivery**

*Enhance the full spectrum of the weather, climate and hydrological services delivery to support the protection of life, property and the environment and the security of food production, energy and water resources. Scale up partnership investments to minimize cost and maximize the opportunity for the networks to be sustainable long beyond the lifetime of donor funded projects.*

**Focus in 2020-2023:**

- Strengthen partnerships and alliances to share knowledge, technology and expertise with particular emphasis on the use of twinning arrangements.

- Enter into strategic, functional and mutually beneficial development partnerships and alliances with the key relevant UN, intergovernmental and nongovernmental organizations, development agencies, the private sector, and academia.
- Provide leadership in promoting the principles on which global meteorology is built, emphasizing authoritative voice, common standards, data and product sharing.

## **Goal 5 Strategic realignment of WMO structure and programmes for effective policy- and decision-making and implementation**

**Long-term outcome:** Improved relevance, effectiveness and efficiency of the constituent bodies and implementation of this Strategic Plan through closer alignment of structures and processes with the strategic goals of the Organization.

### **Objective 5.1 Optimize WMO constituent body structure for more effective decision-making**

*Ensure the effective and efficient use of resources, including those of Members, through a more strategic focus of the WMO action, and constituent body constructs, structures and processes adapted to implement the Strategic Plan.*

#### **Focus in 2020-2023:**

- Implement the decisions of Congress on optimized constructs, processes and duties of WMO constituent bodies and organs to enhance the efficiency and effectiveness of the Organization and good governance.

### **Objective 5.2 Streamline WMO programmes**

*WMO scientific and technical programmes need to be periodically reviewed by the Congress to ensure their relevance to the Strategic Plan of the Organization as well as their effectiveness and efficiency of delivery. This will be done based on the principles of quality management, cost-effectiveness, and optimal support by contributing experts and the Secretariat.*

#### **Focus in 2020-2023:**

- Streamline WMO scientific, technical and service programmes to enable the Organization to better achieve the goals and objectives set in the Strategic Plan, ensuring coherence and consistency between the strategic, programmatic and financial frameworks.

### **Objective 5.3 Advance equal, effective and inclusive participation in governance, scientific cooperation and decision-making**

*Organizations that respect diversity and value gender equality demonstrate better governance, improved performance and higher levels of creativity. Gender equality and the empowerment of women are further key to scientific excellence and essential to meeting the challenges of climate change, disaster risk reduction and sustainable development, particularly Sustainable Development Goal 5.*

#### **Focus in 2020-2023:**

- Advance gender equality across the Organization, especially in governance and decision-making, in implementation of SDG5 and the WMO Gender Equality Policy.
- Provide equitable access to, interpretation of and use of information and services to women, men and all individuals irrespective of their gender and in particular to those from marginalized groups.

- Attract more women, girls and individuals from marginalized groups to science and employment in NMHSs through showcasing role models and investing in human capital.

### **Implementation of the Strategic Plan**

This Strategic Plan will guide the decisions and activities of WMO in helping to realize its 2030 vision, and will serve as the focus for the upcoming financial period 2020–2023, bringing the greatest benefits to Members.

The Strategic Plan takes into account strategic, operational, financial, compliance and reputational risks for the Organization and its Members as outlined in key drivers.

The integrated WMO Operating Plan 2020-2023 presents time-bound programme activities and projects, result-oriented budgets and success indicators. The latter are available on the WMO website and the WMO Community Platform. The Operating Plan forms the basis for resource allocation, and defines the risks and performance matrices against which to assess progress to achieve expected outcomes through the WMO Monitoring and Evaluation System.

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JN 181336



**Resolution 2 (Cg-18)****MAXIMUM EXPENDITURE FOR THE EIGHTEENTH FINANCIAL PERIOD (2020-2023)**

THE WORLD METEOROLOGICAL CONGRESS,

**Noting:**

- (1) Article 23 of the Convention of the World Meteorological Organization,
- (2) Article 4 of the Financial Regulations of the Organization,
- (3) Recommendation 21 (EC-70) – Maximum expenditure for the eighteenth financial period (2020-2023),
- (4) Resolution 1 (Cg-18) – WMO Strategic Plan,
- (5) WMO Operating Plan 2020-2023 (Cg-18/INF. 3(1)),
- (6) Report of FINAC (Cg-18/INF. 9.6(1)),

**Considering** the long-term goals and strategic objectives set in the WMO Strategic Plan (Resolution 1 (Cg-18)),

**Taking into account** the increased resource requirements needed to accelerate, expand and/or scale up the implementation of the Long-term Goals and Strategic Objectives of the Strategic Plan for 2020-2023,

**Considering** the views expressed during the Eighteenth World Meteorological Congress indicating that priority be placed on increasing regional capability,

**Authorizes** the Executive Council during the eighteenth financial period from 1 January 2020 to 31 December 2023:

- (1) To incur maximum expenditures of 271,544,400 Swiss francs to be funded through assessed contributions;
- (2) To distribute the regular budget resources by appropriation part as provided in annex to this resolution; and
- (3) To approve the biennial appropriations for 2020-2021 and for 2022-2023 within these limits;

**Requests** the Secretary-General to include in the regular budget the annual WMO contribution to the United Nations Development System and investigate formalizing an agreement on the United Nations Development System between the United Nations and WMO to promote cooperation between NMHSs and Resident Coordinators particularly in least developed countries;

**Requests** the Secretary-General to identify both efficiency gains especially in administrative work and processes and savings in the regular budget corresponding to at least CHF 5.3 million in 2020-2023, and to also identify others sources of funding during the eighteenth financial period in order to supplement the increased assessed contributions and to report accordingly;

**Further requests** the Secretary-General: (i) to continue to improve timeliness and transparency of budget information and ensure continuity in the budget presentation by securing the recommendation of the Executive Council prior to presentation to Congress; and (ii) to work with the Executive Council for recommendation for improvement in the budget process;

**Requests** the Executive Council:

- (1) To review WMO activities and Programmes through the EC Working Group on Strategic and Operational Planning, in coordination with the Secretary-General, and ensure that priorities identified by the Eighteenth World Meteorological Congress be realized within the available resources, in particular, the reinforcement of regional aspects;
- (2) To oversee the use of efficiency gains, voluntary contributions and other funding sources to help achieve non-core budgetary initiatives including staffing mechanisms;

**Further requests** the Executive Council:

- (1) To closely monitor the financial, administrative and organizational impacts of the WMO reform process and to report to extraordinary Congress in 2021;
- (2) To report to the next extraordinary Congress on the advancements in the implementation of the identified Additional Initiatives, including, but not limited to, the staffing mechanisms for the delivery of the non-core budgetary initiatives;
- (3) To support the Secretary-General in improving the budget process towards the next Congress, in particular the timely submission and transparency of budget proposals;

**Invites** WMO Members to consider contributing through voluntary resources to accelerate, expand and/or scale up the implementation of the Long-term Goals and Strategic Objectives of the Strategic Plan for 2020-2023;

**Further authorizes** the Executive Council to incur other expenditure from voluntary resources contributing to enhanced implementation of programme activities in line with the Strategic Plan, including co-sponsored programmes and initiatives.

## **Annex to Resolution 2 (Cg-18)**

### **MAXIMUM EXPENDITURE FOR 2020-2023 BY APPROPRIATION PART (in Swiss francs)**

<b>Appropriation Parts</b>	<b>Budget 2020-2023</b>
1. Part I. Long-Term Goal 1	64,246,200
2. Part II. Long-Term Goal 2	47,692,300
3. Part III. Long-Term Goal 3	26,011,600
4. Part IV. Long-Term Goal 4	53,007,700
5. Part V. Long-Term Goal 5	2,968,400
6. Part VI. Policy-Making Organs, Executive Management and Oversight	38,960,300
7. Part VII. Language Services	38,657,900
Total maximum expenditure:	271,544,400

### Resolution 3 (Cg-18)

#### USE OF CASH SURPLUS ARISING FROM THE SEVENTEENTH FINANCIAL PERIOD (2016–2019)

THE WORLD METEOROLOGICAL CONGRESS,

**Noting** the Report of the Secretary-General to the Eighteenth World Meteorological Congress,

**Authorizes** the suspension of Financial Regulation 9.1 during the eighteenth financial period (2020-2023), with respect to the distribution of any cash surplus that might arise from the Seventeenth Financial Period (2016-2019),

**Delegates** to the Executive Council the allocation of such cash surplus to priority activities.

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### Resolution 4 (Cg-18)

#### DESIGNATION OF ACTING VICE-PRESIDENTS IN BETWEEN SESSIONS OF CONGRESS

THE WORLD METEOROLOGICAL CONGRESS,

**Having examined** Recommendation 22 (EC-70) – Officers of the Organization,

**Convinced** of the need to ensure continuity in the offices of the Vice-Presidents;

**Decides** that in case the position of the Third Vice-President becomes vacant in between sessions of the Congress, the Executive Council shall designate an Acting Third Vice-President from amongst elected members of the Executive Council in accordance with the provisions of Article 13 of the Convention of WMO. The Acting Third Vice-President shall serve for a period not exceeding the remainder of the term of office of the Vice-President whom he replaces. The General Regulation 15 shall therefore be amended as follows:

*If the Third Vice-President of the Organization resigns or is not able or eligible to carry out the functions of the office, for any cause, the Executive Council shall designate an Acting Third Vice-President from amongst elected members of Executive Council in accordance with the provisions of Article 13 (c) of the Convention of the WMO. The Acting Third Vice-President shall serve for a period not exceeding the remainder of the term of office of the officer who is being replaced;*

**Decides** further to clarify General Regulation 13 and 14 to indicate that in case the Second or Third Vice-Presidents serve as Acting First or Second Vice-President respectively, he/she shall also continue serving in their original office. The General Regulations 13 and 14 shall therefore be amended as follows:

#### *Regulation 13*

*If the First Vice-President of the Organization resigns or is not able or eligible to carry out the functions of the office, for any cause, the Second Vice-President of the Organization shall also serve as Acting First Vice-President of the Organization for a period not exceeding the remainder of the term of office of the First Vice-President;*

*Regulation 14*

*If the Second Vice-President of the Organization resigns or is not able or eligible to carry out the functions of the office, for any cause, the Third Vice-President of the Organization shall **also** serve as Acting Second Vice-President of the Organization for a period not exceeding the remainder of the term of office of the Second Vice-President;*

**Decides** also to amend Regulation 16 (c) to reflect the election process that was previously detailed in Regulation 15 as follows:

*Regulation 16 (c)*

*If the office of the president of an association or commission becomes vacant, the elected president of the association or the commission shall arrange for election of the vice-president of that **body if the vacancy is notified to the Secretary-General at least 130 days before the next ordinary session of the body concerned. This vice-president shall be elected to serve for a period not exceeding the term of office of the officer who is being replaced.***

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## **Resolution 5 (Cg-18)**

### **WMO EXECUTIVE COUNCIL**

THE WORLD METEOROLOGICAL CONGRESS,

**Recalling:**

- (1) That the Seventeenth Congress requested the Executive Council to provide recommendations to the Eighteenth Congress on constituent body constructs,
- (2) Decision 84 (EC-68) – Governance review and Decision 68 (EC-69) – WMO constituent body reform,

**Expressing appreciation** for the work carried out by the Executive Council concerning the construct of governance review of the Organization,

**Having examined** Recommendation 23 (EC-70) — WMO Executive Council,

**Reaffirms** the fundamental role of the Executive Council as established by the Convention and in particular its primary functions as defined by Article 14;

**Endorses** Resolution 35 (EC-70) — WMO Executive Council structures, by which the Executive Council has resolved to streamline the bodies reporting to it around two core bodies as well as the Science Advisory Panel addressing respectively policy, strategic, technical and scientific aspects in addition to the Audit Committee, Financial Advisory Committee and the Staff Pension Committee.

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## **Resolution 6 (Cg-18)**

### **WMO REGIONAL ASSOCIATIONS**

THE WORLD METEOROLOGICAL CONGRESS,

**Recalling:**

- (1) That the Seventeenth Congress requested the Executive Council to provide recommendations to the Eighteenth Congress on constituent body constructs,
- (2) Decision 84 (EC-68) – Governance review and Decision 68 (EC-69) – WMO constituent body reform,

**Expressing appreciation** for the work carried out by the Executive Council concerning the review of the WMO regional associations,

**Expressing further appreciation** to the presidents of regional associations and experts who served in the regional associations' subsidiary bodies during and before the eighteenth financial period, for their leadership, commitment and contribution to the work of the Organization,

**Having examined** Recommendation 24 (EC-70) — Review of the WMO regional associations,

**Recognizing** that the contributions made by Members in establishing the infrastructure, undertaking scientific activities and providing key services can benefit other Members both regionally and globally,

**Recalling** the core functions of the regional associations established in Article 18 of the Convention,

*[Article 18 (d) states: The functions of the regional associations shall be:*

- (i) To promote the execution of the resolutions of Congress and the Executive Council in their respective Regions,*
- (ii) To consider matters brought to their attention by the Executive Council,*
- (iii) To discuss matters of general interest and to coordinate meteorological and related activities in their respective Regions,*
- (iv) To make recommendations to Congress and the Executive Council on matters within the purposes of the Organization,*
- (v) To perform such other functions as may be conferred on them by Congress,]*

**Recognizing** that the regional associations make recommendations to Congress and the Executive Council on matters within the purposes of the Organization, and particularly in regard with:

- (1) Assessing emerging needs and priorities to inform the Organization-wide strategic and operational planning processes and determining the activities and milestones needed to achieve goals and objectives of the Organization in the respective regions as outlined in WMO Strategic Plan,
- (2) Identifying capacity development needs of its Members to support the fulfilment of their NMHS national mandates and achieve compliance with WMO adopted policies, technical regulations and guidelines,

- (3) Defining regional requirements for modernization of systems and services based on collective needs of their Members,

**Recognizing further** that the requirements and expertise of regional associations should be better utilized in the establishment of the tasks and plans of the technical commissions as well as other bodies of the Organization,

**Acknowledging:**

- (1) One of the key roles of regional associations is to encourage its Members' cooperation and collaborative activities that result in more effective regional, inter-regional and sub-regional partnerships,
- (2) The existence of many sub-regional groupings within or across the geographical, political and economic domains of the current regional associations which provide for closer collaboration and cooperation among Members at sub-global and sub-regional levels based on various commonalities (language, technological level, inter-governmental agreements etc.),
- (3) That such cooperative and collaborative approaches should be strongly encouraged and should be more effectively utilized within the current geographical construct of WMO regional associations including through cross-regional cooperation,

**Considering** the need to improve the working mechanisms, in particular the complementary roles of regional associations and technical commissions in the development and implementation of global regional and national systems and services, including in the capacity development, monitoring and evaluation activities,

**Considering further** that the effectiveness of regional associations activities and their contribution to the WMO strategic objectives is dependent on the available secretariat support through adequately resourced and properly geographically located WMO regional offices and field (sub-regional offices),

**Decides:**

- (1) To continue to review the role and functions of regional associations;
- (2) To amend the General terms of reference of the regional associations in Annex II to the General Regulations as provided in the annex;
- (3) That the regional associations should meet as often as necessary, in line with the WMO Congressional meeting and planning cycles, as defined in Annex 2 to Resolution 7, which should be more productive and useful for its Members, aimed at advancing regional priorities and producing clear action-oriented outcomes and inputs to future WMO strategic and operational plans;
- (4) That the regional associations influence and seek to align with all the relevant constituent bodies and structures in supporting the strategic goals of the WMO Strategic Plan. Furthermore, pursuing harmonized structures among all regional associations would promote common approaches and better cross-regional cooperation;

**Requests** the Executive Council:

- (1) To facilitate effective coordination between technical commissions and regional associations in accordance with Resolution 5 (Cg-18);
- (2) To oversee the continued review of the regional associations, their activities, including cross-regional activities, and relations with other regional organizations and structures, with the aim of making recommendations on their form and function to Cg-19;

(3) To report on the implementation of this resolution at the nineteenth session of Congress;

**Requests** the presidents of the regional associations, supported by the respective management groups, to lead a comprehensive review of the activities and working mechanisms of their associations and report to the seventy-second session of the Executive Council with recommendations for improved processes and mechanisms for enhanced regional and inter-regional cooperation and partnerships, resource mobilization and plans for resolving existing capacity gaps and deficiencies;

**Requests further** the presidents of the regional associations:

- (1) To coordinate with the presidents of technical commissions in the selection of experts for technical commissions nominated by the Members in accordance with General Regulation 183 to ensure synergies with the respective regional bodies, better leverage the resources and communicate regional requirements;
- (2) To work with the other relevant bodies and the Secretariat towards establishing and operating an effective performance monitoring and evaluation process that will provide an objective assessment of attained capacity and performance of each Member and also highlight critical deficiencies to be addressed as a matter of urgency;
- (3) In addition to the above, coordinate closely with the presidents of the technical commissions and the Secretariat in conveying regional priorities and requirements to be considered in the work of technical commissions, as well as carrying out scheduled performance monitoring and evaluation of the regional centres and facilities serving Members;
- (4) To strengthen their resource mobilization efforts with regional development agencies, as well as their advocacy role with Members' governments with regard to the needed financial support to the NMHSs as the main providers of vital meteorological, climatological, hydrological and other related environmental information and services;
- (5) To work with WMO other relevant bodies and the corresponding NHMSs of the region in implementing the objectives of the WMO Strategic Plan regionally;
- (6) To promote and facilitate the interaction and integration among research institutions and NHMSs of the region;
- (7) To convene regional meetings or forums during the inter-sessional period as necessary to review the progress of regional priority programmes and activities in alignment with the WMO Strategic Plan;

**Invites** the Members of the Organization to be proactive in their support and participation in the regional cooperation activities that build the individual and collective capacity to provide high quality services to society, including through bilateral and multilateral agreements for cost-effective service delivery, sharing experience and transfer of knowledge and know-how;

**Requests** the Secretary-General, in consultation with the presidents of regional associations, to take the required steps which will ensure adequate resources required by the regional associations for their effective operation during the eighteenth financial period.

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## **Annex to Resolution 6 (Cg-18)**

### **AMENDMENTS TO THE GENERAL TERMS OF REFERENCE OF THE REGIONAL ASSOCIATIONS (ANNEX II TO THE GENERAL REGULATIONS)**

In carrying out the functions specified in Article 18 (d) of the Convention within the allotted geographical areas defined in this Annex, under the general guidance of Congress and the Executive Council and with support from the Secretariat, each regional association, in close coordination and collaboration with other bodies concerned, shall:

- (1) Coordinate and organize its Members' activities related to the planning, implementation and evaluation of agreed programmes, strategies and activities, at the regional and subregional levels;
  - (2) Ensure that WMO is visible and recognized in its Region, and engage stakeholders in regional initiatives and projects related to the strategic priorities of the Organization; promote visibility and institutional capacity-building of its Members, and identify and address critical deficiencies for long-term sustainable modern services through supporting Members in the development of national strategic plans on meteorological and hydrological services; facilitate the exchange of best practices to communicate the socioeconomic benefits of meteorological and hydrological services;
  - (3) Identify requirements amongst members and regional bodies and communicate them, together with any impediments to the timely implementation of planned programmes and activities, to the technical commissions; collaborate with Members, technical commissions and other bodies, as necessary, to support, monitor and regularly review all the regional centres established by WMO bodies, ensuring excellent performance, sustainable operations and effective services to regional Members; consult with technical commissions on the identification of common experts to assist with the sharing of regional priorities and requirements and the implementation of technical priorities and associated capacity building activities; identify technical gaps and promote training to develop future experts;
  - (4) Promote cooperation and efficiency by establishing regional networks and facilities based upon identified regional needs, in close coordination with the technical commissions concerned; monitor the performance of regional networks and facilities, and the open sharing of data and technical expertise, and require corrective measures, as necessary;
  - (5) Contribute to the WMO operating plan and other implementation plans, as necessary, to reflect agreed strategic priorities from a regional perspective and ensure the engagement of Members in focused activities aimed at achieving the expected results of the WMO Strategic Plan;
  - (6) Structure its work to address regional priorities and make the best use of the expertise of its Members to provide guidance and assistance, in accordance with the needs of the Region;
  - (7) Build and promote cooperation and partnerships with relevant regional organizations, including the United Nations Regional Economic Commissions, other United Nations bodies, subregional organizations, development partners, non-governmental organizations, professional associations and academic and research organizations;
  - (8) Advocate, through its president, with regional political and economic entities, and support Permanent Representatives in advocating with their governments, for the necessary political and financial support to Members' capabilities to ensure provision of and access to vital meteorological, climatological, hydrological and other related environmental information and services.
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## **Resolution 7 (Cg-18)**

### **ESTABLISHMENT OF WMO TECHNICAL COMMISSIONS FOR THE EIGHTEENTH FINANCIAL PERIOD**

THE WORLD METEOROLOGICAL CONGRESS,

**Recalling:**

- (1) That the Seventeenth Congress requested the Executive Council to provide recommendations to the Eighteenth Congress on constituent body constructs,
- (2) Decision 84 (EC-68) – Governance review, and Decision 68 (EC-69) – WMO constituent body reform,
- (3) Resolution 43 (Cg-XVI) – Terms of reference of the technical commissions,

**Expressing appreciation** for the work carried out by the Executive Council and its Working Group on Strategic and Operational Planning concerning the construct of technical commissions,

**Having examined** Recommendation 25 (EC-70) – WMO technical commissions and other bodies,

**Recognizing:**

- (1) That, in accordance with the Convention, Congress has established and, from time to time, reviewed commissions consisting of technical experts, to study and make recommendations to Congress and the Executive Council on subjects within the purpose of the Organization,
- (2) That the technical commissions, as per their general terms of reference (Annex III to the General Regulations) have been tasked:
  - (a) To study and review advances in science and technology, keep Members informed and advise Congress, the Executive Council and other constituent bodies on these advances and their implications,
  - (b) To develop, for consideration by the Executive Council and Congress, proposed international standards for methods, procedures, techniques and practices in meteorology and operational hydrology including, in particular, the relevant parts of the Technical Regulations, guides and manuals,
- (3) That the Congress had classified the technical commissions into two groups:
  - (a) Basic commissions – dealing with basic operations and facilities, and research in atmospheric sciences,
  - (b) Applications commissions – dealing with applications to economic and social activities,
- (4) That the technical commissions have played a major role in engaging the collective expertise of Members in coordinating the design and development of globally harmonized systems and services operated by Members, and in the development of related standards and guidance, which have contributed to the achievement of the purposes of the Organization in bringing benefits to its Members,

**Recognizing further:**

- (1) That the rapidly changing technological and institutional environment and the growing societal demand for information and services in all WMO business areas will require a holistic and integrated approach along the service delivery value chain,
- (2) That such a holistic approach would be achieved through the consolidation and streamlining of expertise and normative work in major organizational domains covering: (a) the integrated infrastructure and methodology for Earth system observations, information management, and generation of forecasts and products, and (b) the development of applications and services, and related methodologies for service delivery to governments, citizens and economic sectors, and (c) focused scientific research and capacity development,
- (3) That the restructuring of the technical commissions is intended to support the Strategic Plan, which aims to support the development of:
  - (a) An Earth system science approach to seamless prediction from climate scales down to the microscale that is built upon the concept of the weather, water, ocean and climate linkages,
  - (b) An integrated approach to weather, water, ocean and climate linkages supporting Members' efforts to ultimately unify operational prediction systems using a fully coupled Earth system model approach, concerned with changes such as in the ocean and cryosphere, that have a direct influence on the atmosphere and other elements of the Earth system across all time scales,
  - (c) A holistic, interdisciplinary approach to services and applications with a strong focus on users and use cases, promoting an impact-based approach and supporting a common development of standards and methodologies for generic service attributes like quality, competence, fitness for purpose, accessibility, as well as innovation in service delivery (e.g. through social media),

**Considering** the need to maintain and strengthen the leadership of the Organization in the domains of weather, climate, water and related environmental aspects;

**Considering further** the review of the recommendations of the extraordinary session of the Commission for Hydrology (CHy-Ext.(2019)) by the EC Working Group on WMO Strategic and Operational Planning (WG/SOP);

**Recognizing** that, in view of the scale of the restructuring, which is unprecedented in the history of WMO, the transition from the existing to the new structure should be realized through a transparent and well-managed process encompassing proactive change management with special focus on communication with all stakeholders, in particular, the regional associations and their Members;

**Decides:**

- (1) To establish, in accordance with Article 8 (g) of the Convention, the following technical commissions for the eighteenth financial period:
  - (a) Commission for Observation, Infrastructure and Information Systems (Infrastructure Commission), with terms of reference provided in Annex 1A; and
  - (b) Commission for Weather, Climate, Water and Related Environmental Services and Applications (Services Commission), with terms of reference provided in Annex 1B;

- (2) That the fundamental working principle of the new commissions should be the inclusiveness of the weather, climate, water and other relevant environmental areas covered by the WMO constitutional purpose;
- (3) That, given the capacity development needs of Members, the efficiencies and savings gained from the restructuring of technical commissions will be re-aligned to support activities aimed at enhancing the capacity of Members;
- (4) That, due to the multidisciplinary nature and increased work volume, the composition and working arrangements of the new commissions should be elaborated to ensure a balanced representation of relevant disciplines, active and balanced regional engagement and gender considerations;
- (5) That the two technical commissions shall commence their work as early as possible in accordance with the Transition Plan provided in [Cg-18/INF. 4\(1\)](#) and the timetable provided in Annex 2 to this resolution;
- (6) That, in accordance with the final paragraph of Article 8 of the Convention, the president of each new commission and their co-vice-presidents<sup>6</sup> will be elected by Congress, from amongst current presidents and vice-presidents of technical commissions and those who served during the seventeenth financial period, as a one-time measure aimed at expediting the transition to the new structure of the technical commissions;
- (7) That a Transition Team composed of the presidents and vice-presidents of existing and new technical commissions, the chairs and vice-chairs of the Research Board and the Hydrological Assembly and the presidents of regional associations, chaired by the presidents of the new commissions and the chair of the Research Board, will, by the first joint session of the new technical commissions and the Research Board in April 2020:
  - (a) ensure the orderly transition of normative functions of the technical commissions active during the seventeenth financial period and effective incorporation of their work and deliverables, that are relevant to the priorities identified in the Strategic Plan, into the new structures, (b) assess and manage risks associated with such a transition and (c) guide preparations for the first joint session of new technical commissions and the Research Board in April 2020 and develop recommendations for the establishment of their subsidiary bodies;
- (8) Upon completion of the transition period, to disband the existing technical commissions that have been active during the seventeenth financial period, as follows:
  - Commission for Basic Systems (CBS);
  - Commission for Instruments and Methods of Observation (CI MO);
  - Commission for Hydrology (CHy);
  - Commission for Atmospheric Sciences (CAS);
  - Commission for Aeronautical Meteorology (CAeM);
  - Commission for Agricultural Meteorology (CAgM);
  - Joint WMO-IOC Technical Commission for Oceanography and Marine Meteorology (JCOMM);
  - Commission for Climatology (CCI);

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<sup>6</sup> Due to the multi-disciplinary nature of the new commissions, in interpretation of Article 19 of the Convention, the office of vice-president of commissions can be shared by up to three vice-presidents.

**Expresses appreciation** to the presidents, vice-presidents and experts who served in the technical commissions before and during the seventeenth financial period for their leadership, commitment and contribution to the work of the Organization;

**Requests** the Executive Council to oversee the transition to the new technical commissions and report on the implementation of this resolution at the extraordinary session of Congress in 2021;

**Requests** the presidents of the new technical commissions to ensure the establishment of optimum subsidiary structures as needed to implement the Strategic Plan, recognizing a vision towards a more integrated disciplinary and interdisciplinary approach and to be structured in the most efficient and effective manner;

**Requests** further the presidents of the new technical commissions:

- (1) To endeavour to maximize efficiency and synergy through establishing a strong liaison with relevant internal and external bodies, including, where appropriate, joint bodies and/or inter-agency bodies as well as relevant global and regional partnerships;
- (2) To report on the subsidiary structure and the working plans of the commissions at the seventy-second session of the Executive Council (2020);
- (3) To establish working mechanisms and processes that will respond to the priorities and requirements set by Members by developing technical solutions to meet those priorities and requirements in consultation with regional associations, to ensure the solutions are feasible, affordable and implementable at the regional and national levels;
- (4) To cooperate with the presidents of the regional associations in the selection of experts nominated by Members, to ensure synergies with the respective regional bodies and other technical commissions and better leverage resources, to communicate regional requirements and ensure the implementation of the technological development at national, regional and global level;

**Requests** Members to support the establishment of a solid community of expertise (WMO Expert Network) that will underpin the technical commissions by nominating knowledgeable, experienced and motivated professionals in the related technical fields, taking into consideration regional and gender representativeness, and to support their work in the commissions, in terms of adequate working time and financial commitment, in order to ensure the leadership role of the commissions in the development of global standards, applying innovation and building the national, regional and global technical capacity needed to achieve the purposes of the Organization;

**Requests** the presidents of regional associations to work actively with their Members to ensure that nominated experts are representative of geographic, gender and technical diversity, in order to facilitate comprehensive input on regional needs and issues, as well as to facilitate implementation and uptake of evolving technical systems, standards and regulations at national and regional levels;

**Requests** the Secretary-General to take the required steps that will ensure the smooth transition to the new arrangement of technical commissions in accordance with the Transition Plan.

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Note: This resolution replaces Resolution 43 (Cg-XVI) – Terms of reference of the technical commissions, which is no longer in force.

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## **Annex 1 to Resolution 7 (Cg-18)**

### **TERMS OF REFERENCE OF TECHNICAL COMMISSIONS**

Note: The General Terms of Reference of Technical Commissions provided in Annex III to the General regulations will remain unchanged.

#### **A. Commission for Observation, Infrastructure and Information Systems**

##### ***General mandate***

The overall scope and specific terms of reference for the Commission for Observation, Infrastructure and Information Systems (Infrastructure Commission) shall be in accordance with the purposes of the Organization defined in Article 2 of the Convention, in particular, items (a) through (c) and (e), and Regulations 180 to 196 of the General Regulations.

The Commission shall contribute to: the development and implementation of globally coordinated systems for acquiring, processing, transmitting and disseminating Earth system observations, and related standards; the coordination of the production and use of standardized analysis and model forecast fields; and the development and implementation of sound data and information management practices for all WMO Programmes and their associated application and services areas.

The work of the Commission shall encompass all approved WMO application areas, as listed in the Rolling Review of Requirements, as well as updated and emerging observing, information and infrastructure requirements.

The Commission shall promote the development of integrated systems to cover all application areas wherever possible, and shall ensure that these systems:

- (a) Are user-driven and provide Earth system observations, processed data and relevant services, products and information to Members;
- (b) Are applicable, accessible and with life-cycle management across the full range of WMO Members;
- (c) Are built on a modular and scalable principle to the extent possible;
- (d) Make full use of existing WMO and other relevant standards and regulations;
- (e) Make use of and promote public-private engagement where advantageous;
- (f) Incorporate state-of-the-art optimal and fit-for-purpose technology;
- (g) Are based on user requirements developed in coordination with the Services Commission and the Research Board;
- (h) Are building upon existing partnerships and networks among communities of practice within the service areas, which are beneficial for WMO Members.

The activities of the Commission shall be guided by the WMO Strategic Plan.

**Specific terms of reference**

- (a) Development and maintenance of WMO normative material related to integrated observing systems, data transmission and dissemination systems, data management systems, and data processing and forecast systems as specified in WMO Technical Regulations – the Commission shall:
  - (i) Coordinate the development of new systems and infrastructure-related regulatory material in all application areas of its scope;
  - (ii) Promote and pursue the integration of existing regulatory material;
  - (iii) Keep regulatory material up-to-date through regular amendments, as necessary;
  - (iv) Ensure the consistency of new and amended regulatory material across the application areas;
  - (v) Consider relevant scientific and technological developments to ensure the currency of the regulatory material;
  - (vi) Together with the Services Commission and the Research Board, coordinate linking science, infrastructure and services interactively;
  - (vii) Accompany each recommendation for new and amended regulatory material with its own impact, cost-benefit, and risk analysis;
- (b) Common infrastructure and systems attributes – the Commission shall:
  - (i) Promote a culture of compliance with standards and relevant regulatory material among all Members;
  - (ii) Further develop and promote the use of the Rolling Review of Requirements (RRR) for the assessment of user requirements, the assessment of available capabilities, and the development of gap mitigation strategies in order to further improve the overall systems capabilities of WMO;
  - (iii) Develop and promote a unified approach to data management across all disciplines and WMO application areas;
  - (iv) Develop common methodologies for quality assurance of observations and other data products across all application areas;
  - (v) Actively seek engagement from Earth system observational data providers from all relevant government entities, international organizations, the private sector, and academia.
- (c) Assistance to Members to enhance systems capabilities and enable effective implementation and compliance – the Commission shall:
  - (i) Consult with regional associations and Members to identify need for improvement in observing, data transmission and data management capabilities services and develop the required implementation strategies;
  - (ii) Consult with regional associations to identify experts who can participate in technical commission teams, to facilitate the implementation and uptake of evolving technical systems, standards and regulations at national and regional levels;
  - (iii) Facilitate the regional and national implementation of systems under its remit by developing guidance material aligned with new and amended regulatory material;

- (iv) In consultation with the regional associations, identify Members' needs for assistance in improving their capabilities and providing relevant guidance and capacity building, including training;
  - (v) Propose pilot and demonstration projects as necessary;
  - (vi) Facilitate the transfer of knowledge by supporting relevant events and through communication and outreach activities;
  - (vii) Provide standards and regulations for the basic measurement of variables characterising water quantity, quality and sediments;
  - (viii) Support the technical aspects of the Hydrological Status and Outlook System and the state of the water report;
- (d) Cooperation and partnership – the Commission shall:
- (i) Establish a close coordination and efficient working mechanisms with the Commission for Weather, Climate, Water and Related Environmental Services and Applications (Services Commission), relevant international organizations in the area of meteorological, hydrological, climatological and other environmental observations, information and infrastructure;
  - (ii) Establish and maintain close collaboration and coordination with WMO co-sponsored systems and programmes, and other major international observing programmes and initiatives;
  - (iii) Establish in collaboration with the Research Board consultative mechanisms with relevant scientific and operational user organizations to receive feedback and advice on systems capabilities;
  - (iv) Seek opportunities for leveraging resources through the establishment of joint, including inter-agency, bodies and projects addressing common areas of system development.

### **Composition**

The composition of the Commission shall be in accordance with General Regulation 183.

Participation of leading technical experts in Earth system observations, information management and prediction in the fields of meteorology, hydrology, climatology, oceanography, atmospheric environment and other fields covered by the terms of reference shall be ensured by Members.

UN, international organization partners, and private partners of WMO may be invited to nominate technical experts in their areas of expertise to participate in the work of the Commission in accordance with General Regulation 183 (as amended by Resolution 75 (Cg-18)).

### **Working procedures**

The Commission shall elect a president and up to three co-vice-presidents among the experts on the Commission and determine which of the co-vice-presidents should serve as Acting President in accordance with General Regulation 12.

The Commission shall establish effective and efficient working mechanisms and related necessary time-limited subsidiary bodies:

- (a) Establish effective and efficient working mechanisms through an adequate number of subsidiary bodies;

- (b) Make an effective use of a broad community of practice encompassing Members' collective expertise, including the private and academia sectors;
- (c) Establish a work programme with concrete deliverables and timelines, aligned with the Organization-wide Strategic and Operating Plan and monitor progress regularly using appropriate performance indicators and targets for reporting to the Executive Council and Congress;
- (d) Use electronic forms of coordination and collaboration effectively;
- (e) Establish effective coordination with other technical commissions, the Research Board, the Joint WMO-IOC Collaborative Board and other relevant bodies in particular through the Executive Council's Technical Coordination Committee (TCC), as appropriate;
- (f) Organize effective communication and outreach to inform the WMO community of ongoing work, achievements and opportunities;
- (g) Apply a system for the recognition of achievements, promotion of innovation and the participation of young professionals;
- (h) Ensure regional and gender balance and inclusiveness in all its structures and work plans;
- (i) Ensure adequate representation and consultation with communities of practice among the service areas.

## **B. Commission for Weather, Climate, Water and Related Environmental Services and Applications**

### ***General mandate***

The overall scope and specific terms of reference of the Commission for Weather, Climate, Water and Related Environmental Services and Applications (Services Commission) shall be in accordance with the purposes of the Organization defined in Article 2 of the Convention, in particular, items (d) and (e); Regulations 180 to 196 of the General Regulations.

The Commission shall contribute to the development and implementation of globally harmonized weather-, climate-, water-, ocean- and environment-related services and applications to enable informed decision-making and the realization of socioeconomic benefits by all user communities and society as a whole.

The Commission shall encompass application areas with substructures as needed to implement the WMO Strategic Plan including, but not limited to:

- (a) Regulated and existing meteorological services (covered by WMO *Technical Regulations* (WMO-No. 49), in accordance with General Terms of Reference 2):
  - (i) aeronautical meteorological services;
  - (ii) marine and oceanographic meteorological services;
  - (iii) agrometeorological services;
  - (iv) public weather services;
  - (v) climatological services;
  - (vi) hydrological services;



- (b) Emerging services under development (currently the subject of studies and evaluation for possible inclusion in regulated services, in accordance with General Terms of Reference 1):
- (i) urban services;
  - (ii) environmental services;
  - (iii) multi-hazard early warning services;
  - (iv) polar and high mountain area services;
  - (v) health;
  - (vi) energy;
  - (vii) food security
  - (viii) water management;
  - (ix) land transportation;
  - (x) others, as may become necessary.
- (c) Potential category for hydrological services.

The Commission shall promote a holistic approach to services and service delivery and assist Members to apply:

- (a) Risk-based decision-making in support of disaster risk preparedness and reduction;
- (b) A service-oriented culture;
- (c) A strong user focus with 'fit-for-purpose' services;
- (d) Quality management in service delivery;
- (e) Standards for competence and qualification of personnel;
- (f) Mutually-beneficial public-private engagement providing optimized service delivery and added value to society;
- (g) Accelerated uptake of advanced technology for service delivery;
- (h) Systematic evaluation of socioeconomic benefits and other relevant market-oriented evaluations of products and services.

The activities of the Commission shall be guided by the WMO Strategic Plan and the WMO Strategy for Service Delivery.

***Specific terms of reference***

- (a) Development and maintenance of WMO normative material related to service delivery, as specified in WMO Technical Regulations, the Commission shall:
  - (i) Coordinate the development of new service-oriented regulatory material in all application areas of its scope based on identified needs of Members;

- (ii) Keep the regulatory material up-to-date through regular amendments, as necessary;
  - (iii) Ensure the consistency of new and amended regulatory material across the application areas;
  - (iv) Enhance capacity for prediction and service delivery;
  - (v) Consider relevant scientific and technological developments to ensure the currency of the regulatory material;
  - (vi) Together with the Infrastructure Commission and the Research Board, coordinate linking science, infrastructure and services interactively;
  - (vii) Accompany each recommendation for new and amended regulatory material with its own impact, cost-benefit, and risk analysis.
- (b) Common service delivery attributes – the Commission shall:
- (i) Promote a service-oriented culture in all relevant application areas including customer focus, quality management, as well as an understanding of the value and socioeconomic benefits;
  - (ii) Share best practices and develop harmonized methodologies for user engagement including the identification of requirements and the establishment of feedback mechanisms with users necessary for the continuous improvement of services;
  - (iii) Develop methodologies for impact-based products and services in all application areas, innovative service delivery methods and integrated platforms;
  - (iv) Ensure the harmonization of requirements for the competencies and qualifications of personnel involved in service delivery;
  - (v) Develop a common methodology for the verification and validation of information and service delivery as part of quality management;
  - (vi) Build, through appropriate studies and projects, a better understanding of the economics of service delivery, cost-recovery mechanisms, commercial and market elements, and develop respective guidance for Members;
  - (vii) Seek the engagement of service providers from the private sector and academia;
  - (viii) Promote global and regional partnerships, including building upon existing partnerships and networks among communities of practice among the service areas, which are beneficial for WMO Members.
- (c) Assistance to Members to enhance service delivery capabilities and enable effective implementation and compliance – the Commission shall:
- (i) Consult with regional associations and Members to identify needs for new and improved services and analyse related capabilities, and best practices;
  - (ii) Consult with regional associations to identify experts who can participate in technical commission teams, to facilitate the implementation and uptake of evolving services and applications, standards and regulations at national and regional levels;
  - (iii) Facilitate implementation by developing guidance material aligned with the promulgation of new and amended regulatory material;

- (iv) In consultation with the regional associations, identify Members' needs for assistance in improving their capabilities and providing relevant guidance and capacity-development activities, including training;
  - (v) Propose pilot and demonstration projects as necessary;
  - (vi) Facilitate the transfer of knowledge and best practices by supporting relevant events and through communication and outreach activities.
- (d) Cooperation and partnership – the Commission shall:
- (i) Establish close coordination and efficient working mechanisms with relevant international organizations such as ICAO, IMO and FAO, in the area of service delivery;
  - (ii) Establish consultative mechanisms with user organizations to receive feedback and advice on services;
  - (iii) Consider opportunities for leveraging resources through the establishment of joint, including inter-agency, bodies and/or projects addressing common areas of service delivery.

### ***Composition***

The composition of the Commission shall be in accordance with General Regulation 183.

Participation of leading technical experts in services and applications in the field of meteorology, climatology, hydrology, ocean and the other fields covered by these terms of reference, shall be ensured by Members.

UN, international organizations and private sector partners of WMO may be invited to nominate technical experts in their areas of expertise to participate in the work of the Commission in accordance with General Regulation 183 (as amended by Resolution 75 (Cg-18)).

### ***Working procedures***

The Commission shall elect a president and up to three co-vice-presidents among the experts on the Commission and determine which of the co-vice-presidents should serve as Acting President in accordance with General Regulation 12.

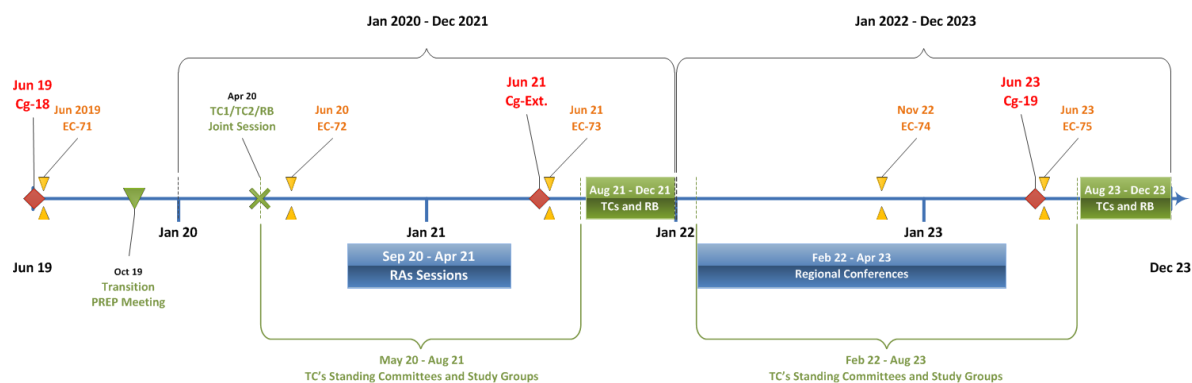
The Commission shall establish effective and efficient working mechanisms and related necessary time-limited subsidiary bodies:

- (a) Establish effective and efficient working mechanisms through an adequate number of subsidiary bodies;
- (b) Make an effective use of a broad community of practice encompassing Members' collective expertise, including the private and academia sectors;
- (c) Establish a work programme with concrete deliverables and timelines, aligned with the Organization-wide Strategic and Operating Plan and monitor progress regularly using appropriate performance indicators and targets for reporting to the Executive Council and Congress;
- (d) Use electronic forms of coordination and collaboration effectively;

- (e) Establish effective coordination with other technical commissions, the Research Board, the Joint WMO-IOC Collaborative Board and other relevant bodies, in particular through the Executive Council’s TCC, as appropriate;
- (f) Organize effective communication and outreach to inform the WMO community of ongoing work, achievements and opportunities;
- (g) Apply a system for the recognition of achievements, promotion of innovation and the participation of young professionals;
- (h) Ensure regional and gender balance and inclusiveness in all its structures and work plans;
- (i) Ensure adequate representation and consultation with communities of practice among the service areas.

### Annex 2 to Resolution 7 (Cg-18)

#### TIMELINES FOR CONSTITUENT BODY SESSIONS DURING A FINANCIAL PERIOD



**Resolution 8 (Cg-18)****RESEARCH BOARD**

THE WORLD METEOROLOGICAL CONGRESS,

**Recalling:**

- (1) Decision 50 (EC-69) – An integrated research and development approach, which includes the main principles to fill the gap between research and operations and to better integrate science in WMO activities,
- (2) Decision 52 (EC-69) – Early career research scientist involvement in WMO activities, which requested all Members to promote and support the early career scientist activities and make them beneficial and accessible to young researchers in their own countries and worldwide,
- (3) Recommendation 1 (CAS-17) – The role of science in serving society, which requested the Executive Council Working Group on Strategic and Operational Planning to take into account the need for a stronger WMO leadership in science and research and to strengthen the integrated role of research in the “science-for-services” context,
- (4) Recommendation 2 (CAS-17) – Seamless prediction systems, which recommended strengthening partnerships with the United Nations system and other international organizations to promote the WMO research agenda towards seamless prediction, and promoting innovation across WMO technical programmes and activities to ensure the co-design of new and improved services and products,

**Considering** that the implementation of the WMO Strategic and Operating Plans will benefit significantly from an effective uptake of research into operational systems and that political decision-making needs a solid scientific foundation,

**Considering further** the need for a mechanism to coordinate the implementation of the research programmes of the Organization to deliver on the long-term goals and strategic objectives of the Strategic Plan, assisted by the guidance provided by the Scientific Advisory Panel established by Resolution 35 (EC-70),

**Decides**, according to Article 8 (h) of the Convention, to establish the Research Board on Weather, Climate, Water and the Environment with the terms of reference as given in the annex to this Resolution.

**Requests** the Executive Council:

- (1) To appoint the Research Board members, starting with an initial core membership at the seventy-first session to ensure that the appropriate expertise is available to contribute to the transition process,
- (2) To ensure, as part of the work of the Transition Team, that rules and procedures for the Research Board and its working structures are developed as part of the revision of the Rules and Procedures,
- (3) To provide oversight on the work of the Research Board through the participation of the chair and vice-chair of the Board in the Technical Coordination Committee,
- (4) To facilitate, through the Technical Coordination Committee, the integration of science into all the domains covered by the technical commissions;

**Requests** the regional associations to facilitate the engagement of Members in the co-design of the research-to-operation initiatives at the regional scale;

**Requests** the technical commissions to facilitate the co-design of the research-to-operation initiatives;

**Urges** Members to encourage engagement of experts in the work of the Board and the WMO Science Forum;

**Requests** the Secretary-General to take the required steps that will ensure the smooth transition to the new arrangement of the Research Board in accordance with the Transition Plan.

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Note: This resolution replaces Resolution 43 (Cg-XVI) – Terms of reference of the technical commissions, which is no longer in force.

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## **Annex to Resolution 8 (Cg-18)**

### **TERMS OF REFERENCE OF THE RESEARCH BOARD ON WEATHER, CLIMATE, WATER AND THE ENVIRONMENT**

#### **Research Board on Weather, Climate, Water and the Environment**

##### ***Mandate***

The Research Board shall convene the large international scientific community, who engage with WMO and who value the opportunity to enhance the societal impact of their research through the relationship with WMO. The Research Board fosters an integrated and multi-disciplinary research approach to weather, climate, water and environment, and develops all elements of the value chain, from discovery science to serving society, in the context of the Earth System science.

By gearing up international scientific and technical endeavours, the Research Board will support and grow the scientific and technological capabilities of WMO and its members, as well as consolidating and strengthening the central role played by WMO in wider international agendas for environmental science and services, for the benefit of the world (e.g. the Paris Agreement, Sendai Framework, Sustainable Development Goals).

WMO, through its sponsored and co-sponsored research programmes, plays a unique role in facilitating and integrating research where international coordination enables scientific advances that would not happen otherwise. The research programmes function by engaging with, and gaining the commitment of, the international science community to their programmes of work, and in turn ensuring that participants derive benefit from engaging in WMO activities.

The building blocks of the Research Board are the research programmes (currently WWRP, GAW and WCRP), each led by a Steering Committee with responsibility to provide the overall scientific direction of the programme. The respective Steering Committees gear up the respective networks; develop and review science and implementation plans; review and assess the development of all elements of the programme; facilitate and prioritize research and development activities in their field of responsibility; facilitate the exchange of information among scientists participating in the programme; and collaborate with the broader scientific community.

Community engagement in WMO research programmes is broad and strong, reaching beyond WMO members to research institutes and academia. Whilst WMO is recognized for providing opportunities to work collaboratively to the greater benefit of the science, much more could be achieved to strengthen WMO convening power and to derive greater value by integrating across the research programmes. This is the mandate for establishing the Research Board.

The Research Board shall convene, organize and motivate, in an inclusive, flexible and forward looking way, the scientific and technical community around the three research objectives of the WMO strategic plan. The Research Board shall ensure that: (i) all elements of the value chain, from discovery science to science-based decision making, are properly built; (ii) WMO member's needs in terms of science and technological advancements are gathered; (iii) members have access to advancements in scientific and technological capabilities; (iv) less developed countries are supported to increase their research capabilities.

The Research Board shall provide the mechanisms for interfacing with the science international community in a cost-effective way, and for engaging with international and national research funding agencies.

The Research Board shall act to translate the strategic aims of WMO and decisions of the Council and Congress into overarching science, and science for services, priorities, and ensure the implementation and coordination of the research programmes to achieve these priorities in accordance with the purposes of the Organization defined in Article 2 (f) of the Convention. The Research Board shall support the implementation of the WMO Strategic Plan based on science and implementation plans for WMO research programmes and science for services activities, as approved by the Executive Council and any co-sponsor governing bodies, as appropriate.

The Research Board shall act to strengthen the development of solutions to major societal challenges by fostering Earth system approaches and seamless working across the research programmes. It shall respond to scientific challenges proposed by WMO Members and the other co-sponsors, taking into account the advice of the Scientific Advisory Panel (SAP).

The Research Board shall contribute to the design, planning and implementation of global, regional, and when needed national, research and innovation activities focusing on: improving Earth system processing, predictive and projection capabilities; advancing fundamental understanding of the Earth system; promoting the uptake of technological and scientific innovation; and maintaining a sustained user's requirement mechanism for innovation in services and research-to-operation.

### ***Specific terms of reference***

The Research Board shall:

- (a) Frame critical and technological priorities that WMO and its partners should focus on,
- (b) Guide the implementation of WMO (sponsored and co-sponsored) research programmes and act as the primary point of contact related to weather, climate, water and related environmental research aspects in WMO,
- (c) Ensure close coordination and cooperation between the WMO (sponsored and co-sponsored) research programmes, maintaining an optimal balance between weather, climate, water, ocean and environmental research initiatives and promote the synergies among such initiatives,
- (d) Ensure that the research programmes are implemented according to agreed implementation plans and that such plans are considering future technological and scientific challenges,

- (e) Convene a "WMO Science Forum", composed of researchers involved in steering, coordination and implementation of WMO research programs, and stimulate and facilitate active interactions across the members of the Forum, as well as the role of the Forum as a broad interdisciplinary sounding board for Research Board deliberations and activities,
- (f) Coordinate and oversee the interactions with the Services Commission and the Infrastructure Commission concerning innovation and research-to-operation,
- (g) Foster, coordinate and oversee WMO global and regional, and when relevant national, research and research-to-operation activities to innovate Member service delivery capacity, with emphasis on strengthening research capabilities in less developed countries and SIDS,
- (h) Maintain and coordinate a rolling review of requirement process concerning innovation and research-to-operation needs coordinating with regional associations,
- (i) Establish effective coordination with national and international funding agencies, as appropriate,
- (j) Apply a system for recognition of achievements and the participation of young professionals, and actively stimulate capacity building and inclusion of young professionals for least developed countries and SIDS.

### **Composition**

The Research Board shall comprise scientific, technological and innovation experts who are recognized WMO Member experts, in order to make an effective use of a broad scientific and technical community encompassing Members' collective expertise, including the private and academia sectors.

In addition, UN, international organization partners, scientific funding agencies and private partners, with which WMO has agreements or arrangements, may be invited to nominate experts in scientific and technical innovation to participate in the work of the Board on a formal or ad hoc basis.

The Research Board shall be composed of around 25 members active in the fields of weather, climate, water, ocean and related environmental and social sciences, taking into account geographical balance and reflecting the WMO gender equality policy, including:

- (a) The chairs or vice-chairs of the scientific oversight/steering committees of the WMO (sponsored and co-sponsored) research programmes (WCRP, WWRP, GAW) and future research programmes that WMO may establish,
- (b) Representatives from the co-sponsors of the research programmes, currently IOC and ISC (International Science Council),
- (c) Selected chairs of partners' programmes such as Future Earth, Group on Earth Observations, World Science Adaptation Programme,
- (d) Invited experts from UN and international organization partners,
- (e) Representatives from major global and regional research funding organizations (e.g. Belmont Forum, Global Research Panel, European Commission), and at least three relevant national science foundation representatives from WMO Members,
- (f) Maximum three representatives of World Meteorological Centres, rotating every two years,



- (g) One representative from each regional association based on their capacity to connect with regional scientific institutions and activities,
- (h) To ensure a strong co-design with the Services Commission and the Infrastructure Commission, one or two representatives from each will be invited to be part of the Research Board,
- (i) Additional invited experts to respond to the functions defined in the terms of reference and to increase the link with the regional associations.

The members will be appointed by the Executive Council.

Decisions on the composition of the Research Board and the Scientific Advisory Panel shall be made independently. However, experts may not be members of the Research Board and the Scientific Advisory Panel at the same time.

The term of engagement shall be four years, except for rotating members; for ex-officio members the duration shall be based on that of their term of office.

The Chair of the Research Board shall coordinate with the presidents of regional associations, the presidents of technical commissions and the World Meteorological Centres in consultation with the Secretariat to produce a proposal for experts under (f), (g) and (h) that maximises the range of expertise, geographical and gender balance and inclusiveness.

### ***Working procedures***

The chair of the Research Board has the responsibility to ensure coordination of the work in the Research Board with the presidents of the technical commissions and regional associations, who similarly shall coordinate their work with the Research Board chair.

The Research Board is structured around and across the WMO (sponsored and co-sponsored) research programmes as an effective and efficient coordinating and steering mechanism. The WMO (sponsored and co-sponsored) research programmes are managed by their respective scientific steering committees, which may establish related necessary time-limited subsidiary bodies, such as working groups, projects or similar. Such temporary substructures shall be reviewed and if relevant be discontinued at the end of every intersessional period.

During the transition period the Research Board shall establish a focus group to design the modes of working with the TCs and RAs with regards to the terms of reference (f) and (g).

The Research Board chair, considering recommendations from the Scientific Advisory Panel, will propose the chairs of the research programmes, who will be appointed by the Executive Council. In the case of co-sponsored programmes, the appointment of the chair will be as specified in the sponsorship agreement.

During the transition period, the Research Board will be chaired by a WMO (science) vice-President, or by an EC member with a high-level scientific profile, and vice-chaired by WMO CAS President or a member of the CAS management group. The Research Board will define the procedure to elect the future chair and co-chair.

The Research Board shall meet in principle once per year.

The Board shall ensure regional and gender balance and inclusiveness in all its structures and work plans.

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## **Resolution 9 (Cg-18)**

### **JOINT WORLD METEOROLOGICAL ORGANIZATION-INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION COLLABORATIVE BOARD**

THE WORLD METEOROLOGICAL CONGRESS,

**Recalling:**

- (1) Resolution 14 (Cg-XIII) – Joint WMO-IOC Technical Commission for Oceanography and Marine Meteorology (JCOMM),
- (2) IOC Resolution XX-12 – Joint WMO-IOC Technical Commission for Oceanography and Marine Meteorology (JCOMM),

**Considering** the revision of the system of technical commissions as decided by Resolution 7 (Cg-18), which entails the disbandment of the technical commissions that have been active during the seventeenth financial period, including JCOMM,

**Considering also** the expanded collaboration between WMO and the Intergovernmental Oceanographic Commission of UNESCO (IOC) in marine meteorology, oceanography and climatology, including in services, observation and information management, research and capacity building,

**Considering further** the evolving needs of a coordinating mechanism between WMO and IOC to support such collaborative activities,

**Having examined** the recommendations of the Joint WMO-IOC Consultation Group on the Reform of JCOMM established by Decision 58 (EC-70) and IOC Decision EC-LI/Dec.5.1,

**Expresses appreciation** to the co-chairs and the members of the Joint WMO-IOC Consultation Group on the Reform of JCOMM for their work,

**Decides**, according to General Regulation 181:

- (1) To incorporate appropriate JCOMM functions and activities on observation and operational ocean forecasting systems into the IOC-WMO-UN Environment-ISC Global Ocean Observing System (GOOS), with functional connections to the Commission for Observation, Infrastructure and Information Systems;
- (2) To incorporate appropriate JCOMM functions and activities on data management and processing into the Commission for Observation, Infrastructure and Information Systems, with a close connection to the work of the IOC International Oceanographic Data and Information Exchange (IODE);
- (3) To incorporate appropriate JCOMM functions and activities on services into the Commission for Services and Applications, with a close connection to relevant IOC activities in early warning and services;
- (4) To establish the Joint WMO-IOC Collaborative Board, as a high-level coordination mechanism with broader engagement of the key relevant bodies of the WMO and IOC, with the terms of reference as given in the annex to this Resolution;

**Decides also** that for the first intersessional period following the adoption of this Resolution the Joint WMO-IOC Collaborative Board will be co-chaired by the current co-chairs of the Joint WMO-IOC Consultation Group on the Reform of JCOMM, with the technical advice of the current JCOMM co-presidents, noting that these co-chairs would have flexibility to adjust the

length of initial appointment terms defined in the Terms of Reference, in order to stagger future rotation of members;

**Decides further** to review, in coordination with IOC governing bodies, the performance of the Joint WMO-IOC Collaborative Board, with an initial review in four years;

**Requests** the Joint WMO-IOC Collaborative Board:

- (1) To facilitate the continued work of all JCOMM functions and activities, by recommending connections to appropriate working structures on both sides,
- (2) To make recommendations on evolving the governance for the Global Ocean Observing System, in consultation with all co-sponsors, to further develop the partnership and functional connections between GOOS and WIGOS,
- (3) To prepare, in consultation with WMO and IOC technical, scientific and regional bodies, a comprehensive and coordinated WMO-IOC Collaborative Strategy, based on existing sectoral strategies, and submit it in two years to the WMO and IOC governing bodies for adoption;

**Encourage** WMO Members and IOC Member States to coordinate national responses to the advice of the Joint WMO-IOC Collaborative Board brought to WMO and IOC governing bodies;

**Instructs** the Secretary-General:

- (1) To define, in consultation with the IOC Executive Secretary, the working arrangements for the sponsorship of current JCOMM bodies and for the Joint WMO-IOC Collaborative Board and to report on implementation at the seventy-second session of the Executive Council;
- (2) To evaluate, in consultation with the IOC Executive Secretary, the financial and secretariat support requirements for the Joint WMO-IOC Collaborative Board, and make adequate provisions in the budget;

**Invites** the IOC Assembly to reflect in its decisions the content of this Resolution.

## **Annex to Resolution 9 (Cg-18)**

### **TERMS OF REFERENCE OF THE JOINT WMO-IOC COLLABORATIVE BOARD**

#### **Joint WMO-IOC Collaborative Board**

##### ***Purpose statement***

The Joint WMO-IOC Collaborative Board will maximize opportunities to co-design, co-develop and implement joint scientific and technical work, across oceanography and meteorology, that ultimately will improve the provision of information and services for societal benefit.

It will suggest initiatives to improve end-to-end links in the value chain from observations, through data management, to forecasting systems and Earth system prediction, to services and end user engagement, and enhance connections with research programmes to promote innovation.

By collaborating across both the oceanographic and meteorological communities, the Collaborative Board will provide strategic advice on programme co-design, implementation and governance in light of relevant long-term goals and objectives. The Collaborative Board will influence how the WMO and IOC jointly enable the delivery of relevant meteorological and oceanographic information and services on the open ocean, in coastal zones and in high latitudes. In addition, while respecting governance, it will provide guidance and advice around technical and scientific issues to optimize the complementarity of activities, including through generating common projects.

The terms of reference of the Joint WMO-IOC Collaborative Board shall be:

### ***Mandate***

- (a) To coordinate, through a quadrennial WMO-IOC collaborative strategy, the collaborative development, integration and implementation of the activities related to oceanographic and meteorological observation, data and information management, services, modelling and forecasting systems as well as research and capacity development carried out by WMO and IOC,
- (b) To provide the WMO and IOC governing bodies with strategic advice on joint work between WMO and IOC to achieve relevant objectives, including proposing new actions, as required, e.g. by preparing coordinated draft resolutions and/or decisions for both the WMO and IOC governing bodies,
- (c) To review work plans and provide technical and scientific recommendations for WMO and IOC subsidiary bodies and programmes, including proposing cross-cutting projects, and
- (d) To engage in liaison or consultation required with relevant intergovernmental and international stakeholders.

### ***Composition***

The membership of the Collaborative Board shall be constituted by:

- (a) Ten representatives of WMO and IOC scientific and technical bodies and programmes, including co-sponsored entities:
  - (i) Five designated by the WMO President, representing the leadership of activities in observing system, data processing and management, forecasting systems, services and applications, and research; from a meteorological perspective;
  - (ii) Five designated by the IOC Chairperson, representing the leadership of activities in observing system, data and information management, forecasting systems, early warning and services, and research; from an oceanographic perspective;
- (b) At large members of the WMO Executive Council and representatives of IOC Member States, taking into account overall geographical balance:
  - (i) Three members of the WMO Executive Council designated by the WMO President;
  - (ii) Three representatives of IOC Member States designated by the IOC Chairperson;
- (c) Two co-chairs:
  - (i) a WMO Vice-President, designated by the WMO President; and
  - (ii) an IOC Vice-Chairperson, designated by the IOC Chairperson.

**Working procedures**

The co-chairs shall hold their office for two years, with the possibility to be re-appointed for a second term.

Other members shall hold their office for four years, or based on the duration of their term as leader in a WMO, IOC or joint activity.

The co-chairs shall represent the Collaborative Board in the sessions of the WMO and IOC governing bodies.

In principle, the Collaborative Board shall meet in person every year, in order to prepare recommendations for WMO and IOC governing bodies. Intersessional work should be carried out by correspondence or virtual means.

Members of the Collaborative Board will work collaboratively across and within their respective constituent bodies and activities on WMO and IOC observations, data, forecasting systems, services and research activities, to achieve the objectives stated in the Collaborative Board's mandate.

The Collaborative Board may establish time-bound substructures for the discharge of specific tasks during an intersessional period. Such temporary substructures shall be discontinued at the end of every intersessional period, or may be re-established.

Chairs of other relevant WMO and IOC regional structures, working groups, panels and expert teams, as well as individual experts, may be invited by either co-chair in consultation with the other to attend meetings of the Collaborative Board as required by the agenda.

Representatives from other United Nations or international organizations may be invited as observers to the Collaborative Board as deemed appropriate by either co-chair in consultation with the other.

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**Resolution 10 (Cg-18)****SCIENTIFIC ADVISORY PANEL**

THE WORLD METEOROLOGICAL CONGRESS,

**Recalling** the global societal challenges underlying the 2030 Agenda for Sustainable Development, the Paris Agreement on climate change and the Sendai Framework for Disaster Risk Reduction and the resulting demand for multi-disciplinary scientific foresight,

**Considering** that benefiting from independent scientific advice would strengthen the ability of the WMO to gain from scientific and technological breakthroughs in order to lead advancements in weather, climate, water and related environmental fields to address the above challenges,

**Decides**, according to Article 8 (h) of the Convention, to establish the Scientific Advisory Panel with the terms of reference as given in the annex to this Resolution;

**Decides also** that the initial term of engagement of the members of the Scientific Advisory Panel will be of two years with the possibility of renewal;

**Requests** the Executive Council to appoint the members of the Scientific Advisory Panel;

**Also requests** the Executive Council, the regional associations, the technical commissions and other bodies to take into consideration the advice of the Scientific Advisory Panel and act as appropriate;

**Further requests** the Secretary-General to facilitate the work of the Scientific Advisory Panel.

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## **Annex to Resolution 10 (Cg-18)**

### **TERMS OF REFERENCE OF THE SCIENTIFIC ADVISORY PANEL**

#### **Scientific Advisory Panel**

##### ***Mandate***

The Scientific Advisory Panel (SAP) shall be the scientific advisory body of the Organization, drawing up opinions and making recommendations to Congress and to the Executive Council on matters concerning WMO research strategies and the optimal scientific directions to support the evolution of its mandate in weather, climate, water and related environmental and social sciences. The Panel shall provide forward-looking strategic advice on emerging challenges and opportunities, and in particular:

- (1) Advise on areas in which, on the basis of available evidence, new technological and scientific advancement would lead to new applications related to WMO core activities,
- (2) Promote the global standing and visibility of WMO as a leading scientific organization in the fields of weather, climate, water and related environmental and social sciences within the UN and otherwise, and enhance the WMO role as facilitator of international cooperation in weather, climate, water, ocean and environmental sciences among all role players,
- (3) Promote science vision, and its downstream trends, with WMO and among its Members as the primary driver for innovation, understanding and the development of new and improved weather, climate, water, ocean and related environmental services and know-how,

##### ***Composition***

The Panel shall be composed of maximum fifteen independent leading internationally recognized experts coming from the fields of weather, climate, water, ocean and related environmental and social sciences.

The opportunity to become a member of the Panel shall be announced publicly for individuals to put their name forward. The members of the Panel shall be appointed by the Executive Council, taking into account regional and gender balance and representation of academia, research bodies, the private sector and user communities reflecting the breadth of engagement in WMO Research Programmes. The selection of the names to be proposed to the Executive Council to be appointed as Panel members shall be done by the Secretariat in consultation with the chair of the Research Board. The term of engagement for members shall be four years with the possibility of renewal for a second term.

A WMO Vice-President shall act as an Executive Council focal point for the Panel to ensure cross-communication.

The chair of the Research Board and a representative of the Secretariat shall take part in the meetings of the Panel.

Decisions on the composition of the Scientific Advisory Panel and the Research Board shall be made independently. However, experts may not be members of the Research Board and the Scientific Advisory Panel at the same time.

### **Working procedures**

The Panel shall select a chair and a vice-chair.

The Panel shall meet in principle once per year prior to a session of the Executive Council.

The chair of the Research Board together with the Secretariat shall support the chair of the Panel in setting up and executing the meetings. The chair of the Panel may invite experts and/or representatives from partner organizations to attend meetings of the Panel as observers.

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## **Resolution 11 (Cg-18)**

### **WMO REFORM - NEXT PHASE**

THE WORLD METEOROLOGICAL CONGRESS,

**Recalling** its decisions at the sixteenth session requesting the Executive Council to continue to work on, and implement as appropriate, continuous improvement of WMO processes and practices to increase the efficiency and effectiveness of WMO constituent bodies and the overall efficiency of the Organization,

**Recalling further** its decisions at the seventeenth session requesting the Executive Council to continue to introduce specific measures for improvement of WMO processes and practices and also to undertake a holistic review of the Organization, including its processes and working practices, to provide recommendations on constituent body constructs and also to provide recommendations on rules, procedures, processes, working mechanisms, and duties, of constituent bodies, WMO Officers (President, vice-presidents, PRAs and PTCs) and the relationship between them and the WMO Secretariat to enhance the efficiency and effectiveness of the Organization and good governance,

**Noting** with satisfaction the work accomplished by the Executive Council, assisted by the Secretariat, during the seventeenth financial period on the reform of the WMO constituent bodies, which had a strong focus on the new construct of the WMO technical commissions and research bodies,

**Having agreed** on the new technical commissions (Resolution 7 (Cg-18)), research and other bodies (Resolutions 8, 9 and 10 (Cg-18)), on the Executive Council structures (Resolution 5 (Cg-18)), on amended terms of reference of regional associations (Resolution 6 (Cg-18)), and on the transition process to be reviewed at Cg-Ext. at 2021 (Resolution 89 (Cg-18)),

**Recognizing** that the global societal risks, the technological developments, and the global agenda put unprecedented requirements and expectations to the WMO and to Members for the provision of vital information and services to underpin the achievement of the Sustainable Development Goals, and the goals of the Paris Agreement and the Sendai Framework,

**Further recognizing** the fundamental role of the Secretariat in ensuring the successful coordination of WMO activities including those for specialized technical responsibilities and partnerships,

**Agrees** that the WMO reform efforts should continue during the eighteenth financial period and should focus on the following areas:

- (a) Ensuring coherence and consistency between the strategic, programmatic and financial frameworks; streamline WMO technical and scientific strategies, plans and programmes according to the WMO Strategic Plan, Operating Plan and budget based on long-term goals and strategic objectives,
- (b) Comprehensive review of the WMO regional concept and approaches in order to strengthen the role and enhance the effectiveness of the regional associations, with the support of the WMO Regional Offices,
- (c) Continual enhancement and innovation in administrative processes, rules and practices,
- (d) Review and alignment of the structure, staffing and rules of the Secretariat to enhance its utility and effectiveness in serving Members for achieving the long-term goals and strategic objectives of the Organization, while ensuring a transparent communication process to minimize concerns in staff,

**Requests** the Executive Council to provide recommendations to Congress on items (a) and (b) above;

**Requests** the Secretary-General to report to Congress and the Executive Council on items (c) and (d) above;

**Further requests** the Executive Council:

- (1) To keep constituent body structure under review, along with the development of the future focus areas (outputs) of the Strategic Plan, and
- (2) To make recommendations to the nineteenth Congress for the establishment of relevant constituent body structures, procedures and measures necessary for implementation of the Strategic Plan in the nineteenth financial period.

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## **Resolution 12 (Cg-18)**

### **WMO METHODOLOGY FOR CATALOGUING HAZARDOUS WEATHER, CLIMATE, WATER AND SPACE WEATHER EVENTS**

THE WORLD METEOROLOGICAL CONGRESS,

**Recalling:**

- (1) Resolution 9 (Cg-17) – *Identifiers for cataloguing extreme weather, water and climate events,*
- (2) The global developments as outlined in the Sendai Framework for Disaster Risk Reduction 2015–2030, the Paris Agreement on climate change, and the United Nations Framework Convention on Climate Change (UNFCCC) Warsaw International Mechanism for Loss and Damage associated with climate change impacts, and the 2030 Agenda for Sustainable Development with its 17 Development Goals (SDGs),
- (3) Recommendation 1 (EC-70) – *On the approach to cataloguing high-impact events,*

**Mindful of** the increasing frequency and magnitude of hazardous weather, water and climate events and their impacts on different socioeconomic sectors, lives and livelihoods,



**Noting** that:

- (1) Many National Meteorological and Hydrological Services (NMHSs) are collecting historical data and products and are developing or maintaining historical databases of hydro-meteorological events and the need for international cooperation to implement such measures including through providing assistance to developing countries and in particular to Least Developed Countries (LDCs),
- (2) Countries have established disaster accounting systems based on losses and damages occurring from hazardous events, that could help in monitoring the implementation of the 2030 Agenda,

**Recognizing:**

- (1) That the absence of globally agreed standards and procedures for identifying and cataloguing hazardous weather, climate, water and space weather events has hampered the routine characterisation and tracking of such events and associated losses and damages,
- (2) That national, regional and global statistics suffer from a lack of internationally agreed definitions and accounting practices on the impacts of such events for aggregation and analysis of losses data,
- (3) That, in many cases, the recorded hazardous weather, water and climate events are not accurately associated with the recorded impact which poses challenges in reliably estimating the total losses associated with hazardous hydrometeorological events,
- (4) The results of the test phases conducted in 2018-19 in Regional Associations (RAs) VI (Europe) and V (South-West Pacific) and the recommendations from the Executive Council Working Group on Disaster Risk Reduction (EC-WG-DRR) and the support expressed by all other RAs for this initiative,

**Reaffirming** that developing identifiers for cataloguing weather, water, climate and space weather events and their characterisation in terms of location, duration, magnitude and timing using a consistent methodology will provide the means by which such events can be unambiguously linked with the associated losses and damages,

**Convinced** that a standard methodology for cataloguing hazardous hydrometeorological events, including internationally agreed definitions and accounting practices, is essential for many disaster risk management (DRM) applications,

**Emphasizing** that developing a standard and authoritative source of event types and their characterisation and accounting systems requires close collaboration between the hydro-meteorological community, involving operational, science and applications activities on one hand, and losses and damages communities involving DRM, civil protection, risk transfer, humanitarian activities on the other,

**Agrees** that the proposed methodology will address the issues identified under Recognizing, including in particular:

- (1) The cataloguing methodology will fill a major gap in the standardisation of data collection and use of information on weather, water, climate and space weather events and their recording and archiving in interoperable databases;
- (2) Systematically catalogued data on hydrometeorological event occurrences will support DRM as well as research on hazardous events including the assessment of observed changes in their frequency and intensity and the attribution of losses and damages to them and enhance Members' capabilities for climate monitoring, projection and adaptation and DRM (including prevention, preparedness, response, recovery and adaptation);

- (3) A WMO coordinated catalogue of hazardous weather, climate, water and space weather events will support a consistent, robust and efficient implementation of key operational WMO activities such as supporting MHEWS or the Climate Watch System (CWS) and seamless interactions between regional and national data for data recording of such events;

**Expresses** its appreciation to the:

- (1) Commission for Climatology (CCI) and the Commission for Basic Systems (CBS) for leading the development of the methodology in collaboration with other commissions within the Inter-Programme Task Team on Cataloguing Extreme Weather, Water and Climate Events (IPTT-CWWCE);
- (2) EC-WG-DRR for overseeing the development of the methodology and providing recommendations for its adjustment and implementation;
- (3) RA VI (Europe) for the excellent coordination of a test phase in Europe by the WMO RA VI Regional Climate Centre (RCC) Node on Climate Monitoring in Offenbach, Germany (see [Cg-18/INF. 5.1\(1\)](#));
- (4) RA V (South-West Pacific) for its testing the proposal in three countries including Australia, Indonesia and the Philippines with the Indonesian Meteorological, Climatological, and Geophysical Agency (BMKG) coordinating and aggregating event reports (in [Cg-18/INF. 5.1\(1\)](#));

**Adopts** the cataloguing methodology hereafter referred to as “WMO Cataloguing of Hazardous Events” (WMO-CHE) as described in the annex to the present resolution;

**Requests** the Executive Council to oversee and facilitate the development of an implementation plan for, and the further implementation of, the cataloguing methodology;

**Requests** the technical commissions and other bodies, in collaboration with the RAs, relevant partner organizations and entities, to:

- (1) Establish an implementation plan for developing globally agreed standards and procedures for identifying and cataloguing hazardous weather, climate, water and space weather events as updates to the technical regulations incorporated in the Global Data Processing and Forecasting System (GDPFS) and the WMO Information System (WIS) describing roles and responsibilities (NMHSs, Regional Specialized Meteorological Centres (RSMCs), RCCs), for data collection processing, archiving and exchange for submission to EC-72 (2020) for approval;
- (2) Ensure the methodology is well linked with relevant WMO DRR initiatives taking into account the requirements of Common Alert Protocol (CAP), impact-based forecasting and warning, CWS and others as relevant;
- (3) Set up a mechanism for the coordination of the implementation of this methodology on an operational basis;
- (4) Develop, update and maintain guidelines including the description of the methodology, list of events, and recommendations/standards for data recording, cataloguing and consolidation, archiving and processing with consideration of regional specificities;

**Urges** Members to engage in the development and implementation of the WMO-CHE;

**Requests** the Secretary-General to facilitate and support:

- (1) The development of new standards and identification of best practices by the technical commissions and other bodies, RAs, and relevant international

organizations/stakeholders and provide the necessary resources and Secretariat support for this initiative;

- (2) The development of linkages and a communication strategy to ensure that the concept is well understood and supported by all stakeholders, including international organizations, research institutes and initiatives, and the insurance industry, to promote the use of the WMO-CHE and to improve the methodology on hazard cataloguing and associated assessments in support of the 2030 Agenda.

[See [Cg-18/INF. 5.1\(1\)](#) for more information.]

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Note: This resolution replaces Resolution 9 (Cg-17), which is no longer in force.

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## **Annex to Resolution 12 (Cg-18)**

### **WMO METHODOLOGY FOR CATALOGUING HAZARDOUS WEATHER, CLIMATE, WATER AND SPACE WEATHER EVENTS (WMO-CHE)**

#### **1. Introduction**

1.1 The proposal centres on identifying hazardous weather, climate, water, space weather events (hereafter we use the term "event" for simplicity) and other related environmental phenomena (such as air quality) uniquely, while at the same time being able to group related events to the larger scale systems which provides additional context and the capability to conduct analysis from local to larger scale systems therefore reducing the risk of event double accounting.

1.2 More specifically, the scheme involves recording an event by first assigning a random Universal Unique Identifier (UUID) number as the event identifier. The UUID is an International Organization for Standardization (ISO) standard random number generated by a relevant national, regional or global authority and can be easily generated from an online tool or a simple system program that is available in most IT standard operating systems.

1.3 Appended to the event identifier are the event attributes which comprise the event record (or data record). These attributes describe the event, including the event start and end times, spatial extent as well as other attributes that provide context such as the hazard specification and description fields (highest wind speeds, precipitation amounts, values of hydrometeorological indexes, etc.) and linkage to other related events (see Figure 1 below and Table 1 in [Cg-18/INF. 5.1/1](#) .

1.4 Importantly, authorities responsible for assessing losses and damages would be able to attribute losses and damages to the corresponding event UUID.

#### **2. Linking of events**

2.1 Each event will have its own UUID with the possibility to cluster related events (e.g. a cyclone, leading to heavy rain, strong winds, storm surge flooding and landslides) into larger scale phenomena (i.e. better attribution to the causal event) as well as linking cascading events and any associated data across borders.

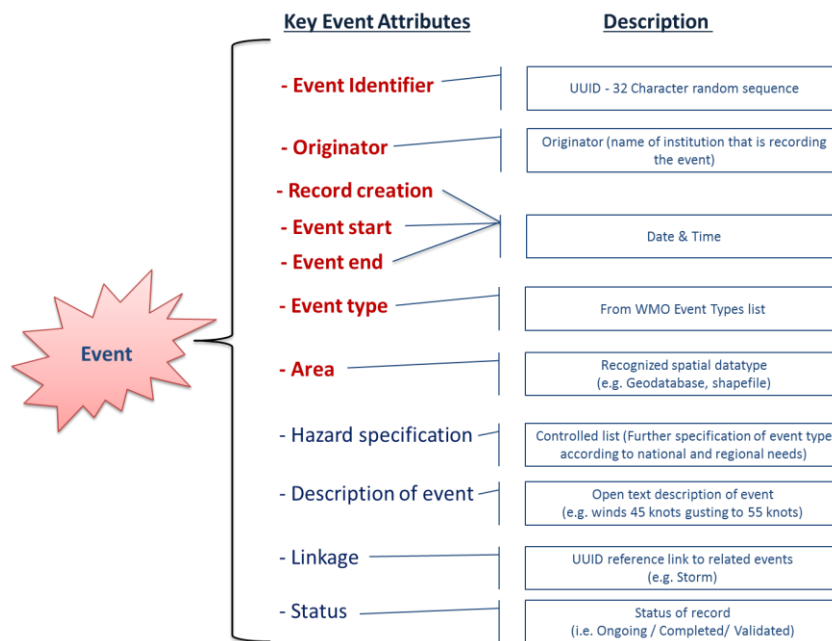
### 3. Event recording process and methodology

3.1 At the time of event onset the UUID, record creation date, event start date, event type are to be recorded. The end date, spatial extent, description and UUIDs of related events are all entered at or prior to the time of record closure. A lead centre (regional/global) would assign the UUID for the larger scale phenomena and conduct, in consultation with national counterparts, a post analysis to link events into a hierarchical clustering. Quality control in partnership with stakeholders of databases containing losses and damages occurring from hazardous weather, water climate and space weather events and other environmental phenomena is necessary to verify and finalize event information (e.g. spatial area and/or relationships among events cross-referenced in each other’s event records).

3.2 As the event evolves with time the Record Status will also evolve from a Status of “Ongoing” to a Status of “Completed” when the event has ended and when the recording of information is completed. In addition, when an event record is completed post processing is conducted to quality control the event record. Upon completion of post processing the Status attribute will change to “Validated”.

### 4. Event types

4.1 The typology contains a standard list of event types which can be potentially associated with losses and damages (Table 1). The list is intended to be a living list that can be amended through the appropriate WMO governance mechanism by WMO Members, WMO regional associations as well as collaborating institutions having a mandate on other hazards. The list has been compiled from authoritative WMO references and resource materials. The purpose of the standard list is to provide the user with a non-technical, practical and authoritative list of most universally known events. It will therefore facilitate standardization of event terminology across various domains of applications. Event definitions can be referred to in the WMO relevant technical regulations. An event might be described with more detail which can be entered in the hazard specification field according to national/regional requirements. For example, a wind event can be further described as a windstorm, gale, downburst, etc. depending on the character of the event at the time of recording and the term used for the event in a specific area or region.



**Figure 1:** Event record containing the Event Identifier (UUID) and key event attributes (attributes in red are mandatory entries)

Avalanche	Frost	Pollen pollution/Polluted air	Tornado
Cold wave	Hail	Rain/Wet Spell	Tropical cyclone
Drought/Dry spell	Heat wave	Snow	Tsunami
Dust storm/Sandstorm	High UV radiation	Snowstorm	Volcanic ash
Extra-tropical cyclone	Icing	Space weather event	Wild land fire/ Forest fire
Flood	Freezing rain	High Seas/Rogue waves etc.	Wind
Fog	Landslide/Mudslide & Debris flow	Storm surge/Coastal flood	
Haze/Smoke	Lightning	Thunderstorms/Squall lines	

**Table 1:** Event Types List

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## Resolution 13 (Cg-18)

### WMO GLOBAL MULTI-HAZARD ALERT SYSTEM

THE WORLD METEOROLOGICAL CONGRESS,

**Recalling:**

- (1) Article 2 of the WMO Convention (WMO-No. 15),
- (2) The [Sendai Framework for Disaster Risk Reduction 2015–2030](#), and its global target (g) to “substantially increase the availability of and access to multi-hazard early warning systems and disaster risk information and assessments to the people by 2030”, reflected in Resolution 10 (Cg-17),
- (3) Annex to paragraph 7.9.2 of the Abridged Final Report of the Seventeenth World Meteorological Congress (Cg-17) – [Role and operation of National Meteorological and Hydrological Services: a statement by the World Meteorological Organization for Decision Makers](#),
- (4) Resolution 5 (Cg-17) – *Public Weather Services Programme*,
- (5) Decision 3 (EC-70) – *Further implementation of the WMO Disaster Risk Reduction Roadmap*,
- (6) Resolution 1 (Cg-18) – *WMO Strategic Plan* and especially its Strategic Objectives 1.1 and 1.4,
- (7) The Annex to Decision 3 (EC-69) – *WMO Global Multi-hazard Alert System*,
- (8) Decision 4 (EC-70) – *Development of the Global Multi-hazard Alert System*,

**Noting that:**

- (1) Global, regional, and sub-regional platforms such as Meteoalarm of the European Meteorological Services Network (EUMETNET), Meteoalert from the Federal Service for Hydrometeorology and Environmental Monitoring of Russia (Roshydromet), the enhanced World Weather Information Service (WWIS) and Severe Weather Information Centre (SWIC) including the WMO Alert Hub serve as good examples that could be leveraged for the development of the WMO Global Multi-hazard Alert System (GMAS),

- (2) Member have developed good practices related to alert system design and services,
- (3) Members have expressed their interest in the development of the WMO GMAS initiative and, through the regional associations (RAs), recently decided to implement initiatives that could be leveraged for the GMAS development and implementation (see Resolutions 1 (RA I-17), 12 (RA II-16), 10 (RA III-17), and 3 (RA VI-17) as well as Decision 4 (RA V-17) for details):
- (a) RA II (Asia) to establish a respective pilot project in order to enhance the capabilities for meteorological DRR, including a regional meteoalarm system (GMAS-Asia), based on the implementation of the Common Alerting Protocol (CAP) and the experience of the Hong Kong Observatory (HKO) in hosting the websites of the [WWIS](#) and the SWIC, coordinated by the China Meteorological Administration (CMA) and HKO,
  - (b) RA III (South America) to launch the initiative "Platform for Monitoring and Early-warning of Hydrometeorological Hazards" as a regional contribution to GMAS,
  - (c) RA I (Africa) to coordinate, in collaboration with World Meteorological Centres (WMCs) and Regional Centres of the WMO Global Data Processing and Forecasting System (GDPFS), the implementation of GMAS Africa sub-regional pilot projects, starting in sub-regions of Southern and East Africa, benefiting from their experience in the provision of warnings within the context of the Severe Weather Forecasting Demonstration Project (SWFDP) (Resolution 1 (RA I-17)), and
  - (d) Regional Association VI (Europe) to pursue the [South-East European Multi-hazard Early Warning Advisory System \(SEE-MHEWS-A\)](#) project which successfully completed Phase I (supported by USAID), published its Implementation Plan and continued Phase II (demonstration phase supported by the World Bank's Global Facility for Disaster Reduction and Recovery (GFDRR)),
- (4) The [Second Multi-hazard Early Warning Conference \(MHEWC-II\)](#) was co-organized and hosted by WMO within the framework of IN-MHEWS on 13 and 14 May 2019 in Geneva, demonstrating to countries how the availability of and access to MHEWS and risk information can be improved, highlighting the role that national governance plays in implementing and sustaining MHEWS and eventually agreeing on a global agenda for strengthening MHEWS that was brought to the [2019 Global Platform for DRR](#),

**Having examined and agreeing with** the GMAS Concept as a living document, developed by the EG-GMAS as requested by EC-70, accepts that this provides underpinning guidance by which to develop a GMAS Framework (see annex to the present resolution),

**Recognizing** the expected benefits of GMAS to Members and their NMHSs and the entire Organization, such as improved recognition and visibility; availability of, and access to, warning and related information and products, contribution to reduced disaster risk and losses, enhanced capacities to strengthen national MHEWS; facilitated trans-boundary cooperation and information exchange; enhanced assistance to the United Nations (UN) and other humanitarian agencies, including Global Clusters, and to the services provided to the UN Operations and Crisis Centre (UNOCC) through the WMO Coordination Mechanism (WCM) to assist the UN and other humanitarian agencies,

**Recognizing further** that the GMAS Framework will help Members share their authoritative warnings with the wider global community,

**Decides** to develop a GMAS Framework which takes into account the initial Concept (as provided in the annex to the present resolution) by which to further guide the development of an implementation plan,

**Requests:**

- (1) The Executive Council to oversee and facilitate the implementation of the GMAS Framework according to a project management approach;
- (2) The technical commissions to develop the GMAS Framework implementation strategy and plan, leveraging all relevant WMO entities and capacity development activities, as well as other relevant institutions dealing with other types of hazards and to submit the strategy and plan to EC-72;
- (3) The Secretary-General to:
  - (a) Facilitate and mobilise resources to support the development of the GMAS Framework associated implementation plan, and Members' engagement;
  - (b) Strengthen collaboration with other international organizations (UN, European Union and others) that are operating specialized centres in support of multi-hazard early warning for the effective exchange of hazard and impact-related data and products and actively support the International Network for MHEWS (IN-MHEWS);

**Invites** development agencies to support capacity development projects for Members using GMAS as a guiding framework, also considering the local knowledge and environment;

**Urges** the regional associations to engage in and support the development and implementation of regional and/or sub-regional MHEWS/GMAS initiatives that contribute to the implementation of the overall GMAS Framework;

**Urges** Members to sustain their engagement in strengthening their MHEWS and to contribute to regional and transboundary multi-hazard early warning mechanisms (platforms, advisory systems) by also providing in-kind support.

## **Annex to Resolution 13 (Cg-18)**

### **ABRIDGED CONCEPT NOTE FOR A WMO GLOBAL MULTI-HAZARD ALERT SYSTEM**

#### **1. Background**

1.1 Early warnings for weather, water, ocean and climate hazards have proven to be very effective in reducing loss of life and damage to property. Authoritative warnings provide the foundation on which early action to take precautions against hazards by the responsible authorities and the public can be realized. National Meteorological and Hydrological Services (NMHSs) *"are the official authoritative source, and in most countries, a single voice, on weather warnings in their respective countries, and, in many, they are also responsible for warnings of climate and hydrological hazards, poor air quality, seismic hazards, tsunamis and space weather"* (See the annex to paragraph 7.9.2 of the general summary (Cg-17) – [Role and operation of National Meteorological and Hydrological Services: a statement by the World Meteorological Organization for Decision Makers](#), reflected also in the [WMO Guidelines on the Role, Operation and Management of National Meteorological and Hydrological Services](#) from 2017). As impacts related to hydrometeorological hazards affect an increasingly exposed and vulnerable population and their assets that frequently cross political boundaries, there is a need for the authoritative warnings and alerts from all countries to be made more easily accessible in a timely manner.

1.2 At its seventieth session in 2018, the WMO Executive Council (EC) through Decision 4 (EC-70) – *Development of the Global Multi-hazard Alert System*, requested the EC Working Group on Disaster Risk Reduction (EC-WG-DRR) to submit a draft concept for a WMO Global Multi-hazard Alert System (GMAS), along with key elements for a possible implementation plan, including responsibilities, and the additional requirements collected and cost estimates to the Eighteenth World Meteorological Congress (Cg-18) for approval. It further requested the EC-WG-DRR's Expert Group on GMAS (EG-GMAS) to gather additional user requirements according to the plan developed by the EC-WG-DRR (based on the drafts developed by the EG-GMAS at its meetings held in October 2017 and March 2018 with support from the Secretariat, see [EC-70/INF. 3.2](#)).

1.3 Based on this work by the EC-WG-DRR and the EG-GMAS (see especially the [report and further documents of the Third Meeting of the EG-GMAS](#) in November 2018), the WMO GMAS Framework will be developed to provide WMO Members (186 sovereign states and six territories as of 2019) and other potential users with authoritative warnings/alerts and information related to potentially high-impact weather, water, ocean and climate events that will be aggregated and visualised on regional and global scales. The vision of GMAS, as articulated by the Annex to Decision 3 (EC-69) in 2017, is *"to be recognized globally by decision makers as a resource of authoritative warnings and information related to high-impact weather, water, ocean and climate events"*.

1.4 To realize this vision, GMAS is considered to be the WMO framework, driver and vehicle for substantially increasing and enhancing the availability of, and access to, authoritative warnings and information related to high-impact weather, water, ocean and climate events at all levels. This is to be achieved through capacity development, efficient outreach, visibility and recognition, harmonization and standardization of warnings, and cross-border cooperation.

1.5 GMAS may have organizational and technical elements and may build on existing and future WMO mechanisms and infrastructure, recognizing and highlighting the ownership of Members. GMAS is being developed under the auspices of the WMO technical commissions and regional associations and will be aligned with the roles and functions of the centres that make up the WMO Global Data Processing and Forecasting System (GDPFS). It may leverage the alert hub technology, prototyped by the U.S. National Oceanic and Atmospheric Administration (NOAA) Big Data Project. It will also leverage the WMO Information System (WIS) to maintain a repository of authorized warnings, alerts and related information and to distribute this information to authorized users. Using WIS would minimise additional costs for NMHSs in implementing this module. GMAS will further leverage existing sub-regional and regional warning mechanisms and platforms as well as a number of current and proposed pilot and demonstration projects, such as the Severe Weather Forecasting Demonstration Project (SWFDP), the Coastal Inundation Forecasting Demonstration Project (CIFDP), Flash Flood Guidance System (FFGS) with Global Coverage or the more GMAS-specific pilot projects in regional associations I, II, III, and VI.

1.6 The [World Weather Information Service \(WWIS\)](#) and the [Severe Weather Information Centre \(SWIC\)](#) are considered as core components of GMAS. They will be developed further to provide a web-based user interface with a map display, ensuring the attribution of information to WMO and NMHSs as authoritative sources of warnings and alerts. The Hong Kong Observatory (HKO) is developing these components as an in-kind contribution to the development of GMAS. Furthermore, other services will be leveraged such as the [Worldwide Met-Ocean Information and Warning Service \(WMMIWS\)](#) web portal, hosted by Météo-France and aimed at shipping users, which already provides many of the functionalities included in the GMAS Concept in a simple, low cost but effective manner.

## 2. Key drivers

2.1 The key drivers for the development and implementation of GMAS are:

- (a) Major gaps in national multi-hazard early warning systems (MHEWS) that continue to cause high losses and death tolls,



- (b) The need to build disaster resilience by strengthening the capacity of WMO Members' NMHSs to deliver timely and effective services for disaster risk reduction (DRR) as an integral part of their national platforms for DRR and climate change adaptation (see the [WMO Statement at the Third United Nations World Conference on DRR \(WCDRR\)](#)),
- (c) The targets expressed in international agreements, such as the global Target G of the [Sendai Framework for Disaster Risk Reduction 2015-2030](#) which aims "*to substantially increase the availability of, and access to, multi-hazard early warning systems and disaster risk information and assessments to people by 2030*",
- (d) Growing demand for access to multi-hazard information as decision makers realize the power of assimilating environmental information into both their short-term response and longer-term decision-making processes,
- (e) Provision of weather, water, ocean and climate information from non-authoritative sources that continue to proliferate through avenues which at times can cause ambiguity in the minds of disaster managers and the public, resulting in delay to key decisions and, ultimately, loss of life,
- (f) The need for the global community, and in particular those who live near political boundaries or are at risk of trans-boundary hazards, to have easy access to trans-national, multi-hazard information including warnings to help mitigate risks and impacts while ensuring respect for the national mandated authorities for warning issuance, and
- (g) The need to maintain and improve the visibility of National Alerting Authorities (NAAs, including NMHSs) and of WMO and the recognition of their products and services by key national, regional and global users and stakeholders, in order to secure the sustainability of the key mandates of the NMHSs and WMO.

### 3. Objectives

3.1 In order to attain the GMAS vision, the objectives of the WMO GMAS are to:

- (a) Establish a framework that includes a repository of warnings and defined information flows, building on and leveraging existing WMO standards and infrastructure that allow for sharing authoritative warning information produced by Members,
- (b) Especially for Members that need to strengthen their warning system(s), provide a roadmap for capacity development (on national, sub-regional and regional levels, including sharing of good practices) to enable them to issue warnings more effectively and efficiently and of higher quality,
- (c) Improve and promote the availability, affordability and accessibility of Members' MHEWS as envisioned in the Sendai Framework, ensuring that they have authoritative warning information (sources) available to anticipate, mitigate, prepare for and respond to weather, water, ocean and climate events,
- (d) Enhance the authoritative voice of Members' NMHSs in issuing official early warnings for weather, water, ocean, climate and space weather events that efficiently reach decision makers and those at risk and Members' capacity to use authoritative information in preparing for and responding to these events,
- (e) Enhance the visibility of the NMHSs to their governments and development agencies, and of WMO in general, as key contributors to the 2030 Agenda,
- (f) Foster cooperation in disaster risk management and MHEWS on national, regional and global levels, including cross-border and interregional collaboration (creating a

community to share warning information and to promote harmonization to the extent possible/appropriate), and

- (g) Provide a framework for development agencies to invest in MHEWS capacity development projects for Members.

#### **4. Expected benefits**

4.1 The expected benefits of the WMO GMAS Framework are:

- (a) Contribution to decreased losses and damages associated with weather, water, ocean and climate events,
- (b) Enhanced capacity of Members to strengthen their national MHEWS as well as target and focus on capacity development investments by development agencies,
- (c) Increased recognition of NMHSs products and services on national, regional and global levels and improved visibility of NAAs (including NMHSs) and of WMO, taking into account global mobility, resulting in sustaining these services,
- (d) Increased accessibility and effective utilisation of hazard products and information generated by NMHSs/GDPFS centres – National Meteorological Centres (NMCs), Regional Specialised Meteorological Centres (RSMCs), Regional Climate Centres (RCCs) and World Meteorological Centres (WMCs) – especially by developing countries, Least Developed Countries (LDCs) and Small Island Developing States (SIDS) in order to assist in tailoring their national warning products,
- (e) Improved availability and accessibility of Members’ warning and related information and products,
- (f) Facilitated trans-boundary cooperation and information exchange during extreme or potentially high-impact (hydrometeorological) events and improved quality, harmonization and standardization of warnings,
- (g) Further standardization of practices for sharing hydrometeorological hazard products and information between and among WMO Members, and
- (h) Enhanced assistance to the United Nations (UN) and other disaster management and humanitarian agencies to deliver more efficient operations through the use of authoritative information and advice.

#### **5. Users and their requirements**

5.1 GMAS will serve a diverse array of users from both the public and private sectors. However, Members will be the primary users of GMAS, as their NMHSs’ core mandate is to serve their national communities. In line with Strategic Objective 4.1 of the Draft WMO Strategic Plan 2020-2023, the needs of developing countries will be prioritized (with emphasis on LDCs and SIDS). Toolkits, guidance products and training material will be developed and delivered with the aim that no one is left behind.

5.2 Emphasis will also be given to UN and humanitarian agencies, which provide critical emergency support and relief to developing countries. This is within the vision of WMO to be the UN’s official voice for weather, water and climate information. Members will ultimately benefit from these services which will be provided under the auspices of the WMO Coordination Mechanism (WCM) to assist the UN and other humanitarian agencies through a variety of services, products and tools (see Resolution 16 (Cg-18)).

5.3 As requested by EC-70, user requirements (categorized by NMHSs, other agencies of Members such as civil protection, UN and other humanitarian agencies, research/academia, the private sector and the general public) have been collected and are included in Section 3 of the [Final Report](#) of the Third Meeting of the EG-GMAS in November 2018.

## **Resolution 14 (Cg-18)**

### **DEVELOPMENT OF THE INITIAL CONCEPT FOR THE WMO COORDINATION MECHANISM TO SUPPORT THE HUMANITARIAN ACTIVITIES OF THE UNITED NATIONS AND OTHER ORGANIZATIONS**

THE WORLD METEOROLOGICAL CONGRESS,

**Recalling:**

- (1) The United Nations (UN) General Assembly Resolution 46/182, which:
  - (a) Stipulates that "each State has the responsibility first and foremost to take care of the victims of natural disasters and other emergencies occurring on its territory",
  - (b) Lays down the principles and framework for humanitarian assistance, and
  - (c) Highlights the importance of international cooperation to address emergency situations and the central and unique role the UN plays in providing leadership and coordinating the efforts of the international community to support the affected countries and the linking of short-term emergency assistance to longer term capacity development,
- (2) The WMO Convention preamble reaffirms "the vital importance of the mission of the National Meteorological, Hydrometeorological and Hydrological Services in observing and understanding weather and climate and in providing meteorological, hydrological and related services in support of relevant national needs", including *inter alia* in protection of life and property, contributing to sustainable development, meeting international commitments and contributing to international cooperation,
- (3) Article VI of the agreement between the UN and WMO, in which WMO "agrees to cooperate with and to render all possible assistance to the United Nations, its principal and subsidiary organs, in accordance with the United Nations Charter and the World Meteorological Convention, taking fully into account the particular position of the individual Members of the Organization which are not members of the United Nations",
- (4) That the Seventeenth World Meteorological Congress (Cg-17) acknowledged the continued collaboration with the UN Office for the Coordination of Humanitarian Affairs (UNOCHA) in the development of procedural arrangements for the provision of meteorological and hydrological assistance to humanitarian contingency planning, preparedness, early warning, response and recovery activities,
- (5) Resolution 2 (Cg-17) – *Implementation of the WMO Strategy for Service Delivery*,
- (6) Decision 13 (EC-68) – *Assistance to Humanitarian Agencies*,
- (7) Decision 10 (EC-69) – *Climate Services Information System Products to Support United Nations System Planning and WMO Members on Seasonal to Inter-Annual Timescales*,

- (8) Decision 3 (EC-70) – *Further implementation of the WMO Disaster Risk Reduction Roadmap,*
- (9) Decision 5 (EC-70) – *Support to the United Nations and humanitarian agencies,*

**Noting** that:

- (1) One of the key drivers in the WMO Strategic Plan is the need to strengthen production and delivery of accessible and authoritative meteorological and hydrological information and services to support the UN system’s needs on humanitarian and crisis management,
- (2) The outcomes of the targeted consultation process with UN and other humanitarian agencies provided significant momentum and inputs into the development of a WMO Coordination Mechanism (WCM) to support the UN’s and other organizations’ humanitarian activities, including calls for new and updated bilateral and multi-lateral agreements between a number of humanitarian agencies, supporting organizations and WMO,
- (3) WMO has developed experience in assisting operational activities of the humanitarian agencies in various regions, in particular during the refugee crisis in Southeast Europe in 2015-2016 where National Meteorological and Hydrological Services (NMHSs) in WMO Regional Association (RA) VI Europe (Southeast European Members and the UK Met Office) provided support to the UN High Commissioner for Refugees (UNHCR),
- (4) Several RAs, at their recent sessions (see Resolution 1 (RA I-17) and Decisions 5 (RA V-17) and 11 (RA III-17)), decided to:
  - (a) Support national humanitarian preparedness and response as well as UN and other regional and global humanitarian agencies by contributing to the development of, and participate in, a WCM that also allows an internal mechanism to provide relevant guidance, coordination and support to Members, and
  - (b) Request its Members, to the degree possible, and the WMO Regional Centres in their respective regions, to actively engage with the Secretariat towards this support by providing data, information, expert advice and further in-kind contributions,

**Noting further** that:

- (1) The UN Secretary-General established the UN Operations and Crisis Centre (UNOCC) at the UN Headquarters in New York, USA, and issued a directive in 2017 for an enhanced strategic information flow to the UN system leadership in support of decision making humanitarian activities, peacekeeping, and political missions,
- (2) WMO has recently appointed a coordination officer for UN decision support in the WMO Liaison Office in New York who actively supports the UNOCC’s flow of strategic information on weather, water and climate to UN leadership on a confidential basis and in close cooperation with WMO Members,
- (3) The potential benefits of a GMAS for the provision of strategic information at global and regional levels by WMO, as described in Resolution 13 (Cg-18),

**Noting with satisfaction** that Members have already expressed their support for the WCM through the provision of data, information, expert advice and in-kind contributions (see Resolution 1 (RA I-17) and Decisions 5 (RA V-17) and 11 (RA III-17)),

**Expresses** its appreciation to the China Meteorological Administration (CMA), Deutscher Wetterdienst (DWD, German Weather Service), Hong Kong Observatory (HKO), UK Met Office and Zentralanstalt für Meteorologie und Geodynamik (ZAMG, Central Institution for

Meteorology and Geodynamics, Austria), Instituto Nacional de Meteorologia do Brasil (INMET, Brazilian National Institute of Meteorology), and South African Weather Service (SAWS) for their voluntary commitments to this effort,

**Taking note** that EC-70 highlighted the urgency of enabling easy access to authoritative information, including the provision of expert advice, to the UN and humanitarian agencies,

**Recognizes** that the WCM will develop a framework by which Members, working in partnership, can better support the needs of the UN and the wider humanitarian community,

**Decides** to further develop the WCM Concept, as a living document and taking into account the initial WCM Concept (as provided in the annex to the present resolution), in order to meet the international commitments of WMO as referred to in the Recalling (2)-(4) above;

**Requests:**

- (1) The Executive Council to monitor and guide the development of the WCM Concept and the subsequent implementation plan, taking into consideration the needs of both the WMO community and the UN and other humanitarian agencies, and to establish a process to ensure accountability of activities under this Concept to Members;
- (2) The appropriate technical commission to:
  - (a) Develop the WCM implementation plan based on this initial Concept and voluntary contributions of Members; and,
  - (b) Explore how best to incorporate the WCM in relevant WMO frameworks and normative documents such as the Global Data-Processing and Forecasting System (GDPFS) Manual;
- (3) The RAs to contribute to this endeavour in their respective regions;
- (4) Members operating global and regional GDPFS Centres to contribute to the development and implementation of the WCM;
- (5) The Secretary-General to:
  - (a) Facilitate the development of the WCM Concept, including through resource mobilization;
  - (b) Develop a communication strategy for ensuring that the concept is well understood by all stakeholders;
  - (c) Maintain and develop linkages of NMHSs with the UN and other humanitarian agencies;
  - (d) Encourage the continuation of existing initiatives and new activities and align them with the initial WCM Concept and incorporate their findings into the further development of the WCM; and,
  - (e) Report to the Executive Council on the above activities;

**Urges** Members to contribute to the further development of the WCM Concept to the best of their ability through in-kind and/or financial support.

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## **Annex to Resolution 14 (Cg-18)**

### **INITIAL CONCEPT NOTE FOR A WMO COORDINATION MECHANISM TO SUPPORT HUMANITARIAN ACTIVITIES**

#### **1. Background**

1.1 One of the purposes of the United Nations (UN), as stated in its Charter, is "*to achieve international co-operation in solving international problems of an economic, social, cultural, or humanitarian character.*" In this regard, in 1991 the UN General Assembly (GA) adopted the comprehensive Resolution 46/182 – *Strengthening of the coordination of humanitarian emergency assistance of the United Nations (A/RES/46/182)* which laid down the principles and framework for humanitarian assistance which continues to guide the work of the humanitarian system. These principles highlight the importance of international cooperation to address emergency situations, the central and unique role the UN plays in providing leadership and coordinating the efforts of the international community to support the affected countries and the linking of short-term emergency assistance to longer term capacity development.

1.2 For the past decade, assistance to humanitarian planning and operations has been a rapidly evolving and sought-after service area for WMO. There is a significant demand by humanitarian organizations for authoritative meteorological, hydrological and climate information products and services which would strengthen their capabilities to anticipate and better prepare for and respond to disasters, emergencies and crises.

1.3 In this regard, the seventieth WMO Executive Council (EC-70) in June 2018 decided (Decision 5) to develop a WMO Coordination Mechanism (WCM) aimed at enabling easy access to authoritative weather, water and climate information and the provision of expert advice to the UN and other humanitarian agencies in anticipation of, during and after emergencies or disasters triggered by hydrometeorological hazards or where hydrometeorological information would be required to support response and relief operations.

#### **2. Principles and types of support**

2.1 The WCM's principles include:

- (a) Each sovereign state has the primary responsibility to take care of the victims of disasters and other emergencies within its territory, as stated in UN GA Resolution 46/182.
- (b) WMO Members are the first source of authoritative meteorological, hydrological and climate information and service provision.
- (c) The WCM will leverage the existing WMO network of National Meteorological and Hydrological Services (NMHSs), including the WMO Integrated Global Observation System (WIGOS), the WMO Information System (WIS), the Centres of the WMO Global Data Processing and Forecasting System (GDPFS) and its cascading process, and other WMO programmes and activities such as the Emergency Response Activities (ERA) Programme, Tropical Cyclone Programme (TCP), Climate Watch System (CWS) or Integrated Drought Management Programme (IDMP), assisted by the WMO Secretariat.
- (d) The WCM contributors' responsibilities will be based on their agreed voluntary commitment (mainly remote, specialized/tailored services), capacities, and regional and key specialization.
- (e) NMHSs are responsible to support the UN and other humanitarian agencies' country teams, and if a NMHS requires support it would request it from the WCM.

- (f) The WCM will contribute to the development of fit-for-purpose mechanisms to gather user requirements and will coordinate with other WMO bodies to prioritise appropriate actions in response.
  - (g) Products and services are relevant and fit-for-purpose from global to sub-national levels.
  - (h) Activities, information and advisory services provided to the users are properly recorded, evaluated and disclosed to the Members to ensure accountability of activities under WCM.
  - (i) Capacity development for WMO Members to provide relevant services to the UN and humanitarian agencies is available, benefitting from relevant WMO capacities and initiatives such as the Severe Weather Forecasting Demonstration Project (SWFDP), the Coastal Inundation Forecasting Demonstration Project (CIFDP) or the Flash Flood Guidance System (FFGS) with Global Coverage.
  - (j) Participating Members need to work in partnership with each other.
  - (k) The Secretariat will provide management, support and outreach functions.
- 2.2 Initially, the WCM will include the following types of support services:
- (a) Regular assistance by NMHSs to humanitarian field operations, as it is not only extreme (hydrometeorological) events that have serious adverse impacts on particularly vulnerable communities such as refugee camps, migration areas, etc.,
  - (b) Emergency assistance by NMHSs upon request and development of a potential crisis situation triggered or worsened by hydrometeorological hazards,
  - (c) Proactive services to raise the awareness of users within the humanitarian community and facilitate their anticipation of hazardous situations, based on monitoring/forecasting products, and
  - (d) Regular or ad hoc regional to global overviews and reports to meet needs at executive levels, e.g. the UN Secretary-General, heads of other agencies via the UN Operations and Crisis Center (UNOCC).

2.3 Services provided to the UN and other humanitarian agencies will be based primarily on contributions by the NMHSs of WMO Members (such as warnings), not replacing nor duplicating what already exists and what was developed under the auspices of the WMO technical commissions and regional associations.

### **3. Considerations for implementation**

- 3.1 The implementation of the WCM will consider:
- (a) Coordination arrangements within the WMO community, including possible adjustments to the current functions of the WMO Centres as defined in the Manual on the GDPFS, for the provision of data and guidance products to Member NMHSs as needed to deliver their services to humanitarian agencies,
  - (b) Coordination arrangements with the UN and humanitarian communities including the development or modification of Memoranda of Understanding (MoUs), Standard Operating Procedures (SOPs) and working arrangements,
  - (c) Support to Members, and
  - (d) Resource mobilization, including in-kind and financial support from Members and various donors, and adequate resourcing at the WMO Secretariat.
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## **Resolution 15 (Cg-18)**

### **STRENGTHENING MULTI-HAZARD EARLY WARNING SERVICES IN AREAS PRONE TO ALL FLOODING TYPES AND SEVERE WEATHER**

THE WORLD METEOROLOGICAL CONGRESS,

**Recalling** Resolutions 1, 12 and 16 (EC-70) through which the Executive Council decided:

- (1) To conduct joint independent reviews of the Coastal Inundation Forecasting Demonstration Project (CIFDP), the Flash Flood Guidance System with Global Coverage (FFGS) and the Severe Weather Forecasting Demonstration Project (SWFDP),
- (2) That, following the review of these projects, a consolidated approach should be considered jointly by the presidents of the Commission for Basic Systems (CBS), Commission for Hydrology (CHy) and the Joint WMO-IOC Commission for Oceanography and Marine Meteorology (JCOMM) to ensure CIFDP, FFGS and SWFDP provide efficient, sustainable services, and
- (3) That the result of the review and the consolidated approach should be reported to Congress by the President of CHy, Chairperson of the WMO Flood Forecasting Initiative Advisory Group (FFI-AG),

**Recalling further** that Resolution 13 (Cg-17) adopted the CBS recommendation that the SWFDP should be renamed Severe Weather Forecasting Programme (SWFP), thus retaining close linkages with the well-established acronym SWFDP, which was however not actioned,

**Noting** with satisfaction that, for a decade, the WMO demonstration projects CIFDP, FFGS and SWFDP have been contributing to improving public safety and reducing disaster risk through enhanced forecasts and delivery of severe weather and flood warnings by participating National Meteorological and Hydrological Services (NMHSs), thereby bringing more benefits to Members,

**Considering** the majority of the world's population live near bodies of water, including coastal areas and islands, with different social economic conditions, and are vulnerable to flooding (from multiple sources such as river-, marine- and geophysical-related events) and impacts from severe weather and flash flooding,

**Considering also** the increasing requests from Members for guidance and support to establish operational early warning systems (EWS) in areas prone to impacts from severe weather and flooding (from multiple sources such as but not limited to river- marine- and geophysical-related events),

**Acknowledging** that the three initiatives have been carried out in parallel, are mainly funded through extra-budgetary resources, and that financial resource mobilization for projects and their sustainability has always been a challenge, both funding-wise and in terms of accessing relevant experts and having adequate human resources for Secretariat coordination,

**Welcoming** the emerging partnerships with development agencies as vehicles to:

- (1) Mobilize resources for scaled-up investments, including for Multi-hazard Early Warning System (MHEWS) services, and
- (2) Bring the knowledge and expertise gained from the CIFDP, FFGS, and SWFDP into projects and programmes promoted by development partners and countries,



**Noting** that to address the above-mentioned Resolutions 1, 12 and 16 (EC-70), experts were engaged to conduct the independent technical reviews of the CIFDP, FFGS, and SWFDP (Part A) and subsequently to address the consolidated approach (Part B),

**Noting also** that the three independent reviews (Part A) were to assess the effectiveness, efficiency, impact, relevance and sustainability of each of the three initiatives, resulting in three separate reports (see linked documents for [CIFDP](#), for [FFGS](#) and for [SWFDP](#)) providing specific findings, conclusions and recommendations, to assist in their individual future overall design and implementation, including that:

- (1) The projects have been very successful in their own right with all of them being relevant with highly positive results,
- (2) Sustainability of each is the key issue and the largest challenge due to limited availability of funding and heavy workloads of the Secretariat staff, and
- (3) The three projects should move away from being “demonstration” type projects,

**Noting further** the following recommendations from the consolidated [report Part B](#):

- (1) The three systems (CIFDP, FFGS and SWFDP) be combined or merged into a sustainable MHEWS environment that can be implemented by NMHSs as soon as feasible, with a significantly changed project management environment,
- (2) A concept document be developed that provides the vision and strategic plan of how these three systems could be combined in the short term, resolving legacy issues, and eventually integrating and expanding the MHEWS so that it can be optimally implemented to meet the growing demand for severe weather, flash floods, riverine flood and coastal flood early warnings, and eventually expanding the MHEWS to include other hazards (such as tsunamis and seasonal and/or climate change impacts) in the future,
- (3) An incremental development of the current systems’ approach (CIFDP, FFGS and SWFDP) be adopted rather than a brand new MHEWS development starting from the initial principles of the three demonstration projects,
- (4) The relevant WMO technical commission(s), as an essential and high priority, to develop a framework of practices and interoperability guidelines, standards and protocols that will guide various efforts by developers and partners in the operational implementation of a MHEWS environment that meets operational performance standards,
- (5) There will be a single cross-cutting MHEWS coordination function within the Secretariat to provide the support necessary for facilitating MHEWS and/or arranging “sponsor supported” implementations in specific countries or regions, and
- (6) The role of WMO’s Global Data-Processing and Forecasting System (GDPFS, see Resolution 58 (Cg-18)) related to seamless GDPFS and the earth system approach, be recognized as essential for setting the standards and processes for the cascading, in both directions, from global to regional to national and vice versa, of relevant data and products. This will provide oversight of the standards and processes (including verification) for the technical aspects of the MHEWS such as forecast, product and data flows and the cascading process where appropriate,

**Recognizing** the need to develop a partnership strategy to advance engagement and participation in MHEWS development and the importance of mobilizing sufficient resources to allow end-to-end EWS development and implementation that will help close the capacity gap of Members,

**Recognizing further:**

- (1) That the success and attainment of highly positive results as documented in the independent review reports (Part A) are a result of the contributions of participating NMHSs and implementing partners, dedicated efforts of national experts in the implementation of specific projects, experts from CBS, CHy and JCOMM, and the support of development agencies, and
- (2) The need for sustained and coordinated research to both improve the information available in cases of severe weather and flooding and to ensure this information is communicated and used,

**Appreciates the:**

- (1) Significant efforts of the engaged experts in having undertaken and completed the three independent reviews (Part A) and the consolidated approach (Part B), and all the experts from CHy, JCOMM and CBS, involved in the CIFDP, FFGS and SWFDP,
- (2) Support provided by development agencies, especially the U.S. Agency for International Development/Office of U.S. Foreign Disaster Assistance (USAID/OFDA), in particular through the Climate Risk and Early Warning Systems (CREWS) Initiative, and by the WMO regular budget for the assessment process,
- (3) Secretariat for the role in coordinating the implementation of the three initiatives (CIFDP, FFGS and SWFDP) which have brought significant benefit to globally to vulnerable communities,

**Congratulates** Members for undertaking efforts to enhance their early warning capabilities and those Members who have successfully implemented projects;

**Decides to:**

- (1) Remove the "demonstration" designation of the CIFDP, FFGS and SWFDP, hereafter referred to as the Coastal Inundation Forecasting Initiative (CIFI), Flash Flood Guidance System (FFGS) and the Severe Weather Forecasting Programme (SWFP);
- (2) Request the technical commissions and other related WMO bodies, as well as WMO partners, in light of the Part A-specific findings, conclusions and recommendations, to:
  - (a) Further develop approaches for assessing national requirements and capabilities of EWS in areas prone to flooding (from multiple sources including but not limited to river-marine and geophysical related events) and impacts from severe weather and flash floods; and
  - (b) Refine the individual future overall design and implementation of each initiative;

**Decides further**, pertaining to Part B, to request the technical commissions and related WMO bodies, in consultation with the regional associations, to:

- (1) Prepare for consideration by the Executive Council a concept document that assesses the approaches, feasibility, cost and timelines of developing an interoperable MHEWS environment, as outlined in Noting further (2) above, and that will, accordingly, take into account the conclusions, findings and recommendations of both Part A and Part B;
- (2) Propose within the concept document a suitable governance and management structure necessary to oversee its design and implementation as well as outlining the requirements to achieve sustainability of the initiative over the long term also taking into account the need to synergize this concept with other MHEWS initiatives going forward;

- (3) Include within this concept document the role of the GDPFS, WMO Integrated Observation System (WIGOS) and the WMO Information System (WIS) as part of the value chain in the development and implementation of the MHEWS environment, and the mechanism for ensuring the scientific advances needed are identified, and research to achieve those advances is facilitated and coordinated;
- (4) Ensure the continuity of future individual projects in concert with Decides (2) above when considering and/or developing a MHEWS environment;
- (5) Consider the suitability of all available technologies in the future design of individual projects for early warnings, as well as the development of an end-to-end system; and
- (6) Report the outcome of their efforts to the Executive Council;

**Requests** the Executive Council to:

- (1) Oversee the implementation of the above decisions while ensuring the continued development of the individual initiatives (CIFI, FFGS, and SWFP) and the development and implementation of the MHEWS environment with integrated coastal, flooding and severe weather capabilities for the WMO, that builds on the GDPFS, WIGOS and WIS and other relevant MHEWS initiatives; and,
- (2) Engage the technical commissions, other relevant WMO bodies and partners (such as the Intergovernmental Oceanographic Commission of the United Nations Educational, Scientific and Cultural Organization (IOC-UNESCO)) in the implementation process;

**Requests** the Secretary-General to:

- (1) Support the implementation of the three individual initiatives (CIFI, FFGS and SWFP) for the benefit of Members, including during any transition period leading to the final mode of operation; and,
- (2) Consider the potential formation of an integrated MHEWS coordination function and its related financial and human resource requirements;

**Urges** Members in view of improving overall project design and its effectiveness, to:

- (1) Consider the benefits of conducting: national assessment of their requirements and capabilities for EWS in areas prone to flooding (from multiple sources, including river-, marine- and geophysical-related) and impacts from severe weather and flash floods; and,
- (2) An evaluation of their forecasts at the national level, to be shared with regional and global centres; and,

**Further urges Members**, with support of their NMHSs, to continue supporting the development and implementation of EWS in areas prone to flooding (from multiple sources, including river-, marine- and geophysical-related) and impacts from severe weather and flash floods, through contributing knowledge, expertise, technology and financial support to ongoing and new individual projects as well as in the design of an integrated system.

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## **Resolution 16 (Cg-18)**

### **GUIDE(S) ON THE SUPPORT OF NATIONAL METEOROLOGICAL AND HYDROLOGICAL SERVICES TO THEIR NATIONAL MULTI-HAZARD EARLY WARNING PROCEDURES, COORDINATION MECHANISMS, SYSTEMS AND SERVICES**

THE WORLD METEOROLOGICAL CONGRESS,

#### **Recalling:**

- (1) The Sendai Framework for Disaster Risk Reduction 2015–2030, especially its global target (g) to “substantially increase the availability of and access to multi-hazard early warning systems and disaster risk information and assessments to the people by 2030”,
- (2) The Annex to paragraph 7.9.2 of the Abridged Final Report of the Seventeenth World Meteorological Congress (Cg-17) – [Role and operation of National Meteorological and Hydrological Services: a statement by the World Meteorological Organization for Decision Makers](#), stating that National Meteorological and Hydrological Services (NMHSs) are the official authoritative source on weather warnings,
- (3) Resolution 2 (Cg-17) – Implementation of WMO Strategy for Service Delivery,
- (4) Decision 3 (EC-70) – Further Implementation of the WMO Disaster Risk Reduction Roadmap,
- (5) Resolution 1 (Cg-18) – WMO Strategic Plan, especially its Strategic Objectives 1.1 and 1.4, and

#### **Acknowledging** that:

- (1) Environmental risks (i.e. those posed by chemical, natural and biological hazards) continue to dominate according to the annual global risks perception survey ([The Global Risks Report 2019 \(WEF, 2019\)](#)) of the World Economic Forum (WEF), accounting for three of the top five risks by likelihood and four by impact where extreme weather was ranked as number one and demonstrates why hydrometeorological services and expertise are needed in decision-making at all levels,
- (2) Tropical cyclones are among the most harmful natural hazards occurring worldwide, disproportionately affecting least developed and developing countries, with for example the 2017 hurricanes Harvey, Irma, and Maria causing damages estimated at some USD 245.4 billion and the 2008 Cyclone Nargis in Myanmar causing 138 000 deaths, according to the [Centre for the Epidemiology of Disaster \(CRED, 2018\)](#),

**Recognizing** that complex hazards usually result in a chain of hazards that require multi-agency coordination and collaboration to deal with at national and international levels,

#### **Noting** that effective MHEWS require:

- (1) Multi-stakeholder partnerships at various levels to ensure actionable warnings including potential impacts and related information are provided to the public in a timely and effective manner,
- (2) Clearly defined roles and responsibilities of stakeholders and coordination mechanisms that are documented in national to local legislation, policies, strategies and plans,

**Noting with satisfaction:**

- (1) The significant number of capacity development projects, helping Members to develop or update their MHEWS SOPs, including those financed under the Climate Risk and Early Warning Systems (CREWS) Initiative and the Global Framework on Climate Services (GFCS), to mention just a few,
- (2) That several regional associations (RAs) have recently decided to enhance national and regional multi-hazard early warning services of their Members to their national and regional stakeholders, benefitting from good practices in their respective regions and regional and global support mechanisms (see Resolutions 3 (RA VI-17) and 3.1/1 (RA I-17), Decisions 4 (RA V-17) and 10 (RA III-17)),

**Mindful** of the many key WMO publications that address hazard-specific warnings as well as warnings of multiple hazards and provide respective guidance and recommended/good practices, such as:

- (1) [MHEWS – A Checklist](#),
- (2) [WMO Guidelines on Multi-hazard Impact-based Forecast and Warning Services](#), and
- (3) [Institutional Partnerships in Multi-Hazard Early Warning Systems \(2012\)](#),

**Considering that** Members would benefit from comprehensive guidance material for NMHSs to support their national MHEWS and disaster risk management activities that would include references to existing guidelines, recommended practices and standards derived from NMHSs' good practices in supporting their national MHEWS,

**Decides** to task the technical commissions and other bodies with the development of guide(s) on procedures/mechanisms for effective support by NMHSs to their national disaster risk management, focusing on MHEWS operations, legislation and policy making and leveraging existing guidance material and good practices related to the four elements of MHEWS – from within WMO but also from its partners – with emphasis on:

- (1) Risk knowledge: Institutional coordination in the areas of risk information and assessment for impact-based forecasting and warning;
- (2) Detection, monitoring, analysis and forecasting of the hazards and possible consequences;
- (3) Dissemination and communication of advisory and warning information and service delivery; and,
- (4) Preparedness and response capabilities at all levels: Support national response and recovery planning;

**Requests:**

- (1) The Executive Council to oversee the development of guide(s) on NMHSs support of their national MHEWS (possibly including a set of hazard-cluster guidelines, taking into consideration Resolution 15 (Cg-18) – *Strengthening multi-hazard early warning services in areas prone to all flooding types and severe weather*);
- (2) The technical commissions and other bodies to develop guide(s) in collaboration with other relevant WMO bodies and Members; focusing the first guide on tropical cyclones as an example of a hazard cluster;
- (3) The regional associations to contribute to the development of the guide(s);

- (4) Members to share their practices related to their MHEWS with the leading technical commission and the Secretariat; and
  - (5) The Secretary-General to provide the necessary support for this initiative.
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## **Resolution 17 (Cg-18)**

### **ENSURING INTEGRATION OF DROUGHT RISK MANAGEMENT IN WMO ACTIVITIES**

THE WORLD METEOROLOGICAL CONGRESS,

**Recalling:**

- (1) Resolution 9 (Cg-17) – Identifiers for cataloguing extreme weather, water and climate events,
- (2) Resolution 17 (Cg-17) – Integrated Drought Management Programme (IDMP),
- (3) Resolution 21 (Cg-XVI) – Use of the Standardized Precipitation Index for characterizing meteorological droughts by all National Meteorological and Hydrological Services,
- (4) Decision 44 (EC-69) – Enhancing national and regional drought-monitoring systems,
- (5) Decisions 3 (EC-69) and 4 (EC-70) on the WMO Global Multi-hazard Alert System (GMAS),
- (6) Resolution 8 (CHy-15) – Development of a pilot WMO Global Hydrological Status and Outlook System,
- (7) Resolution 1 (CAgM-16) – Integrated Drought Management Programme (IDMP),

**Noting:**

- (1) United Nations Convention to Combat Desertification (UNCCD) Decision 29/COP.13 – *Policy advocacy on drought* (Cg-17 Report, Part II),
- (2) The work of the Integrated Drought Management Programme (IDMP), co-sponsored by WMO and the Global Water Partnership (GWP),
- (3) That IDMP and its partner organizations have been assisting the UNCCD Secretariat in its Drought Initiative in many regions of the world,
- (4) That WMO is an official observer to the UNCCD Science Policy Interface,

**Recognizing** that many drought-affected countries do not yet have national drought policies, and that existing policies may need to be updated, and that countries need further assistance in enacting policies that incorporate the IDMP three pillars of drought-monitoring and early warning systems, vulnerability and impact assessments, and mitigation and response measures,

**Decides:**

- (1) To develop a Global Drought Indicator (GDI) as input into WMO activities such as the proposed Global Multi-hazard Alert System (GMAS), Common Alerting Protocol (CAP), Global Hydrological Status and Outlook System (HydroSOS), and cataloguing of high-impact events;
- (2) That information on the outcomes of these efforts be provided to UNCCD in support of relevant UNCCD decisions;

**Requests** the relevant technical commission(s) and other bodies to develop a framework and standards for a GDI addressing the duration, intensity, and spatial extent of droughts based on the cataloguing of high-impact events carried out by the Expert Team on Drought of the Commission for Agricultural Meteorology;

**Invites** Members:

- (1) To incorporate the GDI into the proposed GMAS, HydroSOS, CAP and cataloguing of hazardous events;
- (2) To keep the Secretary-General regularly updated on the status of their national or regional drought-monitoring and early warning systems and national drought policies;

**Requests** the Secretary-General:

- (1) To liaise with the IDMP on integrating the GDI framework and standards into its work on the three pillars in support of WMO Members;
- (2) To work with the UNCCD Secretariat and other United Nations and humanitarian organizations on the uptake of drought policies and drought early warning systems incorporating WMO activities and practices; and,
- (3) To support Members in further developing national and regional drought-monitoring systems.

## **Resolution 18 (Cg-18)**

### **WMO CONTRIBUTIONS TO THE PROVISION OF AGRICULTURAL METEOROLOGY INFORMATION AND SERVICES**

THE WORLD METEOROLOGICAL CONGRESS,

**Recalling:**

- (1) Resolution 22 (Cg-XVI) – Agricultural Meteorology Programme,
- (2) Resolution 43 (Cg-XVI) – Terms of reference of the technical commissions,
- (3) Resolution 17 (Cg-17) – Integrated Drought Management Programme,
- (4) Decision 44 (EC-69) – Enhancing national and regional drought-monitoring systems,

**Having considered** the Abridged Final Report of the Seventeenth World Meteorological Congress (Cg-17) with Resolutions and Recommendations of the Seventeenth Session of the

Commission of Agricultural Meteorology (CAgM) (WMO-No. 1217) and Recommendation 4 (EC-70),

**Noting** the achievements of WMO in assisting Members with the provision of a wide range of deliverables for supporting national agricultural meteorological services including national and regional drought-monitoring and early warning systems and national drought policies and plans and vulnerability and impact assessments,

**Recognizing:**

- (1) The contribution of agricultural meteorological services to the United Nations Sustainable Development Goals including: 1 – Zero Poverty, 2 – No Hunger, 5 – Gender Equality, 6 – Clean Water, 7 – Clean Energy, 13 – Climate Action, 15 – Life on Land, and 17 – Partnerships for the Goals,
- (2) The crucial importance of food security to Members and the provision of weather and climate services for Members to increase food production and reduce impacts of extreme weather and climatic events and climate change on food productivity and stability,
- (3) The continued work of the Global Framework for Climate Services (GFCS) with a focus on agriculture and food security, disaster risk reduction and water priority areas,
- (4) The ongoing work of the Integrated Drought Management Programme (IDMP) with over 34 partner organizations,

**Decides**, in the context of the ongoing WMO governance structure reform:

- (1) That the ongoing work and planned deliverables approved at the Seventeenth Session of the CAgM be adequately incorporated into the governance review outcome; and,
- (2) That the CAgM priority areas (2018–2022) and the Terms of Reference of the CAgM in Resolution 43 (Cg-XVI) – Terms of reference of the technical commissions and other bodies be taken into account, as the basis for any new structure focused on agricultural meteorology such as may arise from the governance review.

## **Resolution 19 (Cg-18)**

### **ENHANCING COOPERATION FOR MONITORING AND FORECASTING SAND AND DUST STORMS**

THE WORLD METEOROLOGICAL CONGRESS,

**Recalling:**

- (1) Decision of Cg-15 (para 3.3.3.6) that created a WMO Sand and Dust Storm Warning System, aimed at coordinating observations and research forecast modelling of sand and dust storms while forging strong links with users including operational forecasters,
- (2) Resolution 13 (EC-66) - Sand and Dust Storm Warning Advisory and Assessment System (SDS-WAS),
- (3) 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,



- (4) Resolution 11 (Cg-17) - Towards a Future Enhanced Integrated and Seamless Data-Processing and Forecasting System,
- (5) Resolution 45 (Cg-17) – World Weather Research Programme (WWRP),
- (6) Resolution 47 (Cg-17) - Global Atmosphere Watch Programme (GAW),
- (7) Decision 20 (EC-68) on Enhancement of the relationship between WMO and the United Nations Environment Programme on atmospheric composition matters,
- (8) Resolution 18 (EC-69) on Revised Manual on The Global Data-Processing And Forecasting System that designated the Regional Specialized Meteorological Centre (RSMC) for Atmospheric Sand and Dust Storm Forecasts in Beijing,
- (9) SDS-WAS “Science and Implementation Plan: 2015–2020”,

**Further recalling** that the 17th Congress:

- (1) Described the progress with the implementation of the Sand and Dust Storm Warning Advisory and Assessment System and agrees that its Science and Implementation plan forms the basis for the implementation of the research component of the project (paras 4.3.90-91),
- (2) Articulates the role of the satellites in the environmental monitoring (para 4.2.4.1),
- (3) Requests strengthening the capacities of the National Meteorological and Hydrological Services (NMHSs) in disaster risk reduction (DRR) at local, national, regional, and international levels (para 3.2.1),

**Noting** the United Nations General Assembly Resolution 70/1 - Transforming our World: the 2030 Agenda for Sustainable Development,

**Further noting:**

- (1) The United Nations General Assembly Resolutions 73/237, 72/225, and 71/219 - Combating Sand and Dust Storms,
- (2) The Global Assessment of Sand and Dust Storms published in 2016 by the UN Environment, WMO and UNCCD - Assessments and proposals for consolidated and coordinated technical and policy options for responding to sand and dust storms,
- (3) The regular updates on sand and dust storms produced by WMO in the form of the WMO Airborne Dust Bulletins since 2017,
- (4) The 25th meeting of the United Nations Environment Management Group (EMG) Senior Officials in September 2018 to establish a UN Coalition on Sand and Dust Storms,
- (5) The assistance already provided by Spain through its Barcelona Regional Specialized Meteorological Center products and services as well as training provided to other Members;

**Considering that:**

- (1) Sand and dust storms are an essential element of the Earth’s natural biogeochemical cycles, but are also caused in part by human-induced drivers including climate change, unsustainable land management, and water use and in turn, sand and dust storms contribute to climate change and air pollution,

- (2) Sand and dust storms impact all over the world and pose a challenge to achieving the Sustainable Development Goals, including SDG 2,3,6,8,11,13 and 15 in affected developing countries,
- (3) There are interlinkages between land degradation, drought, desertification, air pollution, sand movement, and dust storms, and advection of dust,
- (4) Sand and dust storms adversely affect the state of the environment, health, agriculture, socioeconomic well-being, and livelihood of populations on Earth, particularly those living on and around a dry belt,

**Considering** the commitments of WMO to reduce the risks of sand and dust storms through warning systems as part of the Multi-hazard Early Warning Systems and the efforts to improve their forecasting through WWRP, GAW and Global Data Processing and Forecasting System,

**Invites Members to:**

- (1) Promote international cooperation to combat sand and dust storms through the exchange of knowledge, experiences, best practices and by launching training courses;
- (2) Enhance capacity building and technical assistance for monitoring and forecasting sand and dust storms and to support the implementation of national, regional, and global action plans of affected countries,

**Requests the Secretary-General to:**

- (1) Engage with all relevant United Nations entities, in particular the UN Environment Programme, the United Nations Convention to Combat Desertification, and the World Health Organization to promote a coordinated approach to improve resilience to the impacts of sand and dust storms within existing resources;
- (2) Strengthen, in coordination with other organizations, and within existing resources, capacity building and the provision of technical assistance to affected countries in order to develop and implement national, regional and global action plans for increasing resilience to sand and dust storms;

**Requests the Executive Council to** oversee and monitor the progress of the implementation of early warnings of sand and dust storms as part of WMO's multi-hazard early warning system with expertise of the WMO Sand and Dust Storm Warning Advisory and Assessment System (SDS-WAS) project and its regional centers;

**Requests** technical commissions, the Research Board and other bodies, Regional Associations and relevant partners and regional centers to strengthen collaboration and engagement in monitoring and forecasting sand and dust storms and integration of SDS-WAS in MHEWS.

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## **Resolution 20 (Cg-18)**

### **WMO CONTRIBUTIONS TO THE PROVISION OF CLIMATE INFORMATION AND SERVICES IN SUPPORT OF POLICY AND DECISION-MAKING**

THE WORLD METEOROLOGICAL CONGRESS,

**Having examined** Recommendation 3 (EC-70) - Strengthening WMO contributions to the provision of climate information and services in support of policy- and decision- making;

**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 GFCS,
- (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,
- (10) Resolution 61 (Cg-17) - Governance of the Global Framework for Climate Services,

**Recalling also** the *Abridged Final Report of the Seventeenth Session of the Commission for Climatology* (CCI) (WMO-No.1216) and Resolution 5 (EC-70) and in particular their provisions with respect to enhancing Regional Climate Centre operations, climate data modernization and exchange, systematic approaches to climate service delivery, climate information for decision support, use and interpretation of climate change projections on regional and national scales, enhancing flagship products such as the WMO Statement on the State of the Climate, El Niño Bulletin and Global Seasonal Climate Update, and implementation of integrated capacity development support for further operationalization of the Climate Services Information System, including human resource development,

**Noting** the relevance of WMO climate science products to the implementation of the Global Framework for Climate Services (GFCS) and to the Intergovernmental Panel on Climate Change (IPCC) as well as to high-level climate-related policy processes such as the United Nations Framework Convention on Climate Change, the Sustainable Development Goals, and the Sendai Framework for Disaster Risk Reduction,

**Decides** to establish a Climate Coordination Panel for coordination of WMO contributions to the provision of policy- and decision-supporting climate information and services, ensuring, inter alia:

- (1) An enlarged scope which encompasses the provision of services to high-level climate-related policy processes, the United Nations Framework Convention on Climate Change, the Sustainable Development Goals, and the Sendai Framework for Disaster Risk Reduction, 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 World Climate Programme (WCP) implementation;
- (3) Invitation to members of the IPCC Bureau and Executive Committee to present IPCC products;
- (4) Engagement of the operational WMO entities of the Climate Services Information System, including Global Producing Centres, Regional Climate Centres and NMHSs, and other relevant organizations, programmes and initiatives with whom cooperation and

coordination is needed to strengthen WMO contributions to the provision of policy- and decision-supporting climate information and services;

- (5) That the ongoing functions and planned deliverables approved at the 17th session of the Commission for Climatology are continued;

**Requests** the Executive Council to define and adopt the Climate Coordination Panel's terms of reference, based on a model similar to the EC-PHORS, in a way that increases the overall visibility of the GFCS.

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## Resolution 21 (Cg-18)

### IMPLEMENTATION OF THE GLOBAL FRAMEWORK FOR CLIMATE SERVICES

THE WORLD METEOROLOGICAL CONGRESS,

**Recalling,**

- (1) Resolution 48 (Cg- XVI) – Implementation of the Global Framework for Climate Services,
- (2) Resolution 1 (Cg-Ext.(2012)) – Implementation Plan of the Global Framework for Climate Services,
- (3) Resolution 2 (Cg-Ext.(2012)) – Establishment of the Intergovernmental Board on Climate Services,
- (4) Resolution 1 (IBCS-1) – Establishment of the Management Committee of the Intergovernmental Board on Climate Services,
- (5) Resolution 7 – (IBCS-1) – Establishment of a stakeholder engagement mechanism and participation of GFCS stakeholders in the work of the Intergovernmental Board on Climate Services,
- (6) Resolution 2 (IBCS-1) – Implementation Plan of the Global Framework for Climate Services,
- (7) Resolution 62 (Cg-17) – Relationship and interaction between the Intergovernmental Board on Climate Services and WMO constituent bodies,

**Satisfied** that the GFCS has contributed to elevating the awareness of climate services and the role they play in policy and development across global, regional and national scales; has contributed to legitimizing the National Meteorological and Hydrological Services as leaders of climate services within their countries through National Frameworks for Climate Services; is now recognized under the Paris Agreement as a framework for supporting adaptation action; and has engaged in partnership-building across global, regional and national scales that are resulting in support to climate services implementation,

**Content** that the GFCS has been recognized by partners as a vehicle for identifying and aligning investments in order to more coherently support implementation of the climate services value chain, including through the Climate Risk and Early Warning System (CREWS) initiative, the Intra-ACP Climate Services and related applications initiative, funded by the European Commission, the Green Climate Fund (GCF), through its Memorandum of Understanding with WMO, and the Country Support Initiative, a coalition of partners aiming at increasing the effectiveness of investments in weather-, water-, and climate-related services, as well as through individual projects implemented by WMO and partners,

**Convinced** that the GFCS as a framework is even more important and relevant today than when it was initiated in 2009 to provide a credible, integrative and unique platform for guiding and supporting activities implemented across the pillars of the GFCS and within climate-sensitive investment areas in support of climate adaptation and mitigation decision-making,

**Noting** the significant changes that have occurred since 2009, particularly in 2015 with the adoption of the Sendai Framework, aimed at substantially reducing disaster risk and losses; the Paris Agreement to limit global temperature rise and enhance adaptive capacity and resilience; the Sustainable Development Goals, which include taking urgent action to combat climate change and enhance many climate-sensitive development outcomes related to agriculture and food security, disaster risk reduction, energy, human health, water resources; and the operationalization of the GCF, the main financial mechanism for supporting climate action under the Paris Agreement, among others,

**Noting further** that, in its first session, the Conference of Parties of the United Nations Framework Convention on Climate Change (UNFCCC) serving as the meeting of the Parties to the Paris Agreement, invited the World Meteorological Organization, through its Global Framework for Climate Services, with a view to facilitating the development and application of methodologies for assessing adaptation needs, to regularly inform the Subsidiary Body for Scientific and Technical Advice about its activities aimed at improving the availability and accessibility of comprehensive climate information (11/CMA.1),

**Recognizing** that the increase in climate-related activities and financing requires an increase in coordination to align diverse efforts being made, avoid a piecemeal and isolated implementation of activities, and implementation not conforming to relevant standards,

**Mindful** of the fact that successful implementation of the GFCS requires the active participation of partner organizations and other stakeholders in addition to that of WMO Members and the WMO community,

**Acknowledging with satisfaction** the support of partner organizations to the GFCS through their contributions to the implementation of various elements of the climate services value chain, and the role played by WMO Members and partners as champions for the GFCS, promoting the achievement of GFCS goals,

**Acknowledging further** the need to establish a fit-for-purpose oversight and implementation mechanism for the GFCS that makes both maximum use of the capabilities of WMO and its technical partners, while at the same time ensuring effective participation of partners beyond the WMO community,

**Having considered** the results of the mid-term review of the GFCS, conducted in 2017, which concluded that the current governance of the GFCS is no longer fit-for-purpose as it is costly, does not provide for the effective participation of partner organizations, and the membership of the Intergovernmental Board on Climate Services duplicates that of the World Meteorological Congress,

**Having been informed** by the work of the Taskforce on Governance, Management and Finances of the GFCS, established by the Management Committee of the Intergovernmental Board on Climate Services to provide recommendations for improving the governance of the GFCS, the management structures in place, and funding of the GFCS, in response to the key findings and recommendations of the mid-term review of the GFCS [*Cg-18/INF. 5.2(1)*],

**Decides:**

- (1) To dissolve the Intergovernmental Board on Climate Services;
- (2) To adopt the Climate Coordination Panel as the oversight and implementation mechanism for the GFCS, including WMO contributions to the GFCS;

- (3) To continue the GFCS Partner Advisory Committee (PAC) as appropriate, under the remit of the Climate Coordination Panel;
- (4) To reaffirm the GFCS priorities of agriculture and food security, water, health, energy and disaster risk reduction taking into account the cross-cutting nature of the urban dimension;
- (5) To adopt the following priority GFCS tasks for the eighteenth financial period:
  - (a) Partnership and inclusion – coordination of initiatives and communication regarding climate services in all GFCS priority areas; knowledge sharing with key partners and stakeholders, including private sector; presence at relevant climate events such as sessions of the Conference of the Parties (COP) to the UNFCCC to coordinate and strengthen climate services worldwide; global/regional platforms for climate services,
  - (b) Technical coordination support – identification of capacity development needs for the provision of climate services, applications and climate information; support to Members in climate services implementation through advisory services; identify unmet needs for standards and promote adherence to standards and recommended practices for climate services through the Technical Commission and other bodies for Application and Services and appropriate standard setting-entities or partner organizations,
  - (c) Monitoring and review – improving monitoring and regular assessments of service delivery at global, regional and national scales and publishing a “State of climate services” report regularly,
  - (d) Resource mobilization – promote, enable, articulate and facilitate countries’ and regions’ access to climate finance; strengthen rationale for climate services related proposals both in relation to mitigation and adaptation;

**Requests** the Executive Council:

- (1) To provide oversight on GFCS implementation and future development during the intersessional period;
- (2) To establish appropriate arrangements for the effective implementation of the GFCS;
- (3) To ensure broad representation in the Climate Coordination Panel from the GFCS partner organizations actively involved in the implementation, promotion and funding of the GFCS;
- (4) To establish appropriate substructures to the Climate Coordination Panel, as deemed necessary, providing for arrangements to manage oversight and implementation issues related to the GFCS in a focused and effective manner;
- (5) To amend the terms of reference of the GFCS PAC in consultation with its member organizations, as appropriate;
- (6) To further explore mechanisms to enhance the visibility, effectiveness and implementation of the GFCS, including the feasibility of co-sponsorship of the GFCS, with the aim of strengthening political anchoring, political support, and partnerships of partners with such organs as the United Nations Framework Convention on Climate Change (UNFCCC), among others, with the aim of further strengthening political anchoring, financial support and engagement of partners;
- (7) To report to the extraordinary Congress in 2021 on the functioning of the working arrangements according to (1) to (5) above and on reflections on the mechanisms according to (6);

**Urges** Members to play a leadership role in GFCS implementation and in linking climate services to adaptation, mitigation and development efforts across global, regional and national levels;

**Invites** GFCS partner organizations, as well as other relevant regional and international organizations and entities, whether governmental or non-governmental:

- (1) To support implementation of the GFCS through contributions in expertise and participation in the GFCS working mechanism and activities;
- (2) To participate actively and in a coordinated and coherent fashion in the implementation of elements of the climate services value chain for an improved delivery of societal benefits enabled through the GFCS;

**Requests** the Secretary-General to bring this Resolution to the attention of all concerned.

## **Resolution 22 (Cg-18)**

### **MANUAL ON HIGH-QUALITY GLOBAL DATA MANAGEMENT FRAMEWORK FOR CLIMATE**

THE WORLD METEOROLOGICAL CONGRESS,

**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,
- (3) Decision 15 (EC-69) – Strengthening Regional and Global Scale Climate Services Information System Operations,
- (4) Resolution 4 (CCI-17) – Climate Data Modernization,
- (5) Recommendation 2 (EC-70) – Climate data modernization,

**Recalling further** the GCOS Implementation Plan, GCOS-200 (GOOS-214),

**Mindful** of the increased emphasis given by the Members to climate data including its quality and management as expressed at the Commission for Climatology since its fifteenth session when CCI re-emphasized the critical and necessary collaboration of all Members to ensure high quality, timely and accessible climate data from all possible sources and recommended the development of a High Quality- Global Data Management Framework for Climate (HQ-GDMFC),

**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,

**Recognizing further** the growing need in providing standards and advising on recommended practices for managing climate data from all available sources, including in-situ, remote sensing, marine, hydrology and atmospheric data and ensuring its quality standards to support the development on climate knowledge and informed policy making at global, regional and national levels,

**Noting** the progress made by CCI in guiding Members on climate data including on *Climate Data Management Systems Specifications* (WMO-No. 1131), the Strategy concept for CDMSs and the CCI ongoing work on High Quality Global Data Management Framework for Climate (HQ-GDMFC),

**Welcoming** Resolution 4 (CCI-17) on Climate Data Modernization, agreeing that a reference Manual on HQ-GDMFC should be finalized,

**Convinced** of the importance of such a manual for guiding Members on standards and recommended practices with regards to managing 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,

**Appreciating** CCI efforts and its collaboration with other commissions and programmes for finalizing the draft reference manual on HQ-GDMFC,

**Approves** the reference manual on *High Quality Global Data Management Framework for Climate (HQ-GDMFC)* as provided in the [Annex](#) to this Resolution for inclusion to the WMO technical regulations,

**Requests** the Secretary-General to arrange for the publication of the reference manual on HQ-GDMFC after ensuring compliance with WMO editing standards and practices and inform Members on its formal release,

**Requests** the technical commissions and other bodies:

- (1) To ensure and oversee timely updates of the reference manual on HQ-GDMFC,
- (2) To refer to the standards included in the reference manual on HQ-GDMFC in other relevant technical regulations such as WIGOS, WIS and GDPFS for ensuring consistency in the terminology, concepts and definitions of climate data and their management.
- (3) To support development of a reference open-source Climate Data Management System (CDMS) for climate and hydrological data management based on tested software practices, which implements the *Climate Data Management System Specifications* (WMO-No 1131) and the HQ-GDMFC, that can be used as a base for implementation in the NMHSs of Members and other entities.

## **Annex to Resolution 22 (Cg-18)**

### **MANUAL ON HIGH-QUALITY GLOBAL DATA MANAGEMENT FRAMEWORK FOR CLIMATE**

See [Cg-18/Doc. 5.2\(2\), ANNEX, APPROVED](#)

*Editor's note:* The link above was used by the delegates for the approval of the amendments/draft new edition. The final publication, issued after the eighteenth session of Congress, will be posted on the WMO library site at <https://public.wmo.int/en/resources/library>.



## Resolution 23 (Cg-18)

### RECOGNITION OF LONG-TERM OBSERVING STATIONS

THE WORLD METEOROLOGICAL CONGRESS,

**Recalling:**

- (1) Resolution 35 (Cg-17) WMO Recognition of long-term observing stations,
- (2) Decision 40 (EC-68) WMO Mechanism for the recognition of long-term observing stations,
- (3) Decision 8 (EC-69) Recognition of WMO long-term observing stations,
- (4) Resolution 6 (EC-70) WMO recognition of long-term observing stations,

**Recognizing** that preserving long-term observing stations, including centennial stations, is a responsibility of Members' governments for sustaining irreplaceable climate heritage to serve current and future generations' needs for long-term high-quality climate records,

**Noting** that, in response to two WMO calls for candidate stations, 117 long-term observing stations from 43 countries representing all WMO regional associations have been recognized formally so far,

**Noting further** that an in-depth assessment was carried out by the Advisory Board (with representation from the Commission for Climatology, the Commission for Basic Systems, the Commission for Instruments and Methods of Observation and the Global Climate Observing System) for the recognition of long-term observing stations for 39 candidate stations based on additional information from Members,

**Taking note** of ongoing improvements to the recognition mechanism by the Advisory Board for the Recognition of long-term Observing Stations,

**Having considered** the high number of candidate centennial stations worldwide that temporarily limits the Advisory Board's capacities to consider under the mechanism's scheme intermediate-level certification for 50 years and 75 years of observations,

**Having been informed** that the next WMO call for candidate centennial stations will be issued in 2019,

**Decides**, as recommended by the Advisory Board, to recognize 23 centennial observing stations as long-term observing stations as provided in the [annex](#) to the present resolution;

**Requests** the Executive Council to oversee, and the Secretary-General to facilitate, the WMO recognition mechanism for long-term observing stations under the technical commissions and other bodies and to consider under the mechanism's scheme the possibility of intermediate-level certification for 50 years and 75 years of observations;

**Urges** Members to collaborate on this initiative and promote it at highest national governmental levels, as appropriate, to attach WIGOS Station Identifiers to recognized WMO centennial stations to enable their identification by Members in the WIGOS database OSCAR and to seek possibilities to make observations from these long-term observing stations available for scientific research and education;

**Encourages** regional associations to promote the recognition mechanism among Members.

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## Annex to Resolution 23 (Cg-18)

### RECOGNITION OF LONG-TERM OBSERVING STATIONS

#### List of centennial observing stations recognized as long-term observing stations

RA	Country	Station name (Start of observations)
I	Cote d'Ivoire	Tabou (1919)
		Bondoukou (1919)
		Bouaké (1904)
	Spain	Santa Cruz de Tenerife (1865)
II	China	Wuhan (1869)
		Dalian (1904)
		Shenyang (1905)
	India	Thiruvananthapuram (1853)
		Nungambakkam (1792)
		Pune (1856)
		Panjim (1860)
		Mumbai (Colaba) (1841)
	Uzbekistan	Namangan (1878)
III	Brazil	Quixeramobim (1896)
		Salvador (Ondina) (1903)
		Caetité (1907)
		Maceió (1909)
		Juiz de Fora (1910)
		Manaus (1910)
		Cuiabá (1911)
		Curitiba (1911)
VI	Israel	Beit Jimal (1919)
		Miqwe Israel (1897)

## Resolution 24 (Cg-18)

### VISION, STRATEGY AND ORGANIZATIONAL ARRANGEMENTS FOR HYDROLOGY AND WATER RESOURCES IN WMO

THE WORLD METEOROLOGICAL CONGRESS,

#### Recalling:

- (1) Resolution 18 (EC-70) - Outcomes of the special dialogue on water,
- (2) Commission for Hydrology – [Abridged Final Report of the Extraordinary Session of the Commission for Hydrology \(2019\) \(WMO-No. 1230\)](#);

#### Noting:

- (1) The work carried out by the members of the Commission for Hydrology in the successful pre-session discussion and during its Extraordinary Session 2019, as documented in the Abridged Final Report, which constituted the basis of its recommendations to Congress,
- (2) Resolution 7 (Cg-18) - Establishment of WMO technical commissions for the eighteenth financial period,

- (3) Resolution 75 (Cg-18) – Amendments to the General Regulations of the World Meteorological Organization,
- (4) Resolution 89 (Cg-18) – Extraordinary session of Congress in 2021, that will be convened to strengthen institutional arrangements to deliver on the WMO mandate related to the provision of information and services for sustainable management of water resources;

**Noting further** that the considerations of Recommendation 25 (EC-70) “that the specific conditions under which the national hydrological services currently operate and the new direction WMO will take with regard to strengthening its hydrological profile may require specific organizational structures and working mechanisms to enable WMO to effectively promote and integrate activities in operational hydrology, and contribute effectively to, and benefit from, the integrated Earth system approach embraced by WMO in the new Strategic Plan” were aimed at achieving:

- (1) A broader participation in WMO activities and an enhanced sense of ownership of and commitment to the Organization’s Long-term Goals by hydrologists worldwide,
- (2) A greater recognition of WMO as the trusted voice in its three main domains weather, climate and water, in the implementation of Agenda 2030 and in particular in the achievement of the Sustainable Development Goals, the Sendai Framework for Disaster Risk Reduction, the Paris Agreement,
- (3) A better reflection of the needs of NMHSs and more effective support of their operations at national and regional levels,
- (4) A tighter alignment with NMHSs’ challenges and an increased flexibility to respond to their evolving requirements,

**Having examined** Recommendation 1 (CHy-Ext.(2019) - WMO Vision and Strategy for Hydrology, and Recommendation 2 (CHy-Ext.(2019)) – Integration of hydrological activities into the new WMO structure, and decision criteria included therein,

**Having also examined** the recommendations by the open committee on hydrology, contained in [Cg-18/INF. 5.3](#), and noting the support for the proposed Resolutions 24 and 25 (Cg-18) expressed therein,

**Decides:**

- (1) That a Plan of Action should be prepared better to strengthen operational National Hydrological Services and the capabilities of national service providers that will support Member states’ efforts to fulfil the following Long-term Ambitions (see Requests the Executive Council (2) below):
  - (a) No one is surprised by a flood;
  - (b) Everyone is prepared for drought;
  - (c) Hydro-climate and meteorological data support the food security agenda;
  - (d) High-quality data supports science;
  - (e) Science provides a sound basis for operational hydrology;
  - (f) We have a thorough knowledge of the water resources of our world;
  - (g) Sustainable development is supported by information covering the full hydrological cycle;
  - (h) Water quality is known;

(2) To approve the definition of operational hydrology as provided in [Annex 1](#) to this Resolution;

(3) To amend General Regulation 6(b) as follows:

Each Member shall appoint, in consultation with the Permanent Representative, a Hydrological Adviser who preferably should be the Director of the respective National Hydrological Service or other national hydrological agency. The Member shall notify the Secretary-General of such an appointment. The Hydrological Adviser should be consulted by, and advise the Permanent Representative with respect to WMO activities in operational hydrology and its application to water management;

*[This text was recommended by EC WG-SOP. The recommendation from CHy-Ext.(2019) read: "Each Member shall appoint a Hydrological Adviser who preferably should be the Director of the respective National Hydrological Service, or other national hydrological agency, and should advise the Permanent Representative with respect to WMO activities in operational hydrology and its application to water management. The Member shall notify the Secretary-General of such appointments. The Hydrological Adviser will serve as the focal point for technical matters relating to operational hydrology and its application to water management".]*

(4) To amend General Regulation 30(b) as follows:

In each session of Congress an open committee of Congress, entitled the WMO Hydrological Assembly, shall be convened. It should be attended as a rule by the Hydrological Advisers of Members (in accordance with Regulation 6 (b)) and by other representatives of National Hydrological Services or other national hydrological agencies as designated by Members;

*[This text was recommended by EC WG-SOP. The recommendation from CHy-Ext. (2019) read: "In each session of Congress, an open committee of Congress shall be convened, entitled the WMO Hydrological Assembly, attended as a rule by the Hydrological Adviser as designated by the Member (in accordance with Regulation 6(b), amended...) and representatives of National Hydrological Services or other national hydrological agencies as designated by the Members".]*

(5) To adopt the Terms of Reference of the WMO Hydrological Assembly provided in [Annex 2](#) to this Resolution;

(6) To establish a Hydrological Coordination Panel to support an integrated delivery of WMO water-related activities and undertake preparatory work for the Hydrological Assembly;

*[The proposed arrangement recommended by the EC WG-SOP maintains the spirit of CH-Ext.(2019) recommendation while ensuring consistency with the WMO Reform. The recommendation from CHy-Ext. (2019) read: "WMO hydrological activities should be integrated by constituting a joint Hydrological Working Group of Congress and the Executive Council (in accordance with General Regulation 38) to support the integrated delivery of WMO water-related activities between sessions of Congress and to undertake preparatory work for future meetings of the WMO Hydrological Assembly, as well as to support and advise the Executive Council Technical Coordination Committee (EC/TCC) and regional associations..."]*

**Requests** the Executive Council:

(1) To approve the Terms of Reference of the Hydrological Coordination Panel as provided in [Resolution 5 \(EC-71\)](#);

(2) To develop, with the support of the Hydrological Coordination Panel a Plan of Action and draft Declaration for consideration of an extraordinary session of Congress in 2021 taking into consideration, the reinforcement of the importance of operational hydrology in

addressing global water challenges, opportunities in the future in the broader WMO interdisciplinary context and the recommendation of the Hydrology Assembly;

- (3) To explore mechanisms that improve effective engagement and enable a stronger presence of the hydrological community in WMO activities;

**Invites** Members to continue supporting WMO initiatives focused on operational hydrology and its application to water resources management by encouraging their national hydrological and water resources management experts and managers to participate actively and contribute their experience and knowledge to the Organization's activities in the area;

**Urges** Members to enable relevant experts in all aspects of operational hydrology to contribute to WMO programmes and governance.

## **Annex 1 to Resolution 24 (Cg-18)**

### **DEFINITION OF OPERATIONAL HYDROLOGY**

Operational Hydrology is the real-time and regular measurement, collection, processing, archiving and distribution of hydrological, hydrometeorological and cryospheric data, and the generation of analyses, models, forecasts and warnings which inform water resources management and support water-related decisions, across a spectrum of temporal and spatial scales. Operational hydrology requires capacity building and scientific and technical advancement and innovation in the areas of observation, data standards and services, modelling, prediction, hydro-informatics and decision support, communications, training, and outreach.

Annotation:

These data include, but are not limited to, precipitation; air temperature and humidity; water level of streams, lakes, deltas and estuaries; streamflow; snow and ice cover, depth and water equivalent; river and lake ice; glacier mass balance; reservoir storage; soil moisture; groundwater and ground frost; evaporation and evapotranspiration; water temperature; sediment dynamics; water and sediment quality and other related variables, including within the context of global change.

Global change is expressed through different aspects, such as land use changes, socioeconomic dynamics, climate variability and climate change.

## **Annex 2 to Resolution 24 (Cg-18)**

### **TERMS OF REFERENCE OF THE OPEN COMMITTEE OF CONGRESS ENTITLED THE WMO HYDROLOGICAL ASSEMBLY**

*[Amendments to the text originally recommended by CHy-Ext.(2019) have been made on the basis of comments from EC WG-SOP. The text originally recommended by CHy-Ext.(2019) is available in the [final report](#) of the session. ]*

#### **General mandate**

The WMO Hydrological Assembly (hereafter referred to as Hydrological Assembly) is convened as an open Committee of Congress (in accordance with Regulation 30(b)) to make recommendations to Congress and relevant constituent bodies on matters related to hydrology including but not limited to Article 2(e) of the Convention,

*To promote activities in operational hydrology and to further close cooperation between Meteorological and Hydrological Services.*

The activities of the Hydrological Assembly shall be guided by the WMO Strategic Plan and the agenda of Congress and shall focus on:

- (a) Contributing to the integration of hydrology in working programmes of WMO;
- (b) Mobilising the operational hydrological community to participate in WMO governing bodies at all levels;
- (c) Advising the heads of Congress delegations on emerging hydrological issues as well as on their consideration within the governing structures of WMO;
- (d) Motivating Governments to improve the integration of weather, water and climate topics on national and regional levels.

### **Specific terms of reference**

The Hydrological Assembly shall:

- (a) Advise Congress on current and emerging scientific and technical water-related challenges so as to better reflect them in Congress decisions and in further development of the WMO Strategic Plan;
- (b) Encourage hydrologists to stand for election for officers' positions in the technical commissions, and propose candidates for the chairs of hydrology-related standing committees and study groups of technical commissions. The final selection is the responsibility of the commissions concerned;
- (c) Advise Congress on representation of hydrological expertise in the technical commissions and the Research Board;
- (d) Evaluate the representation of hydrology and water resources management specialists in the WMO Expert Network and propose remedial measures should gaps in professional, geographical or gender representation be found;
- (e) Promote a culture of compliance with WMO regulatory material regarding hydrology in NMHSs;
- (f) Encourage among Members the implementation of WMO directives related to hydrology;
- (g) Advise regional associations, technical commissions, the Research Board, and other relevant bodies, as appropriate;
- (h) Facilitate, together with Regional Associations, the exchange and uptake of experience, technology, research, education and training to meet the needs of Members regarding operational hydrology and its application to water resources management.

### **Composition**

The core members of the Hydrological Assembly should be Hydrological Advisers as designated by Members in accordance with Regulation 6(b) and representatives of National Hydrological Services or other national hydrological agencies as designated by Members.

Other delegates at Congress and observers from relevant organizations, including UN, international and regional organizations, private partners, academia and NGOs attending Congress, may participate in sessions of the Hydrological Assembly.

## Working procedures

The Hydrological Assembly shall:

- (a) Elect a chairperson and vice-chairperson, who will represent the Hydrological Assembly between sessions of Congress;
- (b) Convene meetings during the sessions of Congress.

## Resolution 25 (Cg-18)

### MAJOR HYDROLOGICAL INITIATIVES

THE WORLD METEOROLOGICAL CONGRESS,

#### Recalling

- (1) The Abridged Final Report of the Fifteenth Session of the Commission for Hydrology (CHy) (WMO-No. 1184),
- (2) Decision 49 (EC-69) – WMO priority actions in hydrology and water resources management,
- (3) Decision 5 (EC-69) – Flood forecasting,
- (4) Decision 14 (EC-69) – Support the development of actions based on the Global Climate Observing System,
- (5) Resolution 16 (EC-70) - Guidance on ongoing hydrology and water resources initiatives,
- (6) Resolution 18 (EC-70) - Outcomes of the special dialogue on water,
- (7) Abridged Final Report of the Extraordinary Session of the Commission for Hydrology (2019) (WMO-No. 1230),

**Decides** that the following ongoing hydrological activities and systems, in view of their relevance to the fulfilment of the long-term ambitions (L-TAs) for the operational hydrological community (see [Annex 1 to Resolution 24 \(Cg-18\)](#)), are fundamental pillars that support the WMO Strategic Plan and its further development:

- (1) **Quality Management Framework – Hydrology and its further implementation:** with the aim of promoting a stronger culture of compliance and quality assurance, CHy decided to engage in an in-depth review, to be completed by 2021, of its technical and regulatory material, ensuring alignment with other WMO regulatory material and its consistency with other sources of standardization such as ISO. This work started from Technical Regulation vol. III – Hydrology and will also include the review of existing material and guidance and the development of new material, responding to Members' requirements including innovative technologies and citizen science; [Contributes to L-TA (4)]
- (2) **Assessment of the performance of flow measurement instruments and techniques:** the development of software to assist National Hydrological Services (NHSs) in the assessment of the uncertainty of river discharge measurements is nearing completion and will be widely distributed to WMO Members under the coordination of the Management Committee of Project X; the project will continue to provide support and advice to members on flow measurement techniques, including innovative approaches; [Contributes to L-TA (4) and (5)]

- (3) **The Global Hydrometry Support Facility (HydroHub)**: the implementation of Hydrological Cycle Observing System (HYCOS) components according to Members' priorities, under the new World Hydrological Cycle Observing System (WHYCOS) framework and integrating innovative monitoring approaches, is being revamped. Innovation in hydrometry is being harmonised into the hydromet development activities that are financed by the international donor community. A community of practice is being built to support hydrometric requirements of NHSs and an information system developed for stakeholders. The Meteorological, Climatological and Hydrological (MCH) Database Management System will, in coordination with climate data management systems continue to be developed and implemented according to hydrological and climatological needs and the existing MCH community of practice will be extended to other languages in addition to English; [Contributes to L-TA (4) and (6)]
- (4) **Hydrological data operations and management**: the implementation of the WMO Hydrological Observing System (WHOS) Phase II, in accordance with its Implementation Plan endorsed by EC-71, with its governance and architecture compliant with the WMO Integrated Global Observing System (WIGOS), the WMO Information System (WIS) and the Global Data-processing and Forecasting System (GDPFS), will be extended to other regions, on the basis of the successful experiences in the Plata and Sava river basins, as well as in the Arctic; the contributions of global data centres (GRDC, GPCC, IGRAC, HYDROLARE, federated under the Global Terrestrial Network – Hydrology (GTN-H)) are relevant for the GCOS Implementation Plan and their role, especially in the implementation of WHOS, will be reviewed in order to enhance it; [Contributes to L-TA (4) and (6)]
- (5) **The WMO Flood Forecasting Initiative and hydrological contributions to disaster risk management, including flood (APFM) and drought (IDMP) management**: assessment guidelines for End-to-End Early Warning Systems for flood forecasting and to assist Members in the assessment of their flood forecasting capabilities are being finalized and are being implemented through extrabudgetary resources in Burkina Faso and Dominican Republic, with additional donor interest being expressed for their implementation in Ecuador and other RA III/IV countries. Phase III of the project for the advancement and sustainability of a flash flood guidance system with global coverage project started in March 2019. It will allow additional benefits to be accrued to Members including further development and implementation of the Flash Flood Guidance System (FFGS), with advanced features such as landslide susceptibility, urban flash flood forecasting, riverine flood forecasting, and seasonal prediction. Cooperation with the Global Water Partnership (GWP) in the implementation of APFM and IDMP continues and is being reaffirmed through an MoU; [Contributes to L-TA (1), (2), (3) and (5)]
- (6) **WMO Global Hydrological Status and Outlook System (HydroSOS)**: HydroSOS, launched in 2018, will continue to be implemented building on the existing efforts from a number of Members to produce regular analyses of the current national hydrological condition complemented by forward looking assessments of how the water situation may change over sub-seasonal to seasonal time scales, and taking into consideration the need to link this initiative closely with other related WMO activities such as WIGOS (in particular by making use of the opportunities provided by WHOS) and the Global Data-processing and Forecasting System. Pilot projects have been initiated in the Lake Victoria and Ganges-Brahmaputra basins to test the concept, with the ultimate objective of reaching global coverage; this activity can be supported by the Dynamic Water Resources Assessment Tool (DWAT) which allows the assessment of the impacts of land-use changes within the basin over time on water availability. DWAT can be used to assess a wide variety of scenarios as well as the interactions between climate, water and landscape on the availability of water resources; [Contributes to L-TA (2), (3), (6) and (7)]



- (7) **Capacity building in hydrology and water resources management:** the WMO strategy for capacity building in hydrology and water resources management agreed by CHy and endorsed by EC, will continue guiding the activities. Current developments consist of the distance learning course on hydrometry for field hydrologists, developed for the Pacific small islands and later adapted for African countries, being further adapted for other regions. A distance learning course on hydrological data sharing using the WHOS Phase II approach will be developed and the first edition delivered in early 2020; [Contributes to L-TA (1), (2), (4), (6) and (7)]
- (8) **The World Water Data Initiative (WWDI):** together with the World Bank and the Australian Government among other key partners, will promote modern national strategies, including an open data policy, to improve water information and contribute to reinforce the capabilities of countries and other data providers in building and operating hydro-meteorological monitoring networks as well as successful water data management. Together with the HydroHub, identify barriers to effective monitoring and propose approaches for overcoming them, including innovative solutions and modernization of standardization processes; [Contributes to L-TA (6) and (7)]

**Requests** the Executive Council to provide guidance for implementing WMO's activities to address the long-term ambition (8) "Water quality is known" through involvement in relevant initiatives currently underway at a global and regional level;

**Noting** that the governance structure of the above initiatives requires formal representation of the Commission for Hydrology, which will be disbanded according to the Transition Plan of the ongoing WMO Reform,

**Having considered** the importance of accelerating the implementation of hydrological activities to raise the impact of WMO while strengthening synergies between them and with other WMO activities,

**Further requests** the Executive Council to take the necessary steps to ensure the continuity and acceleration of ongoing hydrological initiatives informed by the Long-term Ambitions, taking advantage of the organizational arrangements proposed in Resolution 5 (EC-71);

**Urges** Members to encourage and support relevant national experts participating in the hydrological activities and systems.

## **Resolution 26 (Cg-18)**

### **PROVISION OF IMPACT-BASED FORECAST AND WARNING SERVICES IN AN INNOVATIVE AND INTEGRATED WAY**

THE WORLD METEOROLOGICAL CONGRESS,

**Recalling:**

- (1) Resolution 2 (Cg-17) - Implementation of the WMO Strategy for Service Delivery,
- (2) Resolution 5 (Cg-17) - Public Weather Services Programme,
- (3) Decision 4 (EC-69) – Impact-Based Decision support Services requesting further development of training materials on Impact-Based Forecast and Warning Services (IBFWS), and to incorporate methods of assessing likelihood and risk using numerical weather ensembles into the *WMO Guidelines on Multi-hazard Impact-based Forecast and Warning Services* ([WMO-No. 1150](#)),

- (4) Decision 11 (EC-70) - Concept paper on the development of common interfaces for service delivery, through which EC requested the establishment of standard interfaces for accessing data and services for public service delivery,
- (5) Decision 12 (EC-70) – Symposium to collect Members experiences with IBFWS through which EC decided to approve the organization of a symposium in 2019 for Members to exchange experiences in IBFWS and to collect Members' experiences with IBFWS,

**Noting** that a number of pilot projects and training courses, organized by the initiative of Members in the implementation of IBFWS are already underway,

**Noting further** the WMO training activities on the IBFWS organized within the Severe Weather Forecasting Demonstration Project (SWFDP) in RA I and RA II, as well as Regional Training events organized in RA II, RA III and the pilot demonstration project in Barbados (RA IV) conducted by the Weather Ready Nations (WRN),

**Having considered** the recommendations of the CBS:

- (1) To establish a coordination mechanism to help identify resources to support Member- or Region-based implementation projects on impact-based forecast and warning services and to prevent a duplication of effort in this area between WMO and other development partners, and
- (2) To set a collaboration mechanism to identify the key elements with which to advance GIS- and impact information-based standard interfaces for service delivery,

**Decides** to task technical commissions and other bodies:

- (1) To further promote the shift towards Impact-Based Forecast and Warning Systems by developing a service-focused framework that will support the development and/or enhancement of individual implementation plans among developed and developing NMHS. Such a framework should be founded on the concepts articulated in the "WMO Strategy for Service Delivery and Its Implementation Plan" (WMO-No. 1129) and the "WMO Guidelines on Impact-based Forecast and Warning Services" (WMO-No. 1150);
- (2) To conduct the development of this framework collaboratively with development partners, ongoing projects within Regional Associations, and initiatives such as the "Weather Ready Nations programme", and to foster the dynamic integration of new learning, specialized requirements, and best practices in IBFWS into implementation projects through the publication of a supplement to WMO-No. 1150. Specialised requirements would include guidance with regard to the use of information in GIS-based formats, and the incorporation of data from innovative sources (such as crowdsourcing) into an integrated platform;

**Requests** Members to consider hosting or otherwise contributing to the implementation of workshops to advance the service-focused framework for Impact-based Forecast and Warning System;

**Urges** Members to proactively contribute to the symposium planned for late 2019 by gathering and collating experiences in the implementation of IBFWS as a key input to the symposium;

**Requests further** the Secretary-General:

- (1) To continue technical assistance to Members in IBFWS in scaling up the projects that have already been initiated;
- (2) To facilitate the preparation of an implementation plan based on the *WMO Guidelines on Multi-hazard Impact-based Forecast and Warning Services*, with adequate representation from stakeholders and technical commissions to be published in 2020;

- (3) To facilitate the development of training modules on IBFWS for use by Members, especially LCDs and SIDS by addressing appropriately the local unique knowledge and wisdom.

## Resolution 27 (Cg-18)

### REPORT OF THE SIXTEENTH SESSION OF THE COMMISSION FOR AERONAUTICAL METEOROLOGY

THE WORLD METEOROLOGICAL CONGRESS,

**Having considered** a report by the president of the Commission for Aeronautical Meteorology (CAeM) summarizing the outcomes of the sixteenth session of the Commission and its Technical Conference as well as the latest developments in support of the Aeronautical Meteorology Programme (AeM) [Cg-18/INF. 2.4(1)],

**Noting** the *Abridged Final Report of the Sixteenth Session of the Commission for Aeronautical Meteorology* (CAeM-16) (WMO-No. 1222) comprising, inter alia, the seven (7) recommendations adopted by the session,

**Decides** to approve Recommendations 1 to 6 (CAeM-16) inclusive and to note Recommendation 7 (CAeM-16);

**Further decides** to take the following actions in respect of the CAeM-16 recommendations:

- (1) *Recommendation 1 (CAeM-16) – Scientific and technological advancement in support of meteorological service for international air navigation*

**Requests** the Secretary-General:

- (a) To make the necessary resources available to foster the collaborative development of interdependent initiatives such as the IWXXM (ICAO meteorological information exchange model) and AvRDP (Aviation Research and Development Project) in cooperation with the relevant WMO bodies;
- (b) To ensure that the evolving qualification requirements in the provision of aeronautical meteorological services are reflected when reviewing and updating the Basic Instruction Packages.

- (2) *Recommendation 2 (CAeM-16) – Cooperation with the International Civil Aviation Organization*

**Requests** the Secretary-General:

- (a) To invite Members to foster enhanced coordination and collaboration between national aeronautical meteorological authorities and service providers, as well as respective civil aviation administrations, with a view to improving aeronautical meteorological service delivery;
- (b) To seek opportunities to further improve the efficiency and effectiveness of WMO cooperation with ICAO, including the development of more effective working relationships and/or methods of cooperation for respective expert bodies and the elimination of any existing duplication or redundancy that may exist;

- (c) To make the necessary resources available to foster the recommended review and update of the working arrangements between WMO and ICAO.

(3) *Recommendation 3 (CAeM-16) – Cooperation with other international organizations of relevance to the Commission for Aeronautical Meteorology*

**Requests** the Secretary-General:

- (a) To seek opportunities to foster further cooperation with other international organizations relevant to the provision of meteorological service for international air navigation through new or improved agreements or other such working arrangements, as appropriate;
- (b) To make the necessary resources available to foster the recommended operation and development of the AMDAR system arising from the emerging working arrangement between WMO and IATA with due emphasis that the cost framework should be fair, equitable and transparent.

(4) *Recommendation 4 (CAeM-16) – Long-term plan for the Aeronautical Meteorology*

**Requests** the Secretary-General:

- (a) To make available the necessary resources to contribute to the development and maintenance of the long-term plan;
- (b) To increase Members' awareness of any developments in the regionalization and globalization of aeronautical meteorological service provision that could potentially impact the role of service providers including NMHSs.

(5) *Recommendation 5 (CAeM-16) – World Meteorological Organization regulatory and guidance material addressing the provision of meteorological services for international air navigation*

**Requests** the Secretary-General, in coordination with ICAO:

- (a) To undertake steps necessary to discontinue *Technical Regulations (WMO-No. 49), Volume II – Meteorological Service for International Air Navigation*, while ensuring that any material of continuing relevance is reviewed before being transferred to other (new or existing) regulatory or guidance material of WMO or ICAO;
- (b) To ensure, during the accomplishment of (a), that:
  - (i) Any WMO or ICAO regulatory and/or guidance material that cross-references WMO *Technical Regulations (WMO-No. 49), Volume II* is appropriately amended;
  - (ii) Members are kept fully informed of the relevance and availability of this material as well as other relevant ICAO provisions;

**Further requests** the Secretary-General to keep ICAO informed of these developments and, in consultation with ICAO, to explore means to enable free access, preferably online, to relevant ICAO regulatory and guidance material by all WMO Members and their NMHSs providing meteorological service for international air navigation.

(6) *Recommendation 6 (CAeM-16) – Priority themes and continuity of World Meteorological Organization activities in aeronautical meteorology*

**Requests** Congress, in considering the establishment of a new WMO technical commission structure for the eighteenth financial period (2020–2023):

- (a) To ensure the continuity of activities of the aeronautical meteorology programme (AeMP) corresponding to the following priority themes:
- (1) Education, training and competency of aeronautical meteorological personnel;
  - (2) Aeronautical meteorological information service and governance;
  - (3) Aeronautical meteorological hazards prediction;
  - (4) Impacts of climate change and variability on aviation; and
  - (5) Communication and outreach;
- (b) To ensure the continuity of cooperative arrangements with ICAO and other relevant aviation stakeholders with appropriate positioning of WMO in the international civil aviation community;
- (7) *Recommendation 7 (CAeM-16) – Review of relevant resolutions and decisions of World Meteorological Organization governing bodies related to the Commission for Aeronautical Meteorology*

**Requests** Congress and the Executive Council to take into account this recommendation.

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Note: This resolution replaces Resolution 1 (Cg-17), which is no longer in force.

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## **Resolution 28 (Cg-18)**

### **LONG-TERM PLAN FOR AERONAUTICAL METEOROLOGY**

THE WORLD METEOROLOGICAL CONGRESS,

**Recalling:**

- (1) Resolution 3 (Cg-17) – Aeronautical Meteorology Programme,
- (2) Resolution 66 (Cg-17) – WMO support to evolving aeronautical meteorological services,

**Noting:**

- (1) Decision 43 (EC-68) – Action Plan – Meteorological services for aviation,
- (2) *The Abridged Final Report of the Sixteenth Session of the Commission for Aeronautical Meteorology (CAeM-16) (WMO-No. 1222)* which includes Recommendation 4 (CAeM-16) – Long-term plan for the Aeronautical Meteorology Programme,

**Noting with satisfaction** the development, by the Commission for Aeronautical Meteorology, of a final draft of a first edition of a long-term plan for aeronautical meteorology available at <https://www.wmo.int/aemp/LTP-AeM> which provides a framework for WMO activities in aeronautical meteorology, consistent with the International Civil Aviation Organization (ICAO) Global Air Navigation Plan (GANP) and its aviation system block upgrades (ASBU) methodology and timeline, with special consideration on the drivers for change, the role of science and technology, the WMO role in performance improvement, and strategic guidance for Members,

**Decides** to endorse the final draft of a first edition of the long-term plan for aeronautical meteorology;

**Requests** the Secretary-General to finalize and publish the long-term plan for aeronautical meteorology as the first edition (2019);

**Agrees** that the long-term plan should be a living document that is kept under regular review and periodic update to ensure a high degree of alignment with, inter alia, the WMO Strategic Plan and ICAO GANP;

**Requests further** the president of the Commission for Aeronautical Meteorology (CAeM) and, subsequently, the president of the Services Commission:

- (1) To establish mechanisms to support the future maintenance and development of subsequent editions of the long-term plan for aeronautical meteorology;
  - (2) To ensure that presidents of other technical commissions and presidents of regional associations are kept informed of and consulted on developments in this regard as necessary.
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## **Resolution 29 (Cg-18)**

### **STRENGTHENING MARINE AND COASTAL SERVICES**

THE WORLD METEOROLOGICAL CONGRESS,

**Recalling:**

- (1) The Seventeenth World Meteorological Congress ([Cg-17](#)) (general summary paragraphs 3.1.100-112) urged Members to renew focus on marine forecasting capabilities and service delivery through strengthening marine meteorological and oceanographic services as required under the International Convention for the Safety of Life at Sea (SOLAS), improved forecasting to mitigate coastal hazard risk and addressing deficiencies in capacity development,
- (2) Resolution 6 (Cg-17) - Competency requirements for marine weather forecasters and Resolution 11 (EC-70) - Marine services support for WMO Members,
- (3) The Marine Services Assessment (2016) recommendations for improving marine services to WMO Members [[EC-70 Report Part II](#)],
- (4) Resolution 11 (EC-70) Marine and Coastal Services to Support Members, whereby EC decided to support the new enhanced future vision and direction of maritime safety services, whilst reinforcing this with the appointment of *National Marine Services Focal Points* of WMO Members,

**Mindful** that:

- (1) Marine services do not just contribute to shipping, they also provide essential information to coastal communities for transport, safety, protection of infrastructure and environmental management,
- (2) WMO provides regulatory provisions and guidance for marine and coastal services to Members [see [Cg-18/INF. 5.4](#)],

**Concerned:**

- (1) With the gaps, in all WMO regions, for marine and coastal service provision, as outlined in the *WMO Report of the Marine Services Survey (2018)* and also gaps in competency for marine services as evident from the WMO Education and Training (ETR) survey (2017) [see *Cg-18/INF. 8.2* and *Resolution 71 (Cg-18)*],
- (2) That approximately 40% of Members with marine service responsibilities have a *National Marine Services Focal Point* [see *Cg-18/INF. 5.4*] and the strong correlation that these Members completed the marine survey, whilst generally, Members without a Focal Point did not complete the survey, demonstrating the challenge in communications between the Secretariat and Members with marine services,

**Recognizing:**

- (1) That an ad hoc Task Team for Marine Competency Implementation is being established, to develop guidance for Members implementing the marine forecaster competency framework,
- (2) JCOMM is working to develop options to build capacity and capability within Regional Associations and training centres to address gaps, both known and identified by the above mentioned survey; and other tasks necessary to improve the provision of marine services worldwide [see *Resolution 73 (Cg-18)* and *Cg-18/INF. 8.2*],
- (3) Successful completion of the joint JCOMM and CHy *Coastal Inundation Forecasting Demonstration Projects (CIFDP)* in Bangladesh, the Caribbean and Indonesia, and with expected completion of Fiji by end of 2019 [see *Cg-18/INF. 5.4*],
- (4) Recommendations from the independent assessment of the CIFDP [see *Resolution 15 (Cg-18)*] that the CIFDP has clearly demonstrated its value and should move forward in the future as Coastal Inundation Forecasting Initiative (CIFI), and
- (5) The WMO/IMO International Symposium *Extreme Maritime Weather: Towards Safety of Life at Sea and Sustainable Blue Economies* (October 2019) which will initiate discussions between the met-ocean and maritime communities along with other interested stakeholders,

**Having examined** the outcomes of the *WMO Report of the Marine Services Survey (2018)*,

**Decides** to strengthen marine services, especially in developing countries and Small Island Developing States (SIDS);

**Requests** the appropriate technical commissions, regional associations and other relevant WMO bodies to:

- (1) Continue to support the development of the Coastal Inundation Forecasting Initiatives (CIFI) in the context of decisions taken under *Resolution 15 (Cg-18) Strengthening Multi-Hazard Early Warning Services in Areas Prone to Severe Weather and Flooding*; and
- (2) Support activities that contribute to strengthened marine services, especially in regional contexts;

**Requests** the Executive Council to oversee the implementation of this decision;

**Requests** the Secretary-General to make the appropriate arrangements to support these efforts.

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## Resolution 30 (Cg-18)

### EXPLORING COSTING OPTIONS FOR MARINE SERVICES IN THE FUTURE

THE WORLD METEOROLOGICAL CONGRESS,

**Recalling** Cg-17 (general summary paragraph 3.1.132) requested the co-president of JCOMM and the Secretary-General in consultation with the International Maritime Organization (IMO) to consider cost recovery processes,

**Mindful that:**

- (1) Members have an obligation to provide marine services within their areas of responsibility, and
- (2) Generally, under the International Convention for Safety of Life at Sea (SOLAS), transmission of weather information to vessels at sea has been free to the users,

**Concerned:**

- (1) For Costs to Members for the provision of marine services:
  - (a) Generally, for all with marine responsibilities, and
  - (b) Specifically, to the 19 Members with METAREA responsibilities, whose costs may increase once SOLAS products are broadcast by more than one satellite provider, as a result of the International Maritime Organisation (IMO) decision at the Maritime Safety Committee 99 (2018) [see [Cg-18/INF. 5.4](#)],
- (2) That METAREA broadcasts delivered via the Global Maritime Distress and Safety System (GMDSS) should continue to be provided to the maritime community at no cost to the user in accordance with the International Convention for SOLAS,

**Having examined** the initial results of the cost recovery investigation by JCOMM [see [Cg-18/INF. 5.4](#)],

**Decides** to continue to investigate options for advice to Members on costing models for marine services, to report back to Congress-19;

**Requests** Executive Council to review and make recommendations regarding appropriate costing options for marine services, to inform Congress-19;

**Requests** the Secretary General to enable the relevant consultations with the appropriate bodies, including partners such as the IMO.

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**Resolution 31 (Cg-18)****AMENDMENTS TO THE TECHNICAL REGULATIONS (WMO-No. 49), VOLUME I, PART IV - METEOROLOGICAL SERVICES FOR MARINE ACTIVITIES**

THE WORLD METEOROLOGICAL CONGRESS,

**Recalling** Resolution 10 (EC-70) where revisions to the *Manual on Marine Meteorological Services* (WMO-No. 558), *Volume 1 - Global Aspects* and the associated *Guide to Marine Meteorological Services* (WMO-No. 471) were approved,

**Noting** that subsequently, the aforementioned revised Manual and Guide were both published in December 2018,

**Noting further** that the *Technical Regulations* (WMO-No. 49), *Volume 1, Part IV - Meteorological Services for Marine Activities* now needs to reflect the above revisions,

**Approves** the proposed amendments to the *Technical Regulations* (WMO-No. 49), *Volume 1, Part IV - Meteorological Services for Marine Activities* as provided in Annex 1;

**Urges** Members to act on the amended provisions to ensure strong and competent delivery of marine services,

**Requests** the Secretary General to:

- (1) Make any subsequent editorial amendments, ensuring editorial consistency of the relevant documents, and publish the amendments in the WMO official languages; and
- (2) Bring the above decisions to the attention of all concerned.

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**Annex to Resolution 31 (Cg-18)****AMENDMENTS TO TECHNICAL REGULATIONS (WMO-No. 49), VOLUME I, PART IV METEOROLOGICAL SERVICES FOR MARINE ACTIVITIES**

(Document: [Cg-18-d05-4-WEATHER-INFORMATION-AND-SERVICES-ANNEX-approved\\_en](#))

*Editor's note:* The link above was used by the delegates for the approval of the amendments/draft new edition. The final publication, issued after the eighteenth session of Congress, will be posted on the WMO library site at <https://public.wmo.int/en/resources/library>.

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## Resolution 32 (Cg-18)

### ADVANCING INTEGRATED URBAN SERVICES

THE WORLD METEOROLOGICAL CONGRESS,

**Recalling** Resolution 68 (Cg-17) – Establishing a WMO cross-cutting urban focus and Decision 15 (EC-68) – Implementation of WMO Cross-Cutting Urban Focus that established a WMO urban agenda and outlined its 2016-2019 implementation framework,

**Further recalling** the [global research agenda on cities and climate change](#) that advances climate change science and gives recognition and visibility to the knowledge generated by urban stakeholders developed by the Cities-IPCC Conference and to the contribution of WMO to the United Nations (UN) [New Urban Agenda](#),

**Mindful** of the ever-increasing vulnerabilities and exposure of the population and infrastructure to natural and anthropogenic hazards, especially related to the migration to cities and densely populated environments as well as to climate change,

**Considering** that *Sustainable cities and communities* has been identified as one of the 17 Sustainable Development Goals (SDGs) under the 2030 Agenda for Sustainable Development (SDG 11),

**Recognizing** the critical contributions of WMO technical commissions, programmes, co-sponsored entities and centres to advances in high temporal and spatial resolution observations and modelling systems permitting the development of integrated urban hydro-meteorological, climate, marine meteorological and environmental prediction systems and services that can meet the needs and requirements of urban stakeholders,

**Noting** that urban populations experience elevated health risks and that the health sector is one of the beneficiaries of integrated urban services as per the agreement between WMO and the World Health Organization (WHO) of May 2018, also reflected in Resolution 33 (Cg-18),

**Commending** the delivery of Volume I of the [“Guidance on Integrated Urban Hydrometeorological, Climate and Environmental Services”](#) (Guidance) and the outline for the “Guidelines for the Development of an Integrated Operational Platform to Meet Urban Service Delivery Needs” which were developed by the Commission for Atmospheric Sciences (CAS) and the Commission for Basic Systems (CBS) and an inter-programme working group, which were adopted by Decision 7 (EC-70), as well as on the Guidance Volume II: Demonstration Cities, that includes, *inter alia*, the outcomes of the 2018 Member survey on urban services, submitted to the Executive Council [*Decision 2 (EC-71)*],

**Decides** to:

- (1) Develop a collaborative framework with other agencies and an implementation plan for the contribution of WMO to such a collaborative framework that will ensure international coordination of the efforts related to development and delivery of integrated urban services and support advancement of the broader urban agenda. The plan should align with developing impact-based forecasting and warning systems as specified by WMO *Guidelines on Multi-hazard Impact-based Forecast and Warning Services* (WMO-No. 1150), while also recognizing the specific service needs required by disaster management authorities in megacities. Effective metrics should be developed to assess the benefits of these specific services and their contribution towards meeting the United Nations’ goal (SDG-11) of sustainable cities and communities;
- (2) Integrate the research-to-operations-to-services value chain, that is science-based and services-driven, to support very high-resolution forecasting, predictions and warning

systems as well as products' verification to address the requirements of urban stakeholders, taking into account national policies and NMHSs roles and responsibilities, and the above Guidance, in particular experience of the Demonstration Cities;

- (3) Engage in renewed and expanded partnerships on urban matters, involving the UN (including UN-Habitat, WHO, etc.) and other international organizations, government institutions, academia and the private sector;
- (4) Establish verification, quality management and assessment processes to ensure the smooth transition from science to operations and to determine the social and economic benefits resulting from the urban services;

**Requests:**

- (1) Technical commissions and the Research Board to implement the above decisions and to assist Members in building capacity in urban services;
- (2) Technical Commissions and other bodies to develop a technical guide on measuring, monitoring and modelling of the Urban Heat Island (UHI) effect, which is a growing concern due to accelerating urbanization and warming trends, to support Members' service delivery needs and planning efforts to mitigate the impacts of UHI;
- (3) The Secretary-General to finalize the collaborative framework on the WMO urban agenda for adoption by the Executive Council and support the implementation of the above decision;
- (4) The Executive Council to oversee the development of the integrated urban services as an important emerging service area and to ensure appropriate mechanisms for effective support and implementation;

**Invites** Members to advance the implementation of the integrated urban services, share lessons learned, and support WMO urban-related activities.

## **Resolution 33 (Cg-18)**

### **ADVANCING INTEGRATED HEALTH SERVICES**

THE WORLD METEOROLOGICAL CONGRESS,

**Recalling:**

- (1) Resolution 1 (Cg-Ext 2012) – Implementation of the Global Framework for Climate Services, whereby health was deemed a priority sector,
- (2) Resolution 3 (EC-70) – Integrated Health Services,
- (3) Resolution 47 (Cg-17) – Global Atmosphere Watch Programme, and Decision 62 (EC-68) – Global Atmosphere Watch Implementation Plan for the period 2016-2023,

**Considering** the Sustainable Development Goal 3 -*Ensure healthy lives and promote well-being for all at all ages*, more specifically target 3.9, and the Sustainable Development Goal 11 – *Sustainable Cities and Communities, the Sustainable Development Goal*, more specifically SDG targets 11.5 and 11.6,

**Recognizing** that weather, climate, water and environmental phenomena affect human health outcomes in various ways, including through exposure to ultraviolet (UV) radiation, air

pollution, including sand and dust, and environmentally transported chemicals, as well as to extreme events such as drought, flooding, storms, heat and cold waves that result in food, water, and nutritional insecurity, injury; exacerbation of mental health, communicable and non-communicable diseases, amongst other impacts,

**Considering** the experience gained and lessons learned over time in implementing WMO activities addressing weather, water, climate and environmental services within the health sector by Members' National Meteorological and Hydrological Services (NMHSs),

**Commending** the Collaboration Framework on Climate, Environment and Health agreed between the WMO and the World Health Organization (WHO) in May 2018 and commitments of WMO to collaborate with WHO to enhance global knowledge and action on air quality and to strengthen WMO efforts for research and service delivery for global health applications, through greater integration of its work on weather, water, climate and environment as related to health,

**Noting** that a Joint WMO/WHO Office for Climate and Health, established in 2014, is instrumental in assisting both Organizations to identify and develop closer collaboration and institutional arrangements in this field,

**Noting further** the ongoing collaboration between the climate and health sector at both regional and national levels,

**Decides** to endorse the seamless five-year WHO-WMO Master Plan on Health, Environment, and Climate Science to Services, developed jointly with WHO, as summarized in the [annex](#);

**Requests:**

- (1) The technical commissions and the Research Board to develop the Implementation and Resource Plan on Integrated Health Services; to co-design with research and health community products and services required to effectively support public health by all Members, and to assist in strengthening the capacities of health service providers and users;
- (2) The Implementation and Resource Plans should ensure a joint focus on building integrated information services that enhance urban resilience extending to climate-related health risks including the intersection of urban planning, heat and air quality, climate sensitive diseases, food availability and quality, and water-related illness;
- (3) Regional Specialized Meteorological Centres (RSMCs) and Regional Climate Centres (RCCs) to nominate health sector focal points for health-related research and services;
- (4) The Secretary-General to ensure appropriate arrangements to finalize the Implementation and Resource Plan on Integrated Health Services for adoption by the Executive Council;
- (5) The Executive Council to establish appropriate mechanisms for the effective support and implementation of Integrated Health Services, including the creation of a joint technical oversight mechanism and revision of the WHO-WMO Joint Office terms of reference in accordance with any new mandate, as appropriate;

**Invites** Members to strengthen research and operational mechanisms, including open sharing of meteorological and health data, to facilitate coordination and cooperation of their NMHSs and other relevant actors with the health community on matters of climate, weather, water and environmental risks; and to nominate health experts to the WMO Expert Network;

**Invites also** The World Health Organization, Members and development partners to fund such arrangements;

**Invites further** the World Health Organization to nominate experts to the WMO Expert Network to work in relevant bodies established by technical commissions.

For further details see [Cg-18/INF. 5.5](#).

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## **Annex to Resolution 33 (Cg-18)**

### **SUMMARY OF THE WHO-WMO HEALTH, ENVIRONMENT, AND CLIMATE SCIENCE TO SERVICES MASTER PLAN**

- 1.1 The Health, Environment, and Climate Science to Services Master Plan has been developed to assist WMO and the World Health Organization (WHO) in implementing a Framework Collaboration Agreement signed in 2018. The objective of the Master Plan is to improve health outcomes and enhance the assessment and management of weather, climate, water, and atmospheric related risks to human health. The Master Plan itself serves as a process and instrument to help WHO and WMO enhance dialogue, develop common strategic and technical agendas, and identify and establish the required mechanisms to accelerate cooperation in priority areas at global, regional, and national levels. It aims to provide for high-level alignment and synergies and builds on and complements existing mechanisms and initiatives.
- 1.2 The scope of this Master Plan includes actions to enhance the understanding and management of health risks associated with extreme weather, water and climate events and long-term climate change (including improved access and use of weather, water and climate data for risk assessment and reduction, generation of evidence, adaptation planning, and application of tailored science and services); as well as enhancing the monitoring, forecasting, warning and management of environmental health risks, such as ultraviolet (UV) radiation, hazardous air quality, and water. It seeks opportunities to promote health co-benefits of climate change mitigation and adaptation and to address the needs of populations highly vulnerable to environmental and climatic changes, such as those in urban areas, Low and Middle Income Countries, and Small Island Developing States (SIDS).
- 1.3 WHO and WMO have agreed to work collaboratively and where appropriate, jointly, to:
  - (a) Promote the alignment of relevant policies and raise awareness of environmental and climate related risks and solutions to protect human health;
  - (b) Promote the generation and application of scientific evidence;
  - (c) Establish appropriate technical mechanisms and partnerships to facilitate the development, delivery, access to and use of data and tailored information products on weather, climate, and environmental hazards to health;
  - (d) Develop and disseminate technical and normative guidance, scientific publications and tools, and other actions to support capacity development; and,
  - (e) Monitor progress on the access and use of reliable and relevant weather, climate, and environmental and health information.
- 1.4 The Master Plan reflects the above scope of the Framework Collaboration Agreement, and includes three parts: (1) Overview; (2) Interagency Work Plan; and (3) Implementation Plan. Parts (1) and (2) have been developed (see [Cg-18/INF. 5.5.2](#) . Part (3), the Implementation Plan, should be developed in 2019-2020 reflecting decisions of Cg-18.

- 1.5 The seamless Five-year Interagency Work Plan presents the following joint high-level goals for the four thematic areas:
- (a) **Climate and Health:** Enhance health system resilience to climate variability and climate change through improved evidence, capacity, provision and application of climate information products and services to health policy and programming.
  - (b) **Weather, Climate, Hydrological Extreme events, and Health Emergencies:** Enhance Health Emergency and Disaster Risk Management to better understand, anticipate, and manage health risks of extreme weather, climate, and hydrological events, and benefit from Multi-hazard Early Warning Systems.
  - (c) **Atmosphere and Environment:** Strengthen and harmonize air quality and radiation-related monitoring, modelling, and use of atmospheric and environmental science in public health, including in environmental emergencies.
  - (d) **Water and Health:** Enhance water sanitation and hygiene (WASH) sector climate risk management capacity to maintain and improve access to and quality of water and sanitation through improved availability and use of climate and hydrological information products and services.
- 1.6 Objectives and activities for each thematic area are further divided into five action areas:
- (a) Leadership, partnerships, outreach, and Secretariat functions,
  - (b) Alignment of normative provisions and guidance for providers and users,
  - (c) Data and monitoring,
  - (d) Research and development information products,
  - (e) Operational Services.
- 1.7 Details of individual and joint activities planned for implementation in 2019-2020 are provided, and will be annually updated and reported on to senior management of both organizations. The Work Plan was prepared by WHO and WMO staff, reflecting funded projects, recent commitments and planning processes<sup>7</sup> taking a “user-driven” perspective to identify the most important needs to improve health preparedness and protection from weather, water, air quality and climate risks. An internal and external review process validated the proposed actions, which are expected to evolve and be refined with time.
- 1.8 Furthermore, in advance of the implementation plan development, ongoing activities were prioritized to maintain momentum and visibility, help strengthen relevant relationships, and deliver key products that will help expand future work. These include:
- (a) The **WHO/WMO Joint Climate and Health Office** will continue to provide interagency coordination for strategic and technical activities;
  - (b) The **Health, Environment and Climate Change Coalition** was jointly launched in 2018 by WMO, WHO, and UN Environment to enhance UN-wide coordination on health, environment and climate;

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<sup>7</sup> These include: (i) The implementation of the Health Exemplar of the Global Framework on Climate Services (GFCS); (ii) The continual planning process to identify the “global goods”, and technical support that WHO will provide to countries to achieve the 13th Global Programme of Work Goals; (iii) Collaboration agreements on specific issues, e.g. the commitments by WMO to the 1st WHO Global Conference on Air Pollution and Health in October 2018; (iv) Technical consultations with the Global Heat Health Information Network, reflecting global and regional priorities for the management of extreme heat; and (v) WHO and WMO support for the implementation of health emergency and disaster risk management as included in the Sendai Framework for Disaster Risk Reduction 2015-2030, the International Health Regulations (2005), and other international agendas.

- (c) The **WHO-WMO Science Portal** is being designed to support the overall aims of the Master Plan and will provide WHO and WMO with a public online platform where reliable information and resources on climate, health, and environment will be made available.
- (d) **WMO Integrated Health Service Capacities Mapping and Profiles** will identify existing resources and capacities for integrated information services for health provided by its Members, to identify good practices, and needs and opportunities to support the implementation of the Master Plan;
- (e) **Co-designed information norms and standards** as well as steps to identify the appropriate structures with which to strengthen guidance, such as good practices in sharing arrangements of meteorological and health data, data integration and information management, co-designed sector-specific climate indices, and other tailored products will be explored.
- (f) The WHO-led **Global Air Pollution and Health - Technical Advisory Group (GAPH-TAG)** is an existing mechanism for WHO and WMO collaboration. The Scientific Steering Committee (SSC) and several Scientific Advisory Groups of the WMO Global Atmosphere Watch (GAW) Programme contribute to the activities of this Group, and health-related collaboration on dust issues occurs through the WMO-led Sand and Dust Storms Warning and Advisory System.
- (g) A **Heat and Health Global Synthesis Report and Action Plan** will help prioritize investments for heat risk management and enhance global understanding of related risks and current actions. A joint WHO-WMO Technical Report on occupational heat stress will complement this synthesis.
- (h) **Health in multi-hazard early warning systems (MHEWS)**: WHO and WMO plan activities to scope opportunities to strategically improve the health sector's involvement in MHEWS.
- (i) **Climate services for health country projects**: WHO and WMO together implement the Global Framework for Climate Services (GFCS) Adaptation for Africa Project in Malawi and Tanzania. WHO is scaling up climate service applications in additional countries, notably testing the climate-service readiness assessment tool and building integrated climate and health surveillance systems.
- (j) **Rejuvenation of the INTERSUN Project**: a collaboration between WHO, WMO and UN Environment established in 1995. Revitalisation of the partnership and expanding members will account for recent advances and work to develop guidance on standards to support Member States with UV protection of the public and workers, and explore tools to share relevant UV information.

*[Full work plan is provided in [Cg-18/INF. 5.5](#)].*

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## **Resolution 34 (Cg-18)**

### **GLOBAL BASIC OBSERVING NETWORK**

THE WORLD METEOROLOGICAL CONGRESS,

#### **Recalling:**

- (1) Resolution 40 (Cg-XII) - WMO Policy and Practice for the Exchange of Meteorological and Related data and products including Guidelines on Relationships in Commercial Meteorological Activities,
- (2) Resolution 2 (EC-68) – Plan for the WMO Integrated Global Observing System pre-operational phase 2016–2019,
- (3) Decision 21 (EC-69) – Regional Basic Observing Network,

**Noting** Recommendation 5 (EC-70) Global Basic Observing Network,

#### **Noting also:**

- (1) Resolution 37 (Cg-18) The WMO Integrated Global Observing System transition to operational status commencing in 2020,
- (2) Resolution 55 (Cg-18) Emerging Data Issues,

#### **Having considered:**

- (1) The essential role played by global applications such as numerical weather prediction (NWP) and climate analysis as a backbone for all products and services provided by all WMO Members to their constituencies, including at regional and local levels,
- (2) The need for a continuous real-time supply of observational data from all areas of the globe to critical global NWP and climate analysis systems as being vital to product generation and service delivery capabilities of all WMO Members,
- (3) The preliminary reports from the [WIGOS Data Quality Monitoring System NWP Pilot Project](#) showing that the current international exchange of observational data in many areas falls significantly short of agreed requirements, and that this limits the ability of all WMO Members to understand and predict the atmosphere at all time-scales,
- (4) The Global Basic Observing Network Concept (hereafter/thereafter referred to as "GBON Concept") as provided in the [annex](#) to the present resolution,

**Recognizing** that the new GBON requirements for international data exchange introduced in the annex may necessitate a review of the existing data exchange policies and practices, and that such a review should be a part of a coordinated effort,

**Adopts** the GBON Concept as provided in the [annex](#) to the present resolution;

**Requests** the Infrastructure Commission to draft relevant provisions of the *Manual on the WMO Integrated Global Observing System* (WMO-No. 1160) regarding the implementation of the Global Basic Observing Network, which will clarify international requirements for the exchange of observations and respective obligations of the Members in this regard, and to submit these to EC-72 for approval;



**Requests further** the Infrastructure Commission to:

- (1) Develop a proposal for a process for nomination, review and approval of the composition of the GBON and submit it to EC-72 for approval, with the overall aim of having the initial composition of GBON approved by the Extraordinary World Meteorological Congress in 2021;
- (2) Establish a consultative process to assist Members and relevant international organizations and programmes with the implementation of the GBON;
- (3) Develop a GBON Communication Plan, including necessary capacity development actions, and GBON Guidance to be submitted to EC-72 for endorsement;

**Requests** presidents of regional associations to develop a plan for a phased GBON implementation, taking into account the unique circumstances and capabilities of the individual WMO Members;

**Requests** the Executive Council to take into account the GBON requirements in any update to existing WMO data exchange policies and practices it may propose;

**Requests** the Secretary-General:

- (1) To provide the necessary assistance and Secretariat support for the implementation of GBON,
- (2) To ensure communication and consultation with relevant international organizations and programmes and their engagement in the implementation of the GBON.

## **Annex to Resolution 34 (Cg-18)**

### **GLOBAL BASIC OBSERVING NETWORK CONCEPT**

#### **1. Preamble**

Global Numerical Weather Prediction (NWP) and climate reanalysis play essential roles as backbones for all products and services provided by the National Meteorological and Hydrological Services of WMO Members to their constituencies, even at regional and local levels. Within the WMO Rolling Review of Requirements (RRR) process, all application areas currently listed, with the sole exception of space weather, have some level of dependency on global NWP and climate reanalysis products.

The global systems delivering these products depend on access to globally consistent sets of observations provided by surface- and space-based observing systems. WMO facilitates, coordinates and monitors the collection and international exchange of such observations.

Preliminary reports from the WIGOS Data Quality Monitoring System (WDQMS) NWP pilot show continued poor availability of surface-based observational data over many areas of the global domain. This limits the ability of all WMO Members to provide high quality weather and climate products and services to their constituencies.

In order to ensure that observational requirements for global NWP and climate reanalysis are met more effectively, a new approach is proposed, in which the basic surface-based observing network that is essential to support these applications is designed and defined at the global level. This network is the Global Basic Observing Network, or GBON<sup>8</sup>.

<sup>8</sup> See: [GBON, Executive Summary](#)

## **2. Concept of Global Basic Observing Network (GBON)**

The GBON is a subset of the surface-based subsystem of WIGOS, used in combination with the space-based subsystem and other surface-based observing systems of WIGOS, to contribute to meeting the requirements of global NWP, including reanalysis in support of climate monitoring. The GBON responds to global NWP requirements that cannot currently be met, or fully met, by space-based observing systems alone.

The GBON is the foundation upon which the Regional Basic Observing Networks (RBONs) are built to respond to requirements of a broader range of WMO application areas, including further requirements of global NWP beyond the essential base provided by the GBON. Hence all GBON stations/platforms and their observing programmes (variables and schedules) are included in the respective RBON of the region in which they are operating.

### **2.1 Key attributes of the GBON (not exclusive)**

GBON stations/platforms must comply with the following:

- (a) Requirements for real-time and near-real-time data exchange at the global level,
- (b) Requirements for regular updates of WIGOS metadata in the Observing Systems Capability Analysis and Review tool (OSCAR/Surface),
- (c) Requirements for data exchange in defined WMO formats,
- (d) Requirements for complying with the WIGOS quality management,
- (e) Requirements for change management

as specified in the *Manual on the WMO Integrated Global Observing System* (WMO-No. 1160).

Note: GBON stations/platforms are not necessarily limited to those that fall directly under the responsibility of NMHSs.

### **2.2 Design, implementation and management of GBON**

The GBON is designed starting from the technology-free requirements captured in the Rolling Review of Requirements, and is based on employing currently available technologies that can help address these requirements. The design takes into account the cost-effectiveness of the various technologies, the way in which they complement each other, and the contribution made by space-based observations. The overall aim is to ensure that the GBON observations, together with satellite data and other sources of observations available, adequately address global NWP requirements.

Design, implementation and management of the GBON will be defined in the *Manual on the WMO Integrated Global Observing System* (WMO-No. 1160), section 3.2.2 Global Basic Observing System to be submitted to EC-72 for approval.

In response to the GBON provisions listed in the Manual, Members and relevant international organizations and programmes are requested to commit specific observing stations/platforms with specific observing programmes (variables and schedules) to be part of the GBON, or to take any steps nationally or regionally to develop the required observing capacity. OSCAR/Surface and WQMS will play important roles in the designation and monitoring of the GBON stations, respectively.

### **2.3 Monitoring of the GBON design and implementation**

The Infrastructure Commission will be responsible for defining the tasks necessary for monitoring of the GBON design and implementation. The regional associations in collaboration with the Infrastructure Commission will coordinate the actual monitoring activities. Some monitoring functions and incident management will be coordinated through the WIGOS Data Quality Monitoring System.

Monitoring will include the following functions:

**(a) Progress of implementation**

Progress with regard to GBON implementation and commitments of Members and relevant international organizations and programmes to the GBON will be monitored.

**(b) Effectiveness of the design**

The GBON will be routinely monitored globally to assess adequacy and effectiveness of the design of the GBON to address global NWP requirements.

## **Resolution 35 (Cg-18)**

### **WMO INTEGRATED GLOBAL OBSERVING SYSTEM STATION IDENTIFIERS**

THE WORLD METEOROLOGICAL CONGRESS,

**Recalling** Resolution 2 (EC-68) – Plan for the WMO Integrated Global Observing System pre-operational phase 2016–2019 and Decision 15 (EC-70) - WMO Integrated Global Observing System station identifiers,

**Noting** Resolution 36 (Cg-18) Amendments to Technical Regulations (WMO-No. 49) *Manual on the WMO Integrated Global Observing System* (WMO-No. 1160),

**Noting also** that the WIGOS shall facilitate the use of observations from observing networks that are owned, managed and operated by a diverse array of organizations and programmes,

**Noting further** that being assigned a WIGOS Station Identifier (WSI) is a prerequisite for an observing station to be registered in OSCAR/Surface, and that this registration is mandatory for all stations from which observations are exchanged internationally,

**Acknowledging** the vital role of the WMO co-sponsored observing programmes and relevant international partner organizations and programmes in the implementation of WIGOS, including the GBON and RBON components,

**Having been informed** about multiple pending cases of existing observing stations operating under observing programmes either already contributing or having significant potential to contribute to WIGOS, but currently unable to obtain a WSI from the Permanent Representative of the respective Member with WMO,

**Decides** to delegate authority to:

- (1) The Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO);
- (2) The relevant authority for the observing component of the Global Atmosphere Watch;
- (3) The relevant authority for the observing component of the Global Cryosphere Watch;
- (4) The relevant authority for the Global Climate Observing System (GCOS) Reference Upper-Air Network (GRUAN);

(hereafter/thereafter referred to as "WSI issuers") to issue WIGOS station identifiers for non-NMHS observing stations that contribute to the relevant network on behalf of Members under the circumstances and following the processes as specified in the [annex](#) to the present resolution,

**Requests** the Infrastructure Commission to:

- (1) Further develop and refine the relevant provisions of the *Manual on the WMO Integrated Global Observing System* (WMO-No. 1160), engaging with the user community to form an efficient approach to implementation, to be submitted to EC-72 for approval; and
- (2) Establish an implementation timetable that takes into account the time needed by Members to modify their downstream systems to accommodate the transition to WSI;

**Requests** the Secretary-General:

- (1) To amend the relevant provisions of the *Manual on the WMO Integrated Global Observing System* (WMO-No. 1160) accordingly;
- (2) To delegate authority to other WSI issuers, as deemed necessary, to support WIGOS implementation;
- (3) To work closely with the WSI issuers; and
- (4) To provide the necessary assistance and Secretariat support for the implementation of this resolution;

**Requests Members** and the WSI issuers to work closely on this matter in accordance with this resolution;

**Invites** all WSI issuers, both NMHSs and external partners, to participate in the test currently coordinated by the Secretariat with relevant partners exchanging their observational reports with WSIs.

### **Annex to Resolution 35 (Cg-18)**

#### **CIRCUMSTANCES FOR ISSUING WIGOS STATION IDENTIFIERS BY WSI ISSUERS FOR NON-NMHS OBSERVING STATIONS/PLATFORMS**

1. In circumstances when a WIGOS station identifier is required for a station or platform to support an observing programme contributing to WIGOS and no Member is in a position to issue one (for example, in Antarctica), the Secretary-General is authorized to issue a WIGOS station identifier for that station or platform, using the "issuer of identifier" allocated to the Secretary-General, provided that its operator has committed to:
  - (a) Providing WIGOS metadata;
  - (b) Conforming to relevant Technical Regulations;
2. In circumstances where a WIGOS station identifier is required for a station or platform contributing to WIGOS and the Member concerned is not able to issue one, the WSI issuer will issue a WIGOS station identifier for that station or platform, provided that its operator has committed to:
  - (a) Providing WIGOS metadata;
  - (b) Conforming to relevant Technical Regulations;

3. In circumstances where a WIGOS station identifier is requested by the operator of a station or platform contributing to WIGOS and the Member concerned has not issued one and not provided a valid reason for non-issuance, the WSI issuer will issue a WIGOS station identifier for that station or platform, provided that its operator has committed to:
  - (a) Providing WIGOS metadata;
  - (b) Conforming to relevant Technical Regulations.
4. In all cases where a WIGOS Station Identifier is assigned by an authority other than the Permanent Representative of the respective Member with WMO of the country or territory in which the station is operating, the Permanent Representative of the respective Member with WMO shall be informed in writing by the Secretary-General and shall be given a period of no less than 30 days to reverse this assignment if they believe they have a valid reason for doing so.

### **Resolution 36 (Cg-18)**

**AMENDMENTS TO THE *TECHNICAL REGULATIONS* (WMO-No. 49), VOLUME I, PART I – WMO INTEGRATED GLOBAL OBSERVING SYSTEM, TO THE *MANUAL ON THE WMO INTEGRATED GLOBAL OBSERVING SYSTEM* (WMO-No. 1160), AND TO THE *WIGOS METADATA STANDARD* (WMO-No. 1192)**

THE WORLD METEOROLOGICAL CONGRESS,

**Recalling:**

- (1) Articles 2 (a), 2 (c) and 8 (d) of the Convention of the World Meteorological Organization,
- (2) Resolution 25 (Cg-17) – *Technical Regulations* (WMO-No. 49), Volume I, Part I - WMO Integrated Global Observing System,
- (3) Resolution 2 (EC-68) – Plan for the WMO Integrated Global Observing System pre-operational phase 2016–2019,
- (4) Resolution 3 (EC-68) – Inter-Commission Coordination Group on the WMO Integrated Global Observing System,
- (5) Resolution 1 (EC-69) – *Manual on the WMO Integrated Global Observing System* (WMO-No. 1160), Section 2 and Section 8,
- (6) Decision 21 (EC-69) – Regional Basic Observing Network,
- (7) Recommendation 5 (EC-70) – Global Basic Observing Network,

**Noting:**

- (1) Resolution 34 (Cg-18) Global Basic Observing Network,
- (2) Resolution 37 (Cg-18) The WMO Integrated Global Observing System transition to operational status commencing in 2020,

**Noting further** that the draft WMO *Technical Regulations* (WMO-No. 49), Volume I, Part I and the draft *Manual on WMO Integrated Global Observing System* (WMO-No. 1160) were circulated to all Members and their comments were incorporated accordingly,

**Having considered** the amendments to WMO *Technical Regulations* (WMO-No. 49), Volume I, Part I, as provided in the [Annex 1](#) to the present resolution, and to the *Manual on the WMO Integrated Global Observing System* (WMO-No. 1160) together with the WIGOS Metadata Standard (WMO-No. 1192) (a stand-alone attachment to the Manual) as provided in the [Annex 2](#) and [Annex 3](#) to the present resolution,

**Approves** the amendments to WMO *Technical Regulations* (WMO-No. 49), Volume I, Part I, and to the *Manual on the WMO Integrated Global Observing System* (WMO-No. 1160) together with the WIGOS Metadata Standard (WMO-No. 1192) as provided in the Annex 1, Annex 2 and Annex 3 to the present resolution, with effect from 1 July 2020;

**Affirms** the authority of the Executive Council to approve any amendments to Part I and the Manual together with the Metadata Standard if required before the time of Nineteenth Congress;

**Authorizes** the Secretary-General to make any subsequent purely editorial amendments;

**Requests** the Secretary-General:

- (1) To publish the Volume I, Part I, Manual and the Metadata Standard in all WMO official languages;
- (2) To ensure the editorial consistency of the relevant documents;
- (3) To bring the present resolution to the attention of all concerned.

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Note: This resolution replaces Resolution 25 (Cg-17) and Resolution 1 (EC-69), which are no longer in force.

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### **Annex 1 to Resolution 36 (Cg-18)**

#### **AMENDMENTS TO THE *TECHNICAL REGULATIONS* (WMO-No. 49), VOLUME I, PART I WMO INTEGRATED GLOBAL OBSERVING SYSTEM**

(Document: [Cg-18-d06-1\(1\)-WIGOS-ANNEX-1-No-49\\_draft1\\_en](#))

*Editor's note:* The link above was used by the delegates for the approval of the amendments/draft new edition. The final publication, issued after the eighteenth session of Congress, will be posted on the WMO library site at <https://public.wmo.int/en/resources/library>.

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### **Annex 2 to Resolution 36 (Cg-18)**

#### **AMENDMENTS TO –THE *MANUAL ON THE WMO INTEGRATED GLOBAL OBSERVING SYSTEM* (WMO-No. 1160)**

(Document: [Cg-18-d06-1\(1\)-WIGOS-ANNEX-2-No-1160-draft1\\_en](#))

*Editor's note:* The link above was used by the delegates for the approval of the amendments/draft new edition. The final publication, issued after the eighteenth session of Congress, will be posted on the WMO library site at <https://public.wmo.int/en/resources/library>.

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### **Annex 3 to Resolution 36 (Cg-18)**

#### **AMENDMENTS TO THE WIGOS METADATA STANDARD (WMO-No. 1192)**

(Document: [Cg-18-d06-1\(1\)-WIGOS-ANNEX-3-No-1192-draft1\\_en](#))

*Editor's note:* The link above was used by the delegates for the approval of the amendments/draft new edition. The final publication, issued after the eighteenth session of Congress, will be posted on the WMO library site at <https://public.wmo.int/en/resources/library>.

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### **Resolution 37 (Cg-18)**

#### **THE WMO INTEGRATED GLOBAL OBSERVING SYSTEM TRANSITION TO OPERATIONAL STATUS COMMENCING IN 2020**

THE WORLD METEOROLOGICAL CONGRESS,

**Recalling** Resolution 23 (Cg-17) Pre-operational Phase of the WMO Integrated Global Observing System, and Resolution 2 (EC-68) Plan for the WMO Integrated Global Observing System Pre-operational Phase 2016-2019,

**Recalling** the essential role of observations as the foundation upon which all products and services provided by the WMO Members to their constituencies in the areas of weather, climate and water are built,

**Recalling further** the more than 60 years of success of the World Weather Watch due to its integration of observations, data exchange and quantitative prediction systems in support of production and delivery of watches, warnings and other forecast products,

**Noting** that the draft WMO Strategic Plan for 2020-2023 clearly defines as its long-term Goal 2 to "Enhance Earth system observations and predictions: Strengthening the technical foundation for the future",

**Noting also** the increasingly close links between the various disciplines and application areas that span WMO activities, both as concerns modelling and observations,

**Noting further** that Global Earth System observations will provide a basis for meeting the demand for increasing seamless prediction capability from weather to climate scales based on a unified modelling approach,

**Noting with satisfaction** the progress made during the WIGOS Implementation Phase and the WIGOS Pre-operational Phase toward integration of the surface- and space-based observing programmes for all application areas covered by WMO into a single system,

**Having examined** Recommendation 7 (EC-70) The WMO Integrated Global Observing System in the WMO programmatic structure from 2020 onwards,

**Decides** that WIGOS has reached a sufficient level of maturity for the system to be considered operational effective 1 January 2020;

**Decides** further that WIGOS shall continue as a core WMO activity and that it shall be considered a basic WMO infrastructure element supporting all WMO programmes and application areas, with the continued involvement of all regions and technical and scientific discipline areas;

**Adopts** as initial guidance for the operation and further development of WIGOS during the 2020-2023 financial period, the priority areas, deliverables and outcomes provided in the [annex](#) to the present resolution;

**Requests** Members, regional associations, and the Infrastructure Commission to organize their activities so as to realize WIGOS goals and associated outcomes as described in the [annex](#);

**Requests** Members to continue to provide resources, including through the WIGOS Trust Fund and/or seconded experts, to help support WIGOS operational activities and necessary further development;

**Requests** the Infrastructure Commission:

- (1) To provide the technical lead in WIGOS operational activities;
- (2) To develop the Plan for the WIGOS Initial Operational Phase (2020-2023) based on the guidance provided in the [annex](#) to this resolution, and submit this Plan to EC-72 for its approval;

**Requests** the Secretary-General:

- (1) To provide the necessary assistance and Secretariat support to Members and regional associations, especially to developing and least developed countries, for the further development of WIGOS through its operational phase, within available resources;
- (2) To initiate planning, including the necessary allocation of resources from the regular budget, for the development of WIGOS tools in all WMO official languages, and for the long-term operational sustainability of OSCAR as a core WMO information resource for all Members;
- (3) To allocate resources for continued development and operation of the WIGOS Data Quality Monitoring System;
- (4) To provide central coordination of the Regional WIGOS Centre pilots and to provide the necessary support for their eventual transition to operational phase;
- (5) To motivate Members to contribute the necessary resources for making the WIGOS technical tools, namely the OSCAR databases and the WIGOS Data Quality Monitoring System available;

**Recommends** that the Secretary-General organizes the Secretariat support of WIGOS along lines that mirror the outcome of the governance reform in order to further increase the level of integration of the various WIGOS components and to maximize efficiency and effectiveness of the work;

**Invites** relevant international organizations and programmes to participate in pertinent implementation activities as specified in the [annex](#).

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Note: This resolution replaces Resolution 23 (Cg-17) and Resolution 2 (EC-68), which are no longer in force.

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**Annex to Resolution 37 (Cg-18)**

WORLD METEOROLOGICAL ORGANIZATION

**WMO INTEGRATED GLOBAL OBSERVING SYSTEM  
(WIGOS)**

**WIGOS OPERATIONAL PHASE 2020-2023**



### **EXECUTIVE SUMMARY**

This document describes the objectives and main planned activities for the initial part of the WIGOS Operational Phase, beginning with the eighteenth WMO financial period (2020-2023). The document outlines the initial operational capabilities of WIGOS to be in place by 2020, and it describes the main activities that are planned to take place from 2020 and beyond in order to further develop the system during this next period. These activities are structured in six main priority areas, namely:

- (1) National WIGOS implementation;
- (2) Implementation of the Global Basic Observing Network and the Regional Basic Observing Networks;
- (3) Operational deployment of the WIGOS Data Quality Monitoring System;
- (4) Operational deployment of Regional WIGOS Centres;
- (5) Further development of the Observing Systems Capability Analysis and Review (OSCAR) databases and integration with other system elements;
- (6) Fostering a culture of compliance with the WIGOS technical regulations.

## **1. WIGOS PRIORITY AREAS FOR THE 2020-2023 FINANCIAL PERIOD**

Thanks to the development activities undertaken during the pre-operational phase (2016-2019), the WMO Integrated Global Observing System (WIGOS) has now matured to a level where it is ready to enter its initial operational phase commencing in 2020. However, there are significant remaining capability gaps and other challenges that will need to be addressed during the next phase of WIGOS in order for the system to fully serve all WMO application areas and help Members exploit the full potential of partnership agreements.

The development of WIGOS will thus need to continue during the eighteenth financial period (2020-2023), building upon and adding to the capabilities developed during the pre-operational phase.

The highest priorities for WIGOS during this period are:

- (1) National WIGOS implementation, including necessary capacity development, partnership agreements and integration of observing systems for all application areas;
- (2) Fostering a culture of compliance with the WIGOS technical regulations;
- (3) Implementation of the Global Basic Observing Network and the Regional Basic Observing Networks;
- (4) Operational deployment of the WIGOS Data Quality Monitoring System;
- (5) Operational implementation of Regional WIGOS Centres;
- (6) Further development of the Observing Systems Capability Analysis and Review (OSCAR) databases.

High priority will be given to those activities that will assist Members in developing and implementing their national WIGOS plans, with special emphasis on the Least Developed Countries, Landlocked Developing Countries and Small Island Developing States where the needs are the highest.

An important underlying issue is the need to implement sound practices, policies and capabilities within individual meteorological institutions in relation to the lifecycle management of data, to ensure that Members are able to manage their observations and data efficiently and effectively, to extract the value from the data in support of their services, and to integrate observations and data from diverse platforms and from external sources.

Central guidance provided by the Infrastructure Commission and support provided by the WMO Secretariat will be important. During the WIGOS operational phase, National Meteorological and Hydrological Services (NMHSs) are expected to take on greater responsibility for the national implementation of WIGOS and use the framework provided by WIGOS to exert leadership in the acquisition and management of meteorological observations at the national level. The NMHSs are thus expected to become the key integrators at the national level, both by strengthening their own observing systems in accordance with the WMO Technical Regulations, and by building national partnerships and providing national leadership based on their experience in the acquisition, processing and dissemination of observational data for environmental monitoring and prediction purposes.

## **2. CURRENT STATUS OF WIGOS**

By the end of the WIGOS Pre-operational Phase in December 2019, the expected status of WIGOS can be summarized as follows:

### **2.1 National WIGOS Implementation**

Almost all Members have had exposure to both the WIGOS concept and to the specifics of the WIGOS Technical Systems via a dedicated WIGOS Workshop arranged by the WMO Secretariat in all Regions. A majority of Members have had at least some level of activity in using the OSCAR/Surface database to manage their surface-based observing systems. A small number of countries have developed and approved their National WIGOS Implementation Plans. The

bulk of the national WIGOS implementation work is expected to take place once the Regional WIGOS Centres are fully functional and once National WIGOS Implementation Plans have been developed and approved.

## **2.2 WIGOS Regulatory and Guidance Material**

The Manual on WIGOS has undergone revision, in particular as concerns the WIGOS Metadata Standard and the description of the Global Cryosphere Watch. It has been expanded very significantly with new provisions describing a series of Regional Basic Observing Networks serving a large number of application areas at the global, regional and sub-regional levels, and an overarching Global Basic Observing Network to specifically serve Global NWP and climate analysis.

A guide to WIGOS has been developed and is being continually expanded with new material.

## **2.3 Observing Systems Capabilities and Review (OSCAR) databases**

OSCAR/Requirements has been amended and updated to include all 14 currently recognized application areas. Work toward completing the actual requirements tables is ongoing.

OSCAR/Space 2.0 has been deployed and is widely used by the space agencies and the user community. A strategy for the longer-term evolution of this database and for maintaining both the IT infrastructure and the information content is under development.

The OSCAR/Surface database was operationally deployed in 2016, replacing Volume A (WMO-No. 9), while offering much more extensive metadata information for far more stations than those included in Volume A.

## **2.4 WIGOS Data Quality Monitoring System**

The concept for the overarching WDQMS is relatively mature. A pilot project using the existing monitoring capabilities of the global NWP centres for the surface component of the Global Observing System is being transitioned to pre-operational status, and has already demonstrated the value of such a system.

## **2.5 Regional WIGOS Centres**

Informal agreements to establish two Regional WIGOS Centre Pilot Projects in Region I have been made with the NMHSs of Kenya, Tanzania, and Morocco.

Two formal proposals to establish Regional WIGOS Centres have been received from China and Japan, respectively.

A Virtual RWC was approved by RA III-17, with distributed functions involving two Members, Brazil and Argentina, and a coordination committee. Detailed plans for the operational implementation are maturing for both Members to cover the mandatory functions, as well as some optional functions.

A concept for a distributed Regional WIGOS Centre for RA V was approved by RA V-17.

A formally approved Regional WIGOS Centre pilot project with partial functionality has been established in Region VI.

## **3. KEY DELIVERABLES AND OUTCOMES FOR THE 2020-2023 PERIOD**

The work to be undertaken during the eighteenth financial period (2020-2023) is driven by (i) the desire to fully develop the key WIGOS networks, namely the Global Basic Observing Network (GBON) and the Regional Basic Observing Networks (RBONs), (ii) the need to further mature the technical tools so that WIGOS can support all official WMO application areas, and (iii) the need to strengthen the regional support of national WIGOS implementation.

The projected status of WIGOS at the end of the 18th WMO financial period in 2023 can be described via the following two elements:

**Expected deliverables:** Which elements must be completed, and what are the necessary operational functionalities; and

**Expected outcomes:** What is the expected impact of WIGOS, and in particular, what are the expected benefits to WMO Members.

### 3.1 Expected Deliverables

By the end of the 2020-2023 financial period, the WIGOS framework at the global, regional, and national levels will have been completed, encompassing:

- The Global Basic Observing Network (GBON) will have been implemented;
- An Implementation Plan listing near- and medium-term actions to be taken by observing system developers in response to the Vision for WIGOS in 2040 will have been developed;
- Regional Basic Observing Network (RBON) will have been implemented in all Regions;
- Regional WIGOS Centres will have been established and functional in each Region, and all Members will have affiliated themselves with one RWC;
- National WIGOS Implementation Plans will have been adopted/approved by a majority<sup>9</sup> of WMO Members;
- National WIGOS governance mechanism will have been established by a majority of Members;
- National WIGOS partnership agreements for integration and open-sharing of observations across all WIGOS component observing systems (WMO and partners) implemented and used by a majority of Members;
- WIGOS Station Identifiers: technical issues resolved and new system adopted; policy for issuing IDs defined, adopted and implemented by Members;
- The WIGOS Data Quality Monitoring System (WDQMS) will be fully operational for all essential real-time components of the Global Observing System; national processes for acting on issues and incidents received from the WDQMS will be in place; The WDQMS will have at least functioning pilots for all WIGOS components.
- All Observing Systems Capability Analysis and Review (OSCAR) databases fully operational and updated; a majority of Members will be actively maintaining their metadata in the system; a gap analysis support tool or function will have been implemented.

### 3.2 Expected Outcomes

- An enhanced WMO Integrated Global Observing System delivering observations to support all WMO Priorities, Programmes and application areas;
- Increased visibility and strengthened role of NMHSs at their national level;
- An increased integration and open sharing of observations from WMO and non-WMO sources across national and regional boundaries;
- Enhanced capabilities to identify gaps in global, regional, subregional, and national observing systems in the context of user needs, issues, etc.;
- An enhanced cooperation with partners at the national and regional levels;
- Enhanced compliance with WMO Technical Regulations;
- Improved human and technical capacity of all WMO Members for planning, implementation and operation of WIGOS;
- Improved availability and quality of WIGOS observational data and metadata.

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<sup>9</sup> "Majority" in this context means more than 75 % of WMO Members

### **3.3 Planning**

It is proposed that a *Plan for the WIGOS Initial Operational Phase* (the 2020-2023 period) be developed by the Infrastructure Commission and submitted to EC-72 for its approval. This Plan will guide the development and initial operation of WIGOS over the coming four years at the global and regional levels; it will help set priorities and define targets, and will serve as a reference for Members in the development of their National WIGOS Implementation Plans. Some proposed elements of this plan will be provided in the Annex to this document in due course.

## **4. ACTIVITIES**

A number of specific activities supporting the milestones laid out within the six proposed priority areas of the WIGOS Operational Phase listed in Section 1 are being planned for the 2020-2023 period. An activity table with identified deliverables/outcomes, timelines, responsibilities, resources will be developed and maintained by the responsible department in the WMO Secretariat.

## **5. CAPACITY DEVELOPMENT**

Capacity development (CD) will remain a critical activity area during the WIGOS Operational Phase, and regional and national needs in this area will be one of the main drivers of the expenditure of resources during the 2020-2023 financial period.

It should be noted that it is difficult to distinguish between specific CD efforts and WIGOS as a whole, since a majority of WIGOS activities (development of guidance material, training, support through Regional WIGOS Centres) are in effect capacity development efforts.

The overarching goal of the WIGOS CD effort is to help equip the staff of the NMHSs with the requisite understanding, skills, information and knowledge to enable them to implement WIGOS at a national level, including the development of national partnerships. This will be supported both through the development of guidance material listed in Annex and via the outreach efforts outline in Section 6.

Close collaboration with international, regional and sub-regional development organizations (e.g. the World Bank, GEF, ADB) is needed in order to ensure that donors will benefit from and provide benefit to WIGOS.

## **6. COMMUNICATIONS AND OUTREACH**

Communications and Outreach (C&O) will also play important roles also during the 2020-2023 financial period, both internally and externally.

Internally to the WMO community, there is a continuing need to educate and interact with the Permanent Representatives, partly due to natural turn-over, partly due to the fact that as WIGOS matures and gains visibility, the expectations from the WMO Members tend to increase. In addition to the PRs, there is also a need to engage with their observing system managers, partly to keep them abreast of WIGOS developments, partly to learn from their experiences with national and regional WIGOS development and implementation efforts.

Externally, it is important to engage with partners, e.g. other international organizations, NGOs and commercial entities, both to keep them informed about the WIGOS development and to foster the development of partnerships at all levels.

A number of generic C&O activities are planned:

- (a) A WIGOS newsletter will be published and disseminated on a regular schedule (quarterly), targeting a broad audience with varying levels of technical knowledge;
- (b) As far as possible, WIGOS side events will be arranged at all WMO constituent body sessions;

- (c) The set of communications/outreach material to be showcased and shared with external partners at a variety of events (WMO constituent body sessions, national and international scientific conferences, meetings of GEO, GFCS, etc.);
- (d) Continuous updates of the WIGOS portal with presentations, articles, publications, examples of success stories, case studies, lessons learned, and other material for use by Members and their partners.

## **7. GOVERNANCE, MANAGEMENT AND EXECUTION**

Similar to the WIGOS implementation and pre-operational phases, the development and operations of WIGOS during the 2020-2023 phase will follow the decisions by the World Meteorological Congress, with subsequent governance assigned to the Executive Council and its Technical Coordination Committee, and (assuming the WMO Governance Reform as proposed by EC is approved by Cg-18) the Infrastructure Commission.

Expert Teams or Study Groups established under the Infrastructure Commission will be responsible for guiding specific aspects of WIGOS development, e.g. regulatory and guidance material, observing methodology network design, monitoring, various integration issues, etc. This will be similar to the roles now played by various existing Technical Commissions jointly with ICG-WIGOS, but with a more efficient working structure and less coordination overhead.

### **7.1 Global level**

The management and execution functions will be carried out by the WMO Secretariat, following the guidance provided by delegate bodies as described above. Support to all delegate body discussions regarding WIGOS, as well as the work of Study Groups, Expert Teams and various ad hoc structures will be provided by the WMO Secretariat.

The WIGOS technical systems, primarily OSCAR and WDQMS, will continue to require strong management and coordination support. Many Members and partner organizations are willing and able to contribute to the activities, but it is anticipated that the global coordination role will have to be taken care of by the WMO Secretariat.

Also the Regional WIGOS Centres will continue to rely on strong support from the WMO Secretariat as described in the next section.

### **7.2 Regional Level**

All regional associations are expected to establish regional WIGOS related teams to provide governance and oversight at the regional level. Their specific roles should be:

- (a) Regularly (at least annually) review the WIGOS implementation efforts in their respective Region;
- (b) Guide and prioritize the activities listed in their R-WIP;
- (c) Facilitate and coordinate regional WIGOS projects;
- (d) Submit updates to the R-WIP to the regional association management group for approval;
- (e) Fostering the establishment of Regional WIGOS Centre(s) in the respective Region, providing full regional coverage, by 2022;
- (f) Guide the work of Regional WIGOS Centre(s) when established in the respective Region;
- (g) Provide regional support to Members in accordance with the R-WIP and in a response to their requests (subject to availability of resources/funds);
- (h) Oversee the establishment of the Regional Basic Observing Network in the respective Region.
- (i) Possible regional mechanisms or structures for allocation of WIGOS station IDs.

According to the Regional WIGOS Centre concept developed during the Pre-operational Phase, much of the support for the WIGOS implementation activities at the regional level would be provided by the Regional WIGOS Centres. However, based on the initial experience with the Regional WIGOS Centre pilots during the Pre-operational Phase, it has become clear that the Regional WIGOS Centres will require a substantial amount of external support and strong global coordination unit in order for this concept to work. It is therefore expected that the Secretariat will have to strengthen its support for these entities.

### **7.3 National Level**

The following activities are envisaged to take place at a national level:

- (a) Development of a National Observing Strategy;
- (b) Development of a National WIGOS Implementation Plan (N-WIP), building on the National Observing Strategy;
- (c) Establishment of national WIGOS governance, coordination and implementation mechanisms and team;
- (d) Identification and mitigation of critical gaps in the WIGOS component observing systems (national RRR process implementation);
- (e) Sustained and standardized operation of national observing networks/systems;
- (f) Operational implementation of WIGOS Metadata Standard through populating the OSCAR/Surface database and keeping its content up-to-date;
- (g) Capacity development of staff managing and operating national observing networks/systems;
- (h) Development of national WIGOS partnership agreements for integration and open-sharing of observations across all WIGOS component observing systems (WMO and partners);
- (i) Operational implementation of national process for acting on issues and incidents received from the WDQMS in place;
- (j) Adoption and implementation of a national policy for issuing WIGOS Station IDs.

## **8. MONITORING AND EVALUATION**

In order to foster the general culture of compliance with WMO Regulations and ensure optimal performance of the system, all aspects of WIGOS implementation will be monitored and evaluated using quantitative and objective methodology wherever possible. The WDQMS will be central to monitoring the implementation and performance of the observing networks themselves, but also other aspects of the WIGOS framework will be tracked, e.g. the implementation of the metadata standard, engagement with Regional WIGOS Centres, the maturity of the national planning efforts, etc.

Specific metrics and tools for this will be described in the *Plan for the WIGOS Initial Operational Phase*.

## **9. RESOURCES**

The resourcing of WIGOS will be further detailed in the *Plan for the WIGOS Initial Operational Phase*, which will be developed based on the budget decision made at Cg-18.

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**Resolution 38 (Cg-18)****VISION FOR THE WMO INTEGRATED GLOBAL OBSERVING SYSTEM IN 2040**

THE WORLD METEOROLOGICAL CONGRESS,

**Recalling** Resolution 2 (EC-68) - Plan for the WIGOS pre-operational phase 2016-2019,

**Noting** that EC-66 (2014) had requested CBS to take the lead in developing a Vision for WIGOS in 2040 for its submission to Cg-18 in 2019,

**Having examined** Recommendation 6 (EC-70) - Vision for the WMO Integrated Global Observing System in 2040,

**Approves** the draft Vision for WIGOS in 2040, as provided in the [annex](#) to the present resolution,

**Requests** the Secretary-General:

- (1) To publish the Vision for WIGOS in 2040 in all WMO official languages;
- (2) To ensure the editorial consistency of the relevant documents;

**Requests** the Infrastructure Commission to undertake the necessary planning activities that will help Members and partner organizations respond to the Vision for WIGOS in 2040,

**Requests** Members to take into account the Vision for WIGOS in 2040 when planning the evolution of their observing networks;

**Invites** relevant international organizations and programmes to take into account the Vision for WIGOS in 2040 when planning the evolution of their observing networks.

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**Annex to Resolution 38 (Cg-18)****VISION FOR THE WMO INTEGRATED GLOBAL OBSERVING SYSTEM IN 2040**

(Document: [Cg-18-d06-1\(1\)-WIGOS-ANNEX-4-VISION-2040\\_draft1\\_en](#))

*Editor's note:* The link above was used by the delegates for the approval of the amendments/draft new edition. The final publication, issued after the eighteenth session of Congress, will be posted on the WMO library site at <https://public.wmo.int/en/resources/library>.

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## **Resolution 39 (Cg-18)**

### **ESTABLISHMENT OF COLLABORATION BETWEEN THE INTERNATIONAL AIR TRANSPORT ASSOCIATION AND WMO ON THE DEVELOPMENT AND OPERATION OF THE AIRCRAFT METEOROLOGICAL DATA RELAY PROGRAMME**

THE WORLD METEOROLOGICAL CONGRESS,

#### **Recalling:**

- (1) Decision 60 (EC-69) – Potential future collaboration of WMO and the International Air Transport Association on the operation and development of the WMO Aircraft Meteorological Data Relay Programme, which endorsed the establishment of a Working Arrangement between WMO and the International Air Transport Association (IATA) under which the two organizations would work together to develop the terms of reference and concept of operations for future collaboration on the WMO Aircraft Meteorological Data Relay (AMDAR) Programme,
- (2) Decision 19 (EC-70) – Mechanisms for the provision of shared services, on the principle of procurement and contract management by the Secretary-General of services for shared use by Members and partner organizations,
- (3) Recommendation 9 (EC-70) - Establishment of collaboration between the International Air Transport Association and WMO on the operation and development of the WMO Aircraft Meteorological Data Relay Programme,
- (4) Resolution 10 (RA VI-17) – Development of the Region VI AMDAR Programme under the IATA-WMO collaboration on AMDAR,
- (5) Resolution 11 (RA V-17) - Development of the Region V AMDAR Programme under the IATA-WMO collaboration on AMDAR,
- (6) Resolution 12 (RA III-17) - Development of the Region III AMDAR Programme under the IATA-WMO collaboration on AMDAR,
- (7) Resolution 14 (RA I-17) - Development of the Region I Aircraft Meteorological Data Relay programme under the International Air Transport Association and WMO collaboration,

**Noting** that, following Decision 60 (EC-69), a Working Arrangement was established between IATA and WMO in July 2017 regarding cooperation on matters related to the automated measurement and transmission of meteorological data from an aircraft platform, currently operational as the AMDAR programme and considered a key component of the WMO Global Observing System,

**Noting also** that Decision 60 (EC-69) requested the Secretary-General, in coordination with the president of the Commission for Basic Systems (CBS), to subsequently develop the terms of reference and concept of operations for the future possible collaboration between WMO and IATA on the operation and development of the AMDAR Programme,

**Noting further** that, following Resolutions 10 (RA VI-17), 11 (RA V-17), 12 (RA III-17) and 14 (RA I-17), Regional Associations, VI, V and III, I respectively, have decided that, subject to the confirmation of IATA and WMO to proceed with the establishment of the WMO-IATA Collaborative AMDAR Programme (WICAP), they would each develop and operate regional AMDAR Programmes under WICAP, with RA VI commencing development over 2019, and beginning operations in 2020, and RAs V and III commencing development over 2020 and operations in 2021,

**Having been informed** through the submission of the Purpose and Principles, Concept of Operations and Implementation Plan for WICAP, developed by the EC Task Team on IWCA with IATA, on the proposed legal, operational and financial structure to be established under WICAP and under which IATA will play a significant role in ensuring that the agreed and required AMDAR observations are provided efficiently and economically through promotion and coordination with its member airlines and the wider aviation industry and in accordance with related WMO Technical Regulations,

**Having been further informed** that, under WICAP, WMO regional associations and their Members will have the option to participate in WICAP under a proposed cost and resource-sharing framework established under the Regional WMO Integrated Global Observing System (WIGOS) Centre structure and aimed at establishing and meeting requirements for aircraft-based observations under the Global Basic Observing Network (GBON),

**Convinced that** the collaboration will lead to the expansion and enhancement of the AMDAR observing system globally and, as a result, bring increased and further benefits to meteorological applications and improvement to forecasting skills and services to aviation,

**Decides** to enter into an updated Working Arrangement with IATA encompassing the development and operation of the WMO-IATA Collaborative AMDAR Programme, based on the Purpose and Principles summarized in Annex 1 to this resolution; and also based on existing arrangements within the AMDAR Programme;

**Requests** the Secretary-General to establish the updated Working Arrangement with IATA in accordance with the WICAP Purpose and Principles;

**Requests** the Executive Council to:

- (1) Review, finalize, maintain and oversee the undertaking of the WICAP Implementation Plan in accordance with the WICAP Concept of Operations as summarized in Annex 2;
- (2) Oversee the establishment of the WICAP Governance structure, including the Governing Board, in accordance with the WICAP Concept of Operations;
- (3) Assist RAs in the establishment of Regional AMDAR Programmes based on the WICAP Implementation Plan and Concept of Operations;

**Requests** the relevant Technical Commissions to assist RAs in the establishment of Regional AMDAR Programmes based on the WICAP Implementation Plan and Concept of Operations;

**Recommends** that regional associations

- (1) Develop Regional AMDAR Programmes under WICAP as proposed in the Concept of Operations and according to the WICAP Implementation Plan.
- (2) Carry out further consultations of their Members on the Financing Mechanisms to enable the elaboration of cost sharing schemes, to ensure that financing options at global and regional levels are appropriate to support participation of all Members, in particular Least Developed and Developing Countries.

*[The following documents are available in Cg-18 information document [Cg-18/INF. 6.1\(2\)](#): (i) WICAP Purpose and Principles (summarized in Annex 1), (ii) WICAP Summary Concept of Operations (further summarized in Annex 2, and full version referred from information document 6.1(2)), and (iii) draft WICAP Implementation Plan is available in [Cg-18/INF. 6.1\(2\)](#)].*

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## **Annex 1 to Resolution 39 (Cg-18)**

### **WMO-IATA COLLABORATIVE AMDAR PROGRAMME (WICAP) PURPOSE AND PRINCIPLES**

*[Full version of the WICAP Purpose and Principles is provided in [Cg-18/INF. 6.1\(2\)](#)]*

The Purpose and Principles of the WMO-IATA Collaborative AMDAR Programme (WICAP) provides the primary basis and principles on which the new Working Arrangement between WMO and IATA on the future operation of the Aircraft Meteorological Data Relay (AMDAR) Programme will be based and established. Below constitutes a summary only of the key principles.

#### **Purpose of Collaboration**

IATA and WMO, pursuant to their Working Arrangement dated 7 July 2017, wish to further expand on the development of a business case and framework for a potential collaboration, in order to meet the future enhanced requirements for observational data through the establishment of an extension of the AMDAR Programme. Under this collaboration, the two organizations would together establish a more formal and identifiable framework to be known as the WMO-IATA Collaborative AMDAR Programme ("WICAP"). The WICAP would have the primary purpose to increase the acknowledged benefits of the AMDAR data collected and processed, impacting both the meteorological community and the end-user aviation industry, while recognizing the significant resource investment of National Meteorological and Hydrological Services (NMHSs) Members of WMO within the scope of the existing AMDAR observing system and its operations.

#### **WICAP Principles**

WICAP will:

- (i) **Comply with all principles of the WMO Legal Framework**, in particular including WMO Resolution 40 (Cg-XII) and technical regulations applicable to AMDAR data; which are considered essential for applications that contribute to the safety of life and property;
- (ii) **Promote, encourage and facilitate participation of partner airlines in the AMDAR Programme**, with a focus on expanding the existing AMDAR programme to improve coverage over currently data-sparse areas, particularly those that will provide the greatest benefit to the meteorological and aviation communities and other data users;
- (iii) **Encourage and coordinate the wider implementation of turbulence monitoring and water vapour measurement globally**;
- (iv) **Promote WICAP across the aviation industry**, including equipment manufacturers, data service providers and the Hydrological and Meteorological Equipment Industry ("HMEI"), to encourage greater efficiencies and effectiveness in the development and deployment of AMDAR avionics applications and related infrastructure and of service costs; and
- (v) **Promote WICAP to data users** by demonstrating that improved weather information will support the future aviation transport system by enabling enhanced safety, fuel efficiencies and reduced emissions.

These WICAP principles will form the basis for the establishment of a more efficiently coordinated AMDAR Programme. It will take advantage of the WMO Regional Association structure, the WMO Integrated Global Observing System (WIGOS) framework and IATA's leading role in the aviation industry, to establish governance and guidance frameworks. This will support the future development and expansion of the AMDAR observing system, as described in detail in the WICAP Concept of Operations that is summarized in Annex 2.

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## **Annex 2 to Resolution 39 (Cg-18)**

### **WMO-IATA COLLABORATIVE AMDAR PROGRAMME (WICAP) SUMMARY CONCEPT OF OPERATIONS**

*[Full version of the WICAP Summary Concept of Operations is provided in [Cg-18/INF. 6.1\(2\)](#)]*

#### **Background**

AMDAR is based on the automated measurement and transmission of meteorological data from an aircraft platform. These data make an important contribution to the WMO Integrated Global Observing System (WIGOS) and are of high value to the global meteorological community, in particular for their contribution to increased accuracy of numerical weather prediction, with downstream benefits to all users of weather forecasts, including aviation.

Whilst the programme has been successfully growing and functioning in Europe, North America, Asia and Oceania, there remain significant areas, such as Northern and Central Africa, Eastern Europe, Western and Central Asia, the Southwest Pacific, South America and the Middle East, where coverage is limited. One of the reasons for this, among others, is limited funding available in these regions for programme expansion.

More information on the WMO AMDAR Programme, including its current status, data coverage and its benefits and impact, can be found at: <http://www.wmo.int/pages/prog/www/GOS/ABO/AMDAR/>

WMO and IATA propose to enter into a collaboration for the purposes of managing and evolving the global AMDAR Programme, expanding it to provide coverage in areas of the globe where data voids currently exist. This collaboration will also lower overall combined costs to WMO members and leverage the reach of IATA into the global aviation industry to recruit new airlines. Furthermore, IATA will serve as a focal point for commercialization of AMDAR data to private sector weather entities, thereby providing a source of revenue for programme operations and expansion.

The proposed collaboration will leverage the regional structure of WMO and the WIGOS concept to coordinate programme operations and development on a regional level, further reducing costs to individual, participating WMO members.

The key aspects of the WICAP Concept of Operations only are provided below.

More detail and information on all aspects of the proposed operation of WICAP can be found in the full WICAP Concept of Operations, available as an [Information Document in English only at the following location](#): [https://elioscloud.wmo.int/share/s/0\\_TQ\\_vzsRfiFUtRqN0kh5g](https://elioscloud.wmo.int/share/s/0_TQ_vzsRfiFUtRqN0kh5g)

#### **Aims of WICAP**

To address the current issues of the AMDAR Programme and to maximize the benefits of AMDAR to the global community, WICAP has the following aims:

- (1) Expanded and enhanced global aircraft-based observations data coverage that will contribute to meeting the national, regional and global requirements for upper-air observations under the WMO Rolling Review of Requirements, including focus on efforts to extend water vapour and turbulence measurements globally; and potential synergies with IATA's own developing initiative to increase availability and use of turbulence measurements;
- (2) Implementation of a more efficient and simplified process for airlines to join and contribute to the programme;
- (3) Improved processes for the establishment and provision of requirements for AMDAR data by NMHSs and data users, based primarily on the WMO Rolling Review of Requirements and as a component system contributing to the WMO Integrated Global Observing System (WIGOS);

- (4) Implementation of a sustainable funding mechanism and proposed regional structure to support AMDAR operations and expansion that will also facilitate participation by least developed countries (LDCs) and small island developing states (SIDS);
- (5) Introduction of a simplified, equitable and centralized costing and remuneration system for AMDAR operations and development, based on more efficient and economic solutions for infrastructure and operational services;
- (6) Establishing a more efficient business relationship between AMDAR Programme operators (NMHSs), data users, data providers and other stakeholders;
- (7) More secure, consistent and better defined AMDAR data ownership and management practices;
- (8) Increased efficiency of the global AMDAR Programme derived from improved recognition and better integration of AMDAR with the aviation industry; and
- (9) More extensive and improved use of AMDAR data in support of meteorology, aviation and the wider community.

In meeting these aims, the implementation of WICAP will address the issues identified with the current programme, while at the same time efficiently increasing and extending the benefits to both meteorology and aviation.

### **WICAP Description**

Under WICAP, the operation of a number of aspects of the AMDAR Programme will become more centralized, including the establishment of requirements for data, the establishment of standardized agreements, the processing of AMDAR data and the sharing of programmatic costs and infrastructure by those WMO Members choosing to participate in the programme. Requirements will be gathered and analysed by WMO Regional Associations, with airline partnerships and data processing functions also being coordinated at the regional level.

While requirements for AMDAR data will remain primarily focused on national needs, WICAP will put in place a more formalized process for ensuring that they will also be consolidated at the regional and global levels through the WMO Rolling Review of Requirements and under the Regional Basic Observing Networks (RBON) and the Global Basic Observing Network (GBON).

Through a formalized process coordinated by WICAP and implemented through the establishment of Regional Association working groups and WICAP Operator Centres established by WMO Members under the authority of Regional Associations, the requirements will be addressed through a regional planning and resource mobilization process and the shared resourcing of regional data processing centres. Plans will be implemented with participating and newly recruited airlines in collaboration with IATA.

WICAP will establish the principles to support secure data management and a consistent data policy that will clearly establish the original data ownership by the airlines, while ensuring that products derived from the use of AMDAR data would be owned by the NMHSs, in accordance with their national policies and regulations. Data will continue to be available to all WMO Members on the WMO Information System in accordance with WMO Resolutions and Technical Regulations and, as such, the proposed policy is fully in accordance with Resolution 40 and other relevant technical regulations.

The proposed data policy further defines limited data rights as they pertain to authorized third parties such as research entities and licensed third parties in the commercial sector. IATA is designated as the non-exclusive entity for commercialization of AMDAR data to licensed third parties.

The data policy and other necessary and agreed legal aspects of the programme will be established under an agreement framework, based primarily on an updated Working Arrangement between IATA and WMO that initially establishes WICAP. Standardised agreement templates would be developed in order to facilitate the legal arrangements between WMO Operators and partner airlines in the programme, and between WMO Operators and participating NMHSs for its resourcing.

### **WICAP Benefits and Justification**

The global and regional approach of WICAP will allow the programme to grow much more rapidly and efficiently than under the current, largely national approach while, at the same time, enabling a significant reduction in overall costs of operating the programme.

A financial analysis of the difference in costs of operating WICAP compared to continuing with individual national programmes demonstrates that the regional approach can be expected to reduce both the overall operating and developmental costs to WMO Members by over 50%.

### **Financial Arrangements**

While WICAP proposes a financial framework for a regional, collaborative approach to sharing resources and costs attributable to its operation, further consultations are required with regional associations' Members to elaborate cost sharing schemes, to ensure options that will enable participation of all Members. Each regional association would determine the operational and funding structure that best suits their needs and the preferences of their respective collective membership, while ensuring that they adopt and adhere to the Data Policy principles to be adopted. Under these agreed regional financial arrangements, participating Members of regional associations would determine the resources and funds to support the operation of the regional WICAP.

The proposed WICAP financial framework should include options for financing at global and regional levels to assist and support developing and Least Developed Countries to participate in and benefit from the programme, for example through the provision of voluntary contributions.

Note that the AMDAR Trust fund would continue to separately fund WMO activities supporting the global AMDAR programme.

### **WICAP Governance**

By creating a formal partnership between the airlines (represented by IATA) and the WMO (representing its member NMHSs), WICAP will seek to improve AMDAR Programme management and the overall efficiency of the observing system. This includes the formation of a Governing Board, comprised of managerial and technical expert representatives from both organizations, established by IATA and WMO to monitor and oversee the achievement of WICAP aims and ensure that participation is authorized, balanced, mutually beneficial and sustainable. The Governing Board will have the key responsibilities to develop and oversee implementation of high-level policies, receive and approve routine, consolidated WICAP planning and budgetary documentation, resolve critical issues, report on programme outcomes and promote the programme both within and outside the collaborating organizations.

The WICAP Oversight Planning and Coordination Team (OPCT), comprised of at least one designated officer from each of IATA and WMO and resourced either directly by the respective organizations or by WICAP, will be responsible primarily for overseeing the developmental and operational functions and processes of WICAP. The OPCT would provide both a meteorological and technical coordination support function according to the needs of the programme, assisting in the coordination of WICAP WMO Regional activities and the consolidation of planning and budgetary processes at the regional and global levels and also coordinating the processes within IATA for responding to requirements for AMDAR data through the participation of airline partners. The OPCT would form the crucial conduit between the programme operational functions and the Governing Board and would also oversee and coordinate the activities of Ad hoc Task Teams (ATTs).

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## Resolution 40 (Cg-18)

### MEMBERS' CONTRIBUTION TO THE ACTIONS SPECIFIED IN THE IMPLEMENTATION PLAN FOR THE EVOLUTION OF GLOBAL OBSERVING SYSTEMS, IN THE CONTEXT OF THE FUTURE WMO INTEGRATED GLOBAL OBSERVING SYSTEM IMPLEMENTATION PLAN

THE WORLD METEOROLOGICAL CONGRESS,

**Having considered** Recommendation 10 (EC-70) on Members' contribution to the actions specified in the Implementation Plan for the Evolution of Global Observing Systems, in the context of the future WMO Integrated Global Observing System Implementation Plan,

**Noting** the Implementation Plan for the Evolution of Global Observing Systems (EGOS-IP), WIGOS Technical Report No. 2013-4,

**Invites** Members and identified implementing agents to take steps to better address implementation of some specific EGOS-IP actions, as listed in the annex to this resolution.

### Annex to Resolution 40 (Cg-18)

#### Key actions of the Implementation Plan for the Evolution of Global Observing Systems to be carried out by Members

Members are encouraged to focus on the key EGOS-IP actions listed in the table below, and to provide feedback on how they are implemented at the national level. However, the remaining actions are also important and need to be addressed by the identified actors in the EGOS-IP.

<b>Action No.</b>	<b>Action</b>	<b>Performance indicator</b>
C3	WIS Standards – Ensure all operators producing observations adhere to the WIS standards.	Extent to which WIS standards are applied.
C4	Users consultation – Careful preparation is required before introducing new (or changing existing) observing systems. The impact needs to be assessed through prior and ongoing consultation with data users and the wider user community. Also, data users need to be provided with guidance on data reception/acquisition, processing and analysis infrastructure, the provision of proxy data, and the provision of education and training programmes.	Extent to which user community concerns are captured.
C7	"Change management" procedures – Ensure time continuity and overlap of key components of the observing system and their data records, in accordance with user requirements, through appropriate change-management procedures.	Continuity and consistency of data records.
C8	Data sharing principles – For WMO and co-sponsored observing systems, ensure continued adherence to WMO data sharing principles irrespective of origin of data, including data provided by commercial entities.	Continued availability of all essential observational data to all WMO members.
C12	Radio frequencies – Ensure a continuous monitoring of the radio frequencies which are needed for the different components of WIGOS, in order to make sure they are available and have the required level of protection.	Observation frequency bands available/not available with required level of protection.



<b>Action No.</b>	<b>Action</b>	<b>Performance indicator</b>
G2	Hourly data exchange – Ensure, as far as possible, a global exchange of hourly data which are used in global applications, optimized to balance user requirements against technical and financial limitations.	The standard monitoring indicators used in global NWP.
G4	WIGOS Standards – Ensure exchange of observations from atmosphere, ocean, terrestrial observing system, according to the WIGOS standards. If needed, organize different levels of pre-processed observations in order to satisfy different user requirements.	Statistics on the data made available to each application.
G7	Radiosondes in data-sparse areas – Expand radiosonde stations, or re-activate silent radiosonde stations, in the data sparse areas of Regions I, II and III which have the poorest data coverage. Make all possible effort to avoid closing existing stations in these data-sparse areas, where even a very small number of radiosonde stations can provide an essential benefit to all the users.	The standard monitoring indicators used in NWP.
G13	Radiosonde data availability – Identify radiosonde stations that make regular measurements (including radiosondes operated during campaigns only), but for which data are not transmitted in real time. Take actions to make data available.	A number of the above radiosonde stations providing data to GTS, plus standard monitoring indicators on radiosonde data availability and timeliness.
G14	HR Radiosonde data – Ensure a timely distribution of radiosonde measurements at high vertical resolution, together with position and time information for each datum, and other associated metadata.	Number of radiosonde sites providing the high resolution profiles.
G17	Regional remote sensing profiling stations – Develop networks of remote-sensing profiling stations on the regional scale in order to complement the radiosonde and aircraft observing systems, mainly on the basis of regional, national and local user requirements (although part of the measured data will be used globally).	Number of profiling stations providing quality-assessed data in real time to WIS/GTS.
G18	Processing & exchange of profiler data – Ensure, as far as possible, the required processing and the exchange of profiler data for local, regional and global use. When profiler data can be produced more frequently than 1 hour, a dataset containing only hourly observations can be exchanged globally following the WIS principles.	Number of profiling stations exchanged globally.
G40	Metadata & representativeness of special stations – Ensure, as far as possible in real time, exchange of observations, relevant metadata, including a measure of representativeness made by surface-based stations serving specific applications (road transport, aviation, agricultural meteorology, urban meteorology, etc.).	A percentage of observations from the above stations exchanged regionally and globally in real time.
G45	Dual polarization radars – Increase the deployment, calibration and use of dual polarization radars in those regions where it is beneficial.	Data coverage obtained from this type of radar for each region.
G47	Weather radars for developing countries & DRR – For areas in developing countries which are sensitive to storms and floods, a special effort has to be made to establish and maintain weather radar stations.	Number of operational weather radar stations in the above areas.

## **Resolution 41 (Cg-18)**

### **USE OF THE OBSERVING SYSTEMS CAPABILITY ANALYSIS AND REVIEW TOOL SURFACE COMPONENT (OSCAR/SURFACE) FOR THE COLLECTION AND RECORDING OF THE WMO INTEGRATED GLOBAL OBSERVING SYSTEM METADATA**

THE WORLD METEOROLOGICAL CONGRESS,

**Having considered** Recommendation 11 (EC-70) on the use of the Observing Systems Capability Analysis and Review tool (OSCAR) Surface Component (OSCAR/Surface) for the collection and recording of the WMO Integrated Global Observing System metadata,

**Invites** Members:

- (1) To submit to OSCAR/Surface the required WIGOS metadata for all observing stations, as described below:
  - (a) For all relevant WIGOS observing systems operated by them, in addition to the ones explicitly listed below, (i) preferably through machine-to-machine interface as soon as available, or (ii) directly to OSCAR/Surface using human interface;
  - (b) For any GAW observing stations they operate, through the GAW Information System (GAWSIS);
  - (c) For any weather radars they operate, through the Weather Radar Database (WRD);
  - (d) For any marine meteorological and oceanographic observing systems they operate, through JCOMMOPS;
- (2) Operating their own databases of WIGOS metadata to develop and implement procedures for the use of machine-to-machine interfaces with OSCAR/Surface;
- (3) To consider collaborating and contributing to efforts of the Commission for Basic Systems to develop a WMO stand-alone national implementation metadata management tool for holding national WIGOS metadata;
- (4) Who have not already done so to nominate OSCAR/Surface and WRD National Focal Points as soon as possible in order to ensure that WIGOS metadata in OSCAR/Surface are maintained to the agreed standard;

**Requests** the Joint WMO/IOC Technical Commission for Oceanography and Marine Meteorology to ensure that JCOMMOPS will be fully compliant with the WIGOS metadata standard and to facilitate ingestion of relevant WIGOS metadata in its database while providing fully compliant machine-to-machine interfaces with OSCAR/Surface;

**Requests further** the Secretary General to provide the necessary assistance and secretariat support to Members, especially in developing and least developed countries, for them to provide their WIGOS metadata to OSCAR/Surface in accordance to WMO technical regulations.

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**Resolution 42 (Cg-18)****RADIO FREQUENCIES FOR METEOROLOGICAL AND RELATED ENVIRONMENTAL ACTIVITIES**

THE WORLD METEOROLOGICAL CONGRESS,

**Having considered** Recommendation 12 (EC-70) on radio frequencies and related environmental activities,

**Recalling:**

- (1) Resolution 29 (Cg-17) – Radio frequencies for meteorological and related environmental activities,
- (2) Decision 33 (EC-69) – Preserving the radio-frequency spectrum for meteorological and related environmental activities at the World Radiocommunication Conference 2019,
- (3) Decision 22 (CBS-16) – Preserving the radio-frequency spectrum for meteorological and related environmental activities at the World Radiocommunication Conference 2019,

**Considering:**

- (1) The prime importance of the specific radiocommunication services for meteorological and related environmental activities required for the detection and early warning of hazards and the prevention and mitigation of natural and technological (human-induced) disasters, the safety of life and property, the protection of the environment, climate change studies and scientific research,
- (2) The importance of information provided by the Earth exploration systems including meteorological systems for a wide range of economic activities such as agriculture, transportation, construction and tourism,
- (3) The crucial importance of the allocation of suitable radio-frequency bands for the operation of surface-based meteorological observing systems, including in particular radiosondes, weather radars, radiometer and wind profiler radars,
- (4) The crucial importance of the allocation of suitable radio-frequency bands for the operation of meteorological and research and development satellites, including remote-sensing, data collection and data distribution links,
- (5) Implications of losing critical radio frequencies reserved to Meteorology on services provided by Members in support of the above economic activities as well as protection of life and property, and potential erosion of such services;
- (6) The impact of implementation of future commercial technology transmissions (for example in the 24 GHz band used by the 5G technology) on capabilities of Members to monitor and predict variables related to availability of water resources;

**Stressing** that some radio-frequency bands are a unique natural resource due to their special characteristics and natural radiation enabling spaceborne passive sensing of the atmosphere and the Earth's surface, which deserve adequate allocation to the Earth exploration satellite service (passive) and absolute protection from interference,

**Expresses** its serious concern at the continuing threat to several radio-frequency bands allocated to the meteorological aids, meteorological-satellite, Earth exploration satellite and radiolocation (weather and wind profiler radars) services posed by the development of other radiocommunication services;

**Requests** the Infrastructure Commission to pursue the continuous review of regulatory and technical matters related to radio frequencies for operational and research meteorological and related environmental activities, and preparation of guidance and information for National Meteorological and Hydrological Services, in coordination with other technical commissions especially the Infrastructure Commission Standing Committee responsible for methods of observations, measurements and instrumentation, and in liaison with other relevant international bodies, in particular the Coordination Group for Meteorological Satellites;

**Requests** regional associations to coordinate on a regional basis contributions of meteorological experts to the work of relevant regional telecommunication organizations and of ITU-R, especially ITU-R Study Groups 5 and 7 on Terrestrial (including radiolocation) and Science Services, respectively;

**Encourages** RAs to establish a focal point on RFC matters;

**Urges** all Members to do their utmost to ensure the availability and protection of suitable radio-frequency bands required for meteorological and related environmental operations and research, and in particular:

- (1) To ensure that their national radiocommunication administrations are fully aware of the importance of and requirements for radio frequencies for meteorological and related activities, and to seek their support in the ITU World Radiocommunication Conferences and Radiocommunication Sector (ITU-R) activities;
- (2) To participate actively in the national, regional and international activities on relevant radiocommunication regulatory issues and, in particular, to involve experts from their Services in the work of relevant regional telecommunication organizations and of ITU-R, especially ITU-R Study Groups 5 and 7 on Terrestrial (including radiolocation) and Science Services, respectively;
- (3) To register adequately with their national radiocommunication administrations all radiocommunication stations and radio frequencies used for meteorological and related environmental operations and research;

**Appeals** to the International Telecommunication Union and its Member Administrations:

- (1) To ensure the availability and absolute protection of the radio-frequency bands which, due to their special physical characteristics, are a unique natural resource for spaceborne passive sensing of the atmosphere and the Earth's surface and are of crucial importance for weather, water and climate research and operations;
- (2) To give due consideration to the WMO requirements for radio-frequency allocations and regulatory provisions for meteorological and related environmental operations and research;
- (3) To pay special attention to the WMO positions related to the WRC agenda, in the light of Appeals (1) and (2) above;

**Requests** the Secretary-General:

- (1) To bring the present resolution to the attention of all concerned, including the International Telecommunication Union;
- (2) To pursue as a matter of high priority the coordination role of the Secretariat in radio-frequency matters, especially with ITU-R, including participation of WMO in ITU-R Radiocommunication Study Groups, conference preparatory meetings and World Radiocommunication Conferences;
- (3) To facilitate the coordination between National Meteorological and Hydrological Services and their national radiocommunication administrations, particularly in preparing for the ITU World Radiocommunication Conferences, by providing appropriate information and documentation;

- (4) To assist the Commission for Basic Systems in the implementation of the present resolution.

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Note: This resolution replaces Resolution 29 (Cg-17).

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## **Resolution 43 (Cg-18)**

### **REPORT OF THE SEVENTEENTH SESSION OF THE COMMISSION FOR INSTRUMENTS AND METHODS OF OBSERVATION**

THE WORLD METEOROLOGICAL CONGRESS,

**Recalling** Resolution 28 (Cg-17) – Report of the sixteenth session of the Commission for Instruments and Methods of Observation,

**Noting** the *Abridged Final Report of the Seventeenth Session of the Commission for Instruments and Methods of Observation* (WMO-No. 1227),

**Decides:**

- (1) To note the report,
- (2) To note Resolutions 1 to 9 (CIMO-17),
- (3) To take action on each of the following recommendations as follows:

**Recommendation 1 (CIMO-17) – Capitalizing on the WMO Solid Precipitation Intercomparison Experiment**

- (a) Approves this recommendation;
- (b) Requests the Secretary-General to bring this recommendation to the attention of Members;

**Recommendation 2 (CIMO-17) – Terms of reference for Regional Instrument Centres**

- (a) Approves this recommendation;
- (b) Requests the Secretary-General to arrange for the publication of the updated Terms of Reference for Regional Instrument Centres (RICs) in relevant WMO guidance and regulatory publications, and website;
- (c) Authorizes the Secretary-General to make any subsequent purely editorial amendments;
- (d) Requests Members hosting RICs to abide by those Terms of Reference;

**Recommendation 3 (CIMO-17) – Nomination process for Regional Instrument Centres**

- (a) Approves this recommendation;

- (b) Requests the Secretary-General to arrange for the publication of this process in appropriate WMO documents;
- (c) Authorizes the Secretary-General to make any subsequent purely editorial amendments;
- (d) Requests Regional Associations to follow the Nomination Process for Regional Instrument Centres for all new nominations of RICs and for the periodic reconfirmation of RICs;

**Recommendation 4 (CIMO-17) – Title and structure of the *Guide to Meteorological Instruments and Methods of Observation* (WMO-No. 8)**

- (a) Approves this recommendation;
- (b) Requests the Secretary-General to arrange for the publication of the Guide, with its modified title, and in independent volumes instead of parts.

**Recommendation 5 (CIMO-17) – Publication and translation of the *Guide to Instruments and Methods of Observation* (WMO-No. 8), 2018 Edition**

- (a) Approves this recommendation;
- (b) Requests the Secretary-General to make arrangements for the publication of the new edition of the Guide and to identify resources to translate it into all WMO languages from within the regular budget and/or voluntary contributions to the CIMO Trust Fund;
- (c) Authorizes the Secretary-General to make any subsequent purely editorial amendments;

**Recommendation 6 (CIMO-17) – Improvement of traceability of measurement and calibration results**

- (a) Approves this recommendation;
- (b) Urges Members to implement the strategy for traceability assurance and to establish calibration laboratories, as needed, to improve the traceability of measurements within their region, according to their Regional WIGOS Implementation Plan;
- (c) Requests the Secretary-General to facilitate the provision of training support to enable Members in undertaking and improving traceability of measurements;

**Recommendation 7 (CIMO-17) – Development of e-training tools utilizing the new web-based edition of the *International Cloud Atlas* (WMO-No. 407)**

- (a) Approves this recommendation;
- (b) Encourages Regional Training Centres, and possibly National Training Centres, to collaborate in developing e-learning training modules based on the new edition of the International Cloud Atlas;

**Recommendation 8 (CIMO-17) – Approval of common World Meteorological Organization–International Organization for Standardization standards**

- (a) Approves this recommendation;

- (b) Requests the Secretary-General to arrange for the publication of the recommended WMO internal process for approving common WMO-ISO standards (at the minimum for standards that are non-regulatory for use by Members) into the WMO procedural handbook, and if required to work with relevant technical commissions to refine the process;
- (c) Encourages technical commissions to collaborate with technical committees of the International Organization for Standardization in the development of ISO standards relevant to WMO activities and authorizes the technical commissions to identify new ISO work item proposals of interest to them and to collaborate with the relevant ISO technical committees to develop these standards as common WMO-ISO standards;

**Recommendation 9 (CIMO-17) – Technical Conferences on Meteorological and Environmental Instruments and Methods of Observation**

- (a) Approves this recommendation;
- (b) Requests the Secretary-General and relevant technical commissions to provide appropriate support and make the necessary arrangements to ensure that the series of technical conferences, initiated by CIMO, and held on a biennial basis in conjunction with major instrument exhibitions be continued;

**Recommendation 10 (CIMO-17) – Upper-air instrument intercomparison**

- (a) Approves this recommendation;
- (b) Requests the Secretary-General to identify suitable resources to support this intercomparison and to make the necessary arrangements to ensure that the project will be seamlessly transferred to the new relevant technical commission;

**Recommendation 11 (CIMO-17) – Continuity of WMO activities related to instruments and methods of observation**

- (a) Approves this recommendation;
- (b) Requests the new technical commissions to ensure continuity of the Instruments and Methods of Observation Programme activities supporting the strategies identified in the Vision for the future of environmental measurements (Res. 5, CIMO-17);
- (c) Requests the new technical commissions to continue cooperating with the International Organization for Standardization (ISO), the International Bureau for Weights and Measures (BIPM) and other relevant organizations to ensure the appropriate positioning of WMO within the standardization and metrology communities;

**Recommendation 12 (CIMO-17) – Continuation of the Inter-programme Expert Team on Operational Weather Radars and the Inter-programme Expert Team on Aircraft-based Observations**

- (a) Approves this recommendation;
- (b) Approves the continuation of the Inter-programme Expert Team on Operational Weather Radars and the Inter-programme Expert Team on Aircraft-based Observations until the new governance structure of WMO is in force or until CIMO and CBS recommend that they be disbanded;

- (c) Authorizes CIMO and CBS to make minor changes to the terms of reference of IPET-OWR and IPET-ABO, if necessary, and provided that both commissions agree on the proposed new terms of reference;

**Recommendation 13 (CIMO-17) – Review of resolutions of the Executive Council related to the Commission for Instruments and Methods of Observation**

Approves this recommendation.

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Note: This resolution replaces Resolution 28 (Cg-17), which is no longer in force.

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**Resolution 44 (Cg-18)**

**JOINT WORLD METEOROLOGICAL ORGANIZATION-INTERGOVERNMENTAL  
OCEANOGRAPHIC COMMISSION OF UNESCO STRATEGY FOR MARINE  
METEOROLOGICAL AND OCEANOGRAPHIC DATA MANAGEMENT (2018–2021)**

THE WORLD METEOROLOGICAL CONGRESS,

**Recalling:**

- (1) Resolution 69 (Cg-17) – WMO Strategic Plan (2016–2019),
- (2) Decision 18 (EC-70) on the overall approach to implement the WMO Information System (WIS) 2.0 Strategy,
- (3) Resolution 9 (Cg-18) – Joint World Meteorological Organization-Intergovernmental Oceanographic Commission Collaborative Board,

**Having considered** Recommendation 8 (EC-70) on the joint WMO and Intergovernmental Oceanographic Commission (IOC) of UNESCO Strategy for Marine Meteorological and Oceanographic Data Management (2018–2021),

**Noting:**

- (1) The Intergovernmental Oceanographic Commission (IOC) of UNESCO Medium Term Strategy 2014–2021, and the IOC Strategic Plan for Data and Information Management (2017–2021),
- (2) That one of the objectives of the Joint WMO-IOC Collaborative Board is to implement and maintain a fully integrated end-to-end data management system across the entire marine meteorology and oceanographic community,
- (3) That the seventeenth World Meteorological Congress in Resolution 33 (Cg-17) decided to develop “Part C” of the WMO Information System (WIS) to provide guidance and standards for information management for which the first step of development was the WMO Workshop on Information Management held 2–4 October 2017,
- (4) With satisfaction the work of JCOMM in collaboration with its subsidiary bodies and with IOC of UNESCO to develop the Joint WMO and IOC Strategy for Marine Meteorological and Oceanographic Data Management (2018–2021) hereinafter called Joint Strategy,
- (5) Decision by the Twenty-fifth Session of the IOC of UNESCO Committee on International Oceanographic Data and Information Exchange (IODE) (Tokyo, Japan,



19 to 22 February 2019) to endorse the Joint Strategy, inviting JCOMM to submit it to the 30th Session of the IOC Assembly (2019),

**Considering:**

- (1) The need to have a holistic and strategic approach with regard to marine meteorological and oceanographic data management in the WMO and IOC frameworks, involving all programme areas and the IODE Committee,
- (2) That such a strategic approach should be consistent with the WMO Strategic Plan 2020-2023, and the IOC Medium-term Strategy 2014-2021, including in particular the WMO Information System 2.0 Strategy and the IOC Strategic Plan for Data and Information Management (2017-2021),
- (3) The need to be able to respond to rapid technological developments in the area of data management, information systems, and emerging data issues (e.g. big data),

**Acknowledging** that the Joint WMO-IOC Collaborative Board and the IODE Committee will be able to offer their expertise to assist other groups (e.g. the Ocean Observations Panel for Climate) to specify and implement their own data management requirements, with the overall goal of integrating their data management into the overall end-to end data management system,

**Realizing** that the implementation of the Joint Strategy may encounter limitations based on the availability of resources,

**Adopts** Recommendation 8 (EC-70) and the draft Joint Strategy, subject to parallel approval of the Strategy by the 30th IOC of UNESCO Assembly;

**Decides** to rename the Joint Strategy to "*Joint World Meteorological Organization (WMO) and Intergovernmental Oceanographic Commission (IOC) of UNESCO Strategy for Marine Meteorological and Oceanographic Data Management (2018-2021)*", and to update it to reflect Congress Decisions with regard to the WMO Constituent Body Reform;

**Requests:**

- (1) JCOMM to submit the Joint Strategy to the 30th IOC of UNESCO Assembly;
- (2) The Joint WMO-IOC Collaborative Board to (i) take steps, liaising with IODE and the Infrastructure Commission, in updating the Joint Strategy according to the WMO Strategic Plan period 2020-2023, and have it submitted to IODE-XXVI and EC-73 (2021) for approval, and (ii) develop an implementation plan responding to the Joint Strategy, with support from the Infrastructure Commission;
- (3) The Infrastructure Commission to develop the information management component of WIS in alignment with the Joint Strategy, engaging with the implementation of WIS 2.0, and seeking to implement the Joint Strategy in a way compatible with WIS 2.0;

**Invites:**

- (1) The IOC Assembly to approve the renamed Joint Strategy, to concur with the approach of Congress to have the Joint Strategy updated for consistency with the WMO Strategic Plan period 2020-2023, and to collaborate in its implementation;
- (2) The IOC Assembly to promote the Joint Strategy and its implementation with IOC Member States;

**Encourages** Members/Member States and all other contributors identified in the Joint Strategy to collaborate with WMO and IOC with a view to realizing the outcomes expected from the Joint Strategy;

**Requests** the Secretary-General to bring the present resolution to the attention of all concerned.

[Note: Original version of the Joint Strategy per Decision 19 (JCOMM-5) is available in all languages on JCOMM Website at: [https://www.jcomm.info/index.php?option=com\\_oe&task=viewDocumentRecord&docID=19895](https://www.jcomm.info/index.php?option=com_oe&task=viewDocumentRecord&docID=19895)

The EC-70 changes from above version per Recommendation 8 (EC-70), together with the draft changes proposed by Congress per this Resolution (i.e. renaming of Strategy and consideration of impact of WMO Constituent Body Reform on the document) are reflected in the English version and in track changes in Congress information document [Cg-18/INF.6.1\(3\)-WIGOS-MARINE-OBSERVATIONS\\_en.docx](#).

Assuming Congress and parallel approval by the 30th IOC of UNESCO Assembly of the Joint Strategy, the final version will be finalized and published in all languages by the Secretariat.]

## **Resolution 45 (Cg-18)**

### **ENSURING ADEQUATE MARINE METEOROLOGICAL AND OCEANOGRAPHIC OBSERVATIONS AND DATA COVERAGE FOR THE SAFETY OF NAVIGATION AND THE PROTECTION OF LIFE AND PROPERTY IN COASTAL AND OFFSHORE AREAS**

THE WORLD METEOROLOGICAL CONGRESS,

**Noting** Recommendation 14 (EC-70), and subsequent work of JCOMM and its Observations Coordination Group (OCG) in liaison with the IOC-WMO-UN Environment-ICS Global Ocean Observing System (GOOS) Steering Committee,

**Recalling:**

- (1) Article 2 of the Convention of the World Meteorological Organization, committing Members: "(a) To facilitate worldwide cooperation in the establishment of networks of stations for the making of meteorological observations as well as hydrological and other geophysical observations related to meteorology ... ", and (b) "To promote the establishment and maintenance of systems for the rapid exchange of meteorological and related information",
- (2) The United Nations Convention on the Law of the Sea of 10 December 1982 (UNCLOS), in particular the provisions of Part XIII on marine scientific research, which require States and competent international organizations to promote and facilitate marine scientific research, including through cooperation, in order to increase scientific knowledge of the marine environment as a critical underpinning of effective measures to preserve the marine environment and ensure the sustainable use of ocean resources for the benefit of all mankind,
- (3) The report of the Third Committee of the Third United Nations Conference on the Law of the Sea (1973–1982), which included the letter sent on 25 August 1980 to the Secretary-General of WMO by the Chair of the Committee expressing that in his opinion the provisions of Part XIII of UNCLOS on marine scientific research would not create any difficulties and obstacles hindering adequate meteorological coverage from the ocean areas, including areas within the exclusive economic zones, carried out both in the framework of existing international programmes and by all vessels, since such activities had already been recognized as routine observation and data collecting which was not

covered by Part XIII and that they were in the common interest of all countries and had undoubted universal significance, as they are indispensable for the issue of timely and accurate storm warnings for the safety of navigation as well as for the protection of life and property in coastal and offshore areas,

- (4) The present Marine Meteorology and Oceanography Programme and Tropical Cyclone Programme, which use both vessels, under the Voluntary Observing Ship (VOS) Scheme, and operational surface marine meteorological observing platforms (e.g. moored and drifting buoys, and potentially unmanned surface vehicles), hereinafter called surface observing platforms, and strive to provide adequate meteorological coverage from the ocean areas, including areas within the exclusive economic zones, falling therefore under the content and the spirit of the letter mentioned in paragraph (3) above,
- (5) Resolution 9 (Cg-IX) – United Nations Conference on the Law of the Sea, which requested the Executive Council and the Secretary-General: (a) To arrange, in close consultation with the president of the Commission for Marine Meteorology (now Joint WMO-IOC Technical Commission for Oceanography and Marine Meteorology), for a continuing review of the implications of the legal provisions of the Convention on the ocean-related activities of WMO with a view to informing the United Nations and Members of WMO, as appropriate; and (b) To take action, as necessary, to ensure that the ocean-related activities of WMO, both operational and scientific, are undertaken under the most favourable conditions,
- (6) Resolution 40 (Cg-XII) – WMO policy and practice for the exchange of meteorological and related data and products including guidelines on relationships in commercial meteorological activities, which recognizes marine meteorological observations as essential data, and which are thereby freely exchanged in real time among all countries for the general benefit of all countries,
- (7) The International Convention for the Safety of Life at Sea (SOLAS, 1974) as amended,

**Further noting:**

- (1) The *Technical Regulations* (WMO-No. 49), Volume I, Part I,
- (2) The *Manual on the WMO Integrated Global Observing System* (WMO-No. 1160),
- (3) The *Manual on Marine Meteorological Services* (WMO-No. 558), Volume I, Part I, defining WMO Members' responsibility for issuing warnings for high seas and coastal waters according to internationally agreed procedures,

**Welcoming** the outcome and recommendations of the WMO Technical Workshop on enhancing ocean observations and research, and the free exchange of data, to foster services for the safety of life and property ([Ocean Safe](#), Geneva, 5-6 February 2019), which was organized as a contribution to the planning phase (2019–2020) of the United Nations Decade of Ocean Science for Sustainable Development (2021–2030),

**Considering:**

- (1) That adequate marine meteorological data coverage from ocean areas, including those from the exclusive economic zones (EEZs), is indispensable for the issue of timely and accurate storm warnings for the safety of life at sea and the protection of life and property in coastal and offshore areas,
- (2) That the SOLAS Convention, Chapter V, Safety of Navigation, Regulation 5, specifies that the contracting governments undertake, inter alia, to encourage the collection of meteorological data by ships at sea and to issue warnings of gales, storms and tropical storms,
- (3) That the VOS Scheme, which has undergone technological developments, is even more important today, not only to ensure the safety of navigation and protection of life and property in coastal and offshore areas, but also to face other concerns, in particular the consequences of climate change,

- (4) That Members of WMO have taken on the responsibility of issuing warnings for the high seas and coastal waters according to internationally agreed procedures, including those based on advisories by Regional Specialized Meteorological Centres and Tropical Cyclone Warning Centres,
- (5) That WMO-coordinated research programmes require extensive marine meteorological and oceanographic data sets from the world ocean, including EEZs,
- (6) That meteorological observations from satellites over the oceans, including over EEZs, are routinely made available for operational purposes,
- (7) That *in situ* observations over the oceans, from the VOS and surface observing platforms, are indispensable for the generation of forecasts and services, as some of the marine meteorological and oceanographic observations, such as sea-level pressure, sub-surface temperature and salinity, cannot currently be adequately measured from space,
- (8) That *in situ* observations, for example sea surface temperature, wind and waves are also essential for calibration and validation of satellite data,
- (9) That marine meteorological and oceanographic observations included in numerical models contribute to improving prediction skills at all time scales,

**Recognizing:**

- (1) That since Resolution 9 (Cg-IX) was adopted, the observational user requirements of operational WMO applications, including global and high-resolution numerical weather prediction and sub-seasonal to longer-range prediction, and climate services have substantially evolved, and are now increasingly relying on marine meteorological and oceanographic observations,
- (2) The future direction of WMO, as part of the Strategic Plan, in support of Earth system prediction which, coupled with ocean models, will be relying greatly on marine meteorological and oceanographic data made routinely available to WMO,
- (3) That technological advances can now provide *in situ* observational data of the requisite enhanced quality and spatial and temporal resolution, from the world's oceans, including from EEZs,
- (4) That there is no regulation in place for the collection of marine meteorological and oceanographic measurements within EEZs in support of operational applications of WMO, while the IOC Guidelines for the Implementation of Resolution XX-6 of the IOC Assembly Regarding the Deployment of Profiling Floats in the High Seas within the Framework of the Argo Programme (IOC Resolution EC-XLI.4) are operated effectively and fully consistently with UNCLOS,
- (5) That open source TurboWin software currently used almost worldwide in the VOS Scheme for dissemination of (manual and semi-automated) VOS observations from ship to shore is currently only supported by the Dutch NMHS KNMI in the framework of the EUMETNET programme E-SURFMAR;

**Reaffirms:**

- (1) The indispensable and critical nature of routine marine meteorological and oceanographic observations used operationally by WMO Application Areas, through the variables listed in the annex to this Resolution, including from EEZs, to the provision of services in support of safety of navigation and the protection of life and property in coastal and offshore areas;
- (2) The critical importance of the VOS Scheme and operational surface observing platforms, for ensuring the provision on a routine basis of adequate marine meteorological and oceanographic observations and data coverage, noting that:
  - (a) Voluntary observations from ships have been at the core of WMO and its predecessor's activities since the 1853 Maritime Conference held in Brussels for

devising a uniform system of meteorological observations at sea and are specially recognized and requested in the 1974 SOLAS Convention and previous SOLAS Conventions;

- (b) The VOS Scheme and surface observing platforms are not covered by UNCLOS Part XIII on marine scientific research and can consequently be freely operated in the EEZs;
  - (c) The VOS Scheme and surface observing platforms are supported by consistent practices of Members according to WMO Technical Regulations;
  - (d) While not covered by UNCLOS Part XIII, the operation of the VOS Scheme and surface observing platforms fully complies with UNCLOS general principles, such as the peaceful use of the sea, protection of human life at sea, dissemination of information;
- (3) The need to further strengthen existing cooperation and activities under surface observing platforms;
  - (4) The fact that observations from the VOS Scheme and surface observing platforms are made in the context of agreed, long-standing operational systems and that they are freely exchanged among, and are of general benefit to, all countries;
  - (5) The fact that VOS observations are made, on a voluntary basis under the VOS Scheme, by merchant vessels engaged in normal trading activities, whose officers should be reassured, where necessary, of the continuing legality and importance of their work in this regard;

**Requests** the Joint WMO-IOC Collaborative Board

- (1) In close consultation with the technical commissions and the Research Board to keep reviewing the implications of the legal provisions under ocean-related instruments (e.g. UNCLOS, SOLAS, Polar Code) on the ocean-related activities of WMO with a view to informing the Members of WMO and interested United Nations organizations, as appropriate;
- (2) To foster and contribute actively to projects for the United Nations Decade of Ocean Science for Sustainable Development (2021-2030) that will ensure the design and sustainability of adequate marine meteorological and oceanographic observations and data coverage;
- (3) To search for a more sustainable setup for the maintenance of the TurboWin software worldwide;

**Requests** the Executive Council to include a reference to UNCLOS and other relevant ocean-related legal instruments in Part 3 (Impacts of international agreements) of the WMO Statement on the Role and Functions of National Meteorological and Hydrological Services;

**Urges** Members:

- (1) To facilitate and promote marine meteorological and related oceanographic observational programmes to make their observations collected over the ocean, in particular from within EEZs, available for operational and research purposes;
- (2) To take, as necessary, action to ensure that the ocean-related activities of WMO, both operational and scientific, are undertaken under the most favourable conditions;
- (3) To adopt legislation encouraging the collection of marine meteorological and oceanographic data, as listed in the annex to this Resolution, by surface observing platforms and to arrange for their dissemination and exchange in real time;
- (4) Where marine meteorological observations are generally made on a voluntary basis under the VOS Scheme by vessels engaged in their normal activities, to reassure their officers, where necessary, of the continuing legality and importance of their work in this regard;

**Requests** the Secretary General to relay the Resolution to the United Nations General Assembly for its consideration.

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This Resolution replaces Resolution 9 (Cg-IX), which is no longer in force.

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### **Annex to Resolution 45 (Cg-18)**

#### **Marine meteorological and oceanographic variables, the observation of which is critical for the safety of navigation and the protection of life and property in coastal and offshore areas**

Observations of the following marine meteorological and oceanographic variables, including from within exclusive economic zones, are used operationally by WMO applications and are critical for those applications to allow WMO to deliver the services in support of the safety of navigation and the protection of life and property in coastal and offshore areas:

- Sea level pressure,
  - Surface wind speed and direction,
  - Surface air temperature,
  - Surface relative humidity,
  - Precipitation at the surface,
  - Sea surface temperature,
  - Sea surface salinity,
  - Sea surface currents,
  - Directional and non-directional wave observations,
  - Visibility,
  - Sea-ice,
  - Ice accretion,
  - Sub-surface temperature and salinity,
  - Sea level,
  - Atmospheric composition,
  - Atmospheric temperature, humidity and wind profiles,
  - All other ocean surface and atmospheric observations that are needed to derive fluxes between the ocean and the atmosphere.
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## Resolution 46 (Cg-18)

### FUTURE COLLABORATION BETWEEN WMO AND THE INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION ON FACILITATING OCEANOGRAPHIC OBSERVATIONS IN COASTAL REGIONS IN SUPPORT OF EARTH SYSTEM PREDICTION AND CLIMATE SERVICES

THE WORLD METEOROLOGICAL CONGRESS,

**Recalling** Resolution 43 (Cg-18),

**Noting** a 20-year history of work by the Intergovernmental Oceanographic Commission of UNESCO (IOC) to develop a cooperative framework regarding the sharing of ocean data in Exclusive Economic Zones (EEZs), in particular:

- (1) IOC Resolution XX-6 (1999, "The Argo Project"), defining the Argo profiling float network and its implementation "fully consistent with the UNCLOS [United Nations Convention on the Law of the Sea]," as a part of the Global Ocean Observing System and the Global Climate Observing System,
- (2) IOC Resolution EC-XLI.4 (2008, "Guidelines for the Implementation of Resolution XX-6 of the IOC Assembly Regarding the Deployment of Profiling Floats in the High Seas within the Framework of the Argo Programme"), defining a framework for notification of coastal IOC Member States of Argo profiling floats likely to enter their EEZ,
- (3) Decision IOC/EC-LI/4.8 (2018, "Evolving Capabilities of the Argo Global Array of Profiling Floats"), agreeing to the continued use of the guidelines defined in IOC Resolution EC-XLI.4 for six new biogeochemical parameters, and to a framework for approval of additional new parameters,

**Noting further** that the Argo Information Centre at the Joint WMO-IOC Technical Commission for Oceanography and Marine Meteorology *in situ* Observations Programme Support Centre (JCOMMOPS) plays an important role in ensuring the above guidelines are implemented,

**Acknowledging** that the IOC-WMO-UN Environment-ICS Global Ocean Observing System (GOOS) and the JCOMM Observations Coordination Group (OCG) are presently undertaking work to identify issues related to the implementation of sustained ocean observing in EEZs, under the provisions of UNCLOS,

**Noting with satisfaction** Argo's pioneering free and open data policy, in compliance with the IOC Oceanographic Data Exchange Policy (IOC Resolution XXII-6),

**Recognizing** that:

- (1) The National Meteorological and Hydrological Services operational forecast models and services rely increasingly on sustained global data streams of subsurface ocean observations, to improve the skill of their forecasts, and to provide services that save lives and protect property, and support the blue economy,
- (2) WMO and IOC research, notably on climate change and its impacts, depends on the availability of global sustained ocean observation data streams,
- (3) The UN Framework Convention on Climate Change calls on Parties to strengthen the systematic observation of the climate (Article 5),
- (4) There is an increasing need to develop 'ecological' early warning systems, providing alerts for stakeholders and managers and combining ocean model and *in situ* observations, for example for harmful algal blooms and coral bleaching events,

**Further recognizing** that:

- (1) Many of these oceanographic data streams are implemented and funded by national oceanographic research agencies and organizations working outside the operational framework of National Meteorological and Hydrological Services,
- (2) Many oceanic processes move across EEZ boundaries, and
- (3) The interrelated nature of oceans and seas represent a special case as regards the need for international coordination and cooperation,

**Confirms** the importance of:

- (1) Respecting the relevant legal frameworks for the taking and sharing of ocean data in waters under national jurisdiction;
- (2) Full consultation and exchange of views with WMO Members;
- (3) Informing all WMO Members and IOC Member States of these activities through the UN General Assembly Resolution on Oceans and Law of the Sea;

**Decides** that:

- (1) WMO will work, through its forecasting systems and services, to identify requirements for subsurface ocean variables in order to improve the quality of these forecasts and services;
- (2) WMO will work closely with IOC in order to explore mechanisms that make the highest-impact subsurface ocean data freely available;
- (3) WMO will work to build the capacity of all Members to use the resulting forecast systems and services for societal benefit;

**Requests** technical commissions and the Research Board to include the above Decision in their work programme;

**Urges** Members to extend bilateral and multilateral cooperation in research, observations, forecasting, services and capacity development, in order to make ocean data more freely available.

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## **Resolution 47 (Cg-18)**

### **OCEAN OBSERVATIONS IN SUPPORT OF EARTH SYSTEM PREDICTION AND WMO SUPPORT TO THE GLOBAL OCEAN OBSERVING SYSTEM STRATEGY 2030 (INCLUDING TROPICAL PACIFIC OBSERVING SYSTEM 2020)**

THE WORLD METEOROLOGICAL CONGRESS,

**Recalling** the co-sponsorship by WMO of the Global Ocean Observing System together with IOC, UN Environment, and the International Science Council (ISC),

**Noting:**

- (1) Decision 33 (EC-70) on the WMO Contribution to the IOC-WMO-UN Environment-ISC Global Ocean Observing System (GOOS),
- (2) Resolution 9 (Cg-18) on Joint WMO-IOC Collaborative Board, which decides to incorporate appropriate JCOMM functions and activities on observation and operational



ocean forecasting systems into the IOC-WMO-UN Environment-ISC Global Ocean Observing System (GOOS), with enhanced connections to the WMO Commission for Observation, Infrastructure and Information Systems,

- (3) Resolution 1 (Cg-18), WMO Strategic Plan,
- (4) The draft GOOS 2030 Strategy to be submitted to the IOC of UNESCO 30th Assembly (26 June-4 July 2019) for approval, [Secretariat note: the draft GOOS Strategy is provided in the information document [Cg.18/INF. 6.1\(3\)](#)],
- (5) The [second Tropical Pacific Observing System \(TPOS\) 2020 report](#) and its recommendations, which are now being considered by TPOS stakeholders,
- (6) [GCOS 200 \(GOOS 214\)](#), the Global Climate Observing System: Implementation Needs,

**Noting further** that the Joint WMO-IOC Collaborative Board will advise GOOS, the technical commissions, and the Research Board on how to achieve the relevant objectives of the Board,

**Having considered** Recommendation 13 (EC-70) on the Tropical Pacific Observing System 2020,

**Recognizing** that the participation of WMO in drafting the GOOS Strategy 2030 will require Members' engagement with partner oceanographic organizations at regional and national levels,

**Recognizing** that ocean observations are critical in the Earth system approach as defined in the WMO Strategic Plan 2020-2023, while a great number of these ocean observations are implemented by third parties outside of National Meteorological and Hydrological Services,

**Recognizing further** that the physical, biogeochemical and biological components of the GOOS support the ocean component of the Global Climate Observing System,

**Reaffirms** the important contribution of sustained ocean observations to achieving WMO Strategic Objective 2.1, and **further reaffirms** its co-sponsorship of GOOS;

**Decides:**

- (1) To approve the GOOS 2030 Strategy, subject to its parallel approval by the IOC 30th Assembly;
- (2) To contribute to the implementation of the GOOS 2030 Strategy, including through the fostering of appropriate interfaces into the two new WMO Technical Commissions and the Research Board;
- (3) To encourage further dialogue with GOOS and its associated observing system community in the development and evaluation of the ocean observing system to meet the regional and global requirements of WMO, and to improve the delivery of WMO services and applications;

**Supports** the establishment of a node of a distributed GOOS Office located within WMO through the consolidation of existing ocean observing activities at WMO, and additional effort to facilitate functional connections between WMO Technical Commissions and GOOS and to integrate ocean observations in WIGOS;

**Adopts** Recommendation 13 (EC-70) on TPOS 2020;

**Supports** the recommendations of the second TPOS 2020 report;

**Requests:**

- (1) Members and partners with relevant ocean observing organizations at regional and national levels to engage in GOOS implementation according to the GOOS 2030 Strategy;
  - (2) Members to take the TPOS 2020 report and its recommendations into account when planning their contribution to the Tropical Pacific Observing System;
  - (3) The Technical Coordination Committee to provide advice on any required interfaces between GOOS and the WMO Technical Commissions and the Research Board;
  - (4) The Technical Commissions, the Research Board, the Joint WMO-IOC Collaborative Board, and GOOS to include the TPOS 2020 second report recommendations in their respective work programmes as appropriate.
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**Resolution 48 (Cg-18)**

**KEY DIRECTIONS OF THE POLAR AND HIGH-MOUNTAIN AGENDA  
FOR THE NEXT WMO FINANCIAL PERIOD (2020–2023)**

THE WORLD METEOROLOGICAL CONGRESS,

**Recalling:**

- (1) Resolution 25 (Cg-13) – Exchange of Hydrological Data and Products,
- (2) Resolution 40 (Cg-17) – WMO polar and high-mountain activities,
- (3) Resolution 41 (Cg-17) – Antarctic Observing Network,
- (4) Resolution 48 (Cg-17) – Global Integrated Polar Prediction System,
- (5) Resolution 49 (Cg-17) – Year of Polar Prediction,
- (6) Resolution 43 (Cg-17) – Global Cryosphere Watch,
- (7) 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,
- (8) Resolution 1 (Cg-18) - The WMO Strategic Plan,
- (9) Resolution 40 (Cg-XII) – WMO policy and practice for the exchange of meteorological and related data and products including guidelines on relationships in commercial meteorological activities,

**Noting:**

- (1) Recommendation 16 (EC-70) – Key directions of the polar and high-mountain agenda for the next WMO financial period (2020–2023),
- (2) Decision 43 (EC-70) - Proposal for the declaration of 2020 as the United Nations International Year of Snow and Ice,

- (3) The final report of the Ninth Session of the Executive Council Panel of Experts on Polar and High Mountain Observations, Research and Services (EC-PHORS-9, Geneva, Switzerland, 27-29 March 2019),

**Noting further** the *Manual on WMO Integrated Global Observing System* (WMO-No. 1160), and the regulation of the Antarctic Observing Network (AntON),

**Having considered:**

- (1) The recommendations of EC-PHORS-9 with regard to Key directions of the polar and high-mountain agenda for the next WMO financial period (2020–2023),
- (2) That considerations 1 to 11 of Resolution 40 (Cg-17) with regard to the rationale for WMO polar and high-mountain activities remain valid,
- (3) The critical role of polar and high-mountain regions in the Earth system modelling, prediction and services, and the societal needs in both polar and high-mountain regions related to weather, water and a changing environment and climate, and the risks to society related to water scarcity and disaster resilience in high-mountain regions,
- (4) The achievements of the Executive Council Panel of Experts on Polar and High-mountain Observations, Research and Services (EC-PHORS) in ensuring coordination of activities with other international organizations active in polar and high-mountain regions and in engaging WMO technical commissions and regional associations in the work of the Panel,
- (5) The role of WMO being an Observer to the Arctic Council and an invited Expert to the Antarctic Treaty Consultative Meetings,

**Decides:**

- (1) That an integrated approach continues to be needed to provide the required services to users and advice to governments about adaptation and mitigation to climate change, based on an understanding of the global impact of changes in polar and high-mountain regions, and as the changing climate in the polar regions will have an impact on weather and climate in other regions of the world, teleconnection impact studies will be part of this integrated approach;
- (2) That the future priorities for WMO Polar and High-Mountain Regions Activities within the new Strategic Plan should be those provided in annex to this Resolution;
- (3) That operational and research observing networks including AntON, the observing component of GCW, oceanographic observations and other activities in polar and High-Mountain regions, should be integrated within the framework of WIGOS and WIS;
- (4) That concerted efforts continue to be made to engage Members, technical commissions and regional associations, as well as the World Weather, Climate Research Programmes, the Global Atmosphere Watch (GAW) and other relevant research and international bodies, to improve services in high-latitude and high altitude regions by promoting observations and predictive capability on timescales from hours to centuries;

**Concurs** with Decisions 42 (EC-70) and 43 (EC-70) and strongly endorses the initiative for the organization of a High Mountain Summit in 2019, and the initiative for the designation by the United Nations of the year 2020 or later, as an United Nations (UN) International Year of Snow and Ice, as coordination mechanisms for increasing the focus and sustaining the awareness and understanding of the importance of snow and ice in the climate system and of the implications of impending changes in the Earth's cryosphere for human societies;

**Invites** Members, particularly those that have operational activities in polar and high-mountain regions:

- (1) To ensure continuity of their weather, climate, water and related environmental activities in polar and high-mountain regions;
- (2) To ensure that appropriate hydrometeorological and related environmental data from publicly funded research is made available to the operational community in real time or near real time;
- (3) To provide additional observations in polar and high-mountain regions by using manned and automatic hydrometeorological stations, atmospheric soundings, remote-sensing systems and other geophysical observatories on land, by recruiting additional voluntary observing ships, by equipping aircraft with appropriate means of recording and distributing observations, and by deploying automated observing platforms on and under the sea and ice, in order to meet the needs of numerical weather prediction, hydrological services, climate studies and research programmes, including in particular the Year of Polar Prediction Special Observing Periods (SOPs);
- (4) To enhance their satellite programmes in delivering appropriate satellite observing system infrastructure and products and services required for polar and high-mountain regions;
- (5) To consider the possibility of cooperating with other Members in sharing the costs of reopening and operating previously functioning stations, in expanding existing stations or in deploying new observing and communication systems;
- (6) To support WMO polar and high-mountain activities by providing both human and financial resources in its endeavours to enhance observations, research and services in polar and high-mountain regions;
- (7) To document the experiences on the installation, operation and maintenance of the observing systems in the polar and high mountain areas, and share them with the other Members directly or via the WMO Secretariat;

**Encourages** Members to liaise with all their national groups that may have operational activities in polar and high-mountain regions;

**Requests** the Executive Council:

- (1) To organize the coordination of weather, climate, water and related environmental activities in polar and high-mountain regions and facilitate execution of this Resolution, and consider the re-establishment of the Panel of Experts on Polar and High Mountains Observations, Research and Services;
- (2) To ensure close collaboration with other international organizations concerned such as the Antarctic Treaty Consultative Meetings, the Arctic Council, the Intergovernmental Oceanographic Commission of the United Nations Educational, Scientific and Cultural Organization, the Group on Earth Observations and the International Science Council and their relevant bodies (for example, the Scientific Committee on Antarctic Research, the International Arctic Science Committee, the International Association of Cryospheric Sciences), the International Maritime Organization, the International Hydrographic Organization, the International Mobile Satellite Organization (IMSO), and other relevant associations of the International Union of Geodesy and Geophysics, the Council of Managers of National Antarctic Programs, the Forum of Arctic Research Operators, the Association of Polar Early Career Scientists, the Mountain Research Initiative, Global Water Futures, the Third Pole Environment, and the International Centre for Integrated Mountain Development;
- (3) To ensure that WMO polar and high-mountain priority activities described in the [annex](#) to this Resolution are aligned with the WMO Strategic Plan;

**Requests** the regional associations, the technical commissions, the research board, and other relevant bodies to reflect WMO polar and high-mountain priorities in their activities;

**Requests** the Secretary-General:

- (1) To ensure adequate secretariat support for Polar and High Mountain activities, including connecting in a meaningful manner with partners and policy makers; and to support the cross-cutting nature of these activities through a collaborative planning framework to ensure implementation;
- (2) To bring the present resolution to the attention of all concerned.

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Note: This resolution replaces Resolution 40 (Cg-17), which is no longer in force.

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### **Annex to Resolution 48 (Cg-18)**

#### **Priority activities for polar and high-mountain regions for the next financial period, as part of the WMO Strategic Plan**

The following priority activities are proposed for WMO polar and high-mountain activities as part of the Strategic Plan:

<b>No.</b>	<b>Activity</b>	<b>Strategic Goals</b>
1	Surface and Space Observations	2, 3
2	Polar Predictions and Services, including Climate Services	1 and 2
3	GCW Preoperational Phase	1, 2 and 4
4	High-Mountain Activities	1, 2, 3, 4 and 5
5	Transition from Research to Operation and Services	1, 2, 3 and 5
6	Resources and Partnership	2, 3 and 5

Each activity will be undertaken as follows:

#### **Activity 1 - Surface and Space Observations** <sup>10</sup>

- (a) Consolidation of the observing component of GCW as defined in the GCW Pre-Operational Phase, and including linkages with space-based observations of the cryosphere;
- (b) Integration of the Antarctic Observing Network (AntON) into Global and Regional Basic Observing Networks (RBON);
- (c) Consolidate synergies between Global Cryosphere Watch (GCW), the World Hydrological Cycle Observing System (WHYCOS) and the WMO Hydrological Observing System (WHOS);

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<sup>10</sup> Activities no. 1 and 2 will also involve providing to end users appropriate products in support of relevant Frameworks such as SOLAS, MARPOL, GMDSS and the Polar Code, on the basis of improved value chain (surface and space observations, forecasting systems, dissemination and connectivity in the Polar regions).

- (d) Assess and evaluate community-based observations as a mechanism to support WMO Earth System modelling framework;
- (e) Better utilization of satellite data and products over polar and high mountain regions in order to address identified gaps, and advocacy for critical satellite observations. Working with space agencies in order to improve algorithms allowing improvement of model performance over polar regions, including within the framework of the Polar Space Task Group (PSTG).

### **Activity 2 - Polar Predictions and Services, including Climate Services**<sup>1</sup>

- (a) Addressing the requirements defined in the WMO Strategy for Service Delivery across a range of time scales, applied to Polar and High Mountain regions, including topics such as causes of arctic amplification, increasing concern for weather connections between Arctic and mid-latitudes, polar vortex variability, and impact-based forecasts;
- (b) Continued development of, and sustaining the Polar Regional Climate Centre Networks and Outlook Forums (Arctic, Antarctic, Third Pole) with a particular focus on cryospheric products, including NMHS linkages and user engagement;
- (c) In particular, WMO will continue exploring approaches to develop an integrated service delivery model for Antarctic weather and marine services, including a possible coordinating role of WMO, and how to engage with the Antarctic Treaty Consultative Meeting (ATCM) during this process. (Goals 1, 4 and 5);
- (d) Coordinate the products and services provided to Antarctic operators by NMHSs, build interoperability into existing systems and, where feasible, provide integrated products and services to improve service delivery capabilities of Members to meet end-user needs in the Antarctic, (Goals 1, 4 and 5) (this could be expanded to polar and high mountain regions).

### **Activity 3 - GCW Preoperational Phase**

Responding to Resolution 50 (Cg-18) on the GCW Pre-Operational Phase.

### **Activity 4 - High-Mountain Activities (grand challenges)**

- (a) Identify and address critical knowledge gaps in mountain earth systems science, observations and predictive capacity through advancing science, observing systems and predictive models in the context of identifying system and societal resilience to global change and development pressures in mountains;
- (b) Develop global mountain earth system forecasting and prediction systems to inform mountain communities of policy options to enhance resilience and to reduce and manage risk from mountain-based extreme events and climate change, both in the mountain headwaters and downstream; synergies with the WMO Hydrological Status and Outlook System will be exploited;
- (c) Address socially relevant user-led and rights-holders led questions and priorities on how to adapt and how to manage mountain cryosphere, ecosystems, hydrology and development to promote ecosystem conservation, provide social benefits and direct sustainable development along 'climate resilient development pathways';
- (d) Urge and facilitate the advancement of knowledge and implementation of these systems and solutions by member states and partners for mutual benefit within a global framework.

**Activity 5 - Transition from Research to Operation and Services**

- (a) To ensure the connection across the full value chain from science (including improving fundamental understanding of key processes) to products and services, across all relevant timescales, noting the YOPP as a good example of such an activity for the shorter timescales and the Polar Climate Predictability Initiative (PCPI) being very relevant for longer. An outcome driven approach should be encouraged, including the development of boundary level research and model downscaling over polar and high mountains (e.g. CORDEX);
- (b) Improved characterization of societal risks and opportunities in polar and high mountain regions, where WMO can add value;
- (c) Better service societal needs from hours across to decadal timeframes, remote and in situ polar and high mountain observational monitoring and numerical model Data Assimilation and prediction techniques, fundamental to the skilful current and future characterization of the earth system including the ocean, atmosphere, cryosphere, hydrosphere and biosphere. Continue focus on Polar Prediction Project (PPP) (long term goals 2 and 3), plan for its legacy. Advocacy for data assembly, availability and dissemination will be critical;
- (d) Develop demonstration projects (e.g. pan-Arctic collaborative testbed) to provide a mechanism to transfer technology research results and observation advances into operations and services in a timely and effective manner;
- (e) Ensure meaningful engagement with early career scientists (e.g. APECS).

**Activity 6 - Resources and Partnership**

- (a) Developing and consolidating partnerships with a range of agencies and organizations with interest in Polar and High Mountain regions, and who can potentially contribute to WMO or benefit from WMO activities. For example:
    - (i) On policy matters: Arctic Council and its working Groups, Antarctic Treaty Consultative Meeting (ATCM), International Centre for Integrated Mountain Development (ICIMOD), Intergovernmental Panel on Climate Change (IPCC), the International Arctic Science Committee (IASC), and how WMO will be engaging with these groups, etc.
    - (ii) Intergovernmental, research organizations and other advocacy organizations: Polar Prediction Project (PPP) and its Year of Polar Prediction (YOPP) project and Societal and Economic Research and Applications (SERA) subcommittee, Scientific Committee on Antarctic Research (SCAR), Intergovernmental Oceanographic Commission (IOC) of UNESCO, International Maritime Organization (IMO), International Hydrographic Office (IHO), International Ice-Charting working Group (IICWG), Council of Managers of National Antarctic Program (COMNAP), Forum of Arctic Research Operators (FARO), the Group on Earth Observations (GEO), the Mountain Research Initiative (MRI), the Mountain Partnership, the Third Pole Environment (TPE), the International Association of Cryospheric Sciences (IACS), the International Commission on Snow and Ice Hydrology (ICSIH/IAHS), and UNESCO International Hydrological Programme (IHP), etc.;
    - (iii) Private sector: tourism, shipping, fisheries, natural resource extraction;
    - (iv) Indigenous communities;
    - (v) Non-Governmental Organizations (NGOs);
  - (b) Seek efficient use of resources, working on synergies, coordination and co-design, towards common goals.
-

## **Resolution 49 (Cg-18)**

### **ANTARCTIC OBSERVING NETWORK**

THE WORLD METEOROLOGICAL CONGRESS,

#### **Noting:**

- (1) Resolution 41 (Cg-17) – Antarctic Observing Network,
- (2) Decision 47 (EC-69) and Decision 46 (EC-70) on Antarctic Observing Network,
- (3) Resolution 36 (Cg-18) – Amendments to the *Technical Regulations* (WMO-No. 49), Volume I, Part I –WMO Integrated Global Observing System, to the *Manual on the WMO Integrated Global Observing System* (WMO-No. 1160), and to the *WIGOS Metadata Standard* (WMO-No. 1192),
- (4) The final report of the Ninth Session of the Executive Council Panel of Experts on Polar and High Mountain Observations, Research and Services (EC-PHORS-9, Geneva, Switzerland, 27-29 March 2019),

**Having considered** the recommendations of EC-PHORS-9 regarding the Antarctic Observing Network,

#### **Considering:**

- (1) That the establishment and maintenance of surface and upper-air observing stations in Antarctica to meet the requirements of Members constitutes one of the most important obligations of Members under Article 2 of the Convention of the World Meteorological Organization,
- (2) That the density of the current Antarctic observing network of surface and upper-air stations is much less than that desirable to properly characterize Antarctic weather and climate,
- (3) That observing stations in Antarctica contribute substantially to the WMO Global Cryosphere Watch (GCW),
- (4) That manned stations in Antarctica also contribute vital ozone and other observations to the Global Atmosphere Watch,
- (5) The need for further integration of Antarctic observing systems according to the WMO Integrated Global Observing System practices,
- (6) The needs of the research community as expressed by the Scientific Committee on Antarctic Research,

#### **Decides:**

- (1) To merge the Antarctic Observing Network (AntON) into the Regional Basic Observing Network (RBON);
- (2) To approve the inclusion of the Antarctic observing stations listed in the [annex](#) to the present resolution, in the Regional Basic Observing Network (RBON);



**Requests** the Commission on Infrastructure:

- (1) To ensure that feedback on the impact of Antarctic observing stations in RBON on Earth System prediction will be provided to Members as needed;
- (2) To investigate establishing a Regional WIGOS Centre for Antarctica, which role would essentially be to facilitate collection of WIGOS metadata in OSCAR/Surface, monitor quality of Antarctic observing stations, their impact on Earth System predictions, and provide feedback to Members as appropriate;

**Urges Members:**

- (1) To secure full implementation of the network of stations and observational programmes set forth in the annex to the present resolution, particularly those contributing to the Global Climate Observing System;
- (2) To seek to maintain, and where possible restore, radiosonde stations in Antarctica;
- (3) To increase the number of long term Automatic Weather Stations at strategic locations (e.g. coastal), and install long-term high-quality in situ observations at key locations over West Antarctica;
- (4) To increase weather balloon releases from ships during voyages, and increase met-ocean observations disseminated on the GTS in real time where possible;
- (5) To consider their observing stations for inclusion into the GCW observing network based on its selection criteria;
- (6) To consider the possibility of cooperating with other Members in sharing the costs of reopening and operating silent stations and opening new stations at key locations;
- (7) To comply with the standard times of observation, the coding procedures and the data collection standards, as laid down in the Technical Regulations, *Manual on the WMO Integrated Global Observing System* (WMO-No. 1160), *the Manual on Codes* (WMO-No. 306), *the Manual on the Global Telecommunication System* (WMO-No. 386) and *the Manual on the Global Data processing and Forecasting System* (WMO-No. 485), providing the data in real-time as far as practicable;
- (8) To validate station positions and elevations using modern surveying techniques against those given in OSCAR/Surface at the required resolution and to communicate the results of these measurements to the Secretariat;
- (9) In complying with the WMO Technical Regulations and considering practicalities of the environment in which instrument systems operate in the Antarctic, ensure that traceable calibration certificates are available for instrumentation, in line with the International Organization for Standardization quality management certification;
- (10) To keep updated the observational metadata for all the stations in OSCAR/Surface, to make available appropriate discovery metadata and to provide them with all observational datasets through the WMO Information System;
- (11) To make historic research and routine observational data available to appropriate Antarctic Data Collection and Production Centres for archiving for climate purposes with the focus on the Global Framework for Climate Services;
- (12) To incorporate existing research and new installations in Antarctica into RBON;
- (13) To ensure that feedback is given to stations when numerical weather prediction systems detect problems with data or their transmission;

**Requests** the Secretary-General to bring any changes to the Antarctic Observing Network to the attention of Members.

Note: This Resolution replaces Resolution 41 (Cg-17), which is no longer in force.

### Annex to Resolution 49 (Cg-18)

#### Antarctic Observing Stations in RBON

Antarctic Observing stations to be included in RBON.

WIGOS ID <sup>11</sup>	Station	Operator		
88963	Esperanza	Argentina		
88968	Orcadas	Argentina		
88986	South Thule Island	South Africa		
89002	Neumayer	Germany		
89003	Halvfarryggen EP11	Netherlands		
89004	S.A.N.A.E. AWS	South Africa		
89009	Amundsen-Scott	USA		
89011	Soeerasen	Germany		
89013	Baldrick AWS	UK		
89014	Nordenskiold Base	Finland		
89016	Wasa ep5	Netherlands		
89020	Brunt AWS	UK		
89022	Halley	UK		
89034	Belgrano II	Argentina		
89049	AGO-2	USA		
89050	Bellingshausen	Russia		
89053	Carlini	Argentina		
89054	Dinamet-Uruguay	Uruguay		
89055	Marambio	Argentina		
89056	Frei	Chile		
89057	Arturo Prat	Chile		
89058	Great Wall	China		
89059	Bernardo O'Higgins	Chile		
89061	Palmer Station	USA		
89062	Rothera	UK		
89063	Vernadsky	Ukraine		
89064	Juan Carlos I AWS	Spain		
89065	Fossil Bluff	UK		
89066	San Martin	Argentina		
89087	Thiel Mountains AWS	UK		
89108	Henry	USA		
89132	Russkaja	Russia		
89251	King Sejong	South Korea		
89252	Comandante Ferraz	Brazil		

<sup>11</sup> Note : Only the "Local Identifier" part of the WIGOS Identification Number (WIGOS ID) is given here. Complete WIGOS ID can be found by querying the OSCAR/Surface database – <https://oscar.wmo.int/surface/>. For details on WIGOS ID, see at <https://wiswiki.wmo.int/tiki-index.php?page=WIGOS-Identifiers&structure=WIGOS>

<b>WIGOS ID<sup>11</sup></b>	<b>Station</b>	<b>Operator</b>		
89253	Joinville Island	Brazil		
89257	Limbert AWS	UK		
89262	Larsen Ice Shelf	UK		
89266	Butler Island	UK		
89269	Bonaparte Point	USA		
89272	Sky-Blu	UK		
89314	Theresa	USA		
89324	Byrd Station	USA		
89327	Mount Siple	USA		
89329	Harry	USA		
89332	Elizabeth	USA		
89345	Siple Dome	USA		
89376	Gill	USA		
89377	Lettau	USA		
89504	Troll	Norway		
89507	Kohnen	Netherlands		
89512	Novolazarevskaja	Russia		
89514	Maitri	India		
89528	AGO-3	USA		
89532	Syowa	Japan		
89536	Plateau Station	Netherlands		
89542	Molodeznaja	Russia		
89558	Pole of Inaccessibility	Netherlands		
89564	Mawson	Australia		
89570	Davis (whoop whoop)	Australia		
89571	Davis	Australia		
89573	Zhongshan	China		
89574	Progress	Russia		
89575	Druzhnaya-4	Russia		
89577	Dome A	Australia and China		
89578	Eagle	Australia and China		
89586	Mount Brown	Australia		
89592	Mirnyj	Russia		
89598	AGO-4	USA		
89601	Oazic Bangera	Russia		
89606	Vostok	Russia		
89610	Cape Poinsett	Australia		
89611	Casey	Australia		
89614	Wilkins Runway West	Australia		
89615	Wilkins Runway East	Australia		
89625	Concordia	Italy		
89628	AGO-1	USA		
89642	Dumont D'Urville	France		
89643	Port Martin	USA		
89646	Sitry Point	Italy		
89648	Mid Point	Italy		
89657	Leningradskaja	Russia		
89659	Priestley Glacier	Italy		
89661	Cape Phillips	Italy		
89662	Mario Zuchelli Station	Italy		
89664	Mcmurdo	USA		
89666	Cape Ross	Italy		
89667	Pegasus North	USA		
89734	Dome Fuji	USA		

<b>WIGOS ID<sup>11</sup></b>	<b>Station</b>	<b>Operator</b>		
89744	Relay Station	USA		
89767	G3	Australia		
89768	Minna Bluff	USA		
89769	Linda	USA		
89799	Nico	USA		
89776	Bharati	India		
89807	Snyder Rocks	Australia		
89809	Casey Skiway South	Australia Ias		
89811	Law Dome Summit	Australia		
89815	Haupt Nunatak	Australia		
89817	Bunger Hills	Australia		
89828	Dome C II	USA		
89832	D-10	USA		
89834	D-47	USA		
89836	D-85	USA		
89859	Jang Bogo	South Korea		
89864	Manuela	USA		
89865	Whitlock	USA		
89866	Marble Point	USA		
89868	Schwerdtfeger	USA		
89869	Marilyn	USA		
89872	Ferrell	USA		
89873	Elaine	USA		
89879	Possession Island	USA		

Sub-Antarctic Observing stations to be included in RBON.

<b>WIGOS ID<sup>12</sup></b>	<b>Station</b>	<b>Operator</b>		
61997	Crozet	France		
61998	Kerguelen	France		
68906	Gough island	South Africa		
68992	Bouvet island	Norway		
68994	Marion island	South Africa		
85934	Punta arenas	Chile		
87925	Rio Gallegos aero	Argentina		
87934	Rio Grande b.a.	Argentina		
87938	Ushuaia aero	Argentina		
88878	Pebble island	UK		
88883	Weddell island	UK		
88889	Mount Pleasant Airport	UK		
88897	Sea Lion Island	UK		
88900	Bird Island South Georgia	UK		
88903	Grytviken South Georgia	UK		
93929	Enderby Island AWS	New Zealand		
93947	Campbell Island AWS	New Zealand		
94997	Heard Island (the spit)	Australia		
94998	Macquarie Island	Australia		
95997	Heard Island (cove)	Australia		

<sup>12</sup> Note : Only the "Local Identifier" part of the WIGOS Identification Number (WIGOS ID) is given here. Complete WIGOS ID can be found by querying the OSCAR/Surface database - <https://oscar.wmo.int/surface/>. For details on WIGOS ID, see at <https://wiswiki.wmo.int/tiki-index.php?page=WIGOS-Identifiers&structure=WIGOS>

**Resolution 50 (Cg-18)****PRE-OPERATIONAL PHASE OF THE GLOBAL CRYOSPHERE WATCH**

THE WORLD METEOROLOGICAL CONGRESS,

**Recalling:**

- (1) Resolution 43 (Cg-17) – Global Cryosphere Watch,
- (2) Resolution 7 (Cg-18) – Establishment of WMO technical commissions for the eighteenth financial period,
- (3) Resolution 48 (Cg-18) – Key directions of the polar and high-mountain agenda for the next WMO financial period (2020–2023),
- (4) Resolution 29 (EC-70) – Global Cryosphere Watch Surface Observing Network,
- (5) Decision 21 (RA II-16) – Development of the Asia High-Mountain Global Cryosphere Watch Observing Network,
- (6) Decision 16 (RA III-17) - Polar and high-mountain regions, Global Cryosphere Watch, Antarctic Regional Climate Network and Polar Space Task Group,
- (7) Decision 20 (RA IV-17) – Development and implementation of the Global Cryosphere Watch in the polar and high-mountain regions of Regional Association IV,
- (8) Decision 18 (RA V-17) Global Cryosphere Watch, related high-mountain activities and climate services,
- (9) Decision RA VI-17/18 on the RA VI engagement with the Global Cryosphere Watch,
- (10) Resolution 1 (CHy-15) – Response of the Commission to decisions of Congress of relevance to hydrology and water resource management,
- (11) Resolution 4 (CIMO-17) - Commission for Instruments and Methods of Observation contribution to the per-operational phase of the Global Cryosphere Watch,
- (12) Decision 6 (JCOMM-5) – Collaboration with the Global Cryosphere Watch,
- (13) Recommendation 17 (EC-70) – Pre-operational Phase of the Global Cryosphere Watch,

**Noting:**

- (1) The final report of the Ninth Session of the Executive Council Panel of Experts on Polar and High Mountain Observations, Research and Services (EC-PHORS-9, Geneva, Switzerland, 27-29 March 2019),
- (2) That the GCW Surface Observing Network is one of the four components of the WMO Integrated Global Observing System (WIGOS), and a component of the WMO Information System (WIS),
- (3) That GCW is a contributor to the Global Framework for Climate Services (GFCS) and the Global Climate Observing System (GCOS),

- (4) That synergies between GCW and the WMO Hydrological Observing System are beneficial for both the cryosphere and the hydrosphere,

**Noting also** that the development of GCW has progressed with resources allocated by Seventeenth Congress, and with extra-budgetary resources,

**Noting with satisfaction:**

- (1) The successful contributions of Members and of research organizations active on polar and high-mountain matters, to the implementation of GCW,
- (2) The collaboration of GCW with the Arctic and Third-Pole Regional Climate Centres,

**Mindful:**

- (1) That the cryosphere is global, existing in various forms spanning all latitudes and elevations, and occurring in approximately 100 countries and the Antarctic region,
- (2) That cryosphere-related feedbacks contribute to the amplification of climate change, impacting weather, climate, and water, globally,
- (3) That water stored as snow and ice is critical to the world's available freshwater supply,
- (4) That understanding cryosphere-related risks and hazards, is key to effective adaptation strategies,

**Having considered:**

- (1) The goal of the WMO Strategic Plan, to enhance Earth system observations and predictions,
- (2) That the cryosphere is one of the most under-sampled and least understood components of the Earth system,
- (3) The need for further development of technical standards and guidelines to support Members with their operational cryosphere observations, data, and services,
- (4) The recommendations of EC-PHORS-9 with regard to the GCW Pre-operational phase,

**Decides** that the development of the Global Cryosphere Watch will continue during its pre-operational phase, during the eighteenth financial period, with the aim of proving to Members the benefits of GCW as an operational, cross cutting activity across WMO Programmes, from 2024 onward;

**Decides further:**

- (1) That the priorities of the GCW pre-operational phase, will be as provided in the [annex](#) to the present Resolution;
- (2) That special priority must be given to assisting Members in addressing national cryosphere related priorities (e.g. on water resource management, disaster risk reduction, etc.), with a special focus on developing countries and for high mountain regions;

**Requests** the Executive Council:

- (1) To re-establish the GCW Steering Group, as a mechanism responsible to steer and monitor the activity during the pre-operational phase of GCW, to work under the remit of the proposed Panel of Experts on Polar and High Mountain Observations, Research and Services, and to coordinate with the Technical Commissions, the Research Board, and the other relevant bodies the integration of GCW components within the working structure of WMO;
- (2) To ensure the representation of partners undertaking cryosphere related activities, including with the Executive Council Panel of Experts on Polar and High-mountain Observations, Research and Services (EC-PHORS)' Polar Space Task Group;
- (3) To adopt the high-level draft plan for the GCW pre-operational phase;

**Also requests** the regional associations:

- (1) To support the engagement of their Members in addressing their specific cryosphere-related service priorities within the framework of GCW;
- (2) To collaborate with GCW organizing workshops including capacity development and outreach activities;

**Further requests** Technical Commissions, the Research Board, and other relevant bodies:

- (1) To integrate the components of GCW within their structures, aligned with their respective terms of reference, and accounting for the cross-programme nature of GCW functions;
- (2) To collaborate with GCW in further developing consolidated cryosphere observational requirements, necessary standards and guidelines on data, information, and products for sustainable cryosphere services;

**Urges** Members:

- (1) To consolidate the cryosphere service needs connected to societal and economic benefits, e.g. management of water resources, early warning systems;
- (2) To further enhance and sustain their cryosphere activities within the framework of GCW, especially in data-sparse regions, and in support of application areas relying on cryosphere information;
- (3) To foster partnerships at national level, with a focus on cryosphere for addressing emerging service needs on weather, climate, water, natural hazards, etc.;
- (4) To coordinate their WIGOS and WIS activities with the GCW pre-operational phase;
- (5) To contribute to the work of GCW by nominating and supporting cryosphere experts and practitioners, and to contribute with financial resources;

**Calls upon** the Secretary-General:

- (1) To ensure the appropriate support through the GCW Project Office and financial resources for the pre-operational phase of GCW;
- (2) To take the necessary actions to further develop and maintain WMO collaboration on matters related to cryosphere, through GCW, with United Nations system organizations and other relevant organizations, agencies, and institutions;

**Invites** partner organizations:

- (1) To participate in relevant activities during the GCW pre-operational phase;
- (2) To further support the implementation of GCW by contributing with human and financial resources.

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Note: This resolution replaces Resolution 43 (Cg-XVII), which is no longer in force.

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## **Annex to Resolution 50 (Cg-18)**

### **GCW priorities during the pre-operational phase**

During the pre-operational phase, GCW will further develop capacity in support of Members in delivering cryosphere services addressing specific user needs for water resource management, climate services, climate science, weather forecasting, and improved understanding of natural hazards and risks, by:

- (a) Continuing to improve and optimize the global coverage of the GCW Surface Observing Network and homogeneity of cryosphere observations within the framework of WIGOS, including strong linkages with the space-based observation of the cryosphere;
- (b) Promoting the long-term monitoring of key cryospheric processes, facilitating the definition of observational requirements, and the development and publication of common standards and relevant regulatory and guidance material;
- (c) Establishing the GCW Data Portal as a Data Collection or Production Centre (DCPC) in the WMO Information System (WIS), and facilitate the standardization, access to, and quality management of current and past cryosphere data, information, and products;
- (d) Fostering the development and publication of user-driven value-added cryosphere products based on in-situ, space-based, and airborne observations, as well as models;
- (e) Fostering collaboration through partnerships between operational and scientific communities to expand the availability and access to cryosphere data and information;
- (f) Supporting Members in implementing cryosphere-related deliverables at national level, including capacity development (monitoring, data, research, prediction, dissemination, etc.), as defined in the framework of GCW.

A special focus shall be given to strengthening the links between cryosphere and operational hydrology activities.

[The draft GCW Pre-operational phase plan is available in [Cg-18/INF 6.1\(4\)](#)]

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## **Resolution 51 (Cg-18)**

### **IMPLEMENTATION OF THE ARCHITECTURE FOR CLIMATE MONITORING FROM SPACE**

THE WORLD METEOROLOGICAL CONGRESS,

**Recalling** Resolution 5 (Cg-XIV) – WMO Space Programme, which initiated a new major WMO Space Programme as a cross-cutting programme to increase the effectiveness and contributions from satellite systems to WMO Programmes,

**Recalling** Resolution 19 (Cg-XVI) – Development of an Architecture for Climate Monitoring from Space, which requested WMO to develop the architecture for climate monitoring from space as:

- (1) A component of the future WMO Integrated Global Observing System (WIGOS) and the Global Framework for Climate Services (GFCS), for consideration by Congress,
- (2) A major initiative of the WMO Space Programme and as an important component of WIGOS and in coordination with satellite operators, the Committee on Earth Observation Satellites (CEOS), the Coordination Group for Meteorological Satellites (CGMS), the Global Climate Observing System (GCOS), the Group on Earth Observations (GEO) and the World Climate Research Programme (WCRP),

**Recalling further**

- (1) The Abridged Final Report with Resolutions of the Seventeenth World Meteorological Congress (WMO-No. 1157), paragraph 4.2.4.16, in which Congress underscored the need for the satellite operators and the Secretariat to pursue the development of the Architecture for Climate Monitoring from Space with a view to ensure seamless continuity of climate monitoring satellite programmes, comparability of measurements, provisions for continuity and contingency, and traceability to reference standards,
- (2) Resolution 1 (EC-68) – WMO support to the Paris Agreement, in which Executive Council decided to further address the provision of reliable, long-term, high-quality observations of global atmospheric composition changes through the revised GCOS Implementation Plan addressing Systematic Observations in support of the United Nations Framework Convention on Climate Change (UNFCCC), the Global Atmosphere Watch (GAW) and related information on trends and distribution of greenhouse gases in the atmosphere and through the Integrated Global Greenhouse Gas Information System (IG3IS),
- (3) Decision 7 (EC-69) – WMO support to implementation of the Paris Agreement,
- (4) Decision 14 (EC-69) – Support the development of actions based on the Global Climate Observing System Implementation Plan,
- (5) Resolution 2 (EC-70) – WMO integrated approach to high-level climate-science-related policy processes,
- (6) Decision 35 (EC-70) - Architecture for climate monitoring from space,

**Noting** the significant progress that has been made in observing the Earth globally and synoptically with higher temporal, spectral and spatial resolutions, which before the advent of satellites was all but impossible,

**Noting also** the importance of combining space-based and surface-based observations in the applications supported by WIGOS, including climate monitoring,

**Convinced** of the pivotal role of satellite data to contribute to scientifically sound, evidence-based policy- and decision-making for sustainable development,

**Noting** that space-based observations will be vital for the successful implementation of the Paris Agreement,

**Having assessed** progress made on the implementation of the Architecture for Climate Monitoring from Space (hereafter/thereafter referred to as "Architecture") as provided in [Cg-18/INF. 6.1\(5\)](#),

**Taking note** that the Architecture provides an overall framework for assuring that the space-based component of the WMO Integrated Global Observing System will provide vital observations and products for climate monitoring in line with user requirements,

**Noting further** that the Architecture has been reviewed by GCOS, CEOS, CGMS and by the Joint CEOS/CGMS Working Group on Climate,

**Appreciates** the progress made with the implementation of the Architecture and confirms its importance,

**Considers favourably** the significant contributions made by CEOS and CGMS satellite operators in the implementation of the Architecture,

**Endorses** the approach taken for the implementation of the Architecture;

**Urges** CEOS and CGMS satellite operators to maintain their efforts towards full implementation of the space-based climate observing system component in accordance with the Vision for WIGOS in 2040.

**Requests** the Secretary-General to take appropriate action through the WMO Space Programme and in partnership with WMO Members for the further implementation of the Architecture.

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## Resolution 52 (Cg-18)

### STRATEGY FOR THE VIRTUAL LABORATORY FOR EDUCATION AND TRAINING IN SATELLITE METEOROLOGY 2020–2024

THE WORLD METEOROLOGICAL CONGRESS,

**Recalling** Resolution 5 (Cg-XIV) – WMO Space Programme, which initiated a new major WMO Space Programme as a cross-cutting programme to increase the effectiveness and contributions from satellite systems to WMO Programmes,

**Recalling** that the Sixteenth World Meteorological Congress agreed with the Space Programme description (Annex II, WMO-No. 077, Sixteenth World Meteorological Congress, Geneva, 16 May–3 June 2011, Abridged final report with resolutions),

**Noting** that one of the four main components of the WMO Space Programme is related to information and training with the long-term objective to raise awareness on satellite capabilities and promote satellite-related education to keep Members' operational and scientific staff up to date with the latest technological innovations, with a focus on developing countries,

**Noting also** that the World Meteorological Organization (WMO) and the Coordination Group for Meteorological Satellites (CGMS) established the Virtual Laboratory for Training and Education in Satellite Meteorology (VLab) as a global network of specialized training centres and meteorological satellite operators working together to improve the utilisation of data and products from meteorological and environmental satellites (see <https://www.wmo-sat.info/vlab/>),

**Noting further** that the WMO Space Programme implements the Five-year Strategy for the Virtual Laboratory for Training and Education in Satellite Meteorology and Environmental Applications (VLab), relying on the network of Centres of Excellence sponsored by satellite operators,

**Taking note** of the achievements under the Five-year Strategy for VLab 2015-2019,

**Having examined** the proposed Five-year Strategy for VLab 2020-2024 (hereafter/thereafter referred to as "VLab Strategy 2020-2024") endorsed by the Fifth Session of the Inter-Programme Expert Team on Satellite Utilization and Products (IPET-SUP-5) and recommended by the president of CBS,

**Decides** to approve the VLab Strategy 2020-2024, as provided in the [annex](#) to the present resolution;

**Calls upon** WMO Members to contribute to the implementation of the VLab Strategy 2020-2024 by hosting VLab activities, by making available qualified trainers and by providing resources to the WMO VLab Trust Fund as requested by Decision 27 (EC-70) - Sustaining the VLab technical support officer;

**Requests** the Secretary-General to take appropriate action to facilitate the activities identified in the VLab Strategy 2020-2024 FYP2020-23 in partnership with WMO Members and CGMS satellite operators.

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## **Annex to Resolution 52 (Cg-18)**

### **FIVE-YEAR STRATEGY FOR THE WMO-CGMS VIRTUAL LABORATORY FOR EDUCATION AND TRAINING IN SATELLITE METEOROLOGY 2020-2024**

#### **Scope and Definition**

The WMO-CGMS Virtual Laboratory for Education and Training in Satellite Meteorology (VLab) is an activity of the WMO Space Programme, based on a global network of specialized training centres, named Centres of Excellence (CoEs), that are supported by one or more CGMS satellite operators (see <http://vlab.wmo.int>).

The CoEs are established in the various WMO Regions to meet user needs for increased skills and knowledge in using satellite data within their region. They are often co-located with WMO Regional Training Centres (RTCs).

VLab activities are implemented by CoEs in cooperation with CGMS satellite operators.

#### **Mission of VLab**

To improve weather, water, climate and related environmental services by enabling WMO Members to utilize satellite data.

### **Objectives of VLab**

1. Achieve better exploitation of data from the space-based component of the WMO Integrated Global Observing System (WIGOS) for services that are increasingly reliant on satellite data;
2. Share globally knowledge, experience, methods, and tools related to access and usage of satellite data, especially in support of WMO Members that have limited resources.

### **Strategic Drivers and Challenges Outside VLab that we Seek to Support**

The strategic drivers of VLab are:

- Need to address societal challenges and global development agendas such as the 2030 Agenda for Sustainable Development, the Sendai Framework for Disaster Risk Reduction and the Paris Climate Agreement;
- Responding to new and emerging service demands for weather, water and climate, such as in support of marine, land, impact-based decision support services (IDSS) and the applications in support of the Global Framework for Climate Services (GFCS);
- Improved scientific understanding and technological advances that can lead to enhanced services, and evolution in the provision of meteorological services;
- Increased diversity of services offered by WMO Members in line with the WMO Earth System approach and efforts to enhance the quality of these services;
- Improved availability of Earth observing data to support operational service delivery in line with the expected growth of the space-based observing system component as outlined in the Vision for WIGOS in 2040;
- Increased range of resources available for user training, and the challenges users and trainers have in efficiently finding and repurposing these resources;
- Introductions of new satellites, with new data types and products, new data manipulation and handling technology, as well as new dissemination systems, including cloud hosted data sources;
- Continued need to support simple and "backup" data delivery for emergency preparedness and for WMO Members that have limited resources;
- Achieving the competence and quality control requirements, and professionalism within WMO Services, in particular noting the human resource management challenges facing many National Meteorological and Hydrological Services (NMHSs);
- Growth in social/crowd created projects and increased volume of co-creation content;
- Ideas for NMHS service improvement generated within the WMO bodies.

### **Status and Achievements of VLab for the Period 2015-2019**

In its 20 years of existence, VLab has demonstrated its capability to deliver global scale events on training and education in satellite meteorology. In addition, all of the VLab activities support the objectives of the WMO Global Campus.

In the period 2015 to 2018, VLab conducted the following activities, implementing the VLab Strategy 2015-2019:

- (1) Training activities

- (a) Hosted more than 120 Regional Focus Group discussions (RFGs) and 350 training courses, reaching 12 500 participants.
  - (b) Supported transition to new satellite systems in all WMO regions.
  - (c) Provided training materials created specifically for identified gaps in content and data access, which included the Conceptual Models for the Southern Hemisphere (CM4SH), ASMET modules, GEONETCast Americas broadcast, and ways to display the data through SIGMACast, McIDAS-V, and python scripting.
- (2) Collaboration and sharing
- (a) Further developed the WMO SP-12 "Guidelines on Satellite Skills and Knowledge for Operational Meteorologists".
  - (b) Participated and contributed to WMO Global Campus activities and collaboration mechanisms.
- (3) Management and oversight
- (a) Held two face-to-face meetings of the VLab Management Group (VLMG) and 15 online meetings to plan and oversee VLab activities.
  - (b) Maintained good communication between training centres and satellite data providers around the globe, bringing research into training and operations.
  - (c) Accelerated new product development and implementation in operations, such as the RGBs and the development of quick guides.

### **Strategy for the Period 2020 to 2024**

VLab will strive to meet the increasing demands of WMO Members in line with:

- [WMO Strategic Priorities](#);
- WMO Education and Training Programme;
- CGMS High Level Priority Plan ([HLPP 2018-2022](#));
- [GFCS Priority Areas](#);
- [Group on Earth Observations \(GEO\) Societal Benefit Areas](#).

VLab will work towards its objectives by:

- Developing and implementing training interventions, linking the intervention to the skills, competencies and qualification frameworks where they exist;
- Encouraging evaluation of the impact of the training for the use of satellite data and products and its long-term benefits;
- Encouraging the availability of more training material in WMO official languages other than English;
- Encouraging exchange of information between researchers and operational users in developing new products from current satellite data that can lead to improved meteorological services;
- Promoting the benefits of using new satellite-based products and providing technical support, where possible, to make them available to users;

- Promoting good practice in training within the WMO Global Campus network and growing relationships with other training centres in allied areas such as oceans, agriculture, and forestry to explore opportunities to collaborate and share tools and knowledge for the delivery of the VLab objectives; encouraging those programmes to use the WMO competency frameworks;
- Engaging directly with and reporting to its co-sponsors, which currently include the WMO Inter-Programme Expert Team on Satellite Utilization and Products (IPET-SUP) and the Coordination Group for Meteorological Satellites (CGMS);
- Engaging actively with the WMO Global Campus and contributing to the continuous development of WMOLearn;
- Increasing the coordination and collaboration between CoE's in order to maximise the efficiency of effort;
- Fostering the use of the User Centred Design framework of processes to maximise the discoverability and usability of resources;
- Fostering the co-creation of learning interventions utilising existing and emerging platforms, including social;
- Developing or exploring guidance for impact-based decision support services (IDSS) and Global Framework for Climate Services (GFCS) applications;
- Increasing efforts to engage with the next generation of young professionals in all fields related to the work of WMO and to create more opportunities for them to participate in and contribute to WMO activities; promoting mentoring and peer to peer learning opportunities for both students and instructors.

VLab will implement its overall strategy by:

- Developing and delivering training in the form of distance and face-to-face events, RFG discussions, and self-study resources;
- Supporting Regional and cross-Regional Satellite User Conferences;
- Contributing to the regional satellite data requirement dialogues, and providing briefing information on regional data access to enable NMHS managers to ensure they have the right staff to support access and application of the satellite data;
- Providing feedback to satellite operators on the use of the available data, products, systems and services and challenges associated with full exploitation;
- Providing information using the WMO Space Programme databases, including the Observing Systems Capability Analysis and Review Tool for space-based capabilities (OSCAR/Space), the WMO Product Access Guide (PAG) for satellite products and the WMO-CGMS Satellite User Readiness Navigator (SATURN);
- Advertising training events in the VLab [Training Events Calendar](#) and [WMOLearn Events Calendar](#);
- Sharing training resources developed by VLab Members in the WMOLearn section of the [WMO E-Library](#).

The delivery of training will rely on:

- Use of digital technology where appropriate;
- Enhanced communication capabilities for data and training material;
- Classroom (face-to-face) and distance learning delivery of training where appropriate;
- Collaboration among CoEs;
- Cooperation with other entities providing training;
- Continued support from CGMS members.

In the period 2020 to 2024, VLab will pay particular attention to:

- Big data: noting that there are a number of cloud-based satellite access platforms, and anticipating a growth in cloud-based services, including hosted processing. This shall include exploiting such platforms to support application training, and training in the use of such systems.
- Impact-based forecasting and impact-based decision support services (IDSS): encourage NMHS personnel to continuously work with core partners, such as emergency personnel and public safety officials, on the production and dissemination of accurate and consistent forecast information for certain weather, water, and climate events that have a high impact, noting that not all forecasting services will adopt IDSS in the short-term.
- Knowledge transfer: acting as a bridge between the CoEs to support knowledge sharing related to new data applications, for example regarding SAR data or hydrological models.
- Technical capacity-building: supporting the technical staff involved in satellite data reception and processing, through training, provision of up-to-date information, and potentially a skills framework;
- Space weather: noting the growth in interest for space weather services around the world, VLab will engage and cooperate with relevant partners seeking to enhance the implementation of space weather services. To provide relevant training, a space weather competency framework needs to be developed, which will require working with partners, including the Committee on Space Research (COSPAR) and the WMO Inter-Programme Team on Space Weather Information, Systems and Services (IPT-SWeISS), that have the appropriate skills in this area.

#### Quality Control and Evaluation

To ensure the quality of services provided by VLab, continuous internal quality evaluations will be conducted. These include undertaking evaluations of the training impact of its activities following the best available approaches, as well as establishing procedures to ensure that VLab expectations are being met. Annual reviews of achievements will be carried out to ensure focus is kept on the provision of training in the main priority areas established in this strategy.

#### Cooperation

The development and delivery of training, with particular emphasis on national and regional specific demands and requirements, relies on the strong collaboration between VLab CoEs and satellite operators. VLab believes that a strong collaboration between CoEs and partner

Satellite Operators will contribute to the economic benefit of the large investments in the space-based observing system.

The continuation of VLab collaboration with other training and education programmes in the subject of meteorology, including CALMet, and the WMO Training and Education Programme is also essential for further success. VLab will further build on the partnership with the Committee on Space Research (COSPAR) and explore partnerships with the Working Group on Capacity Building and Data Democracy (WGCapD) of the Committee on Earth Observation Satellites (CEOS) and with other programmes in areas of common or complementary interest.

#### Resources

VLab is an entity sustained by contributing CoEs and Satellite Operators. The technical support function is critical for the organization of online events and VLab coordination. Currently, VLab provides broad support to CoEs activities with its central website (<https://vlab.wmo.int/>) serving as a platform for collaboration and networking. The work of a dedicated Technical Support Officer (TSO), who also provides pedagogical advice to the VLab community, is mission-critical in this regard. VLab will seek to provide continuous instructional and technical support of its activities through the work of the TSO. However, this requires a long-term collaborative funding effort from CGMS Satellite Providers via the designated WMO VLab Trust Fund, as per section 5.2.3 of CGMS HLPP.

## Resolution 53 (Cg-18)

### FOUR-YEAR PLAN FOR WMO ACTIVITIES RELATED TO SPACE WEATHER 2020–2023

THE WORLD METEOROLOGICAL CONGRESS,

**Recalling** Resolution 38 (Cg-17) and Decision 33 (EC-68) – Four-year Plan for WMO Coordination of Space Weather Activities 2016-2019, and Decision 41 (EC-70) – Space weather linkage with the WMO Strategic Plan,

**Recognizing** the impact of space weather on areas such as observation and telecommunication infrastructures, aviation and maritime safety, energy distribution networks, and satellite-based navigation services,

**Having considered** the potential for synergy between the delivery of space weather services and meteorological services,

**Having considered also** that the planned WMO activities related to space weather 2020-2023 will continue, and the activities pursued by the Inter-programme Team on Space Weather Information, Systems and Services (IPT-SWeISS) will significantly expand and will include a transition from a demonstration stage to an operational implementation stage for several applications areas,

**Having noted** that the International Civil Aviation Organization (ICAO) has designated global space weather information providers for international air navigation and has, consequently, embarked on the implementation phase of the service, including all associated preparatory activities such as roles and responsibilities and handover procedures amongst the designated providers to become operational in late 2019, to be augmented by regional space weather information providers no later than November 2022,

**Acknowledging with appreciation** the excellent interagency cooperation and coordination between ICAO and WMO that is expected to continue in the period 2020-2023 and that such interagency arrangements demonstrate the key role of WMO in contributing to operational,



service-oriented areas such as aviation by providing a framework for building collaborative partnerships between the space weather science community and the meteorological community in support of the needs of aviation users and decision-makers,

**Adopts** the Four-year Plan for WMO Coordination of Space Weather Activities 2020-2023 (hereafter/thereafter FYP2020-23) as provided in [Cg-18/INF. 6.1\(5\)](#);

**Calls** Members to support the implementation of the FYP2020-23 with participation of experts and with in-kind and other contributions to the Space Weather Trust Fund;

**Requests** the Secretary-General:

- (1) To take appropriate action to facilitate the activities identified in the FYP2020-23 in partnership with relevant organizations such as the International Space Environment Service, as well as national and international agencies;
- (2) To submit to the Nineteenth World Meteorological Congress a report on the results achieved and a proposal for future activities in this domain.

### **Resolution 54 (Cg-18)**

#### **IMPLEMENTATION PLAN OF THE REGIONAL OPERATIONAL SUBPROJECT FOR SPACE-BASED MONITORING OF WEATHER AND CLIMATE EXTREMES IN EAST ASIA AND THE WESTERN PACIFIC**

THE WORLD METEOROLOGICAL CONGRESS,

**Recalling:**

- (1) Decision 6 (EC-69) – Monitoring Extreme Weather and Climate Events from Space,
- (2) Decision 36 (EC-70) – Development of the Space-based Weather and Climate Extremes Monitoring Demonstration Project,

**Having considered** the significant development and progress of the Space-based Weather and Climate Extremes Monitoring (SWCEM) Demonstration Project (SEMDP), from its concept to the first SEMDP regional subproject implemented in East Asia and Western Pacific in 2018, focusing on persistent heavy rainfall and drought, and involving two Global Satellite-derived Product Providers (JAXA, NOAA), three WMO Regional Climate Centres (RCC Beijing, SEARCC-Network, Pacific RCC-Network), and three NMHSs (Malaysia, Thailand, Vietnam). The participating RCCs and NMHSs recognized and appreciated the support from the Global Satellite-derived Product Providers,

**Having considered also** the importance of accurate and timely weather and climate extremes monitoring for Members and that, if successful, the concept of the SEMDP in East Asia and Western Pacific should be implemented throughout RA II and RA V and expanded to other WMO Regions, especially in developing countries,

**Having considered further** that the project was contributing significantly and in a very concrete way to capacity-building in the NMHSs through a better understanding and use of satellite-derived products together with ground-based observations,

**Further noting** that the project provided opportunities to improve interaction with Disaster Management and Civil Protection Authorities, thereby supporting the goal of increasing the visibility of NMHSs,

**Acknowledging with appreciation** the development of the Space-based Weather and Climate Extremes Monitoring (SWCEM) East Asia and Western Pacific regional operational subproject Implementation Plan (hereafter/thereafter referred to as "SWCEM IP") as provided in [Cg-18/INF. 6.1\(5\)](#),

**Noting** that the working mechanisms and responsibilities to implement this plan have been coordinated between the presidents of the Commission for Basic Systems and the Commission for Climatology to provide efficient oversight by these technical commissions,

**Adopts** the SWCEM IP;

**Endorses** its implementation from 1 January 2020;

**Requests** technical commissions and relevant regional associations:

- (1) To establish a consultative process to assist Members and relevant international organizations and programmes with the implementation of the SWCEM regional operational subproject implemented in East Asia and Western Pacific, as well as connecting with the existing activities, such as RA II WIGOS Project, RA V TT-SU (Task Team on Satellite Utilization) and AOMSUC (Asia/Oceania Meteorological Satellite Users' conference);
- (2) To develop an action plan for phased SWCEM implementation with strengthened end-user engagement;
- (3) To consider the possibility of implementing similar projects in Africa and South America;

**Requests** the Secretary-General to:

- (1) Provide the necessary assistance and Secretariat support for the implementation of SWCEM;
- (2) Submit to the Nineteenth World Meteorological Congress a report on the results achieved and a proposal for future activities in this domain;

**Invites** the relevant international organizations and programmes to contribute to and support the implementation of the SWCEM regional operational subproject in East Asia and Western Pacific.

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## **Resolution 55 (Cg-18)**

### **EMERGING DATA ISSUES**

THE WORLD METEOROLOGICAL CONGRESS,

**Recalling:**

- (1) Resolution 65 of (Cg-17) in which the Executive Council was requested to guide a review of emerging issues in data and its use, in order to provide clarity and guidance for Members in navigating the rapidly changing world of data and data technologies,
- (2) Decision 41 (EC-68) in which the Commission for Basic Systems was requested to lead, in coordination with other technical commissions, a review of the challenges and risks, opportunities and benefits related to big data, crowd-sourced data, social media as well

as emerging and future data sources, and their potential impact on Members, as the basis for production of a guidance document for Members,

**Noting with appreciation** that the report of the CBS-led Review of Emerging Data Issues, provided in full as [Cg-18/INF. 6.2\(1\)](#), and as executive summary in Annex 1 to Resolution 56 (hereafter referred to as "the review"), has been completed after revision by the Presidents of Technical Commissions and the Presidents of Regional Associations,

**Recognizing:**

- (1) The need for the WMO community, including all stakeholders and individuals contributing to WMO programmes, to work together in order to:
  - (a) Be better prepared to manage the challenges of emerging data issues, to address the risks and take advantage of the opportunities, and
  - (b) Ensure that no Member is left behind in their capability to source, access and extract the highest value from data and from investment in data-related technologies, for the benefit of society,
- (2) That the highly successful World Weather Watch (WWW) epitomizes a fundamental strength of WMO in relation to:
  - (a) Its public interest mandate and associated data sharing policies and principles,
  - (b) Its unique global science capability,
  - (c) Its core observing and data exchange infrastructure, standards, quality control and regulated practices,
  - (d) Its access to expert knowledge, and
  - (e) Its cascading global structure which is critical to ensuring all Members can access essential data and modelling products and that no Members are left behind,
- (3) That a compliance-based approach to data, especially to standards, technical regulations and data sharing arrangements, is a unique strength of WMO, which contributes directly to the collective performance of all Members;

**Recognizing further:**

- (1) That digital age disruption has already brought changes, challenges and opportunities to WMO and its Members and will continue to do so, particularly in relation to the application of data, insights from data analytics, data science and technology, data-driven science, partnership opportunities, and user expectations,
- (2) That harnessing the power of innovative, new data technology and investing in data-related capabilities, in a way that aligns with strategy and budget and is targeted at delivering greater impact and value, will ensure that meteorological and hydrological service providers can more efficiently and effectively serve their users, inform better decisions and return higher value,
- (3) That new data technologies will require us to interact with different players (than the traditional stakeholder groups),
- (4) The importance of a strategic approach to data, new data technologies and innovation across the WMO community, and the value of proactive engagement with the wider community of participants (people, organizations, sectors), and

- (5) The opportunity afforded by the convening power of WMO, especially in light of the constituent body reform and the WMO Strategic Plan 2020-23, to take a leadership role in facilitating the sharing of experiences, opportunities, achievements, plans and aspirations in relation to emerging data issues across the widest community,

**Reinforces** its commitment to the evolution of the WWW, via WIGOS, WIS 2.0 and seamless GDPFS, to reflect the challenges and opportunities of the 'data age';

**Requests** the Executive Council to consider the recommendations of the review and continue the evaluation of the emerging data issues and their implications on Members and weather enterprise as a whole;

**Requests** the Presidents of Technical Commissions:

- (1) To consider the recommendations in the report in ensuring that the next generation of WWW systems are fit for purpose for the evolving and increasingly disruptive data paradigm that WMO and its Members are facing; and
- (2) To prioritize the development of appropriate practical measures to monitor and assess a compliance-based approach to data, including identification of barriers to compliance, and related capacity development actions;
- (3) To establish an appropriate cross-cutting subsidiary body to continue the analysis of the emerging data issues and their impacts, including initiative coordinated activities and engaging in pilot project activities aligned with WIS2.0, and to develop further WMO guidance on the subject;
- (4) As part of the ongoing evaluation of emerging data issues, to consider new approaches to encourage sharing of commercially-sourced data, crowd-sourced data and social media data, in order to allow greater access to non-traditional sources of data or data not owned by governments, as well as to foster greater reciprocity within the WMO community;

**Requests** the Presidents of Regional Associations to promote the utilization of the review by Members and to contribute to the future study of data issues by providing relevant regional perspective and expertise;

**Requests** the Secretary-General:

- (1) To convene a global "WMO Data Conference" in 2020 if possible, or early in 2021 at the latest, as described in [Cg-18/INF. 6.2\(4\)](#), with the aim of exploring the evolution and sustainability of systems for the acquisition and exchange of meteorological data, including possible pathways toward establishing innovative modes of collaboration, and to provide input to ongoing WMO assessment and associated actions in relation to emerging data issues, with the participation of a broad range of stakeholders from the public, private and academic sectors;
- (2) To secure the resources necessary to convene the "WMO Data Conference";
- (3) To arrange for the translation and publication of the review into all WMO languages as a 'WMO Guidelines on Emerging Data Issues';

**Invites** Members to participate in coordinated initiatives, in collaboration with technical commissions and with stakeholders spanning public, private and academic sectors, to explore the potential to harness innovation and emerging technical opportunities and applications for the benefit of all.

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## Resolution 56 (Cg-18)

### DATA POLICIES AND PRACTICES

THE WORLD METEOROLOGICAL CONGRESS,

#### Recalling:

- (1) Resolution 40 (Cg-12) on the WMO policy and practice for the exchange of meteorological and related data and products including guidelines on relationships in commercial meteorological activities,
- (2) Resolution 25 (Cg-13) on the WMO policy and practice for the exchange of Hydrological data and products,
- (3) Resolution 60 (Cg-17) on the WMO Policy for the International Exchange of Climate Data and Products to Support the Implementation of the Global Framework for Climate Services,
- (4) Resolution 65 (Cg-17) in which the Executive Council was requested to guide a review of emerging issues in data and its use, in order to provide clarity and guidance for Members in navigating the rapidly changing world of data and data technologies,

**Noting with appreciation** that the report of the CBS-led Review of Emerging Data Issues, provided in full as [Cg-18/INF. 6.2\(1\)](#), and as executive summary in the annex (hereafter referred to as "the review"), has been completed after revision by Presidents of Technical Commissions and Presidents of Regional Associations,

**Noting** that the review highlights:

- (1) That meteorological and hydrological data are already amongst the most complex types of data to manage, being big, heterogeneous, dynamic and multi-dimensional, as well as inherently geospatial and multi-temporal,
- (2) That the global community of WMO, with its strong foundation of science, standards and data exchange, provides a singularly important alliance for Members through its regulatory basis and evolving technical structures in relation to data,
- (3) That the sustained open sharing of data, expertise and know-how, supported by the alignment of capacity development with needs and the WMO global cascading partnership of Members, are key to delivery of quality service outcomes at all levels and the principle that no Member is left behind,

#### Recognizing:

- (1) The changes occurring in the 'data landscape', with increasing diversity of observations and observing platforms, products and services that are dependent on sustained data availability and accessibility, as well as diversity of actors engaged in the provision of observations across public, private and academic sectors, and the diversity of business models for acquiring and sharing data,
- (2) That the sustainable operation of global NWP is dependent on access to prescribed data from all Members and that any data gaps impact on the performance and ongoing improvement of such models,
- (3) That the exponential increase over the last two decades in the availability of and dependence on satellite-based observations, as an essential data source for global NWP, has been a significant factor in improvements in characterizing, understanding and modelling the Earth system and in improving forecast skills, but that the existing WMO

data policies lack clarity in the importance and requirements for the sharing of remote sensing observations,

- (4) That the above factors impact Members' decisions on investments in observations and data sharing which necessitates further a review of WMO data policies and relevant implementation guidance.

**Requests** the Executive Council to:

- (1) Establish a process for the review of the WMO data policies and practices expressed in Resolution 40 (Cg-12), Resolution 25 (Cg-13) and Resolution 60 (Cg-17);
- (2) Report to the next session of Congress on the outcomes of the review, together with proposals of corrective measures for identified deficiencies which maintain the principle of free and unrestricted international exchange of data and products, and reflect on new requirements and opportunities, including the current and evolving observational data paradigm expressed in the CBS-led Review of Emerging Data Issues.

## **Annex to Resolutions 55 and 56 (Cg-18)**

### **Executive Summary of Review on Emerging Data Issues**

*[Full review is provided in [Cg-18/INF. 6.2\(1\)](#)]*

The CBS-Led Review of Emerging Data Issues draws on a wide range of source materials and experts, including material compiled by the technical commissions at the request of the President of WMO and ongoing discussions in Congress, the Executive Council, CBS and other technical commissions, and in working bodies associated with WIGOS, WIS, GDPFS and PWSD. The review responds to a range of concerns raised by Members related to their preparedness for the rapidly growing volume and diversity of data, their growing awareness of the potential of 'Big Data' analytics, new data technologies, such as internet of things (IoT), and of the new players active in providing data and services, the changing approaches to data sharing as the diversity of data sources and players has expanded, and the implications of greater capacity and agility for innovation by the private sector on the operation of the overall global weather enterprise.

The discussion and the framing of potential advice to bring back to Congress roams from evolution to revolution, including the need to strengthen the 'irreducible core' of WMO and its Members through reinforcing the essential role of the WWW; the aspiration that 'no Member will be left behind' and that 'no Member stands alone'; the need to engage, be inclusive and build alliances, especially between the public, private and academia sectors; the need to create and exploit opportunities through data; and the need to challenge traditional pathways while recognizing the important ongoing, though potentially changing, roles of people.

Emphasis is placed on harnessing the excellent work already being provided through the WMO response to data and technology, in particular through WIGOS, WIS/WIS2.0, GDPFS/S-GDPFS (which together are heralding WWW 2.0) and Service Delivery Strategy (SDS), on equipping Members with the essential tools and advice to adapt, adopt and respond to these opportunities, and on mobilizing WMO as a brand focussed on standardization, coordination and facilitation of a global community in the service of society. Recognizing that some Members are better equipped than others to manage the challenges of increasing data volumes and technical complexity, the review calls for practical steps to equalize capacity, guide decisions and extract genuine value from data for all Members.

The review converges around the important reminder that data is a means to an end, not an end in itself. It is only through its intelligent use in engaging with users and in the development and uptake of services and associated outcomes that meet societal needs, that

data delivers its full value, be it over the long term required for historical climate insight and impact management, the medium term for effective water and natural resource management and disaster preparedness, or over the shorter term to warn of, and support response to, impending severe weather events and disasters. The review provides a response framework featuring concrete actions centred on:

### **1. Thinking global**

- (a) Building on the fundamental role and strengths of WMO epitomized through its mandate and regulatory framework, its unique global science capacity, its global observing and data sharing policies and infrastructure, and its commitment to building capacity across all Members, and committing to implementing the next generation of WWW systems (WWW 2.0) that are fit-for-purpose for the evolving, and increasingly disruptive, data paradigm that WMO and its Members are experiencing;
- (b) Reinforcing the importance of a strategic approach to data and data sharing, and the leadership role and convening power of WMO in the overall global weather enterprise through proactive engagement and partnering with the wider community of participants, embracing the public and private sectors and academia, and through collaboration in reviewing the principles, policies and resolutions that underpin free and open sharing of meteorological and related data;
- (c) Supporting Members, through guidance material and the WMO cascading processes, on emerging data and supply chain decisions, including on defining national mandates and policies in relation to weather, climate and water data and services; and
- (d) Aligning WMO programmes and the working mechanisms of technical commissions and regional associations with due consideration to emerging data challenges, risks and opportunities.

### **2. Acting local**

- (a) Harnessing the power of Members, data and people to inform choices across national data and service delivery supply chains, and to extract the highest value from data and the best outcomes for national and regional communities;
- (b) Building partnerships with non-NMHS data providers to extend the coverage of observations, to collaborate in the design of networks and targeting of services and to harness their voice as advocates for sustained investment in national meteorological and hydrological infrastructure;
- (c) Investing in people and capabilities for the long term through identifying current and emerging skill requirements that enable Members to uniquely deliver user-valued benefits and sustainable outcomes through more effective use of data and management of data infrastructure, with a focus on diversity, inclusion and collaboration; and
- (d) Leveraging digital communications and social media to build productive two-way connections with provider and user communities, and to facilitate data crowd-sourcing.

### **3. Reaching out**

- (a) Embracing emerging opportunities in data, science, technologies and partnerships and harnessing the power of innovation and data-disruption, including through sharing experiences and participation in pilots and/or coordinated initiatives with partners across the global weather enterprise;

- (b) Implementing an innovation framework at the institutional level to identify and test new ideas aligned with priority needs and strategy, in the context of budget and capability; and
- (c) Reimagining what high-impact services might look like, including through expanding the concept of impact-based services into an integrated services approach, where publicly-funded-data is freely accessible and integrated with data from sector-based sources to develop more context-relevant and actionable services that directly inform and benefit users.

Emerging trends in data and data technologies offer the whole WMO community, individual WMO Members and the broader global weather enterprise, the challenge and the opportunity of new scientific and technological horizons. They challenge us to reimagine what efficient, effective and relevant services and service delivery could look like, how through working together in new and innovative ways we can better position ourselves for the future, and how genuine value can be delivered to society through and from data.

## **Resolution 57 (Cg-18)**

### **WMO INFORMATION SYSTEM: AMENDMENTS TO THE TECHNICAL REGULATIONS AND WIS 2.0 IMPLEMENTATION APPROACH**

THE WORLD METEOROLOGICAL CONGRESS,

#### **Recalling:**

- (1) Decision 17 (EC-70) relating to the review of the *Manual on the WMO Information System* (WMO-No.1060) and the *Guide to the WMO Information System* (WMO-No.1061),
- (2) Resolution 23 (EC-70) and Decision 18 (EC-70) relating to the development and implementation of WIS 2.0,
- (3) Decision 19 (EC-70) acknowledging strategies for WIGOS, WIS and the DPFS are built on an expectation of increased sharing of service provision by Members and that some Members are asking WMO to play a role in establishment and coordination of such services,

**Noting** that the Commission for Basic Systems (CBS) undertook a consultation process approved by the WMO President in consultation with the CBS President, with CBS Members notified by a circular letter on 29 November 2018 to review documents and issues presented to the CBS Technical Conference (CBS TECO 2018) (Geneva, Switzerland, 26-29 March 2018),

**Noting also** that some of the documents provided to CBS TECO 2018 were further reviewed by CBS expert teams and updated prior to the consultation process,

#### **Having reviewed:**

- (1) The [Recommendations of the Commission for Basic Systems relating to the WMO Information System](#),
- (2) The Statement from the WIS Workshop on Future Technologies (Geneva, 19 to 20 March 2019) provided in [Cg-18/INF. 6.2\(2\)](#),



**Adopts**, on the recommendations of the Commission for Basic Systems:

- (1) Amendments to the Technical Regulations on the operational management of Information and Communications Technology as provided in [Annex 1](#) of the present resolution;
- (2) Amendments to the Technical Regulations on the WIGOS Metadata Representation and WIS Information Management as provided in [Annex 2](#) of the present resolution;
- (3) The WMO Information System 2.0 Implementation Approach as provided in [Annex 3](#) of the present resolution;

**Authorizes** the Executive Council to make decisions on WIS 2.0 during its development and implementation, including the use of shared services contractually managed by the Secretariat;

**Requests** the Secretary-General to publish the amendments to the Technical Regulations and associated guidance material recommended by CBS;

**Urges** Members:

- (1) To promulgate the value-added benefits of WIS 2.0 and participate proactively in the WIS 2.0 development and implementation process;
- (2) To support the WIS project office, through secondments and additional funding to the WIS Trust Fund;
- (3) To consider provision of additional resources necessary for the development and implementation of WIS 2.0 facilitating the evolution of Data Processing and Forecast Systems and Public Weather Services and the making of WIGOS to be fully operational.

### **Annexes to Resolution 57 (Cg-18)**

**Annex 1:** [Cg-18-d06-2\(2\)](#) – Operational Management of Information and Communications Technology,

**Annex 2:** [Cg-18-d06-2\(2\)](#) - WIGOS Metadata Representation and WIS Information Management,

**Annex 3:** [Cg-18-d06-2\(2\)](#) - WMO Information System 2.0 Implementation Approach.

*Editor's note:* The links above were used by the delegates for the approval of the amendments/draft new edition. The final publication, issued after the eighteenth session of Congress, will be posted on the WMO library site at <https://public.wmo.int/en/resources/library>.

### **Resolution 58 (Cg-18)**

#### **FUTURE INTEGRATED SEAMLESS GLOBAL DATA PROCESSING AND FORECASTING SYSTEM COLLABORATIVE FRAMEWORK**

THE WORLD METEOROLOGICAL CONGRESS,

**Recalling** Resolution 11 (Cg-17) – Towards a future enhanced integrated and Seamless WMO Data-processing and Forecasting System, through which Congress:

- (1) Decided to initiate a process for the gradual establishment of an enhanced integrated and Seamless WMO Data-processing and Forecasting System,
- (2) Requested the Executive Council to formulate Terms of Reference for this process, and a description of the set of products the system should produce for consideration by Cg-18,

**Noting** the Recommendation 15 (EC-70) endorsing the overall approach taken for the development of the seamless GDPFS (S/GDPFS) implementation plan and the subsequent work of the EC in developing the draft S/GDPFS Collaborative Framework (see [Cg-18/INF. 6.3\(1\)](#)),

**Noting further** the wide consultation, subsequent to EC-70, with Members, RAs and TCs on the draft Collaborative Framework of S/GDPFS,

**Having examined** the Executive Summary of the Collaborative Framework for Seamless GDPFS, recommendations therein of the World Meteorological Centres Workshop in Beijing, the People's Republic of China (26-29 March 2019) and the proposed key priority areas for S/GDPFS as provided in the annex,

**Acknowledging** that seamless GDPFS will contribute to the realization of Long-term Goal 2 (Enhance Earth system observations and predictions) and Long-term Goal 3 (Advance targeted research) through Strategic Objective 2.3 (Enable access and use of numerical analysis and Earth system prediction products at all temporal and spatial scales from the WMO seamless Global Data Processing and Forecasting System) and Strategic Objective 3.1 (Advance scientific knowledge of the Earth system) defined in the WMO Strategic Plan (Resolution 1 (Cg-18)),

**Decides to** endorse the recommendations and key priority areas described in the annex;

**Requests:**

- (1) The Executive Council to continue to oversee the implementation of S/GDPFS and report on progress;
- (2) The Technical Commissions, Research Board, Regional Associations and other WMO bodies to continue their effective collaboration in order to fully accommodate the cross-sectorial nature of S/GDPFS, to reflect this effort in their work plans, and to ensure implementation with respect to the WMO Quality Management System (QMS);
- (3) The Secretary-General to facilitate the implementation and strengthen coordination and collaboration with partner organizations;

**Urges** Members to develop pilot projects identified in the S/GDPFS Collaborative Framework (see [Cg-18/INF. 6.3\(1\)](#)) as elements of the Implementation Plan.

## **Annex to Resolution 58 (Cg-18)**

### **Executive Summary of the Collaborative Framework for Seamless GDPFS**

#### **1. Main action areas and key priorities**

Since the adoption of Resolution 11 (Cg-17), a number of important activities were held in relation to the development of the Seamless GDPFS. The Executive Council Seamless GDPFS Steering Group's Drafting Team for the S/GDPFS Implementation Plan, composed of representatives from Technical Commissions (including CAS) and Regional Associations, identified **three main action areas and key priorities**: system and services, research and innovation, and accessibility and web platform.

### 1.1 System and services

- (a) The operational predictive capability of the future S/GDPFS will be integrated across multiple time and space scales from weather to climate and will address a broader spectrum of user needs, recognizing that this requires an Earth System modelling approach. The future S/GDPFS will be able to exchange and use data from a variety of sources, including vulnerability and exposure data to facilitate impact-based forecasting and risk-based warnings across different disciplines. Interoperability will also require the development of common data formats for new technologies. The future S/GDPFS will benefit from a higher level of coordination internally (for the integration and interaction of individual components - WMC, RSMC, NMC), other WMO systems (e.g. the GFCS – Climate Services Information System) and with external agencies and organizations;
- (b) Key priority areas: Enhancement of the Quality Management System and a strengthening of the coordination mechanism among WMCs and WMCs/RSMCs;

### 1.2 Research and Innovation

- (a) The research and innovation component of S/GDPFS will strengthen the science linkages among compartments of the Earth system to allow the development of novel operational products, exploit predictability on all time-space scales, adapt to emerging technologies, and promote socioeconomic research within the Earth system enterprise value cycle (Seamless Earth System Prediction). Reliable access to quality-controlled global data and models for research purposes is essential, through a 2-way approach where research can contribute and beta test new modelling capabilities. A well-established rolling review to understand user requirements is also essential. The research and innovation component will be focused on delivering the required scientific advances through the following actions:
  - Implement a value cycle approach to set research priorities, using knowledge of predictability to focus research efforts in areas where success is expected;
  - Co-design operational projects that rely on research advances;
  - Develop an integrated approach for research programmes spanning weather, climate, water and the environment;
  - Engage with research funding agencies;
- (b) Key priority areas: Development and implementation of a Rolling Review of Requirements (involving the Working Group on Numerical Experimentation (WGNE)); Strengthening the link with the Research Board and Research Programmes; Design of pilot projects to be prioritized and endorsed by EC;

### 1.3 Accessibility and Web platform

- (a) The accessibility of data, products and services from the S/GDPFS will be complemented and facilitated by the future plans for the federated WMO Information System (WIS 2.0). Meanwhile, users expect to access weather, water and climate information and services through the same mechanisms that they use for other types of information, using familiar interfaces and applications. They also wish to combine mobile, cloud and social media technologies to access a wider range of information sources and to collaborate in new and different ways. Common data sharing platforms and technology are a prerequisite. The system will provide access to data, models, products and software packages in a user-friendly manner, ensuring interoperability and integration with other systems, geospatial reference data, metadata and advanced standards and documentation. Technological aspects such as federated nodes and bandwidth issues will be considered and linked to WIS

development, while S/GDPFS will implement those parts not implemented by other WMO initiatives. The whole S/GDPFS infrastructure will be visible and easy to identify. A dedicated effort and investment in software infrastructure will produce web tools for handling data and creating on-demand products based on core requirements; the maintenance of metadata and infrastructure will be clarified in collaboration with WIS and WIGOS;

- (b) Key priority areas: Identification of S/GDPFS requirements to WIS 2.0; Benchmark of LDCs and SIDS' access to data and information through pilots;

## **2. Recommendations from the World Meteorological Centres' Workshop**

Recalling Decision 40 (EC-70) to hold a WMCs Workshop involving operations and research to ensure collaboration among the centres and the development of new initiatives to support Members, specially LDCs and SIDS, the first meeting of the WMCs (26-29 March 2019, Beijing, People's Republic of China), developed the following recommendations to advance the implementation of the S/GDPFS;

### **2.1 Develop the Rolling Review of Requirements (RRR)**

- (a) The starting point for the implementation process will be the development of a Rolling Review of User Requirements. This process will reflect on lessons learned from the Rolling Review within WIGOS, and take advantage of the broad ecosystem of stakeholder interaction that is already in place in the Regional Associations and Technical Commissions, including the Global Framework for Climate Services, the Public Weather Services programme, and the Commission for Hydrology;
- (b) While the targeted users within the cascading process of the GDPFS would be the National Meteorological and Hydrological Services, the RRR must ultimately consider the needs of the final beneficiaries being served by the NMHSs. It is these beneficiaries, such as humanitarian agencies, that require services that are seamless in time and in discipline within the S/GDPFS;

### **2.2 Ensure Co-design of the S/GDPFS between research and operations**

- (a) The relationship between research and operations within the S/GDPFS must be very close, and the development of products and services must be done jointly, and must involve the user (as per recommendation 2.1). Ideally, research priorities will be shaped by operational needs; solutions to user requirements will take advantage of research innovations, and the knowledge and technological transfer will be conducted jointly. Best management practices should be developed based on existing experiences and challenges documented from WMCs, regional associations, and Members, as well as experiences from previous and future research and forecast demonstration projects (including Severe Weather Forecast Demonstration Projects (SWFDPs)). Also identified was the benefit of attracting universities into SWFDPs. Ultimately, extending an operational link into the Working Group on Numerical Experimentation was seen as an effective way of taking advantage of an existing coordination mechanism to help coordinate co-design within the S/GDPFS;

### **2.3 Coordinate with WIS 2.0 to enable accessibility of products and services**

- (a) The WMCs Workshop provided an excellent opportunity to identify priority activities within the WIS 2.0 planning that will facilitate accessibility within the S/GDPFS, and assist LDCs and SIDS in overcoming some of the challenges related to limited bandwidth;
- (b) The following initiatives were identified as a priority:

- Services using Web Application Programming Interface (API) (e.g. interactive maps, tools to do data selection and operations on data) will be exposed through URLs;
- Use of open standards to enable interoperability on the web;
- Use of the cloud to run processing closer to the data to avoid moving big data (note that remote processing of data residing in different clouds remains a challenge that will require interoperability between clouds);
- New message queuing technologies in GTS are a flexible way to exchange observations and products;

#### 2.4 Ensure capacity development mechanisms for NMHSs in LDCs and SIDS

- (a) The development of business models to support Members is required, with a priority on serving LDCs/SIDS. While it is recognized that business models may be different from one country to another due to unique economical and technical conditions, a sustainable plan needs to be developed for each country. These should leverage the existing WMO Country Support Initiative, and learn from the creation of a catalogue of existing support mechanisms:
- Data, products and services;
  - Training and development;
  - Infrastructure;
  - Management practices;
  - Other ongoing support/advice;
  - Pilots or test-beds, RCOPS, or SWFDPs;

#### 2.5 Ensure there are adequate coordination mechanisms between WMCs/RMSCs to support Members

- (a) As the user requirement process evolves, sustainable and well-defined coordination mechanisms will be required that enable effective communication between WMCs and WMCs/RSMCs. There are already some effective coordination mechanisms in place, including the SWFDPs and the WGNE that can be adapted. Some suggested actions were identified to facilitate coordination:
- Develop catalogues of products and services, and share on-going activities;
  - Ensure that the types of products are consistent for interoperability reasons;
  - Enhance/develop the quality assurance process of products and services;
  - Collaborate to produce multi-model products (e.g. TIGGE);

#### 2.6 Take advantage of low-hanging fruit; identify appropriate existing and planned test-beds and pilot projects to facilitate implementation

- (a) In order to ensure resources are used effectively, it is recommended that criteria need to be developed and used as the basis for initiating and ranking pilot projects. Projects should have clearly articulated outcomes, and well-defined strategies for determining their conclusion or conditions for sustained implementation.

Furthermore, project-management guidelines should be developed to ensure consistent development of proposals;

- (b) Some of the criteria that should be considered include the use of a rolling-review of user requirements to identify priority needs of NMHSs and end-users; the testing of the elements and measuring the outcomes of a Seamless GDPFS initiative; or the development of an effective and sustainable coordination mechanism within regions, and among WMCs, RSMCs and SWFDPs;
- (c) A list of examples of existing and potential future pilot projects is available in [Cg-18/INF. 6.3\(1\)](#);

*[Comment: two additional recommendations added as discussed at the WMCs workshop and at the CBS-MG-17 (May 2019)]*

## 2.7 Develop regulations and guidance for the use of community data formats

- (a) The use of community data formats is considered important to reduce the barriers to data operational exchange, to improve the research to operations (R2O) process and to reach the wider communities involved in the use and production of data for Seamless GDPFS. However community data formats don't have a governance level and a standardisation sufficient to satisfy the requirements of interoperability or long-term archiving and are not suitable for operational exchange;
- (b) The development of a collaborative framework with the communities maintaining those data formats, in particular netCDF and CF conventions, is needed in order to allow the evolution of such formats suitable for Seamless GDPFS purposes. Moreover the development of regulations and guidance is necessary to allow the required operational levels and interoperability between systems;

## 2.8 Strengthen the quality management system

- (a) Since the products and information provided from S/GDPFS will be used for decision making, their quality must be ensured. The Manual on GDPFS (WMO-No. 485) has been thoroughly reviewed to fit into the WMO quality management framework;
  - (b) The scope of GDPFS now goes beyond the World Weather Watch Programme and new types of RSMCs are being established. It is anticipated that requests from Members for a GDPFS centre designation will increase. To ensure the quality of products and activities of the centres, a quality management system should be established and strengthened within S/GDPFS, especially in the following areas:
    - Review and development of standard verification methods;
    - Development and implementation of regular compliance audits of the centres;
    - Review and development of an efficient reporting mechanism on S/GDPFS and related research activities at national level.
-

## **Resolution 59 (Cg-18)**

### **AMENDMENTS TO THE MANUAL ON THE GLOBAL DATA-PROCESSING AND FORECASTING SYSTEM (WMO-No. 485)**

THE WORLD METEOROLOGICAL CONGRESS,

**Recalling:**

- (1) Resolution 6 (Cg-XVI) – The World Meteorological Congress agreed that the Revised *Manual on the Global Data-processing and Forecasting System* (WMO-No. 485) is the single source of technical regulations for all operational data-processing and forecasting systems operated by WMO Members, including its designated centres,
- (2) Resolution 18 (EC-69) - approval for the publication of the revised [Manual on GDPFS \(WMO-No. 485\)](#) including the addition of new types of centres. The Manual was effectively published on 16 February 2018 and entered into force 16 November 2018,
- (3) Resolution 12 (Cg-17), which endorsed the transition arrangements (Recommendation 3 (CBS-Ext.(2014))), in particular that existing Regional Specialized Meteorological Centres (RSMCs), once they have mapped themselves onto new types of centres, will retain their status until the Eighteenth World Meteorological Congress in 2019 (Cg-18); and, to retain their status after Cg-18, they will need to have demonstrated compliance by the date of Cg-18,

**Noting** with satisfaction the number of new designated centres following the revision of the Manual on GDPFS, in particular the designation of 6 new World Meteorological Centres, bringing their number to nine,

**Noting further with satisfaction** the first workshop of WMCs hosted by the People's Republic of China in March 2019, where the contribution of the WMCs to the implementation plan of seamless GDPFS and the coordination mechanism among centres as well as the development of new initiatives to support Members especially LDCs and SIDS were discussed pursuant to Decision 40 (EC-70),

**Recognizing that** a number of Members still have to map their centres onto the new types of centres and demonstrate compliance, therefore not being able to address Resolution 12 (Cg-17),

**Recognizing further** that the Centres' audit mechanism still needs to be developed,

**Having examined** the following Recommendations from:

- (1) The Commission for Basic Systems (CBS):
  - (a) For the formal designation of new WMC and RSMCs and their inclusion in Part III of the Manual on GDPFS as per Annex 1:
    - (i) RSMC for non-nuclear emergency response: Montreal (Canada),
    - (ii) RSMC for severe weather forecasting: Dakar (Senegal), Dar-es-Salam (United Republic of Tanzania) and Nairobi (Kenya),
  - (b) To amend the list of RSMCs with geographical specialization to reflect the centres that have already mapped and demonstrated compliance as per Annex 1,

- (c) To amend the section of the GDPFS Manual on "Annual to decadal climate prediction" as per Annex 2, to redirect the current link to the Appendix to the appropriate one,
  - (d) To amend the section of the GDPFS Manual on " Nuclear and Non-nuclear environmental emergency response" including Appendix 2.2.27, Appendix 2.2.28, Appendix 2.2.29 and Attachment 2.2.5 as per Annex 3 to clearly define the functionalities and to reflect technical advancement,
  - (e) To amend the section of the GDPFS Manual on "Atmospheric sandstorm and dust storm forecasts" including Appendix 2.2.23 as per Annex 4, to clarify the terms of sandstorm and dust storm,
- (2) The Joint WMO/IOC Technical Commission on Oceanography and Marine Meteorology (JCOMM):
- (a) For the formal designation of a new RSMC and its inclusion in Part III of the Manual on GDPFS as per Annex 1 to this resolution:
    - RSMC for Numerical Ocean Wave Prediction: Melbourne (Australia),
  - (b) To amend the section of the Manual on "Numerical ocean wave prediction" and on "coordination of wave forecast verification" as per Annex 5 to update bodies responsible for the designation of relevant centres,
  - (c) To add Appendix 2.2.39 and 2.2.40 to the Manual on GDPFS as per Annex 6 in order to specify mandatory products and standardized verification of marine meteorological services,
- (3) The Commission for Aeronautical Meteorology (CAeM):
- (a) Replace in Part III of the Manual: "RSMC for Volcano watch service for international air navigation" by "ICAO designated Volcanic Ash Advisory Centres" and add the following VAAC as per Annex 1:
    - VAAC Anchorage,
    - VAAC Buenos Aires (co-located with RSMC Buenos Aires),
    - VAAC Darwin (co-located with RSMC Melbourne),
    - VAAC London (co-located with RSMC Exeter),
    - VAAC Montreal (co-located with RSMC Montreal),
    - VAAC Tokyo (co-located with RSMC Tokyo),
    - VAAC Toulouse (co-located with RSMC Toulouse),
    - VAAC Washington (co-located with RSMC Washington),
    - VAAC Wellington (co-located with RSMC Wellington),
  - (b) To amend the section of the Manual related to "Volcano watch services for international air navigation" as per Annex 7 to clearly express the role of ICAO for this service,
- (4) The Commission for Climatology (CCI):
- (a) For the formal designation of a new RCC and its inclusion in Part III of the *Manual on GDPFS* as per Annex 1 to this resolution:
    - Regional climate prediction and monitoring: Washington (United States of America)

**Approves** the above recommendations;



**Decides** to extend the transition arrangement for centres to map themselves onto the new types of centres and to demonstrate compliance with the designation criteria in the revised Manual on GDPFS, to Cg-19 (2023);

**Authorizes** the Secretary-General, in consultation with the presidents of technical commissions concerned to make editorial amendments to the revised *Manual on the Global Data-processing and Forecasting System* (WMO-No. 485);

**Requests** the Secretary-General, in consultation with the technical commissions, to facilitate the development and implementation of the Centres' audit mechanism;

**Urges** Members who have not completed the mapping of their centres, especially those hosting a RSMC with a geographical specialization and those who have completed it but have not yet demonstrated compliance, to take action as soon as possible to complete the process for demonstrating compliance and to retain their status according to the new designations. In order to complete the process a formal application with supporting documentation should be sent to the Secretary-General for assessment and formal designation if appropriate. The application process is available at the following link: [Designation Process for GDPFS Centres pdf](#)

## Annex 1 to Resolution 59 (Cg-18)

### AMENDMENT TO THE MANUAL ON THE GLOBAL DATA-PROCESSING AND FORECASTING SYSTEM (WMO-NO. 485) CONCERNING DESIGNATION OF CENTRES

#### PART III. CURRENT DESIGNATED GLOBAL DATA-PROCESSING AND FORECASTING SYSTEM CENTRES

**1. The Regional Specialized Meteorological Centres with geographical specialization are located at:**

Algiers	<del>Khabarovsk</del>	<del>Pretoria</del>
<del>Beijing</del>	Melbourne	<del>Rome</del>
Brasilia	Miami	Tashkent
Buenos Aires	<del>Montreal</del>	<del>Tokyo</del>
Cairo	<del>Moscow</del>	Tunis/Casablanca
<del>Dakar</del>	<del>Nairobi</del>	<del>Washington</del>
Darwin	New Delhi	<del>Wellington</del>
<del>Exeter</del>	<del>Novosibirsk</del>	
Jeddah	<del>Offenbach</del>	

Note: The name of centre was deleted to reflect the centre that has already mapped itself into a new type of centre and has demonstrated compliance

**2. The Regional Specialized Meteorological Centres for specialized activities are the following:**

.....

Provision of atmospheric sand ~~storm~~ and dust storm forecasts:

- RSMC-ASDF Barcelona
- RSMC-ASDF Beijing (RA II)

Provision of atmospheric transport and dispersion modelling (for environmental emergency response and/or backtracking) – Non-nuclear:

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----- RSMC Montreal

Provision of severe weather forecasting:

.....

----- RSMC Dakar  
RSMC Dar-es-Salam  
RSMC Nairobi

Provision of numerical ocean wave prediction:

.....

----- RSMC Melbourne

ICAO designated Volcanic Ash Advisory Centres (VAAC) responsible for the Provision of volcano watch services for international air navigation:

----- RSMC Tokyo

- ---- VAAC Anchorage
- ---- VAAC Buenos Aires (co-located with RSMC Buenos Aires)
- ---- VAAC Darwin (co-located with RSMC Melbourne)
- ---- VAAC London (co-located with RSMC Exeter)
- ---- VAAC Montreal (co-located with RSMC Montreal)
- ---- VAAC Tokyo (co-located with RSMC Tokyo)
- ---- VAAC Toulouse (co-located with RSMC Toulouse)
- ---- VAAC Washington (co-located with RSMC Washington)
- ---- VAAC Wellington (co-located with RSMC Wellington)

Regional climate prediction and monitoring:

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----- RCC Washington (RA IV)

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## **Annex 2 to Resolution 59 (Cg-18)**

### **AMENDMENT TO THE MANUAL ON THE GLOBAL DATA-PROCESSING AND FORECASTING SYSTEM (WMO-NO. 485) CONCERNING ANNUAL TO DECADAL CLIMATE PREDICTION**

#### **2.2.2.3 Annual to decadal climate prediction**

Centres conducting annual to decadal climate prediction (GPCs for annual to decadal climate prediction (GPCs-ADCP)) shall:

- (a) Prepare, with at least annual frequency, global forecast fields of parameters relevant to ADCP;

- (b) Prepare verification statistics as defined in Appendix 2.2.21;
- (c) Provide an agreed set of forecast and hindcast variables (as defined in ~~Appendix 2.2.21~~ Appendix 2.2.20) to the Lead Centre(s) for ADCP;

### **Annex 3 to Resolution 59 (Cg-18)**

#### **AMENDMENT TO THE MANUAL ON THE GLOBAL DATA-PROCESSING AND FORECASTING SYSTEM (WMO-NO. 485) CONCERNING NUCLEAR AND NON-NUCLEAR EMERGENCY RESPONSE**

##### **2.2.2.8 Non-nuclear environmental emergency response**

Note: This activity includes a network of regional centres and NMCs within a geographical region.

Centres conducting a non-nuclear ~~nuclear environmental~~ environmental emergency response shall:

.....

- (d) Make available on a website up-to-date information on the characteristics of their ATDM systems (minimum information to be provided is given in Appendix 2.2.31) and a user interpretation guide for ATDM products ~~(Attachment 2.2.5)~~.

Note: The bodies in charge of managing the information contained in the present Manual related to non-nuclear environmental emergency response are specified in Table 17.

Table 17. WMO bodies responsible for managing information related to non-nuclear environmental emergency response

##### **APPENDIX 2.2.27. SPECIFICATIONS FOR SUPPORT TO THE COMPREHENSIVE NUCLEAR-TEST-BAN TREATY ORGANIZATION**

The specifications for the backtracking are as follows:

- Simulate a release of  $1.3 \times 10^{15}$  Bq of a tracer integrated backward in time (no deposition, no decay) at a constant rate at the point of the station location from surface to 30 m from measurement stop to measurement start.
- Calculate the respective (backward) tracer concentrations in  $\text{Bq m}^{-3}$  at a global  $1^\circ \times 1^\circ$  or  $0.5^\circ \times 0.5^\circ$  grid, with an output frequency of three hours, time average of output three hours, from surface to 30 m.

##### **APPENDIX 2.2.28. ACTIVATION OF SUPPORT FOR NON-NUCLEAR ENVIRONMENTAL EMERGENCY RESPONSE**

Environmental emergencies can be caused by a broad range of events with various temporal and spatial scales involving the release of hazardous substances into the environment. The scope of non-nuclear emergency response activities includes: smoke from large fires, chemical releases and industrial fire/smoke, ~~emissions from volcanic eruptions (excluding those service arrangements covered by 2.2.2.10 – Volcano watch services for international air navigation) and large chemical releases~~. Atmospheric ~~s~~Sand and ~~d~~Dust storm forecasts are covered under activity 2.2.2.9. ~~Ash emitted by volcanic eruptions, relating to aviation, is covered under activity 2.2.2.10 – Volcano watch services for international air navigation.~~

National Meteorological and Hydrological Services may request RSMC support for releases that have the potential for large-scale (that is, mesoscale) and/or long-duration (hours to days) impacts, according to the capability of the RSMC. RSMC products are typically not applicable for shorter range incidents. RSMCs may be able to provide services for other types of incidents on a case-by-case basis. RSMCs will advise NMHSs if requests are not within their capabilities.

#### **APPENDIX 2.2.29. MANDATORY ~~LIST OF NON-NUCLEAR ENVIRONMENTAL EMERGENCY RESPONSE PRODUCTS AND GENERAL RULES FOR DISPLAYING PRODUCTS (NON-NUCLEAR)~~**

1. .... The following ~~list of~~ mandatory non-nuclear ~~responses-products~~ shall be provided:

- Smoke from forest, grass or peat fires (default values in Appendix 2.2.~~320~~) shall be used for source parameters not provided):
  - Forecast duration 36 hours;
  - Relative concentrations from the surface to 200 m;<sup>13</sup>
  - Images at intervals of one, three or six hours;<sup>14</sup>
  - Contouring to be determined based on specifics of the event or the request;
- Smoke from industrial fire (default values for parameters not provided):
  - Forecast duration 12 hours;
  - Relative concentrations from the surface to 200 m;<sup>1</sup>
  - Images at intervals of one or three hours;<sup>2</sup>
  - Contouring to be determined based on specifics of the event or the request;
- Chemical releases not involving fire (default values for parameters not provided):
  - Forecast duration 12 hours;
  - Relative concentrations from the surface to 100 m;<sup>1</sup>
  - Images at intervals of one or three hours;<sup>2</sup>
  - Contouring to be determined based on specifics of the event or the request.

~~All products shall be displayed following the general rules, as listed in Attachment 2.2.5.~~

The RSMC shall perform a quick assessment of the products before they are issued, and shall provide a short explanatory message if any issues of concern are noted.

2. .... General rules for displaying results

The designated centres will make available in Documentation on RSMC Support for Environmental Emergency Response (WMO/TD-No. 778) on the WMO Emergency Response Activities website, an interpretation guide for users.

To make the interpretation of the maps easier, the producing centres should adopt the following guidelines:

General guidelines for all maps:

- (a) Provide labelled latitude and longitude lines at regular intervals and sufficient geographic map background (shorelines, ~~country borders~~, rivers, and the lake, and possibly roads

<sup>13</sup> Absolute concentrations may be provided if an estimated or actual value of the total mass released or mass release rate is given.

<sup>14</sup> Additional products (for example, GIS-format files) may be provided to requesting NMHSs if possible.

and town names for localized events) to be able to locate precisely the trajectories and contours;

- (b) Indicate the source location with a highly visible symbol (▲, ●, ■, etc.);
- (c) Indicate the source location in decimal degrees (latitude – N or S specified, longitude – E or W specified, plotting symbol used), date and time (UTC) of release, and the meteorological model initialization date and time (UTC);
- (d) Each set of maps should be uniquely identified by at least product issue date and time (UTC) and issuing centre;
- (e) Previously transmitted products from the dispersion model need not be retransmitted;
- (f) Indicate with a legend if this is an exercise or a requested service.

Specific guidelines for concentration maps:

- (a) Adopt a maximum of five concentration contours;
- (b) A legend should indicate contours used on the chart;
- (c) Contours may be colour filled but should be clearly distinguishable from map background lines;
- (d) Indicate the following input characteristics:
  - (i) Source assumption (height, duration, pollutant type, amount released);
  - (ii) Units of concentration;
- (e) In addition, charts should specify:
  - (i) "Surface to xxx-metre layer concentrations", where xxx depends on the pollutant type, and whether the default source is used;
  - (ii) "Results based on default initial values";
- (f) Indicate, if possible, the location of the maximum concentration with a symbol on the map and include a legend indicating the symbol used and the maximum numerical value;
- (g) Indicate the start and end date and time (UTC).

#### **~~ATTACHMENT 2.2.5. USER INTERPRETATION GUIDE FOR NON-NUCLEAR ATMOSPHERIC TRANSPORT AND DISPERSION MODELLING PRODUCTS PROVIDED BY REGIONAL SPECIALIZED METEOROLOGICAL CENTRES~~**

~~The designated centres will make available in Documentation on RSMC Support for Environmental Emergency Response (WMO/TD-No. 778) on the WMO Emergency Response Activities website an interpretation guide for users.~~

~~General rules for displaying results:~~

~~To make the interpretation of the maps easier, the Producing Centres should adopt the following guidelines:~~

~~General guidelines for all maps:~~

- ~~(a) Provide labelled latitude and longitude lines at regular intervals and sufficient geographic map background (shorelines, country borders, rivers, and the like, and possibly roads and town names for localized events) to be able to locate precisely the trajectories and contours;~~

~~(b) Indicate the source location with a highly visible symbol (▲, ●, ■, etc.);~~

~~(c) Indicate the source location in decimal degrees (latitude N or S specified, longitude E or W specified, plotting symbol used), date and time (UTC) of release, and the meteorological model initialization date and time (UTC);~~

~~(d) Each set of maps should be uniquely identified by at least product issue date and time (UTC) and issuing centre;~~

~~(e) Previously transmitted products from the dispersion model need not be retransmitted;~~

~~(f) Indicate with a legend if this is an exercise or a requested service;~~

~~Specific guidelines for concentration maps:~~

~~(a) Adopt a maximum of five concentration contours;~~

~~(b) A legend should indicate contours used on the chart;~~

~~(c) Contours may be colour filled but should be clearly distinguishable from map background lines;~~

~~(d) Indicate the following input characteristics:~~

~~(i) Source assumption (height, duration, pollutant type, amount released);~~

~~(ii) Units of concentration;~~

~~(e) In addition, charts should specify:~~

~~(i) "Surface to xxx metre layer concentrations", where xxx depends on the pollutant type, and whether the default source is used;~~

~~(ii) "Results based on default initial values";~~

~~(f) Indicate, if possible, the location of the maximum concentration with a symbol on the map and include a legend indicating the symbol used and the maximum numerical value;~~

~~(g) Indicate the start and end date and time (UTC);~~

~~Specific guidelines for back trajectory maps:~~

~~(a) Distinguish each trajectory (levels chosen will depend on the specifics of the event or the request) with a symbol (▲, ●, ■, etc.) at synoptic hours (UTC);~~

~~(b) Use solid lines (darker than map background lines) for each trajectory;~~

~~Provide a time-height (m or hPa) diagram, preferably directly below the trajectory map, to indicate vertical movement of trajectory parcels;~~

~~The RSMCs will distribute their standard products to the NMHS operational contact points by email or enable retrieval by the NMHS from an RSMC password-protected designated website. Standard products in the ITU-T T.4 format suitable for group 3 facsimile machines will be maintained by exception and only if requested by the NMHS operational contact point. The RSMC may also make use of other appropriate technologies;~~

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### Annex 4 to Resolution 59 (Cg-18)

#### AMENDMENT TO THE MANUAL ON THE GLOBAL DATA-PROCESSING AND FORECASTING SYSTEM (WMO-NO. 485) CONCERNING SAND AND DUST STORMS

##### 1.1.2 Activities supported by the Global Data-processing and Forecasting System

1.1.2.2 The Global Data-processing and Forecasting System shall be organized as a three-tier system of activities as follows:

(b) Specialized activities:

- Atmospheric sand~~storm~~ and dust~~\_storm~~ forecasts

##### 2.2.2.9 Atmospheric sand~~storm~~ and dust~~\_storm~~ forecasts

Centres conducting atmospheric sand~~storm~~ and dust~~\_storm~~ forecasts shall:

- (b) Prepare limited-area analyses of variables relevant to atmospheric sand~~storms~~ and dust storms;
- (c) Prepare limited-area forecast fields of variables relevant to atmospheric sand~~storms~~ and dust~~\_storms~~;

Note: The bodies in charge of managing the information contained in the present Manual related to atmospheric sand~~storm~~ and dust~~\_storm~~ forecasts are specified in Table 18.

#### Table 18. WMO bodies responsible for managing information related to atmospheric sand~~storm~~ and dust~~\_storm~~ forecasts

#### APPENDIX 2.2.33. MANDATORY ATMOSPHERIC SAND~~STORM~~ AND DUST~~\_STORM~~ PRODUCTS TO BE MADE AVAILABLE ON THE WMO INFORMATION SYSTEM

### Annex 5 to Resolution 59 (Cg-18)

#### AMENDMENT TO THE MANUAL ON THE GLOBAL DATA-PROCESSING AND FORECASTING SYSTEM (WMO-NO. 485) CONCERNING NUMERICAL OCEAN WAVE PREDICTION AND COORDINATION OF WAVE FORECAST VERIFICATION

##### 2.2.1.6 Numerical ocean wave prediction

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#### Table 7. WMO bodies responsible for managing information related to numerical ocean wave prediction

<i>Responsibility</i>			
<i>Changes to activity specification</i>			
To be proposed by:	JCOMM/ET- <del>WCH</del> DRR		
To be recommended by:	CBS	JCOMM	
To be decided by:	EC/Congress		
<i>Centres designation</i>			
To be recommended by:	RA	CBS	JCOMM
To be decided by:	EC/Congress		
<i>Compliance</i>			
To be monitored by:	JCOMM/ET- <del>WCH</del> DRR		
To be reported to:	CBS	JCOMM	

Acronyms not previously defined: ET-~~WCH~~DRR – Expert Team on Disaster Risk Reduction~~Waves and Coastal Hazards Forecasting Systems~~; JCOMM – WMO–IOC Joint Technical Commission for Oceanography and Marine Meteorology.

#### 2.2.3.4 Coordination of wave forecast verification

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**Table 24. Bodies responsible for managing information related to coordination of WFV**

<i>Responsibility</i>			
<i>Changes to activity specification</i>			
To be proposed by:	CBS/ET-OWFPS	JCOMM/ET- <del>WCH</del> DRR	
To be recommended by:	CBS		
To be decided by:	EC/Congress		
<i>Centres designation</i>			
To be recommended by:	CBS		
To be decided by:	EC/Congress		
<i>Compliance</i>			
To be monitored by:	CBS/ET-OWFPS		
To be reported to:	CBS/ICT-DPFS	CBS	

### Annex 6 to Resolution 59 (Cg-18)

#### INTRODUCTION OF TWO NEW APPENDICES TO THE MANUAL ON THE GLOBAL DATA-PROCESSING AND FORECASTING SYSTEM (WMO-NO. 485) CONCERNING MARINE METEOROLOGICAL SERVICES

#### **APPENDIX 2.2.39. MANDATORY AND HIGHLY RECOMMENDED PRODUCTS FOR MARINE METEOROLOGICAL SERVICES TO BE MADE AVAILABLE ON THE WMO INFORMATION SYSTEM**

##### **Mandatory products of the Worldwide Met-Ocean Information and Warning Service:**

Marine meteorological services for the high seas, comprising of the Worldwide Met-Ocean Information and Warning Service, shall include the provision of:

- Meteorological warnings;
- Marine forecasts;
- Sea-ice information services.

The standard and recommended practices covering the format and content of each service is described in the *Manual on Marine Meteorological Services* (WMO-No. 558).

#### **APPENDIX 2.2.40. STANDARDIZED VERIFICATION FOR MARINE METEOROLOGICAL SERVICES**

There are a number of challenges in establishing a verification framework for the WWMIWS. These include:



- The large spatial domains of the forecast and warning areas
- The format of the product is text based
- The sparseness of the verifying observations
- The gaps in required verifying observations

Customer surveys are used to measure satisfaction with the WWMIWS, and to understand opportunities for improvement.

A periodic self-assessment is conducted by METAREA Coordinators against the mandatory service requirements established by the International Maritime Organization (IMO), and the standard practices established by the WMO Technical Regulations.

#### **2.2.2.11 Marine meteorological services**

Notes:

1. Operations, including practices, procedures and specifications are described in the *Manual on Marine Meteorological Services* (WMO-No. 558), Volume I;
2. This activity includes a network of National Meteorological Services.

##### **2.2.2.11.1 National Meteorological Centres conducting marine meteorological services (including Preparatory Services) shall:**

- (a) Issue forecasts of marine environmental conditions for coastal and offshore areas, as defined in Appendix 2.2.39;
- (b) Issue warnings of marine meteorological hazards for coastal and offshore areas, as defined in Appendix 2.2.39;
- (c) Coordinate with national agencies responsible for marine matters, including disaster risk reduction and search and rescue.

##### **2.2.2.11.2 In compliance with the *Joint IMO/IHO/WMO Manual on Maritime Safety Information*, members holding METAREA responsibility under the *WMO/IMO Worldwide Met-Ocean Information and Warning Service (WWMIWS)*, shall:**

- (a) Issue forecasts of marine environmental conditions for the high seas, as defined in Appendix 2.2.39;
- (b) Issue warnings of marine meteorological hazards for the high seas, as defined in Appendix 2.2.39;
- (c) Organize the broadcast of marine forecasts and warnings on broadcast systems compliant with the GMDSS;
- (d) Undertake METAREA Coordinator responsibilities, including activities of validation and verification defined in Appendix 2.2.40.

Note: The bodies in charge of managing the information contained in the Manual related to marine meteorological services are specified in Table 19.

#### **Table 19 Bodies responsible for managing information related to marine meteorological services**

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## **Annex 7 to Resolution 59 (Cg-18)**

### **AMENDMENT TO THE MANUAL ON THE GLOBAL DATA-PROCESSING AND FORECASTING SYSTEM (WMO-NO. 485) CONCERNING VOLCANO WATCH SERVICES FOR INTERNATIONAL AIR NAVIGATION**

#### **1.1.2.2 The Global Data-processing and Forecasting System shall be organized as a three-tier system of activities as follows:**

(b) Specialized activities:

- Volcano watch services for international air navigation [\(see 2.2.2.10.1\)](#)

#### **2.2.2.6 Tropical cyclone forecasting, including marine-related hazards**

2.2.2.6.3 All six RSMCs for tropical cyclone forecasting together with Tropical Cyclone Warning Centre Darwin, which are designated as Tropical Cyclone Advisory Centres (TCAC) by regional air navigation agreement within the framework of the tropical cyclone watch of the International Civil Aviation Organization (ICAO), shall issue tropical cyclone advisories for aviation in accordance with the provisions made in *Meteorological Service for International Air Navigation*, Annex 3 to the Convention on International Civil Aviation, ICAO; and *Technical Regulations* (WMO-No. 49), Volume II, Parts I and II. SIGMET information concerning tropical cyclones shall be issued by meteorological watch offices for the flight information region concerned and ~~shall~~ should be based on the tropical cyclone advisory information issued by the ~~Tropical Cyclone Advisory Centres~~ TCACs in accordance with ICAO Annex 3/WMO-No. 49, Volume II, 3.4 and 7.

#### **2.2.2.10 Volcano watch services for international air navigation**

~~Note: -- Volcanic ash advisory centres which provide services in support of international air navigation are designated by ICAO. This designation is made in consultation with WMO. Service provision arrangements in this respect and those for volcano observatories are described in *Technical Regulations* (WMO-No. 49), Volume II, 3.5 and 3.6, respectively.~~

2.2.2.10.1 The Nine Volcanic Ash Advisory Centres (VAAC), designated by the International Civil Aviation Organization (ICAO), shall issue volcanic ash advisories for aviation in accordance with the provisions made in *Meteorological Service for International Air Navigation*, Annex 3 to the Convention on International Civil Aviation and *Technical Regulations* (WMO-No. 49), Volume II, 3.5. Eight of the nine VAACs are co-located with RSMCs. SIGMET information concerning volcanic ash shall be issued by meteorological watch offices for the flight information region concerned and should be based on the volcanic ash advisory information issued by the VAACs, in accordance with ICAO Annex 3/WMO-No. 49, Volume II, 3.4 and 7. Service provision arrangements for volcano observatories in support of aviation are described in ICAO Annex 3/WMO-No. 49, Volume II, 3.6.

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**Resolution 60 (Cg-18)****FUTURE WMO RESEARCH AND SUPPORT ACTIVITIES**

THE WORLD METEOROLOGICAL CONGRESS,

**Recalling:**

- (1) Resolution 15 (Cg-17) World Climate Research Programme (WCRP),
- (2) Resolution 45 (Cg-17) World Weather Research Programme (WWRP),
- (3) Resolution 47 (Cg-17) Global Atmosphere Watch Programme (GAW),
- (4) Resolution 11 (Cg-17) – Towards a future enhanced integrated and seamless WMO Data-processing and Forecasting System,
- (5) Decision 61 (EC-68) – World Weather Research Programme Implementation Plan for the period 2016-2023,
- (6) Decision 62 (EC-68) – Global Atmosphere Watch Implementation Plan for the period 2016-2023,
- (7) Resolution 30 (EC-70) – The 2018 review of the World Climate Research Programme,
- (8) Resolution 46 (Cg-17) – Integrated Global Greenhouse Gas Information System,
- (9) IG<sup>3</sup>IS Science Implementation Plan,
- (10) Recommendation 18 (EC-70) – Future WMO research and supporting activities,

**Recalling also** the outcome of the 17th session of the Commission for Atmospheric Sciences (CAS-17), the preceding Science Summit, and the recommendations on the future WCRP strategy made by the WCRP review panel,

**Recalling further:**

- (1) The United Nations General Assembly Resolution 70/1 – Transforming our World: the 2030 Agenda for Sustainable Development,
- (2) The United Nations General Assembly Resolutions 73/237, 72/225 and 71/219 – Combating Sand and Dust Storms,

**Noting:**

- (1) That WCRP has played a pivotal role in advancing fundamental understanding of the climate variability and change in support of the Earth system science and societal demands by initiating and coordinating major collaborative activities around its Core Projects (GEWEX, CLIVAR, SPARC and CliC), Grand Challenges (e.g. on Extremes, Regional Sea Level etc.), the Coupled Model Intercomparison Project (CMIP) in support of IPCC, the Coordinated Regional Climate Downscaling Experiment (CORDEX), and through the work of its respective Working Groups and other initiatives,
- (2) That WWRP is fostering fundamental Earth system science and application of science for services through the effective execution of its Implementation Plan, its three core projects (Polar Prediction Project, High-Impact Weather Project and the WWRP-WCRP co-

sponsored Sub-Seasonal to Seasonal Prediction Project), the co-design of the future seamless Global Data Processing and Forecasting Implementation Plan, and key regional research initiatives with main thrust on extreme weather events,

- (3) That GAW is growing the international network of high-quality atmospheric composition observations across the global to local scale to drive high quality and impact science while co-producing a new generation of research-enabled products and services. GAW provides contributions to the cross-cutting integrated urban and health services and develops a new generation of science-enabled user-driven services through three core projects: Integrated Global Greenhouse Gas Information System (IG<sup>3</sup>IS) that supports climate services, Measurement-model fusion for total atmospheric deposition (MMF-TAD) that supports the ecosystem assessment and food security communities and Monitoring, Analysis and Prediction of Air Quality (MAP-AQ) that supports the health sector,

**Noting further** that the advancement in research coordinated by WMO is essential to advance the capabilities of National Meteorological and Hydrological Services (NMHSs), and furthermore, to fully implement the WMO Strategy for Service Delivery for the benefit of society,

**Recognizing** the critical need and its timeliness to improve integration and cross-coordination of research activities of weather, climate, water and related environmental domains in all WMO programmes, in order to provide a suitable environment for mutually beneficial collaboration among NMHS, research in public and private sectors academic institutions and the private sector and users, with the common goals of necessary scientific and technical advances for targeted and societally relevant services,

**Recognizing further** that the scientific leadership of GAW, WCRP and WWRP have already initiated consultations within and outside of the traditional WMO community to strengthen their strategic partnerships and to promote the co-design of relevant research activities with the relevant organizations,

**Decides** to address the three strategic objectives of the long-term goal 3 defined in the WMO Strategic Plan (Resolution 1 (Cg-18)), namely "Advance scientific knowledge of the Earth system", "Enhance the science-for-service value chain ensuring scientific and technological advances improve predictive capabilities" and "Advance policy-relevant science" through the collaborative and integrated work of existing and new (sponsored and co-sponsored) research programmes together with IPCC, GCOS and the scientific component of GFCS;

**Requests** the Executive Council to ensure effective coordination, integration and resourcing of those activities among technical and scientific bodies supporting the continuous research-to-operations-to-services value chain;

**Requests** the Research Board:

- (1) To ensure coherent planning and implementation of WMO research activities, as framed in the WMO Strategic Plan and Reform documents, across weather, water, climate and environmental related topics, considering research elements in all WMO programmes, developing future research areas with special attention to emerging unusual high impact events and taking into account the advice of the Scientific Advisory Panel, as appropriate;
- (2) To foster a research for services approach through the implementation of the Global Data Processing and Forecasting System and development of collaborative frameworks such as outlined in the Ocean Dialogue, and the Integrated Urban and Health Services;

**Requests** the Secretary-General:

- (1) To promote WMO research at high levels of the United Nations as well as to the major international science initiatives, and to foster their engagement in its implementation, considering also the alignment with IPCC and GFCS;
- (2) To facilitate consultation with other relevant agencies of the United Nations (such as UNESCO), international scientific agencies (including Future Earth), engagement of social science and humanitarian communities and initiatives within the context of Earth System science;
- (3) To actively engage in resource mobilization initiatives to support the Research Programmes and their collaborative work towards a seamless Earth system approach;

**Urges** Members and Regional Associations:

- (1) To actively reach out and collaborate with research institutions, academia and stakeholders to enhance national and regional partnerships for weather, climate, water and environmental related research;
  - (2) To establish collaboration in developing coherent research initiatives at regional and national level;
  - (3) To increase support for global, regional and national research-related activities, including through Global Producing Centres, Regional Climate Centres and National Meteorological and Hydrological Services, to facilitate the development of advanced predictive capabilities within the context of Earth System science;
  - (4) To increase their support to CMIP, CORDEX and to its international coordination so as to ensure sustained and timely contributions to IPCC and GFCS;
  - (5) To continue their support to WWRP core projects (Polar Prediction Project, co-sponsored Sub-Seasonal to Seasonal Prediction, High-Impact Weather) in order to guarantee a continuous research-to-operation development;
  - (6) To continue their support to initiatives that will advance cross-cutting integrated urban and health services, Sand and Dust Storms early warning advisory systems, and the new generation of science-enabled user-driven services, and ensure financial support of such activities;
  - (7) To cooperate on data exchange and management of data, including impact information from societal and economic perspectives, in support of research activities and applications development.
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## **Resolution 61 (Cg-18)**

### **INTEGRATED AND COORDINATED WMO RESEARCH TO SERVE SOCIETY**

THE WORLD METEOROLOGICAL CONGRESS,

#### **Recalling:**

- (1) Decision 50 (EC-69) – An integrated research and development approach, which includes the main principles to fill the gap between research and operations,
- (2) Decision 41 (EC-69) – Guidelines for the development of an integrated operational platform to meet urban service delivery needs, which requested to “expedite work on a Guide for Urban Integrated Hydrometeorological/Climate/Environment Services, using the expertise of the WMO GAW (Global Atmosphere Watch) Urban Research Meteorology and Environment (GURME)” project, which would improve the connection between research and operations,

#### **Recognizing:**

- (1) The advances in Earth system prediction that integrate different time scales and compartments, and the growing need of the user community for more sophisticated services,
- (2) That better integration of science and services requires a move from the current linear model of sporadically transferring research results to operations, to an interactive model in which stakeholders assess and articulate their future needs, researchers work in dialogue with stakeholders to define and implement appropriate research programmes, the research results are transferred to operations at appropriate intervals, and stakeholder needs and research programmes are refined taking into account the knowledge and experience gained,
- (3) That the World Climate Research Programme and programmes of the Commission for Atmospheric Sciences (the World Weather Research Programme and Global Atmosphere Watch) draw on the capabilities of a much larger science community than those in National Meteorological and Hydrological Services (NMHSs), and that those capabilities are fundamental for advancing the WMO strategy for service delivery,
- (4) That WMO research activities have a central role in promoting innovation across different service applications and that their coherence and consistency are an added value for WMO in promoting its international profile,

**Noting** that the development of specific services in diverse application areas requires involvement of the scientific community at all stages of the production chain,

**Decides** that WMO research needs to be better integrated and more closely coordinated across weather, climate, water and related environmental domains in order to provide the necessary scientific and technical advances needed to address the growing need for targeted and societally relevant services and to create an attractive environment in which NMHSs, academic institutions, the private sector and end users can engage in research to their mutual benefit;

**Requests** the WMO technical commissions and the Research Board, regional associations and other relevant WMO bodies:

- (1) To co-design in advance, when designing operational projects that rely on research, with WMO research Programmes the full range of activities that are required to bring a new or improved service or supporting system from conception through the different phases of production;
- (2) To promote the development of integrated research pilots to foster the value chain approach by jointly identifying research needs based on regional priorities for meteorological and environmental services;

**Requests also** the WMO technical commissions, the Research Board and other relevant bodies to develop a technical guide on the measuring, monitoring and modelling of the Urban Heat Island (UHI) effect, which is a growing concern due to accelerating urbanisation and warming trends, to support Members' service delivery needs and planning efforts to mitigate the impacts of UHI, using the expertise of the WMO GAW (Global Atmosphere Watch) Urban Research Meteorology and Environment (GURME) project;

**Urges** Members to improve connections among NMHSs, research institutions, academia, stakeholders and end-users of services on a national level to ensure that research responds to requirements for the development of new and improved services, and that advances in research are appropriately included in operations;

**Requests** the Secretary-General:

- (1) To take all necessary actions, within available budgetary resources, to ensure a strongly coordinated and integrated WMO research function to support science-based services that will promote innovation across the Organization;
  - (2) To ensure a coordination mechanism within the Secretariat, led by the Research Department, to identify and coordinate, according to the agreed principles of the integrated research and development approach, WMO activities aimed at developing new or improving existing services and supporting systems in the weather, climate, water and related environmental domains;
  - (3) To assist Members in promoting research as part of the development of new and enhancement of existing services, particularly in developing countries, by promoting capacity-building, facilitating training and exchange of scientists, and providing guidance and advice, as required, within available budgetary resources;
  - (4) To take all necessary actions to initiate, develop and maintain WMO collaboration in matters related to weather, climate, water and related environmental research with relevant organizations, agencies, groups and institutions, from both the public and private sectors.
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## **Resolution 62 (Cg-18)**

### **A SEAMLESS RESEARCH STRUCTURE FOR WMO**

THE WORLD METEOROLOGICAL CONGRESS,

#### **Noting:**

- (1) That leveraging the predictive skill at a broad range of temporal and spatial scales that are inherent in the various components of the Earth system and their interactions would allow Members to improve their services,
- (2) That the Data-processing and Forecasting System (DPFS), through Resolution 17 (EC-69) – Seamless Data-processing and Forecasting System, will become a pillar in the future WMO Service Delivery Strategy,
- (3) Decision 50 (EC-69) – An integrated research and development approach, which endorsed the principles towards better integrated research and development support to Members,
- (4) Decision 49 (EC-69) – WMO priority actions in hydrology and water resources management, in support of the ambitious work plan of the Commission for Hydrology,
- (5) Resolutions 24 and 25 (Cg-18) on existing and future WMO hydrology activities,

**Recalling** that the implementation plans of the World Weather Research Programme (WWRP) and of the Global Atmosphere Watch (GAW) Programme, endorsed by Decision 61 (EC-68) – World Weather Research Programme Implementation Plan for the period 2016–2023, and Decision 62 (EC-68) – Global Atmosphere Watch Implementation Plan for the period 2016–2023, respectively, call for development of integrated modelling products and services,

#### **Considering** that:

- (1) Advancing the scientific understanding of the Earth system has been endorsed by Decision 65 (EC-69) – Preparation of WMO Strategic Plan 2020–2023, as a strategic objective (strategic objective 3.1) of the Plan,
- (2) Collaborations among GAW, WWRP and other partners are essential to make research advances in the emerging strategic areas of WMO, in particular on aspects of model development, the water cycle and urban development,
- (3) The ongoing Sub-seasonal to Seasonal Prediction Project (S2S Project) (Resolution 16 (EC-LXIV) – Sub-seasonal to Seasonal Prediction Project), Polar Prediction Project (Resolution 17 (EC-LXIV) – Polar Prediction Project), High-impact Weather Project (Resolution 12 (EC-66) – High-impact Weather Project), GAW Urban Research Meteorology and Environment Project, and Integrated Global Greenhouse Gas Information System (Decision 51 (EC-69) – The Integrated Global Greenhouse Gas Information System Implementation Plan) complement each other towards a seamless-oriented research structure,

#### **Agrees** that:

- (1) Research plays a critical role in developing future predictive seamless systems and in underpinning decisions on the development of related observing systems for weather, climate, water and environment;



- (2) The Working Group on Numerical Experimentation shall play a central role in coordinating the development of seamless research components across GAW, WWRP and the World Climate Research Programme (WCRP), including interacting and building connections with the technical commissions' relevant subsidiary bodies that work on aspects of numerical experimentation;

**Decides:**

- (1) That GAW, WWRP and WCRP, supported by the Research Board and in collaboration with technical commissions' relevant subsidiary bodies, shall play a major role in promoting research across temporal and spatial scales and across environmental domains towards a unified, integrated Earth system modelling approach in an interactive set-up that ensures the transfer of research concepts, tools and techniques to operations as informed by users;
- (2) To convene an overarching Open Science Conference on the Earth System, possibly in 2022, to facilitate this integrated and interactive approach;

**Requests** the Research Board to further strengthen collaborative efforts between the Research Programmes' steering committees to support innovation for DPFS;

**Encourages** the Research Board, subsidiary bodies of technical commissions in charge of hydrology and agrometeorology, Hydrology Coordination Panel and Climate Coordination Panel, to further strengthen interactive feedbacks between multi-disciplinary research activities within WMO, as well as to promote the use of research products such as S2S Project database across the research and application domains;

**Requests also** the Secretary-General to align the appropriate research activities and resources in WMO to optimally support the development and enhancement of DPFS and of the Global Framework for Climate Services;

**Requests further** Members to actively participate in research activities for predictive seamless systems, to contribute to the trust funds of the above-mentioned Programmes and to provide strong support for the implementation of project activities in their respective countries.

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## Resolution 63 (Cg-18)

### SEAMLESS REGIONAL RESEARCH FOR WATER

THE WORLD METEOROLOGICAL CONGRESS,

**Noting:**

- (1) Resolution 12 (EC-66) – High-impact Weather Project, which established the Project,
- (2) Decision 5 (EC-69) – Flood forecasting, which requested the relevant technical commissions to ensure that the future Global Data-processing and Forecasting System is an operational system that has a direct interface to applications such as the Flash Flood Guidance System,

- (3) Decision 49 (EC-69) – WMO priority actions in hydrology and water resources management, which expressed support for the ambitious work plan of the Commission for Hydrology (CHy),

**Noting further:**

- (1) That sustainable development requires a systematic assessment of water resources from global to regional and local scales,
- (2) The common interests of the World Weather Research Programme (WWRP), the World Climate Research Programme, the WMO Hydrological Water Resources Programme (HWRP), UNESCO International Hydrological Programme (IHP), the UNEP GEMS/WATER Programme and the [International Groundwater Resources Assessment Centre](#) in the monitoring of groundwater and the dissemination of data,
- (3) The need to develop links between the Global Atmosphere Watch Programme, WWRP and the Global Energy and Water Cycle Experiment on aspects of extreme events and precipitation processes, such as quantitative precipitation forecasts and urban flooding,
- (4) The role of water vapour as a climate driver and an atmospheric chemical constituent,

**Stressing:**

- (1) The need to strengthen WMO regional activities related to the understanding and assessment of the coupled water cycle, avoiding redundancy and duplications across weather, climate, water and environment programmes,
- (2) The need to establish integrated pilot projects, which should be developed in collaboration with key partners, as well as with stakeholders and users, following the example the Hydrological Cycle in the Mediterranean Experiment,

**Requests** the technical commissions, the Research Board and regional associations in collaboration with the Hydrological Coordination Panel, to enhance WMO's involvement in research activities that address regional needs focusing on the exchange processes between Earth system components related to water, in cooperation with the WMO Research Programmes and UN-Water, taking into account the advice from the Scientific Advisory Panel and other relevant WMO bodies;

**Requests further** the Secretary-General to strengthen or establish cooperation on water-related issues with relevant United Nations and other international organizations.

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## **Resolution 64 (Cg-18)**

### **CREATING AN ENVIRONMENT FOR INNOVATION AND ITS OPTIMAL RESOURCING**

THE WORLD METEOROLOGICAL CONGRESS,

**Recalling:**

- (1) Decision 73 (EC-68) – Cooperation between the public and private sectors for the benefit of society, which promotes a framework for fruitful collaboration between National Meteorological and Hydrological Services (NMHSs) and the private sector for the benefit of society,

- (2) Decision 50 (EC-69) – An integrated research and development approach, which endorsed the principles towards better integrated research and development, and among which it stressed the role of co-design and continuous consultation between users and stakeholders,
- (3) Decision 69 (EC-68) – Resource mobilization, which approved the WMO Resource Mobilization Strategy that highlighted, among potential mechanisms, appropriate partnerships with the private sector and increased focus on research funding mechanisms,
- (4) Resolution 17 (EC-69) – Seamless Data-processing and Forecasting System, which requested the Steering Group on the Seamless Data-processing and Forecasting System (DPFS) to develop a detailed implementation plan, and the Commission for Atmospheric Sciences (CAS) to utilize its forthcoming Science Summit and its seventeenth session as a platform for interaction between the Commission for Basic Systems, CAS and representatives of other technical commissions and regional associations, to define the scientific progress needed to realize the future seamless DPFS,

**Mindful** of the Resolution 1 (Cg-18) - WMO Strategic Plan, which defines the long-term goal of advancing targeted research with the purpose of improved understanding of the Earth system and the implications to weather, climate, water and related environmental matters, and enhancing predictive capabilities in a seamless context through the application of scientific and technological advances,

**Noting** that:

- (1) The development of integrated services for urban environments was requested by Members and supported by the technical commissions and the Global Framework for Climate Services, and that development of such services requires advances in science and innovation to resolve processes on different spatial and temporal scales,
- (2) Research and operations need to work hand in hand with user needs as a target in advancing the seamless DPFS,
- (3) Research activities are at the base of any innovation, and that these require adequate investment, the involvement of a critical mass of experts through shared facilities and virtual partnership, and a culture that recognizes and values excellence,

**Mindful also** that non-optimal use of resources in research and the duplication of effort between different stakeholders lead to the depletion of innovation potential,

**Satisfied** with the fact that the private sector and foundations create opportunities for innovation through open calls and competition,

**Recognizing** that research needs a balanced approach, combining long-term activities that will support continuous improvement and short-term innovation for targeted challenges,

**Agrees** that:

- (1) There is a need to join efforts between NMHSs, the private sector, civil society and the academic world in promoting partnerships at the national, regional and global levels;
- (2) There is a need to involve key international partners in co-designing WMO research activities with a special focus on the seamless DPFS and on cross-cutting areas of interest;

- (3) There is a need for a formal engagement of key international stakeholders in setting up the WMO research agenda in order to deliver the WMO Strategic Plan and long-term goals and in providing concrete inputs to research implementation and governance;

**Urges** Members:

- (1) To contribute to the WMO research coordination efforts through global partnerships towards a dramatic increase in predictive skills, to be materialized in improved services of the seamless DPFS;
- (2) To sustain funding for long-term research activities and fund research supporting the development of new products and services, including research activities that incorporate social sciences;
- (3) To work closely with funding agencies and other resourcing mechanisms to ensure inclusion of the unified scientific priorities defined by the WMO Strategic Plan and long-term goals in their agendas;

**Encourages** NMHSs to take a more active part in innovation calls supported by the private sector;

**Requests** the technical commissions, the Research Board and regional associations, taking into account the advice of the Scientific Advisory Panel and other relevant WMO bodies, to work towards the establishment of centres of excellence and virtual networks to be driven by ambitious scientific targets in order to catalyse innovation, for example using the Severe Weather Forecasting Demonstration Project as an opportunity to foster innovation through co-design between research and operations;

**Requests also** Members to ensure support of communication systems to allow distributed access to the centres of excellence and virtual networks and for effective cooperation on research challenges;

**Requests further** the Secretary-General:

- (1) To take all necessary action, within the available budgetary resources, to encourage the culture of innovation and research across the Organization;
  - (2) To assist Members in establishing global partnerships towards the development and utilization of distributed centres of excellence;
  - (3) To assist Members in mobilizing resources through research funding mechanisms;
  - (4) To promote the value of research and innovation in partnership with the private sector and other stakeholders in civil society within WMO, and acknowledge the excellence of groups for their contribution;
  - (5) To ensure that excellence in science is recognized through appropriate incentive schemes;
  - (6) To take all necessary actions to initiate, develop and maintain WMO collaboration on matters related to weather, climate, water and related environmental research with relevant organizations, agencies, groups and institutions, from both public and private sectors.
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## Resolution 65 (Cg-18)

### WMO AND THE OCEAN

THE WORLD METEOROLOGICAL CONGRESS,

**Having convened** the Ocean Dialogue on 11 June 2019,

**Noting** the outcomes of the dialogue that encouraged WMO to play a stronger role in the evolving global ocean agenda in order to support the needs of Members,

**Recalling** the resolutions of Congress and the Executive Council in force concerning ocean-related matters in observation, data processing and management, services, science and the law of the sea, provided in [Cg-18/INF. 7.3\(1\)](#),

**Also recalling** the WMO strategies, roadmaps and implementation plans with relevance to the ocean, also provided in [Cg-18/INF. 7.3\(1\)](#),

**Further recalling** the position paper “The ocean and WMO: ocean issues, opportunities and priorities that contribute to the WMO Strategic Plan” endorsed by EC-70,

**Recognizing** the critical contributions of WMO technical commissions, programmes, co-sponsored entities and centres, provided in [Cg-18/INF. 7.3\(1\)](#), to the understanding of the ocean and its role in the weather and climate systems, the protection of life and property at sea and in coastal and offshore areas, the generation of socioeconomic benefits and ocean sustainability,

**Mindful** of the importance of ocean science and information for delivering enhanced weather, marine and climate and environmental services for a resilient and sustainable blue economy,

**Having considered** the variety and evolution of WMO ocean-related activities in observation, data processing and data management, modelling and forecasting systems, services and applications, research and related capacity development and their contribution to the Strategic Plan and the implementation of the Operating Plan,

**Having also considered** the need to ensure coherence and coordination of such ocean-related activities for maximizing benefits to Members, optimizing resources and enhancing engagements with partner organizations,

**Having further considered** that the reform of constituent bodies offers opportunities for a more effective organization of WMO crosscutting activities,

**Satisfied** with the renewed strategic approach to the collaboration with the IOC of UNESCO as embodied in the establishment of the Joint WMO-IOC Collaborative Board through Resolution 9 (Cg-18) to maximize, through the development of a collaborative strategy, opportunities to co-design, co-develop and implement joint scientific and technical work that ultimately will improve the provision of information and services for societal benefit;

**Decides** to adopt a collaborative framework on the ocean according to the outline provided in the annex to the present resolution and the concept described in [Cg-18/INF. 7.3\(1\)](#) to:

- (1) Facilitate aggregation, and enhanced impact of WMO ocean-related activities,
- (2) Support interagency coordination and cooperation on ocean matters, including with IOC and through UN-Oceans and other mechanisms,

- (3) Contribute to the United Nations Decade of Ocean Science for Sustainable Development 2021-2030 leveraging existing structures and current activities as well as available resources;

**Requests** WMO technical commissions, the Research Board and regional associations to integrate the ocean in the continuous research-to-operations-to-services value chain, underpinned by science, and to finalize WMO contribution to the UN Decade of Ocean Science for Sustainable Development 2021-2020;

**Also requests** the Joint WMO-IOC Collaborative Board to collaborate to this task;

**Urges** Members to implement WMO ocean-related resolutions and standards and follow guidance documents and to support WMO ocean-related activities;

**Calls upon** WMO technical commissions, the Research Board and regional associations and Members to engage in renewed and expanded partnerships on ocean matters, involving United Nations and international organizations, government institutions, academia and the private sector;

**Requests** the Secretary-General to:

- (1) Finalize the collaborative framework on the ocean for adoption by the Executive Council at its seventy-second session,
- (2) Maintain a register of ocean-related resolutions, decisions and strategic documents and a dashboard on status for information and periodic review by the Executive Council.

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## **Annex to Resolution 65 (Cg-18)**

### **OUTLINE OF THE COLLABORATIVE FRAMEWORK ON THE OCEAN**

#### **1. Introduction: the importance of the ocean for WMO mission**

#### **2. WMO ocean activities and partnerships**

- 2.1 Research
- 2.2 Observations
- 2.3 Data processing and management
- 2.4 Modelling and forecasting
- 2.5 Services delivery
- 2.6 Policy advice

#### **3. Emerging developments and demands**

- 3.1 Demands for and development of tailored/impact-based services
- 3.2 Developments in modelling and prediction capabilities
- 3.3 Developments in observation technologies and capability
- 3.4 Research frontiers

#### **4. Collaborative Framework on the Ocean**

4.1 Objectives: contribution to the Strategic Plan

4.2 Activities and deliverables in collaboration with partners: contribution to the Operating Plan 2020-2023

4.2.1 Strengthening the Global Ocean Observing System (GOOS) within WMO observing and data processing activities and facilitating meteorological and oceanographic observations and services in coastal regions and the open ocean

4.2.2 Fostering Earth system modelling – coupling ocean with land, cryosphere and atmosphere – to advance science, prediction and services: leveraging the United Nations Decade of Ocean Science for Sustainable Development

4.2.3 Promoting ocean science to support the value chain of the seamless Global Data Processing and Forecasting System and enhancing socioeconomic benefits of marine meteorological and oceanographic services

4.2.4 Better integrating the ocean in multi-hazard early warning with WMO disaster risk reduction, climate applications and services, and research activities (e.g. tropical storm, cyclones, sea level rise and other coastal inundation components)

4.2.5 Raising the capacity of developing countries, including small island developing States, in ocean observation, science and services through an enhanced regional approach

4.3 Coordination

4.4 Resourcing, timeline and review process

### **Resolution 66 (Cg-18)**

#### **UNITED NATIONS OCEAN CONFERENCE 2020**

THE WORLD METEOROLOGICAL CONGRESS,

#### **Recalling:**

- (1) United Nations General Assembly Resolution 71/312 – Our ocean, our future: call for action,
- (2) United Nations General Assembly Resolution 72/73 – Oceans and the law of the sea, proclaiming the United Nations Decade of Ocean Science for Sustainable Development for the 10-year period beginning on 1 January 2021, within existing structures and available resources,
- (3) Decision 54 (EC-70) – Decade of Ocean Science for Sustainable Development,
- (4) United Nations General Assembly Resolution 73/292 – 2020 United Nations Conference to Support the Implementation of Sustainable Development Goal 14: Conserve and sustainably use the oceans, seas and marine resources for sustainable development,

**Noting** the anticipated Ocean Conference to Support the Implementation of Sustainable Development Goal 14: Conserve and sustainably use the oceans, seas and marine resources for sustainable development, to be co-organized by Portugal and Kenya in Lisbon in 2020

under the theme "Scaling up ocean action based on science and innovation for the implementation of Goal 14: stocktaking, partnerships and solutions";

**Decides** to commit to participating in the Ocean Conference and to emphasize the priority of ocean science, based on sustained observation and information sharing, for delivering enhanced services to strengthen the resilience of societies to the socioeconomic consequences of extreme weather, climate, water and other environmental events, and underpin their sustainable development;

**Urges** Members to advocate the above priority during the foreseen preparatory meeting of the UN Ocean Conference 2020, in February 2020, at the United Nations Headquarters in New York, for inclusion among the topics of the conference;

**Requests** the Secretary-General to support Members in the promotion of this resolution through the provision of relevant information and documentation and contribution to the concept papers for the conference.

## **Resolution 67 (Cg-18)**

### **WMO SCIENTIFIC AND TECHNOLOGICAL SUPPORT TO THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE AND CLIMATE POLICY**

THE WORLD METEOROLOGICAL CONGRESS,

**Recalling:**

- (1) Resolution 15 (Cg-17) - World Climate Programme and Resolution 56 (Cg-17) - Intergovernmental Panel on Climate Change,
- (2) Decision 17 (EC-68) - WMO support to the implementation of activities of the Intergovernmental Panel on Climate Change (IPCC),
- (3) Decision 7 (EC-69) - WMO support to implementation of the Paris Agreement,
- (4) Decision 9 (EC-69) - Strengthening the WMO Statement on the State of the Global Climate,
- (5) Decision 50 (EC-69) - An Integrated Research and Development Approach,
- (6) Resolution 2 (EC-70) - WMO integrated approach to high-level climate-science-related policy processes,
- (7) Decision 6 (EC-70) - Implementation of Intergovernmental Panel on Climate Change activities,
- (8) Decision 9 (EC-70) - Promoting the use and interpretation of climate change projections on regional and national scales,
- (9) Resolution 30 (EC-70) - The 2018 review of the World Climate Research Programme,
- (10) Resolution 20 (Cg-18) - WMO contributions to the provision of climate information and services in support of policy and decision-making,
- (11) Resolution 60 (Cg-18) - Future WMO research and support activities,



**Recalling further:**

- (1) The support of WMO, together with the United Nations Environment Programme (UNEP), as parent organizations of the IPCC dedicated to providing governments at all levels with scientific information that they can use to develop climate policies, the hosting of the IPCC Secretariat at WMO and provision of administrative, language and conference services,
- (2) The support of WMO, together with IOC-UNESCO and the International Science Council (ISC), as co-sponsors of WCRP, dedicated to facilitating the analysis and prediction of Earth system variability and change for use in an increasing range of practical applications of direct relevance, benefit and value to society,

**Noting:**

- (1) The report of the Chair of IPCC [[Cg-18/INF. 7.3\(2\)](#)],
- (2) The critical role of WMO in supporting IPCC activities and key reports, such as the IPCC Special Report on Global Warming of 1.5°C invited by the UNFCCC Conference of Parties (COP21), and which provided one of the scientific underpinnings for the Talanoa Dialogue at COP24 last year,
- (3) The relevance of the IPCC's Sixth Assessment cycle in supporting the climate science-policy interface,
- (4) The annual WMO assessments on climate related topics: the Statement on the State of the Global Climate, the annual WMO Greenhouse Gas Bulletin, the WMO Aerosol Bulletin as well as other relevant Bulletins under the Global Atmosphere Watch (GAW) Programme,
- (5) The role of WCRP to convene the international climate modelling community, to coordinate the development and improvement of climate and Earth system models, and to deliver climate predictions and longer-term climate change projections, including at regional scale,
- (6) That the WCRP Coupled Model Intercomparison Project (CMIP), now in its 6th phase, serves as both an organizer and coordinator of international climate research through the definition of experimental protocols and provider of supporting infrastructure that allow for coordinated multi-model global climate simulations, and that the WCRP Coordinated Regional Climate Downscaling Experiment (CORDEX), now in its 2nd phase, is an initiative to provide global coordination of regional climate downscaling for improved regional climate change adaptation and impact assessment.

**Noting further** that CMIP contributes to one of the foundational elements for the Intergovernmental Panel on Climate Change (IPCC) assessments, the United Nations Framework Convention on Climate Change (UNFCCC) policy deliberations, and climate services and products disseminated world-wide,

**Recognizing:**

- (1) That CMIP and CORDEX have been extraordinarily successful, and leverage a large investment from individual countries, research centres, agencies and individual scientists who contribute to the underlying essential infrastructure,
- (2) The growing dependency on CMIP and CORDEX products by a broad research community, by national and international climate assessments, by climate services and policy making,

- (3) That basic CMIP and CORDEX activities, such as the creation and regular update of forcing datasets, the provision, archiving and quality check of CMIP and CORDEX products, model development, and international coordination are currently at significant risk if not institutionalized in some way, as they still rely largely on volunteer work and research funding,

**Decides** to enhance WMO scientific support to climate policy through:

- (1) Coordination of annual WMO assessments on the State of the Global Climate, Greenhouse Gas concentrations and other relevant atmospheric constituents, and climate observations and associated data with IPCC assessments and other complementary reports regularly released by other entities using the mechanism established through Resolution 20 (Cg-18);
- (2) Coordination through the WCRP international research on predictions, longer-term climate change projections and robust attribution, as well as on associated big data analytics and artificial intelligence techniques, including at regional scale, through its new strategic and implementation plans, ensuring key contributions to the Sixth Assessment Report (AR6);
- (3) Using the research and innovation framework of the Seamless Data-processing and Forecasting System (GDPFS, Resolution 58 Cg-18), towards continuous development of CMIP models and tools within a research-to-operation context;
- (4) Ensuring institutionalization and operationalization of the CMIP and CORDEX delivery for the preparation of AR6, including timely preparation and quality control of data for producing the appropriate scenarios and projections supporting the IPCC assessments and guidance for robust sectoral impacts supporting climate services, as well as the application of protocols for standardization developed in the CMIP modelling framework;

**Urges** Members:

- (1) To enhance financial support to the IPCC through the IPCC Trust Fund or in-kind contributions;
- (2) To coordinate, via IPCC national focal points, among different ministries, agencies and academic networks, including social sciences, to foster, as appropriate, the establishment of National Panels or other institutional arrangements for the IPCC that can bring together all the relevant expertise;
- (3) To contribute institutional, technical and financial resources as necessary to ensure sustainable and robust CMIP and CORDEX climate change projections delivery to IPCC;
- (4) To adhere to existing standards in order to facilitate data exchange between institutions and to co-develop future adaptations in collaboration with the climate research community;

**Requests** the Secretary General:

- (1) To set up a dedicated ad-hoc Task Force with representation of WCRP, UNFCCC and the Infrastructure Commission (in relation to the GDPFS) to prepare recommendations for the Executive Council regarding the implementation of the CMIP and CORDEX delivery to IPCC, and the related organizational and financial aspects. Members of the IPCC (Bureau/Executive Committee) can be invited by the Task Group to present the products of the IPCC;
- (2) To consider ways to enhance the coherence and consistency of climate products among WMO climate activities and the IPCC;

- (3) To continue the support of the IPCC Secretariat and to pursue more efficient delivery and closer cooperation on climate assessments.
  - (4) To strengthen the national human and technical capacities to develop climate models involved in CMIP, in particular in those countries not doing so yet and to pay particular attention to young scientists from Small Islands and Developing States.
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## **Resolution 68 (Cg-18)**

### **VOLUNTARY COOPERATION PROGRAMME**

THE WORLD METEOROLOGICAL CONGRESS,

#### **Recalling:**

- (1) That the VCP marked its 50th anniversary in 2017 and the current VCP database has recorded over 2000 requests from 153 Members in all WMO Regions including support for observation systems, technical expert services, installation of technical equipment, human resources development and strategic and legal frameworks of National Meteorological and Hydrological Services (NMHSs),
- (2) That the Emergency Assistance Fund (EAF) was established by the Eleventh World Meteorological Congress in 1991 specifically to assist Members affected by disasters to immediately re-instate basic services including rehabilitation and restoration of essential observing network, data collection and processing facilities,

**Noting** that the Rules of VCP need to be periodically revised to reflect the current operating environment of the Secretariat and the beneficiary NMHSs regarding submission and approval of VCP requests and implementation of VCP projects and now also considering the WMO Reform process,

#### **Decides:**

- (1) That the VCP will continue to operate through the following facilities:
  - (a) The Voluntary Co-operation Fund (VCP(F));
  - (b) The Equipment and Services Coordinated Support (VCP(ES));
  - (c) The Emergency Assistance Fund (VCP-EAF);
- (2) That the fields of cooperation covered by the VCP shall include the following:
  - (a) Development of relevant legislation and National Strategic Plans of NMHSs;
  - (b) Granting of short-term and long-term fellowships;
  - (c) Support to short-term training seminars;
  - (d) Support to user engagement for meteorological, climatological and hydrological applications and service delivery;
  - (e) Establishment / enhancement of observing and data-processing facilities, applications and service delivery / dissemination services;
  - (f) Contingency planning for cases of severe disasters;
  - (g) Other areas of cooperation as may be proposed by the WMO Secretary General or the Executive Council;

**Adopts** the revised Rules of the Voluntary Cooperation Programme given in the [annex](#) to this Resolution;

**Urges** Members to contribute to the maximum extent possible to the VCP in the form of financial support and equipment and services, including fellowships and requests particular attention to calls for contributions for emergency assistance following extreme events,

**Authorizes** the Executive Council to review the rules and procedures for the operation of the VCP, when necessary, bearing in mind the decisions of the Eighteenth World Meteorological Congress.

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Note: This resolution replaces Resolution 30 (Cg-XVI), which is no longer in force.

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## **Annex to Resolution 68 (Cg-18)**

### **RULES OF THE WMO VOLUNTARY COOPERATION PROGRAMME (VCP)**

#### **Terminology**

1. The programme shall be known as the WMO Voluntary Co-operation Programme (VCP). It shall consist of the following components:

- (a) Voluntary Co-operation Fund (VCP(F));
- (b) Equipment and Services Coordinated Support (VCP(ES));
- (c) Emergency Assistance Fund (VCP-EAF).

#### **Purpose and resources of the VCP**

2. The VCP shall be established and maintained by voluntary contributions received from Members, for the purpose of meeting officially submitted requests proposing co-operation projects in different fields, as indicated in paragraph 6 below. Contributions may take the form of financial payments in any currency which can be readily used for the VCP(F) and VCP-EAF and/or offers of expertise, equipment and services including training/fellowships.

3. Financial contributions are made unconditionally; the Secretary-General shall invite Members once every year to notify him as early as possible of the amount and the currency of financial contributions which they wish to pledge for the next calendar year.

#### **Administration of the VCP**

4. The VCP shall be administered by the Secretary-General in accordance with:

- (a) The provision of the present rules;
- (b) The Financial Regulations of the Organization, except as otherwise provided for in these rules as a trust fund;
- (c) Any supplementary directives for interpretations of these rules and regulations that may be decided upon by the Executive Council.

5. Costs involved in the management of VCP should be kept to a minimum and should be met from the appropriate allocations in the Regular Budget together with allocations from VCP(F), as necessary, and be exempt from project support cost levy.

**Fields of co-operation**

6. The fields of co-operation covered by the VCP shall include:
- (a) Development of relevant legislation and National Strategic Plans of National Meteorological and Hydrological Services;
  - (b) Granting of short-term and long-term fellowships;
  - (c) Support to short-term training seminars;
  - (d) Support to user engagement for meteorological, climatological and hydrological applications and service delivery;
  - (e) Establishment / enhancement of observing and data-processing facilities, applications and service delivery / dissemination services;
  - (f) Contingency planning for cases of severe disasters;
  - (g) Other areas of cooperation as may be proposed by the WMO Secretary-General or the Executive Council.

7. The VCP shall not compete with or replace other means and resources available for promoting activities mentioned in paragraph 6 above. Accordingly, the VCP should be regarded as being a supplement to the following programmes:

- (a) National programmes in meteorology and operational hydrology;
- (b) Bilateral or multilateral programmes of technical co-operation in the above fields;

The NMHS Member concerned, shall in all cases have the signed agreement of the Permanent Representative to the project and to any counterpart action or contribution on its part.

**Types of co-operation**

8. Support provided through the VCP may consist of any of the following, taking into account the provisions of paragraphs 6 to 7 above:

- (a) Equipment;
- (b) Expert services;
- (c) Training/Fellowships;
- (d) Counterpart services.

Sub-paragraph (d) above refers to the nature and scope of the national contribution to projects which may include accommodation, staff, expendables and the infrastructure within which the completed project will function.

**Criteria for VCP projects**

9. All VCP projects shall satisfy the following criteria:
- (a) The project cannot be implemented under other bilateral or multilateral programmes of technical co-operation and there is no reasonable prospect of its being met by any of the other means;
  - (b) There is a reasonable prospect that at the end of the project the benefits will be lasting or the services installed will be maintained;
  - (c) The project contributes to one or more of the areas listed in paragraph 6.

**Approval for the utilization of the VCP(F)**

10. Authority to approve the utilization of the VCP(F) shall be vested in the Secretary-General. In approving each project the Secretary-General shall specify clearly the amount and currency authorized for this purpose. The Secretary-General shall have the right to amend any previously approved project prior to its completion as it considers necessary, in the light of changing circumstances.

**Formulation of proposed projects**

11. Proposed projects in the fields of cooperation given in paragraph 6 shall be based on official requests received from the Permanent Representative. Each request for equipment and services will specify the following details:

- (a) Purpose and description of the project;
- (b) Reason why other sources of support cannot be expected;
- (c) Overall goal(s) (explanation of how the project fits into the implementation of activities listed in paragraph 6 within the framework of the WMO Strategic and Operating Plan);
- (d) Expected outcomes (regional or national benefits to be expected from the project);
- (e) Nature and scope of national contribution to the project, for implementation and continued operation;
- (f) Nature and scope of VCP assistance requested with budget proposal;
- (g) Estimated duration to complete the project.

Details requested in sub-paragraph (f) will include information on budget support planned for spare parts and consumables after the initial operation and information on particular problems to be expected with customs clearance or reimbursement of taxes by the NMHS to the government for countries where applicable.

12. For projects concerning fellowships, each request will specify the following details:

- (a) Background information for evaluation of training requirements;
- (b) Field of specialization in which training is requested;
- (c) Proposed duration of training;
- (d) Purpose of training.

Each request shall be made on the appropriate WMO request form and if relevant be accompanied by the completed WMO fellowship nomination form. The acceptance of the basic WMO conditions governing the award of the WMO Fellowships under VCP, as they appear on the WMO request form, is implied in the submission of the request by the Member concerned.

**Circulation of proposed projects**

13. VCP requests will be circulated by the Secretary-General with minimum delay to VCP supporting Members.

14. The Secretary-General will periodically notify Members of the Organization of the projects supported by Members through VCP.

**Procedures for implementation of projects**

15. Before implementation of any supported project begins, the Secretary-General shall negotiate the appropriate agreements between the Members concerned and the Organization.

16. The following principles shall be incorporated in the agreements between WMO and the Members providing equipment and services:

- (a) The agreement shall be signed by the Permanent Representative of the contributing Member and the Secretary-General of WMO or his designate;
- (b) The agreement shall specify in detail the equipment and training to be provided and services to be rendered by the contributing government, with a planned schedule for the implementation of the project;
- (c) The agreement shall specify clearly that the equipment in question is donated to the recipient Member, the transfer of title to be effective at a time and place specified;
- (d) Notwithstanding principle (d), the agreement may and shall normally include arrangements for the transportation of equipment and its installation. As far as possible the costs involved shall be met by one or other of the co-operating parties;

17. The following principles shall be incorporated in the agreements between WMO and the Members being provided with cash, equipment or services under the VCP:

- (a) The agreement shall be signed by the Permanent Representative and the Secretary-General of WMO or his/her designate;
- (b) The agreement shall specify in detail the equipment which the Organization shall transfer to the government and the services which shall be rendered by the Organization or its authorized agent, which may be the contributing country;
- (c) In the case of projects which involve contribution in cash to a Member the agreement shall specify the items for which the cash contribution will be used and shall lay down procedures for the financial accounts to be submitted by the Member concerned;
- (d) The agreement shall specify in detail the counterpart responsibilities accepted by the Permanent Representative in respect of the local facilities, internal transportation, site preparation, provision of personnel to be trained, installation, subsequent operation and maintenance of the equipment, with a planned schedule for the implementation of the project;
- (e) The agreement shall specify that after implementation of the project a report will be provided stating that the equipment is operational, the project completed and the operating Member assumes responsibility for continued operation of the equipment from national resources.

18. The Secretary-General shall submit a progress report on the programme to each session of the Executive Council.

### **Duration of validity of projects**

19. The Secretariat should ensure that the approved projects are completed within the agreed time limit. Furthermore, projects which have been circulated for more than one year and have not been supported shall be reviewed, updated or cancelled as appropriate. The Secretary-General shall take appropriate action in this respect with Members concerned and if necessary assist them in reformulating the VCP request.

### **Review of these rules**

20. These rules can be amended by the Executive Council as necessary to ensure an efficient management of the Voluntary Cooperation Programme.

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## **Resolution 69 (Cg-18)**

### **GUIDELINES ON THE ROLE AND OPERATIONS OF WMO REGIONAL AND REPRESENTATIVE OFFICES**

THE WORLD METEOROLOGICAL CONGRESS,

**Noting:**

- (1) Resolution 1 (Cg-18) - [WMO STRATEGIC PLAN](#),
- (2) Resolution 6 (Cg-18) - [WMO REGIONAL ASSOCIATIONS](#),

**Noting further** the excellent progress since the Seventeenth World Meteorological Congress regarding the relocation of the Regional Offices for Asia and the South-West Pacific and for Africa to Singapore and Addis Ababa, respectively, and that all WMO Regional and Representative Offices are now located in their respective regions,

**Recognizing** that the WMO Regional and Representative Offices are the Organization's "front line". They are the gateway to WMO Members and Partners for the Secretariat and the conduit back to the Secretariat of the expectations, needs and priorities of the Members and Regional Associations,

**Considering** the need to improve the working mechanisms, in particular the complementary roles of regional associations and technical commissions in the development and implementation of global, regional and national systems and services, including in the capacity development, monitoring and evaluation activities,

**Considering further** that the effectiveness of regional associations' activities and their contribution to the WMO strategic objectives are dependent on the available secretariat support through adequately resourced and properly geographically located WMO Regional and Representative Offices,

**Welcoming** that the Secretary-General has increased the human resource capacity of several of the WMO Regional and Representative Offices through regular and extra-budgetary financing and secondments including the Regional Office for Asia and the South-West Pacific (Singapore), the Representative Office for Eastern and Southern Africa (Nairobi, Kenya), the Representative Office for South-West Pacific (Apia, Samoa) and that new staff will soon be deployed in the Regional Office for the Americas (Asuncion, Paraguay) and the Representative Office for North America, Central America and the Caribbean (San Jose, Costa Rica) using extra-budgetary resources and that the WMO project office in Croatia is being strengthened in its capacities to support Members in South-East Europe (SEE),

**Notes with appreciation** *Volume I of the Guidelines on the Role and Operations of the WMO Regional and Representative Offices* issued under the authority of the Secretary-General as summarized in the [annex](#) and detailed in [Cg-18/INF. 8.1\(3\)](#),

**Expresses heartfelt appreciation** to the Governments of those Members hosting WMO Regional and Representative Offices,



**Decides:**

- (1) That the current geographical distribution of WMO Regional and Representative Offices should be maintained and, if possible, strengthened by consideration of additional sub-regional offices and / or project offices as appropriate such as aligned with specific economic or language groupings;
- (2) That the WMO Regional and Representative Offices, working closely with presidents of regional associations should support and influence the full alignment of the activities of the regional associations with the relevant structures of the technical commissions and with the strategic goals of the WMO Strategic Plan, pursuing harmonized structures among all regional associations to promote common approaches and better cross-regional cooperation;

**Urges** Members and presidents of regional associations to liaise closely with the WMO Regional and Representative Offices in the respective Regions regarding their work plans;

**Requests** the Executive Council, the regional associations, the technical commissions and the Secretary-General to support the work of the WMO Regional and Representative Offices adhering to the vision, overarching priorities, long-term goals and strategic objectives set forth in the WMO Strategic and Operating Plan and in particular capacity development activities such as those described in [Cg-18/INF. 8.1\(2\)](#);

**Requests** the Secretary-General to:

- (1) Strengthen the role of the WMO Regional and Representative Offices in facilitating and accelerating the implementation of the development programmes / projects supported by international funding as addressed in Resolution 74 (Cg-18);
- (2) Allocate additional resources to support the work of the WMO Regional and Representative Offices;
- (3) Ensure that the WMO Regional and Representative Offices actively engage with the UN Development System and the UN Resident Coordinators to raise visibility of the work and priorities of WMO and Members in the regions;
- (4) Ensure that the WMO Regional and Representative Offices work closely with Development Partners and relevant regional structures;

**Appreciates** the support of Members who have provided secondments, interns and Junior Professional Officers and encourages them to continue to do so;

**Calls upon** Members to consider further support to the WMO Regional and Representative Offices through secondment of staff and support to activities through the Voluntary Cooperation Programme and other assistance mechanisms.

### **Annex to Resolution 69 (Cg-18)**

## **GUIDELINES ON THE ROLE AND OPERATIONS OF WMO REGIONAL AND REPRESENTATIVE OFFICES**

### **Executive summary**

This 2019 version of WMO Guidelines on *The Role and Operations of WMO Regional and Representative Offices*, issued under the authority of the WMO Secretary-General, details the role of the WMO Regional and Representative Field Offices and provides the framework for their operational policies and procedures.

The document is in two volumes:

Volume 1. Role and Responsibilities of WMO Regional Offices and Representative Offices (This Annex)

Volume 2. Operational Manual for WMO Regional Offices and Representative Offices – Processes and Procedures (to be developed)

Volume 1 is intended to serve as a guide for all WMO staff members, Members and constituent bodies as well as an introduction to WMO partners on the WMO Regional approach. The document is intended to foster a clearer understanding of the major principles guiding the WMO presence in the regions by providing an overview of the role of the WMO Regional Offices and Representative Offices as “front line” to WMO Members and their operations.

Volume 2 covers the internal management of the Regional and Representative Offices and is intended to serve as a manual for all WMO staff members serving in the field and at WMO headquarters. It provides guidance on the work planning and procedures of WMO operations in the field.

The Guidelines recognize that WMO priorities are Member driven and require a strong focus on nationally owned development priorities and results, and should reflect the guiding principles of national ownership, especially in relation to capacity development along all aspects of the weather, water and climate services value chains. While the primary audience for the Guidelines is WMO staff, it is hoped that it will also contribute to the efforts of all our partners.

The guiding framework of WMO work in regions and countries is the WMO Strategic and Operational Plans 2020-2023 ([Resolution 1 \(Cg-18\)](#)), which provides guidance to WMO management and staff on key objectives and desired outcomes of WMO efforts to support its Members and in particular least developed countries and Small Island Developing States. They reflect the intentions of the WMO Congress and also inform WMO stakeholders of how WMO conducts its work.

*[The full Volume 1 can be accessed in [Cg-18/INF. 8.1\(3\)](#)]*

## **Resolution 70 (Cg-18)**

### **COUNTRY PROFILE DATABASE**

THE WORLD METEOROLOGICAL CONGRESS,

**Recalling** Resolution 7 (EC-68) - Country Profile Database, that acknowledges the need for investment in the CPDB to enable efficient data collection and sharing, and monitoring of national capabilities, gaps and projects, and urges Members to contribute to CPDB development,

**Noting** that Version 3 of the Country Profile Database (CPDB) will be launched in the second half of 2019 where significant improvements are envisioned in terms of access, data collection and management, data visualization and storage; that dashboards, maps and other interactive features will be developed to improve performance reporting; and that Members’ nominated focal points will have access to tools that will allow NMHS to update and report on their own profile, as well as the ability to compare their profile against regional and global profiles,

**Recognizing** that the ultimate objective is to turn CPDB into a single repository of information accessible to and used by all Members as the WMO Community platform. That the existence of such a knowledge hub is expected to facilitate decision-making and inform strategic planning nationally as well as for WMO as a whole and further help in the identification of priorities and capacity gaps as well as assist in resource mobilization for WMO and development partners,

**Considering** that the new Platform integrates contact management and Member profiles with questionnaires and surveys to reduce redundancies in requested information and ease the process of data collection, for example by allowing to delegate different parts of surveys to different experts; and that advanced business intelligence capabilities and visualization in tailored dashboards will allow more comprehensive visualization of information,

**Welcoming** that the establishment of such a knowledge hub will facilitate the identification of capacity gaps at the national level, support regional priority setting, and inform the investment decisions of stakeholders including development partners,

**Decides** that when all modules are implemented later in 2019 and to reflect the expanded functionalities, the new version should be called the "WMO Community Platform",

**Requests Members:**

- (1) To regularly update their profiles on the WMO Community Platform and provide Monitoring and Evaluation (M&E) data, as needed,
- (2) To review and, if not already assigned, designate M&E Focal Points / Community Platform Focal Points, authorizing them to:
  - (a) Serve as liaison with the Secretariat on related issues;
  - (b) Facilitate the collection of monitoring data;
  - (c) Ensure timely, accurate, reliable and comprehensive performance information; and
  - (d) Participate in the continued development and improvement of the WMO Community Platform;

**Requests** the presidents of the regional associations to:

- (1) Monitor the WMO Community Platform for their region;
- (2) Support Members in providing their information into the platform;
- (3) Provide guidance to the Secretariat on the development of new reporting formats which will support them to identify gaps in their region, and effectively support Members in the implementation of the Strategic Plan.

*[See for more information [Cg-18/INF. 8.1\(1\)](https://community.wmo.int/) / The new platform is accessible under: <https://community.wmo.int/>]*

## **Resolution 71 (Cg-18)**

### **THE EDUCATION AND TRAINING PROGRAMME AND DELIVERY MECHANISM**

THE WORLD METEOROLOGICAL CONGRESS,

**Recalling** Resolution 51 (Cg-17) on the WMO Education and Training Programme;

**Noting** the outcome of the Thirteenth World Meteorological Organization (WMO) Symposium on Education and Training (SYMET-13), 29 to 31 October 2017, Needham's Point St. Michael, Bridgetown, Barbados [see [Cg-18/INF. 8.2](#)];

**Considering:**

- (1) The capacity development strategic objective in the WMO Strategic Plan,
- (2) That the availability of competent experts and viable institutions on meteorology, hydrology, climatology and related disciplines is fundamental for capacity development of National Meteorological and Hydrological Services (NMHSs),
- (3) That NMHSs of many Members, particularly Least Developed Countries (LDCs) and Small Island Developing States (SIDS) are still in need of support to establish and sustain a critical mass of human resources in order to deliver quality services,
- (4) That scientific research is critical to the development of education and training capacity in meteorological, hydrological and climatological sciences both in terms of content and delivery methodology,
- (5) That specialized training is a prerequisite for putting NMHSs and allied national institutions in an appropriate position to support current and future national and international social and economic activities,

**Decides** that:

- (1) The major focus and strategy of the ETR Programme should continue to be directed towards the development of qualified and competent NMHS staff to ensure the availability of quality education and training opportunities in collaboration with education and training providers at national and international levels, particularly Regional Training Centres (RTCs) and other allied institutions;
- (2) Leadership and management development in NMHSs should be given prominent attention in the development and implementation of the Programme;
- (3) The Programme should continue to leverage available resources from relevant stakeholders to complement those available in the WMO Regular Budget as a way of meeting the increasing demand for education and training opportunities;

**Urges** Members:

- (1) To collaborate in, and give required support to the implementation of the WMO education and training activities, in particular by sharing national education and training opportunities, resources and expertise with other Members;
- (2) To strengthen their national capacity in the attainment of self-sufficiency in meeting their education and training needs;
- (3) To encourage the participation of women in education and training programmes in order to reduce the gender gap;

**Requests** the Executive Council:

- (1) To take all necessary actions to enable the Programme to meet its objectives under the WMO Strategic Plan;
- (2) To work with stakeholders in promoting research and development as a major activity of meteorological and hydrological training institutions and to promote the uptake of

scientific developments in areas such as climate change, air quality and numerical weather prediction into education and training curricula;

**Requests** the Secretary-General:

- (1) To support education and training activities as a major component of WMO capacity development endeavours;
  - (2) To continue to collaborate with development partners and training providers regarding the development of the required human resource capacity of Members through formal and continuing education;
  - (3) To develop the competency requirements of leadership and management of NMHSs as resources allow;
  - (4) To support the incorporation of education and training components in bilateral and multilateral cooperation projects;
  - (5) To promote the exchange of knowledge and expertise on education and training issues between interested stakeholders, inter alia, through volunteerism;
  - (6) To work with stakeholders in promoting research and development as a major activity of meteorological and hydrological training institutions and to promote the uptake of scientific developments in areas such as climate change, air quality and numerical weather prediction into education and training curricula;
  - (7) To continue to work in close collaboration with WMO constituent bodies in the development and delivery of its Education and Training Programme.
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## **Resolution 72 (Cg-18)**

### **THE WMO GLOBAL CAMPUS INITIATIVE**

THE WORLD METEOROLOGICAL CONGRESS,

**Recalling** Resolution 53 (Cg-17) – WMO Global Campus Feasibility Study – to continue the feasibility study initially agreed by the Executive Council at its sixty-sixth session, and requesting a formal proposal to be considered at the Eighteenth World Meteorological Congress,

**Noting:**

- (1) Resolution 16 (EC-66) – Feasibility Study for Establishing a WMO Global Campus – decision that the EC Panel of Experts on Education and Training should proceed with a feasibility study on the WMO Global Campus,
- (2) Decision 48 (EC-70) – Education and Training – decision to endorse the WMO Global Campus initiative,

**Noting also** [See [Cg-18/INF. 8.2](#)]:

- (1) The strong endorsement of the 2017 Symposium on Education and Training (SYMET-13), and the recommendation of the EC Panel of Experts on Education and Training,

- (2) Outcomes of the November 2018 meeting on the WMO Global Campus Initiative, including strong support from universities interested in advancing meteorological education and in the fields of weather, water and climate,
- (3) The 2019 Status Report on the WMO Global Campus Feasibility Study,

**Noting with satisfaction** the significant progress demonstrated by the feasibility study, including new tools and collaboration opportunities for WMO Regional Training Centres and other WMO Education and Training Programme partners,

**Mindful** of Resolution 16 (EC-66) which decided that a proposal for a WMO Global Campus must not undermine the purpose and programmes of the network of WMO Regional Training Centres (RTCs), which are operated by Members for the benefit of the wider meteorological community,

**Having examined** the WMO Global Campus Roadmap and other information and tools available on the WMO Learn website (<https://public.wmo.int/en/resources/training/wmolearn>),

**Decides** to endorse the WMO Global Campus for developing a coordinated and collaborative network of institutions that work together to meet the growing education and training needs of WMO Members, building upon the existing network of WMO Regional Training Centres (RTCs) and other educational and training institutions partnering with the WMO Education and Training Programme;

**Urges** Members:

- (1) To take an active role in the WMO Global Campus by forming regional and global collaborations, and by sharing learning resources, infrastructure, and other appropriate support as possible to further the goals of meeting the education and training needs of all WMO Members;
- (2) To promote the exchange of best practices and expertise between interested stakeholders on projects contributing to and benefiting from the WMO Global Campus;
- (3) To make available experts as volunteers to support the activities of the Global Campus;

**Requests** the Secretary-General:

- (1) To provide dedicated support for the coordination of the activities of the WMO Global Campus within the Secretariat;
- (2) To monitor progress and provide updates as appropriate on WMO Global Campus activities at WMO Constituent Body Meetings.

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Note: This resolution replaces Resolution 53 (Cg-17), which is no longer in force.

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## Resolution 73 (Cg-18)

### STRENGTHENING THE CAPACITY OF MEMBERS IN SERVICE DELIVERY

THE WORLD METEOROLOGICAL CONGRESS,

**Recalling** competency requirements for those working in aviation, climate, public weather, and marine services (see Resolutions 4, 6, 8 (Cg-17), Resolution 5 (EC-68), as well as ongoing revisions and additions to standards and guidance material regarding agricultural meteorology services),

**Concerned** by the increasing impact and frequency of severe weather and associated hazards affecting a growing global population (especially mega-cities) in a changing climate,

**Acknowledging** the recognized gaps in service delivery, as shown in the recent surveys

*[Status of Human Resources in National Meteorological and Hydrological Services - ETR-No.21; WMO Survey of National Marine and Coastal Services (2018) – see Resolution 29 and Cg-18/INF 8.2; Assessment of the Coastal Inundation Demonstration Forecasting Project (2018) – see Resolution 15; Outcomes of the WMO 2018 Urban Survey; Survey on Service Delivery (2015), and Outcomes of the 2016-2017 Global Survey on Aeronautical Meteorological Service Provision, AeM Series No. 1],*

**Requests** the Executive Council with the support of the Technical Coordination Committee (TCC), the Capacity Development Panel, and relevant technical commissions to:

- (1) Analyse Members' competency assessments through the WMO Community Platform (Country Profile Database) and prioritise interventions;
- (2) Develop training and other capacity development initiatives to address gaps in Members' ability to deliver services; and
- (3) Address the necessary implementation measures for these initiatives;

**Requests** Members to support these training and capacity development initiatives in line with WMO technical regulations, guides, and competency requirements *[see example Training Initiative in Marine Meteorological Service Delivery, Cg-18/INF. 8.2]*, in collaboration with relevant partners (e.g. through the provision of experts and other resources);

**Further requests** Members to refer to the Guide to Competency (WMO-No. 1205);

**Encourages** Members to provide their staff with opportunities to participate in training on service delivery.

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## **Resolution 74 (Cg-18)**

### **CLOSING THE CAPACITY GAP: SCALING UP EFFECTIVE PARTNERSHIPS FOR INVESTMENTS IN SUSTAINABLE AND COST-EFFICIENT INFRASTRUCTURE AND SERVICE DELIVERY**

THE WORLD METEOROLOGICAL CONGRESS,

#### **Acknowledging:**

- (1) That according to the World Economic Forum 2019 Global Risks Report, the world's top four risks are weather, climate and water related. These risks and the growing challenges place WMO and its Members centre stage as regards sustainable development and climate action, as reflected in the vision of the WMO Strategic Plan,
- (2) That increasing weather, climate and water-related risks require Members and development partners to scale up and increase effectiveness and sustainability of investments for high quality weather, climate, hydrological and environmental services, and enhance cooperation and synergies with all UN Agencies and other bodies for sustainable development,
- (3) That the effective implementation of investments to improve weather, climate and water services requires effective coordination and commitment with users to enable the joint design and development of specific products and services, through the Global Framework for Climate Services (GFCS), for example, to ensure the sustainability of investments and adapt interventions to the ends,

#### **Recalling:**

- (1) Resolution 49 (Cg-16) WMO Capacity Development Strategy, particularly Objective 4, which calls on WMO to actively explore new funding opportunities and develop proposals through dialogue with stakeholders and development partners,
- (2) Resolution 1 (Cg-18) WMO Strategic Plan and particularly Strategic Objective 4.3, which calls for closing the capacity gap on weather, climate, hydrological and related environmental services through effective partnerships,
- (3) Recent Regional Associations' decisions (RA I-17, RA III-17, RA V-17) that request the Secretary-General to scale up support to strengthen NMHSs' infrastructure, capacity, and service delivery through the establishment of effective partnerships, including with the Green Climate Fund and the World Bank; and to increase diversification of WMO country support mechanisms, including the WMO Country Support Initiative (CSI),
- (4) The 2019 Cairo Declaration of the African Ministerial Conference on Meteorology, welcoming the creation of the Alliance for Hydromet Development and the WMO Country Support Initiative and committing to mobilize financial and political support to enhance national and regional capacity to perform the public service mandate of meteorological and hydrological services,

**Welcoming** the announcement of the World Bank together with WMO to jointly create the Alliance for Hydromet Development, made at the World Bank Group Annual Meetings 2018,

**Further acknowledging** the declaration by the Presidents of the Regional Associations stating the importance of the Country Support Initiative to increase WMO responsiveness in addressing Members' needs and strengthening their capacity and looking forward to the launch of the initiative,



**Decides:**

- (1) To pursue the establishment of the Alliance for Hydromet Development, jointly with the World Bank and in collaboration with a larger group of international development partners, for increased and more effective and sustainable development assistance in support of developing Member countries and territories, based on the concept outlined in [Annex 1](#);
- (2) To establish the WMO Country Support Initiative, as a complementary vehicle to support developing Member countries and territories and development partners in translating the commitment of the Alliance for Hydromet Development into practice. The Initiative will provide advisory services aimed at increasing effectiveness of investments in weather, climate and hydrological services, as outlined in the [Annex 2](#) to this resolution;

**Invites** all Members:

- (1) To promote the principles of collaboration that underpin the Alliance for Hydromet Development when providing or receiving development assistance in support of weather, climate and hydrological services;
- (2) To scale up the provision of expertise through the WMO Country Support Initiative to support developing Member countries and territories and their development partners, including using existing WMO information infrastructures such as the expert database of the WMO Community Platform;

**Invites further** Development Partners:

- (1) To partner with WMO and the World Bank in pursuing the establishment of the Alliance for Hydromet Development and associated principles;
- (2) To utilize and promote the advisory services provided by WMO Members through the WMO Country Support Initiative so that projects in support of weather, climate and hydrological services benefit from WMO standards and good practices and contribute to strengthening integrated global-regional-national WMO systems, in line with the Agenda 2030 and the Sustainable Development Goals, the Sendai Framework for Disaster Risk Reduction and the Paris Agreement;

**Requests** Technical Commissions:

- (1) To provide technical guidance to the Country Support Initiative in translating WMO standards into operational advice tailored to the needs of developing Member countries and territories;
- (2) To consider the practical experience gained through the implementation of the WMO Country Support Initiative when further developing technical standards;

**Requests** Regional Associations:

- (1) To provide regional guidance to the Country Support Initiative in translating WMO knowledge and expertise into operational advice tailored to the needs of developing Member countries and territories;
- (2) To take advantage of the Country Support Initiative for achieving regional priorities

**Requests** the Executive Council

- (1) To follow the implementation progress of the CSI framework and the Alliance for Hydromet Development;

- (2) To ensure that the CSI and other WMO activities which support capacity development are complementary and take into consideration the unique national context of Members;
- (3) To take further actions to support the implementation of the CSI and the Alliance for Hydromet Development, as needed, and report to Congress;

**Requests further** the Secretary-General:

- (1) To facilitate the establishment of the Alliance for Hydromet Development in collaboration with the World Bank and other development partners;
- (2) To mobilize extra-budgetary resources and Members' expertise to enable the implementation of the Country Support Initiative.

## **Annex 1 to Resolution 74 (Cg-18)**

### **CONCEPT FOR THE ALLIANCE FOR HYDROMET DEVELOPMENT**

**Global threats and challenges related to climate change and the impact of adverse weather events are rapidly increasing, yet developing countries face major capacity constraints** to respond to growing demands for reliable high-quality weather, climate, hydrological, marine and environmental services. While many development partners are contributing to hydromet development<sup>15</sup> and strengthening national capacities, uncoordinated investments have led to a fragmented flow of projects funded by development partners, often resulting in a patchwork of observation infrastructure and technologies that are impossible for NMHSs to sustain.

**The Alliance for Hydromet Development is expected to create a shared commitment between WMO and major development partners to scale up and increase effectiveness of development cooperation** for high quality weather, climate, hydrological, marine and environmental services.

**The Alliance is expected to be guided by principles of collaboration along the lines outlined below:** Members of the Alliance commit to:

- **Align efforts to achieve commonly shared hydromet development targets.** Drawing from the WMO Strategic Plan 2020-2023 and major international agreements – Agenda 2030 and its Sustainable Development Goals, Paris Agreement, and Sendai Framework for Disaster Risk Reduction – the Alliance will establish a limited number of high-level hydromet development targets. These targets will guide hydromet development cooperation. Progress on achieving these targets will be measured.
- **Jointly develop a “hydromet gap” flagship report.** This regular and increasingly refined report will provide the analytical underpinning of the Alliance and measure progress in closing the gap.
- **Strengthen inter-connected WMO operational systems through well-coordinated projects.** Today, very important observational data are missing, especially in developing countries. This lack of well performing observation infrastructure limits prediction and understanding of weather and climate patterns across the globe. Members of the alliance will strengthen integrated national, regional, and global WMO operational systems in a coordinated manner.

<sup>15</sup> The term “hydromet investments” refers to investments that strengthen meteorological, climatological, and hydrological capacity and services.

- **Provide adequate resources for hydromet development** in line with the Addis Ababa Action Agenda on Financing for Development,<sup>16</sup> in particular its action area on international development cooperation. Members of the Alliance will dedicate an adequate share of development and climate finance to strengthen hydromet capacity.
- **Increase effectiveness and sustainability of hydromet investments** in accordance with internationally agreed principles of development effectiveness.<sup>17</sup>

**The WMO Country Support Initiative (CSI) will support the Alliance for Hydromet Development.** While the Alliance will create the commitment, the CSI will provide objective technical advice to the members of the Alliance, including on the design of hydromet-related projects based on WMO requirements, regulatory material, standards, and good practices. The initiative will also undertake a continuous and strategic country project mapping, spearhead the creation of the "one-stop-shop" hydromet knowledge platform, and support the development of the "hydromet gap" global flagship report.

**The CSI will support development partners in the design of hydromet-related projects based on WMO requirements, regulatory material, standards and good practices.** An important aspect of this support is to provide guidance for investments to ensure integration across two areas - integration of country-level investments within WMO regional and global systems, and integration of individual projects into broader country-led programmes

**The Alliance for Hydromet Development represents a commitment, it is not an institution.** The Alliance will have an open architecture. All development partners committed to strengthen meteorological, climatological, and hydrological capacity and services and willing to adhere to the collaboration principles of the Alliance are invited to join.

**The Alliance does not require additional funding for its functioning.** As part of its regular work, the WMO Development Partnerships Office will facilitate communication of and within the Alliance and coordinate with the CSI Secretariat on its support to the members of the Alliance. The members of the Alliance will meet on the occasion of the World Meteorological Congress to take stock and discuss how to further increase the ambition level of the Alliance to respond to growing challenges.

**The creation of the Alliance has been spearheaded by the WMO Secretariat and the World Bank.** It emerged as an outcome of the second hydromet Development Partners Conference that took place in March 2018. The conference agreed that progress made since the first such conference in 2016 was not sufficient and explored ways to move beyond business as usual. At the World Bank Group Annual Meetings in October 2018, the World Bank Vice President and WMO Secretary-General announced their commitment to create the Alliance with an expected launch at the next Annual Meetings in October 2019.

## **Annex 2 to Resolution 74 (Cg-18)**

### **WMO COUNTRY SUPPORT INITIATIVE**

**The World Meteorological Organization (WMO) Strategic Plan 2020-2023 puts strengthening Member capacity centre stage.** Scaling up effective partnerships for investments in sustainable and cost-efficient infrastructure and service delivery is a strategic objective of this Plan.

<sup>16</sup> Addis Ababa Action Agenda of the third International Conference on Financing for Development. Available at: [https://www.un.org/esa/ffd/wp-content/uploads/2015/08/AAAA\\_Outcome.pdf](https://www.un.org/esa/ffd/wp-content/uploads/2015/08/AAAA_Outcome.pdf)

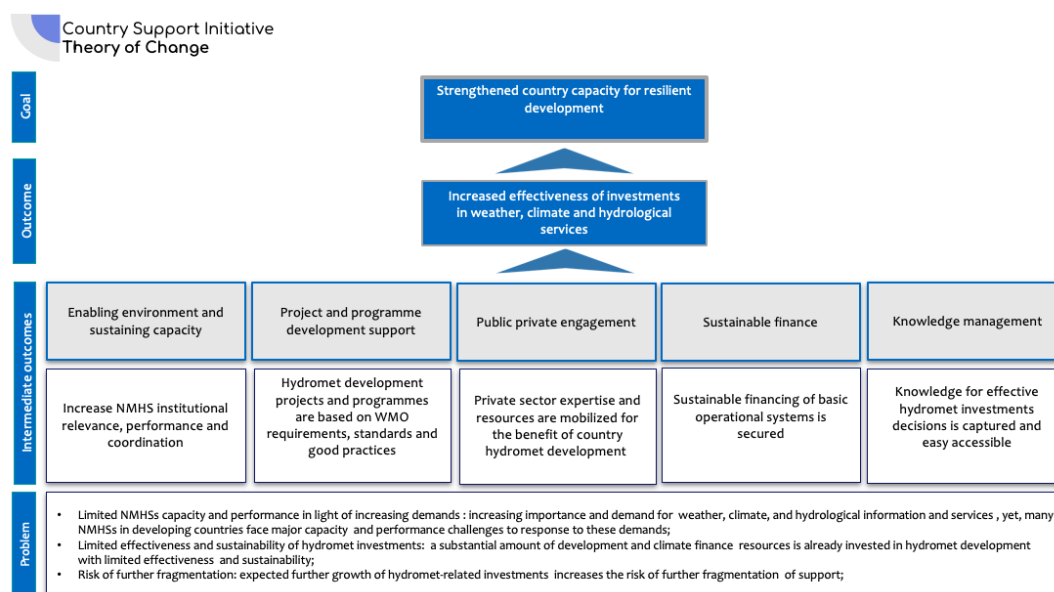
<sup>17</sup> The Busan Partnership for Effective Development Cooperation, June 2012. Available at: <http://www.oecd.org/dac/effectiveness/Busan%20partnership.pdf>

**While a sizeable amount of development and climate finance resources has been invested in hydromet development,<sup>18</sup> experience has shown that effectiveness and sustainability of these investments has been rather limited.** The increasing weather, climate, water and related environmental challenges and consequent expected growth of hydromet-related investments makes increasing effectiveness of these investments a prime development agenda.

**The Country Support Initiative (CSI) is forming a “high ambition coalition” with the objective to increase the effectiveness of investments in weather, climate, and hydrological services.** The CSI will complement and leverage existing initiatives and funding mechanisms. It will function, on a voluntary basis, as an initiative of like-minded partners. It will provide demand-driven, objective and rapid response advice to developing countries and development partners.

**The CSI is a building block of the Alliance for Hydromet Development. While the Alliance will create the commitment, the CSI will provide technical support.** The Alliance is being established by WMO and the World Bank in collaboration with international development partners. The Alliance is expected to create a shared commitment and mutual accountability between WMO and development partners to scale up and increase effectiveness of development cooperation for reliable weather forecasts, early warning systems, and climate services.

**The CSI will support developing countries and development partners in five inter-linked areas to increase effectiveness of hydromet investments:**



**The CSI will create a “one-stop-shop” hydromet knowledge platform and support the development of a regular “hydromet gap” global flagship report.** The knowledge platform will include country baseline information, hydromet project mapping, gap analysis and good practices. The information collected and generated will be made available to all countries and development partners, taking advantage of and contributing to the upgraded WMO Country Profile Database. Based on this information, the “hydromet gap” flagship report will provide an increasingly refined analysis of the state of hydromet development, targeting most senior level decision makers. The report will provide analytical underpinning for the members of the Alliance for Hydromet Development to jointly close the financial and effectiveness gaps.

<sup>18</sup> The term “hydromet development” refers to investments that strengthen meteorological, climatological, and hydrological capacity and services.

**The CSI will create an enabling environment for and sustain the capacity of National Meteorological and Hydrological Services (NMHS).** It will support NMHSs on performance and compliance assessments aligned to WMO standards, development of strategic plans, and resource mobilization and coordination of development partners' support.

**The CSI will support development partners in the design of hydromet-related projects based on WMO requirements, regulatory material, standards and good practices.** An important aspect of this support is to provide guidance for investments to ensure integration across two areas - integration of country-level investments within WMO regional and global systems, and integration of individual projects into broader country-led programmes.

**The CSI will support public-private engagement and facilitate mobilization of private sector expertise and resources for the benefit of hydromet development in developing countries.** In June 2018, EC-70 adopted the WMO Policy Framework on Public-Private Engagement. The CSI will support interested countries in translating this framework into practice.

**The CSI will contribute to more sustainable approaches to financing basic operational systems. This includes developing options for innovative financing models.** Innovative finance needs to address the perennial sustainability issue of investments in and maintenance of operational systems, consider the global public good of observations, and incentivize NMHSs' performance, service delivery and open data exchange that is vital to the global system.

**At the heart of the CSI is a multi-partner core delivery team.** It is comprised of staff from core delivery partners, i.e. staff from NMHSs committed to join the CSI through the provision of adequate human resources, complemented by staff from the WMO Secretariat. The core delivery team is responsible for delivering CSI assignments.

**For each assignment, a CSI assignment team is assembled by the CSI Secretariat in coordination with the core delivery team.** Creation of the respective CSI assignment teams will consider delivery partners' competencies, geographic and thematic experiences, resources, and linguistic skills. The assignment team is responsible for assignment planning, timely and quality delivery, and reporting on the respective CSI assignment. Each assignment team will be comprised of at least two core delivery partners to combine knowledge and experience, foster joint learning, and ensure objectivity

**A small CSI Secretariat is created to administer the CSI, coordinate implementation of CSI activities, and ensure overall CSI communication and reporting.** The CSI Secretariat is accountable to the CSI funding partners and is hosted by the WMO Secretariat in Geneva under WMO management and applicable policies and procedures.

**An Independent Technical Advisory Group will provide technical advice to the CSI Secretariat, as requested.** The group will advise on the composition of the assignment team, risk management, quality assurance of services and handling potential conflict of interest situations. The group will comprise top-notch experts from WMO, and international development and research communities.

**A donor trust fund will be established to receive financial contributions from CSI funding partners.** To become operational, the CSI requires a minimum funding of USD 10 million for its initial phase of up to three years. The CSI provides an opportunity for bilateral development partners to leverage their funding. The WMO Secretariat will serve as the trustee of the CSI trust fund. The CSI trust fund will be administered in accordance with WMO financial rules, policies and procedures and will allow for transparent monitoring and reporting and traceability of financial contributions.

**A CSI steering committee will serve as the decision-making body for the CSI activities delivered under the donor trust fund and guide the overall direction of the CSI.** The steering committee comprises decision-making members (funding partners) and

observers. Observers would include representatives from core delivery partners, WMO technical commissions and regional associations, as well as the trustee, the CSI Secretariat host, and the chair of the WMO Capacity Development Panel.

**CSI delivery partners will provide advisory services on a cost recovery basis.** Basic services up to agreed thresholds are funded through the donor trust fund, i.e. are at no cost for clients, albeit co-funding is encouraged. Additional advisory services requested beyond these thresholds are fully financed by the clients.

**The CSI is expected to be implemented in an action learning manner.** The areas of intervention and the Theory of Change provide the scope and the results framework. Implementation experience will be systematically captured and guide the refinement and scaling up of CSI operations. Each CSI assignment will be evaluated by the client, an annual CSI self-evaluation will be undertaken, and an independent external evaluation of the CSI is planned after two years of CSI operation to further shape and scale up the initiative after its initial phase.

**The creation of the CSI has been spearheaded by the WMO Secretariat in collaboration with a growing number of committed NMHSs and development partners.** The WMO Secretariat is expected to support implementation of the CSI in three ways, serving as trustee of the CSI trust fund, hosting the CSI Secretariat, and contributing to the delivery of CSI assignments.

*[Full Concept Note of the WMO Country Support Initiative is provided in [Cg-18/INF. 8.3](#)]*

## **Resolution 75 (Cg-18)**

### **AMENDMENTS TO THE GENERAL REGULATIONS OF THE WORLD METEOROLOGICAL ORGANIZATION**

THE WORLD METEOROLOGICAL CONGRESS,

**Recalling** that the Seventeenth Congress requested the Executive Council to provide recommendations to the Eighteenth Congress on constituent body constructs and to provide recommendations on rules, procedures, processes, mechanisms and duties of constituent bodies and WMO Officers (President, Vice-Presidents, presidents of regional associations and technical commissions) and on their relationship with the WMO Secretariat to enhance the efficiency, effectiveness and good governance of the Organization,

**Having considered:**

- (1) Resolution 4 (Cg-18) – Designation of acting vice-presidents in between sessions of Congress,
- (2) Resolution 5 (Cg-18) – WMO Executive Council,
- (3) Resolution 6 (Cg-18) – WMO regional associations,
- (4) Resolution 7 (Cg-18) – Establishment of WMO technical commissions for the eighteenth financial period,
- (5) Resolution 8 (Cg-18) – Research Board,

- (6) Resolution 9 (Cg-18) – Joint World Meteorological Organization-Intergovernmental Oceanographic Commission Collaborative Board,
- (7) Resolution 24 (Cg-18) – Vision, strategy and organizational arrangements for hydrology and water resources in WMO,
- (8) The report of the Executive Council WMO Constituent Bodies Reform Task Force (Cg-18/INF. 4(2)),
- (9) The recommendations of the Executive Council Working Group on Strategic and Operational Planning (Cg-18/INF. 4(1)),

**Taking note** that the Convention of the World Meteorological Organization in its present form provides a good framework for the current and future work of the Organization and its constituent bodies, and that no changes to the articles of the Convention are envisaged at this stage,

**Recognizing** that the General Regulations should be updated and streamlined to serve their purpose as high-level rules for the Members, the officers of the Organization, constituent bodies and other bodies of the Organization and the Secretariat, for a consistent, efficient and effective conduct of the Organization's convening and other activities,

**Adopts** the amendments to the General Regulations, as provided in the annex, which fall into the following categories:

- (1) Substantial amendments to existing regulations;
- (2) Transfer of regulations of a procedural nature to *the Rules of Procedure*;
- (3) Removal of obsolete regulations;
- (4) Editorial changes;

**Notes** the draft "*Rules of Procedure for constituent bodies*" submitted for adoption by the Executive Council, and **requests** the Executive Council to keep the Rules of Procedure for technical commissions and regional associations under review, to develop the Rules of Procedure for the Research Board and for other bodies of the Organization and to update them, as necessary;

**Requests** the Secretary-General to publish the 2019 edition of the *Basic Document No. 1* (WMO-No. 15) containing the amended General Regulations and to inform all concerned of this decision.

## **Annex to Resolution 75 (Cg-18)**

### **AMENDMENTS TO THE GENERAL REGULATIONS**

#### **(1) Substantively amended regulations:**

6(b), 13-15, 16(c), 30(b), 36, 119, 180, 181, 183, 185, 187, 194 and 195 are as follows:

#### REGULATION 6

*[editorial note: Resolution 24 (Cg-18)]*

- (b) Each Member shall appoint, in consultation with the Permanent Representative, a Hydrological Adviser who preferably should be the Director of the respective National Hydrological Service or other national hydrological agency. The Member shall notify the Secretary-General of such appointment. The Hydrological Adviser should be consulted by and advise the Permanent Representative with respect to operational hydrology and its application to water management.

## REGULATIONS 13, 14, 15 and 16(c)

*[editorial note: see Resolution 4 (Cg-18)]*

## REGULATION 30

*[editorial note: Resolution 24 (Cg-18)]*

- (b) In each session of Congress an open committee of Congress, entitled the WMO Hydrological Assembly, shall be convened. It should be attended as a rule by the Hydrological Advisers of Members (in accordance with Regulation 6 (b)) and by other representatives of National Hydrological Services or other national hydrological agencies as designated by Members.

## REGULATION 36

*[editorial note: As per amended Regulation 183]*

An invitation to any technical expert in accordance with Regulations 34 or 35 to participate in the work of a subsidiary body shall be in accordance with Regulation 183. An invitation to any other individual to participate in the work of a subsidiary body shall require the prior concurrence of the Permanent Representative of the Member in which the individual lives, or of the competent authority of the United Nations or another international organization in which the individual works and with which the Organization has concluded arrangements or agreements. Invitations to individuals from these organizations shall be validated by the Secretariat.

## REGULATION 119

All official languages shall be working languages at Congress and Executive Council. Working languages at the Executive Council's committees' sessions shall be determined by the President based on the participation of members. The working languages for sessions of constituent bodies and their subsidiary bodies shall be determined by the Secretary-General, in consultation with the president of that constituent body, among the official languages as appropriate, with regards to working languages of Members or experts participating in the session.

## REGULATION 180

*[editorial note: Specific terms of reference of new commissions from Resolution 7 (Cg-18) will be included in the Rules of Procedure]*

- (a) The titles, their approved abbreviations and the general terms of reference of technical commissions shall be as specified in Annex III;
- (b) At each regular session of Congress, the technical commissions for the next financial period shall be established in accordance with Article 8 (g) of the



Convention. Members shall normally notify the Secretary-General on which commissions they intend to be represented. Such notification should normally be sent within 90 days after closure of the session of Congress and not later than 60 days before the ordinary session of the commission concerned.

#### REGULATION 181

In conformity with Articles 19 and 26 of the Convention, a technical commission, or other body, may be established jointly with another intergovernmental body of the United Nations system when the proposed terms of reference of the technical commission overlap substantially with the activities of the other body, and such joint sponsorship is deemed to be in the interests of WMO...

#### REGULATION 183

Technical commissions shall be composed of technical experts in the fields covered by the terms of reference of the commission. The designation of technical experts to participate in the activities of a technical commission shall be by the Permanent Representative, in consultation with the Hydrological Adviser (as relates to experts in hydrology), of the Member represented on the commission, and by the competent authority of the United Nations or other international organization with which the Organization has concluded arrangements or agreements. After the establishment of the technical commission by Congress, PRs and relevant international organizations will be invited to designate experts (update existing designations) according to the required expertise. Designations by the PRs shall be through the WMO Community Platform. Designations by the organizations shall be through the Secretariat, which should validate designations and enter them into the WMO Community Platform. These experts will form the WMO Expert Network from which the composition of commissions' subsidiary bodies will be drawn.

#### REGULATION 185

Only technical experts designated by Members with voting rights in accordance with Regulation 183 shall be eligible for election as president or vice-president of that commission.

#### REGULATION 187

- (a) Ordinary sessions of a commission shall normally be held at intervals not exceeding two years;
- (b) An extraordinary session of a commission may be convened for consideration of specific items by decision of Congress or the Executive Council;
- (c) The date and place of a session shall be determined by the Secretary-General in consultation with the president of the commission.

#### REGULATION 194

The quorum for a meeting shall be a simple majority of the Members with voting rights who are represented on the commission (as per Regulation 180 (b)).

#### REGULATION 195

If a quorum is not obtained at a **meeting**, the decisions, other than elections, adopted by a **simple** majority vote of those Members present shall be referred by correspondence to **Members represented on a commission**. Any such decision shall be considered a decision of the commission only when it has been approved by a **simple** majority of votes cast for and against within 90 days after it has been sent to the Members.

**(2) Regulations of a procedural nature transferred to the *Rules of Procedure*:**

3, 28, 29, 36 (b)-(d), 39-42, 47-52, 54, 172-176, and 188-193.

**(3) Obsolete regulations removed:**

30 (a), 31-32, 65, 113-117, 120-122, 125, 126, 138, 140, 147, 158, 159, 179, 182, 184 and 196.

**(4) Regulations with editorial changes (English version)<sup>19</sup>:**

4, 5, 9-12, 19, 21, 23-27, 33-35, 37, 38, 43-46, 55, 56, 57, 69, 75, 77, 82, 86, 87, 88, 93, 95-96, 106, 108-112, 118, 123, 127, 128, 136, 137, 142-143, 152, 154-156, 163, 167, 168, 182, 186, 198, 199 and 201.

*[editorial note: Full text of amended General Regulations with track changes is provided in approved [Cg-18/Doc. 9.3\(1\)-Appendix](#)]*

*Editor's note:* The link above was used by the delegates for the approval of the amendments/draft new edition. The final publication, issued after the eighteenth session of Congress, will be posted on the WMO library site at <https://public.wmo.int/en/resources/library>.

## Resolution 76 (Cg-18)

### ENHANCED FRAMEWORK FOR THE WMO TECHNICAL REGULATIONS

THE WORLD METEOROLOGICAL CONGRESS,

**Noting** amendments to the *Technical Regulations* (WMO-No. 49), its annexes (Manuals) and related Guides approved by the Executive Council since the seventeenth session of Congress [[Cg-18/INF. 9.3\(2\)](#)],

**Having examined** Recommendation 28 (EC-70) – Enhanced framework for the WMO Technical Regulations,

**Noting with appreciation** the significant progress that has been made towards the enhanced framework of the WMO Technical Regulations under the guidance of the Executive Council,

**Noting further** the prime role of the technical commissions in reviewing and updating the WMO Technical Regulations and their relevant Manuals and Guides,

**Recognizing** that the WMO role in setting international standards and recommended practices, supplemented by the relevant implementation guidance, will become even more important in the context of a multi-sector multi-stakeholder engagement between public, private and academic sectors, and scaling-up effective partnerships for investment,

**Acknowledging** that the enhancement of the normative work carried out by WMO is one of the main rationales for the constituent bodies reform with expected positive impact on the

<sup>19</sup> Changes in the English version related to gender neutral language may not be needed in other languages.

overall quality and relevance of the WMO Technical Regulations, including their broader recognition and acceptance by stakeholders from private and academic sectors, and by development partners,

**Requests** technical commissions to cooperate closely to ensure continuity and consistency of the normative work, including throughout the transition of the new constituent bodies structure;

**Requests** the Executive Council to ensure the sustainability and continuity of the Technical Regulations framework;

**Requests** the Secretary-General:

- (1) To establish the necessary supporting processes and mechanisms of the Secretariat to ensure further the implementation of the framework in the next financial period;
- (2) To conduct a pilot study to investigate the following and provide a report on the findings to Executive Council 72:
  - (a) More efficient and effective collaborative workflow with associated tools for technical experts undertaking the development and maintenance of Technical Regulations, Guides and Manuals;
  - (b) Industry recognized good practices for the development of Technical Regulations - particularly relating to the testing and validation of Technical Regulations proposals prior to their recommendation for operational use;

**Requests** the Executive Council to consider the outcomes of the pilot study and to establish new working practices for the development and maintenance of Technical Regulations;

**Reaffirms** the authority delegated to the Executive Council to approve amendments to the Technical Regulations if they need to be implemented before the time of the next Congress.

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Note: This resolution replaces Resolution 45 (Cg-XVI), which is no longer in force.

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## **Resolution 77 (Cg-18)**

### **REVISIONS OF THE FINANCIAL REGULATIONS OF THE WORLD METEOROLOGICAL ORGANIZATION**

THE WORLD METEOROLOGICAL CONGRESS,

**Mindful** that Article 8(d) of the Convention of the World Meteorological Organization authorizes Congress to determine regulations prescribing the procedures of the various bodies of the Organization and, in particular, the Financial Regulations,

**Noting** Resolution 2 (Cg-18) – Maximum expenditure for the eighteenth financial period (2020-2023),

**Having examined** the Recommendation 27 (EC-70) - Revisions of the Financial Regulations of the World Meteorological Organization,

**Considering** that Financial Regulations under Article 3 (Maximum Expenditures for the Financial Period), Article 6 (The Biennial Budget) and Article 7 (Appropriations) require revision to reflect the format of the budget for the eighteenth financial period, aligned with the long-term goals and strategic objectives set in the WMO Strategic Plan (Resolution 1 (Cg-18)),

**Considering further** that Financial Regulations under Article 10 (Other Income) require adjustment to include all sources of other regular resources,

**Decides** to amend the Financial Regulations as set out in the annex to this resolution effective 1 January 2020.

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## **Annex to Resolution 77 (Cg-18)**

### **REVISIONS OF THE FINANCIAL REGULATIONS OF THE WORLD METEOROLOGICAL ORGANIZATION**

Financial Regulations 3.3, 6.3, 7.7 and 10.1 are amended as follows:

3.3 The estimates shall be made by appropriation parts corresponding to the Long-Term Goals and presented in a results-based ~~budget~~ format and shall be accompanied by such informational annexes and explanatory statements as may be requested by, or on behalf of, Congress and such further annexes or statements as the Secretary-General may deem necessary and useful.

6.3 The biennial budget estimates shall be presented in a results-based budget format based on the Long-Term Goals at the level of Strategic Objectives and shall be accompanied by such informational annexes and explanatory statements as may be requested by, or on behalf of, the Executive Council and such further annexes or statements as the Secretary-General may deem necessary and useful.

*[Note: Performance will be managed at a Strategic Objective level.]*

7.7 A transfer between appropriation ~~parts~~ sections of the results-based budget format may be made by the Secretary-General subject to confirmation by the Executive Council.

10.1 (e) Revenue from rental of excess space, conference rooms and cafeteria facilities, and sales of publications and souvenirs.

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## **Resolution 78 (Cg-18)**

### **AMENDMENTS TO THE STAFF REGULATIONS**

THE WORLD METEOROLOGICAL CONGRESS,

**Having considered** that by [Resolution 38 \(EC-70\)](#), the Executive Council, subject to the approval of Congress in accordance to Staff Regulation 12.3, amended Staff Regulations 9.5 and 3.4,

**Decides** to approve the amendment of Staff Regulations 9.5 and 3.4 as follows:

Staff Regulation 9.5 to read:

Staff members shall not be retained in active service beyond the age of 65 years. The Secretary-General may, in the interests of the Organization, retain staff members in service beyond this age limit in exceptional cases;

The retention of a staff member in the Professional category and above beyond the age of 65 shall require the authorization of the Executive Council;

Staff Regulation 3.4 to read:

The Secretary-General shall establish a scheme for the payment of dependency benefits, education grants and such other allowances as he/she may consider necessary in the interest of the Organization and in accordance with grants, allowances and benefits afforded to the United Nations personnel.

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## **Resolution 79 (Cg-18)**

### **OPEN CONSULTATIVE PLATFORM "PARTNERSHIP AND INNOVATION FOR THE NEXT GENERATION OF WEATHER AND CLIMATE INTELLIGENCE"**

THE WORLD METEOROLOGICAL CONGRESS,

#### **Recalling:**

- (1) Resolution 67 (Cg-17) – WMO Guidance on Partnerships with the Private Sector,
- (2) Decision 73 (EC-68) – Cooperation between the Public and Private Sectors for the Benefit of Society,
- (3) Decision 61 (EC-69) – Public-Private Engagement: a Roadmap to the Eighteenth World Meteorological Congress,
- (4) Resolution 33 (EC-70) – Public-Private Engagement,

**Noting with satisfaction** the active dialogue held during the seventeenth financial period with stakeholders from public, private and academic sectors, in cooperation with partner organizations, such as the World Bank, GFDRR and HMEI,

**Taking note** of the Geneva Declaration 2019: Building Community for Weather, Climate and Water Actions, adopted by Congress through Resolution 80 (Cg-18),

**Having been informed** of the outcomes of the High-Level Round Table with participation of public, private and academic sectors held in Geneva on 5 and 6 June 2019 in parallel with the Meteorological Technology World Expo 2019, and the launch of the Open Consultative Platform "Partnership and innovation for the next generation of weather and climate intelligence" as a new consultative mechanism for stakeholder engagement from all sectors, as provided in [Cg-18/INF. 9.4\(2\)](#);

**Convinced** that the new WMO-facilitated consultative mechanism will be instrumental in strengthening relationships and will lead to an improved common awareness through a sustainable dialogue between public, private and academic sectors, as well as with user communities and civil society,

**Agrees** that WMO should continue to play a central role in facilitating the dialogue between the sectors in line with the general policy established through the new Geneva Declaration 2019: Building Community for Weather, Climate and Water Actions;

**Agrees further** with the proposal for conducting annual thematic sessions of the Open Consultative Platform as part of the programme of the Executive Council or Congress sessions;

**Encourages** Members and partner organizations to support the Open Consultative Platform as an opportunity to realize a common vision for the whole community in advancing and

enhancing knowledge and services to all spheres of society at national, regional and global levels;

**Requests** the presidents of regional associations to stimulate in their regions informal consultations with stakeholders from all sectors, across the value chain, to analyse and build understanding of sub-regional and regional circumstances, including legal frameworks that govern public-private engagement, and provide regional inputs through the Open Consultative Platform;

**Requests** the Executive Council to continue overseeing the developments related to the partnerships and engagements of the public, private and academic sectors, review progress and provide advice on the functioning of the Open Consultative Platform;

**Requests** the Secretary-General to support the Open Consultative Platform with the necessary resources and to provide regular updates to the Executive Council on the outcomes of the consultative mechanism with the public, private and academic sectors.

## **Resolution 80 (Cg-18)**

### **GENEVA DECLARATION – 2019: BUILDING COMMUNITY FOR WEATHER, CLIMATE AND WATER ACTIONS**

THE WORLD METEOROLOGICAL CONGRESS,

**Recalling** that the Geneva Declaration of the Thirteenth World Meteorological Congress (1999), was adopted in response to the United Nations General Assembly, the Economic and Social Council and the regional economic and social commissions' appeal to WMO to contribute, within its field of competence, to the action taken at international, regional and national levels to promote and support sustainable development, especially activities pertinent to weather- and climate-related natural disasters, climate change and the protection of the environment,

**Noting** Decision 51 (EC-70) on preparing a new high-level policy document for consideration by the 18th Congress reflecting the WMO position, policy and guidance on public-private engagement in light of the global developments outlined in the UN Agenda for Sustainable Development 2030, the Paris Agreement, and the Sendai Framework for Disaster Risk Reduction,

**Having considered** the text of the Declaration which has been widely reviewed by Members and partner international organizations,

**Adopts** the Congress Declaration entitled "Building Community for Weather, Climate and Water Actions", provided in the annex to this Resolution, as a call for action,

**Recognizing** that the main texts of the Geneva Declaration (1999) have already been included in the preamble to the Convention,

**Decides** to remove the Geneva Declaration (1999) from the WMO policy documents and to replace it with the current Declaration, under the name "Geneva Declaration – 2019: Building Community for Weather, Climate and Water Actions";

**Urges** Members to consider and act upon the Geneva Declaration – 2019, in particular in capacity building, through legislation and pertinent national and regional actions, policies and strategies;

**Requests** the presidents of the technical commissions and of the regional associations to pay due attention to the Geneva Declaration – 2019 in applying inclusive approaches in their work including their subsidiary bodies, leveraging expertise and innovation from all sectors;

**Requests** the Secretary-General:

- (1) To circulate the Geneva Declaration – 2019 to all Governments and to pertinent international and regional organizations;
- (2) To publish the Geneva Declaration – 2019.

## **Annex to Resolution 80 (Cg-18)**

### **DECLARATION OF THE EIGHTEENTH WORLD METEOROLOGICAL CONGRESS**

#### **BUILDING COMMUNITY FOR WEATHER, CLIMATE AND WATER ACTIONS**

**We, the delegates from 160 Member States and Territories of the World Meteorological Organization (WMO)**, meeting in Geneva from 3 to 14 June 2019 at the Eighteenth World Meteorological Congress, having considered:

- that the global societal risks related to extreme weather, climate, water and other environmental events should be addressed through interdisciplinary and multi-sectoral partnerships, and
- that the expanding opportunities to use meteorological, climatological, hydrological and related environmental information and services to inform critical decisions can foster increased societal and structural resilience, and sustainable economic development;

declare as follows:

#### **We NOTE**

- **The strong focus of the global agenda** on both immediate and long-term challenges related to weather, climate and water, as reflected in the 2030 Agenda for Sustainable Development, the Paris Agreement, and the Sendai Framework for Disaster Risk Reduction;
- **That achieving the sustainable development goals will benefit from inclusive partnerships** amongst public, private and academic sectors, as well as civil society, at global, regional, national and local levels;

#### **We FURTHER NOTE**

- **The progress in science and technology** that significantly improves our collective ability to generate decision-supporting data, products and services for governments, businesses and citizens;
- **That the rapidly growing and changing demand** for weather, climate and water information and services can be met more effectively through open dialogue that enhances coordination and collaboration between the public, private and academic sectors;

**We RECOGNIZE**

- **The need to strengthen the entire weather, climate and water services value chain** – from acquisition and exchange of observations and information, through to data processing and forecasting, and service delivery – to meet growing societal needs;
- **The evolving capabilities and growing engagement of the private sector** in contributing to all links of the value chain and accelerating innovation;
- **The heterogeneous business models** of the diverse stakeholders and differing legislative frameworks of the Members;
- **The persistent capacity gap between developed and developing countries** in the provision of essential services that impedes resilience to natural hazards;
- **The pressure on public funding** which inhibits the ability of some National Meteorological and Hydrological Services (NMHSs) to sustain and improve requisite infrastructure and services;
- **The crucial need for WMO to work more closely** with development and funding agencies, the private sector and the international finance community in designing and guiding development assistance aimed at closing the capacity gap;
- **The need for innovative approaches and incentives** to enable fair and equitable access to data, including to the rapidly growing non-traditional data from all sectors;

**We REAFFIRM**

- **The mission of WMO** outlined under Article 2 of the WMO Convention as to facilitate worldwide cooperation on monitoring and predicting changes in weather, climate, water and other environmental conditions through the exchange of information and services, standardization, application, research and training.;
- **The role of WMO in the development and promulgation of international standards** to ensure the quality, interoperability and fit-for-purpose information and services, and in promoting the adherence by all stakeholders to those standards;
- **The vital importance of the mission of the NMHSs** in monitoring, understanding and predicting weather, climate and water, and in providing related information, warnings and services that meet national, regional and global needs;
- **The commitment of Members to broaden and enhance the free and unrestricted exchange of meteorological, hydrological and climatological data and products** as articulated in Resolutions 40 (Cg-12), 25 (Cg-13) and 60 (Cg-17) of the World Meteorological Congress, and to enable access to the international infrastructure and facilities coordinated by WMO through its programmes;
- **The responsibility of Members' governments to maintain and sustain requisite infrastructure** and the operation of international systems and facilities for observations, data exchange and information supply;

**We WELCOME**

- **The opportunities for all stakeholders and the broader user community** that will result from a closer collaboration among public, private and academic sectors;
- **The engagement of all sectors** in addressing the societal needs through weather, climate, water and other environmental information and services;



- **The contributions of Members and partner international organizations to sustaining and developing the global meteorological infrastructure** coordinated by WMO through its programmes;
- **The evolving role of WMO** as a facilitator in establishing and expanding partnerships among stakeholders, from public, private and academic sectors that will significantly improve the availability of high-quality weather, climate, water and other related environmental information and services in all countries;

**We URGE all stakeholders** from public, private and academic sectors to adhere to the UN Global Compact and WMO established principles for successful partnerships, by:

- **Contributing collectively** to achieving the overarching purpose articulated in the WMO Convention;
- **Respecting shared values** that create opportunities for innovation and growth based on science, leverage expertise to provide positive outcomes and solutions for all parties, support knowledge and technology transfer and uptake, invest in local research, and develop human capacity;
- **Promoting sustainability of the global infrastructure** by seeking opportunities for multi-sector engagements that improve efficiency and better serve society;
- **Promoting free and unrestricted international data sharing**, based on national circumstances, with intellectual property rights duly respected;
- **Enabling all countries to advance together** through a coordinated approach for engaging the public, private and academic sectors, as well as civil society and investment partners, with special focus on bridging existing gaps in developing countries, Least Developed Countries (LDCs) and Small Island Developing States (SIDS);
- **Fostering and maintaining fair and transparent arrangements**, adhere to quality and service standards, to advance collective objectives in delivering public goods, and take into account specific stakeholder needs, such as:
  - Ensuring that access to commercial data with use restrictions is treated equally by and between public and private sector entities; and
  - Committing to comply with relevant national and international legislation and policies with respect to both data provision and avoidance of anti-competitive behaviour;
- **Seeking integrity** by engaging in mutually beneficial relationships and partnerships to the benefit of society;
- **Respecting the sovereign** right of Members in deciding how weather, climate and water services are organized and provided, including the application of national and regional legislation and policies for making data and products available on a free and unrestricted principle, as well as the assignment of key national responsibilities related to public safety;

**We ALSO ENCOURAGE**

- **Pursuing efficiencies that enhance value-for-money**, including multi-sector and cross-border partnerships;
- **Developing innovative data exchange mechanisms and incentives** to increase data availability, resolve existing data gaps, promote greater data sharing and avoid fragmentation;
- **Continuing dialogues and initiatives** aimed at building trust, mutual understanding and cooperation between stakeholders from all sectors;
- **Stakeholders from all sectors** to act as powerful advocates for sustained investment in core public infrastructure and capability;
- **Working with economic communities** to better understand business models and economic frameworks for the provision of weather, climate, water and environmental services, and to work towards innovative and mutually beneficial approaches;

**We CALL on all Governments** to give due consideration to the statements expressed in this Declaration to:

- **Foster structured dialogue** between public, private and academic sectors at both national and international level;
- **Safeguard and strengthen the authoritative voice of NMHSs** for the issuance of warnings and relevant information to support critical decisions related to natural hazards and disaster risks, in collaboration with national disaster management authorities;
- **Endeavour to put in place appropriate legislative and/or institutional arrangements** to enable effective cross-sector partnerships and remove barriers to mutually beneficial cooperation and collaboration;
- **Ensure the fulfilment of international commitments**, including those stemming from the WMO Convention, for sustainable operation of the international infrastructure and exchange of required data;
- **Promote uptake of and compliance with WMO standards and guidance by all stakeholders** to enhance interoperability and the quality of data and products;
- **Engage with civil society** to extend the outreach to communities and citizens in particular to enhance public understanding and response to warnings of natural hazards;
- **Encourage stakeholders from all sectors** to facilitate international data sharing and make their data available as needed for essential public purposes, such as disaster risk reduction;

**WE CALL ON partner organizations and development agencies** to work closely with WMO to:

- **Increase the impact of capacity development** initiatives through strategic multi-stakeholder partnerships leveraging the investments, expertise and knowledge of all sectors;
- **Ensure the best use of development funds** to close the capacity gap, by exploiting financially viable business models that provide sustainable solutions for modernizing infrastructure and enhancing services in developing countries, LDCs and SIDS;

- **Optimize national adaptation planning** and disaster risk management to build resilience at all levels through a greater involvement of the expertise of the NMHSs in partnership with other public institutions, private and academic sectors, as well as civil society;
  - **Reinforce the capability** of developing countries, LDCs and SIDS to contribute to the international exchange of data and products through WMO global systems, and to benefit from the global public goods produced collectively by the Members.
- 

## **Resolution 81 (Cg-18)**

### **WMO MANDATORY PUBLICATIONS AND DISTRIBUTION POLICY FOR THE EIGHTEENTH FINANCIAL PERIOD**

THE WORLD METEOROLOGICAL CONGRESS,

**Recalling** Resolution 58 (Cg-17) – Publications for the seventeenth financial period,

**Reaffirming** that the free and unrestricted dissemination of WMO publications to the operational, scientific, educational and other interested institutions of Members promotes awareness and a broader use of WMO standards, guides and other products,

**Reaffirming further:**

- (1) That the management of the Publications Programme, notably the presentation and method of reproduction of publications and the most economical use of available publication funds, including the revenue from sales of publications, shall be the responsibility of the Secretary-General within the framework established by the World Meteorological Congress and taking into account the guidance given by the Executive Council,
- (2) That additional publications may be produced during the eighteenth financial period given the availability of the necessary funding,

**Noting** that web distribution is given preference over the distribution of hard-copy versions, which are reserved only for exceptional cases in line with the WMO paper-smart approach to publications and documentation,

**Mindful** that the latest technological developments in the area of artificial intelligence will yield significant results in the linguistic field in a very short time,

**Adopts** the list of WMO publications recommended by the Executive Council (Recommendation 19 (EC-70)) as mandatory for production during the eighteenth financial period and included in the regular budget as provided in Annex 1 to the present resolution;

**Approves** the WMO Publications Distribution Policy as provided in Annex 2 to the present resolution;

**Requests** the Secretary-General to allocate the necessary funding for investments in new translation and publishing technologies, so as to produce more technical and educational publications in all WMO official languages, as requested by Members;

**Invites** Members to provide in-kind support to translation and publishing and through contributing to the WMO Mandatory Publications Trust Fund so as to have more technical publications available in all WMO official languages.

Note: This Resolution replaces Resolution 58 (Cg-17), which remains in force until 31 December 2019.

## Annex 1 to Resolution 81 (Cg-18)

### List of WMO publications mandatory for production during the eighteenth financial period and included in the budget proposal

<i>Publication</i>	<i>Number</i>	<i>Languages</i>	<i>Responsibility</i>
<b>1. Governance and technical publications</b>			
<i>Basic documents</i>	WMO-No. 15	A, C, E, F, R, S	CER
<i>Rules of Procedure for Constituent Bodies</i>	WMO-No.	A, C, E, F, R, S	CER
Abridged final reports of Congress		A, C, E, F, R, S	DSGO
Abridged final reports of the Executive Council		A, C, E, F, R, S	DSGO
Abridged final reports of the regional associations		Sessions working languages	DRA
Abridged final reports of the technical commissions		A, C, E, F, R, S	Technical departments
WMO Strategic Plan		A, C, E, F, R, S	CER
<i>Technical Regulations, Volume I</i>	WMO-No. 49	A, C, E, F, R, S	Technical commissions, technical departments
<i>Technical Regulations, Volume II</i>	WMO-No. 49	A, C, E, F, R, S	CSA, WDS
<i>Technical Regulations, Volume III</i>	WMO-No. 49	A, C, E, F, R, S	CSA, CLW
<i>Technical Regulations, Annexes:</i>			
<i>Annex I – International Cloud Atlas, Volume I – Manual on the Observation of Clouds and Other Meteors</i>	WMO-No. 407	A, C, E, F, R, S	COIIS, OBS
<i>Annex II – Manual on Codes, Volume I</i>	WMO-No. 306	E, F, R, S	COIIS, OBS
<i>Annex III – Manual on the Global Telecommunication System</i>	WMO-No. 386	E, F, R, S	COIIS, OBS
<i>Annex IV – Manual on the Global Data-processing and Forecasting System</i>	WMO-No. 485	C, E, F, R, S	COIIS, OBS
<i>Annex V– Manual on the Global Observing System, Volume I</i>	WMO-No. 544	C, E, F, R, S	COIIS, OBS
<i>Annex VI– Manual on Marine Meteorological Services, Volume I</i>	WMO-No. 558	C, E, F, R, S	CSA, WDS
<i>Annex VII – Manual on the WMO Information System</i>	WMO-No. 1060	A, C, E, F, R, S	COIIS, OBS
<i>Annex VIII – Manual on the WMO Integrated Global Observing System</i>	WMO-No. 1160	A, C, E, F, R, S	COIIS, OBS
<i>Manual on Stream Gauging, Volumes I and II</i>	WMO-No. 1044	E, F, R, S (either the manual or the training material)	CSA, CLW
<i>Manual on Flood Risk Mapping</i>	WMO-No.	E, F, R, S	CSA, CLW

<i>Publication</i>	<i>Number</i>	<i>Languages</i>	<i>Responsibility</i>
<i>Guides:</i>			
<i>Guide to Meteorological Instruments and Methods of Observation</i>	WMO-No. 8	A, C, E, F, R, S	COIIS, OBS
<i>Guide to Climatological Practices</i>	WMO-No. 100	A, C, E, F, R, S	CSA, CLW
<i>Guide to Agricultural Meteorological Practices</i>	WMO-No. 134	E, F, R, S	CSA, CLW
<i>Guide to Hydrological Practices, Vol. I and II</i>	WMO-No. 168	E, F, R, S	CSA, CLW
<i>Guide to Marine Meteorological Services</i>	WMO-No. 471	C, E, F, R, S	CSA, WDS
<i>Guide to the Global Observing System</i>	WMO-No. 488	C, E, F, R, S	COIIS, OBS
<i>Guide to Wave Analysis and Forecasting</i>	WMO-No. 702	C, E, F, R, S	CSA, WDS
<i>Guide to the Practices for Meteorological Offices Serving Aviation</i>	WMO-No. 732	E, F, R, S	CSA, WDS
<i>Guide to Public Weather Services Practices</i>	WMO-No. 834	C, E, F, R, S	COIIS, WDS
<i>Guide to Aeronautical Meteorological Services Cost Recovery: Principles and Guidance</i>	WMO-No. 904	C, E, F, R, S	CSA, WDS
<i>Guide to the WMO Information System</i>	WMO-No. 1061	A, C, E, F, R, S	COIIS, OBS
<i>Guide to the Implementation of a Quality Management System for National Meteorological and Hydrological Services</i>	WMO-No. 1100	A, C, E, F, R, S	CSA, WDS
<i>Guide to Information Technology Security</i>	WMO-No. 1115	E	COIIS, OBS
<i>Guide to Participation in Radio Frequency Coordination</i>	WMO-No. 1159	A, C, E, F, R, S	COIIS, OBS
<i>Guide to the WMO Integrated Global Observing System</i>	WMO-No. 1165	A, C, E, F, R, S	COIIS, OBS
<i>Guide to Storm Surge Forecasting</i>	WMO-No. 1076	A, C, E, F, R, S	CSA, WDS
<i>Guide to Aircraft-Based Observations</i>	WMO-No. 1200	A, C, E, F, R, S	COIIS, OBS
<i>Guide to General Service Delivery</i>	WMO-No.	A, C, E, F, R, S	COIIS, WDS
<i>Guide to Information Management</i>	WMO-No.	A, C, E, F, R, S	COIIS, OBS
<i>Guide to Competency</i>	WMO-No. 1205	A, C, E, F, R, S	CSA, WDS
<i>Guide to the Integrated Urban Services</i>	WMO-No.	A, C, E, F, R, S	CSA, RES/WDS
<i>WIGOS Metadata Standard</i>	WMO-No. 1192	A, C, E, F, R, S	COIIS, OBS
<i>Use of radio spectrum for meteorology: weather, water and climate monitoring and prediction</i>	WMO-No. 1197	A, C, E, F, R, S	COIIS, OBS
<i>Satellite Data Telecommunication Handbook</i>	WMO-No. 1223	A, C, E, F, R, S	COIIS, OBS
<i>Technical Reference on the Global Data Management Framework for Climate</i>	WMO-No.	A, C, E, F, R, S	COIIS, CLW
<i>Guidelines on the role, operation and management of NHS</i>	WMO-No. 1003	A, C, E, F, R, S	CSA, CLW
<i>Weather Reporting, Volume D, Information For Shipping</i>	WMO-No. 9	E, F, R, S	CSA, WDS
<i>Climatological Normals (CLINO) for the Periods 1981-2010 and 1991-2020</i>	WMO-No.	Multilingual	CSA, CLW
<b>2. Scientific statements and bulletins</b>			
<i>WMO Statement on the State of the Global Climate</i>	WMO-No.	A, C, E, F, R, S	CSA, CLPA/CLW
<i>WMO Greenhouse Bulletin</i>		A, C, E, F, R, S	RB, RES
<i>WMO Aerosol Bulletin</i>		E, F, S	RB, RES
<i>WMO Antarctic Ozone Bulletin</i>		E	RB, RES

<i>Publication</i>	<i>Number</i>	<i>Languages</i>	<i>Responsibility</i>
<b>3. General information publications</b>			
WMO Annual Report	WMO-No.	A, C, E, F, R, S	CER
WMO Bulletin		E, F, R, S	CER
MeteoWorld		E	CER
World Meteorological Day package		A, C, E, F, R, S	CER

## **Annex 2 to Resolution 81 (Cg-18)**

### **WMO PUBLICATIONS DISTRIBUTION POLICY**

#### **1. Distribution to Members and experts from NMHSs**

1.1 To further the objectives of the Organization and its Members, the Secretariat pursues WMO publications sales and distribution policies, including pricing, within the framework established by Congress and taking into account the guidance given by the Executive Council and the views of WMO Members.

1.2 The Secretariat should make publications freely available online and inform Members and experts from NMHSs of each release. Unlimited and free distribution of WMO publications (in both low and high resolution) to Members and experts from NMHSs would be effected by electronic means. Any requests for hard copies within that free distribution would be met only in the case of least developed country Members, using the most cost-effective way, for example by providing a printout of the electronic files.

1.3 Certain publications, for example technical ones and public information material, such as the WMO Bulletin, annual report, information brochures and kits produced for special events, may be distributed both in hard-copy format and electronically. In such cases free distribution of printed copies is done according to the list of recipients defined in the best interests of the Organization and approved by the Secretary-General.

#### **2. Distribution to non-Members and public users**

Electronic copies in low resolution are freely available to non-Members and all web public users, whereas high-resolution and/or printed copies are sold through the WMO bookstore.

## **Resolution 82 (Cg-18)**

### **GENDER ACTION PLAN**

THE WORLD METEOROLOGICAL CONGRESS,

**Recalling** [Resolution 59 \(Cg-17\)](#) – Gender equality and empowerment of women and [Decision 55 \(EC-70\)](#) - Implementation of WMO Gender Equality Policy and Action Plan (thereafter referred to as “Policy” and “Action Plan”),

**Reaffirming** the Organization’s goal of achieving gender equality and building resilience through the provision of gender-sensitive weather, hydrological and climate services which respond to the specific needs and socioeconomic circumstances of women and men,

**Convinced** that diversity and inclusion are instrumental for modern organizations as fostering innovation, boosting performance, facilitating improved governance, and better serving society,

**Noting with satisfaction** the progress made in the implementation of the Action Plan's priorities for 2016-2019, particularly with respect to capacity development, communications and strategic planning (ref. [Cg-18/INF. 9.5](#)),

**Noting further** the dedicated effort on behalf of technical commissions and regional associations to advance gender equality within their areas of responsibility, as evidenced by the systematic discussions, investment in female leadership, the development of an Action Plan for Advancing Gender Equality in RA III, and the appointment of gender equality focal points and custodians,

**Mindful** of the need to sustain the achievements made, replicate good practice and accelerate the implementation of the Action Plan in the next financial period,

**Having examined** the statistical trends in female and male participation in the work of the constituent bodies, which show an encouraging surge in female representation,

**Recognizing** the opportunity presented by the WMO governance reform for improving the gender as well as regional composition of constituent bodies and making them more diverse and balanced,

**Decides** to endorse the updated WMO Gender Action Plan and the priorities identified for 2020-2023 as provided in the [annex](#) to the present resolution;

**Requests** the Executive Council to:

- (1) Oversee the implementation of the Action Plan and the 2020-2023 priorities (see Resolution 7 (EC-71) on the Capacity Development Panel);
- (2) Strive for the establishment of subsidiary bodies that are diverse, inclusive and gender-balanced;

**Requests** regional associations to:

- (1) Downscale the Action Plan to the regional and national levels by analyzing its applicability and relevance, identifying regional needs and priorities, and coordinating regional implementation;
- (2) Raise Members' awareness of gender equality issues and actions pertaining to NMHSs and strengthen their capacity for the implementation of the Action Plan;
- (3) Facilitate diverse and balanced expert networks in terms of gender and regional representation;
- (4) Report to the Executive Council and to Congress on progress;

**Requests** technical commissions, the Research Board and other relevant WMO bodies to:

- (1) Apply and implement the Action Plan within their areas of responsibility;
- (2) Build and nurture networks of female scientists and technical experts as well as invest in their capacity;
- (3) Ensure regional and gender balance and inclusiveness in all structures and work plans (as included in their Terms of Reference);
- (4) Report to the Executive Council and to Congress on progress;

**Urges** Members to:

- (1) Refer to the Action Plan for guidance and take action, in accordance with their needs and context both at the national and regional levels;
- (2) Ensure the appointment of focal points for the coordination of gender activities at the national level;
- (3) Ensure that gender mainstreaming policies, which are aligned with national legislation and WMO Gender Equality Policy, are in place and implemented within the NMHSs;
- (4) Support and empower national gender equality focal points to effectively and efficiently coordinate the implementation of relevant aspects of the Action Plan;
- (5) Maintain and regularly review gender-disaggregated statistics on employment, management, participation in capacity building, research, etc.;
- (6) Actively participate in the WMO gender surveys and any other related endeavours that are aimed at enhancing gender mainstreaming activities both at the national and regional levels;
- (7) Collaborate with other organizations that are actively involved in gender mainstreaming activities;
- (8) Partner with key relevant organizations that are in possession of financial resources for the implementation of gender activities;
- (9) Provide voluntary contributions to the WMO Gender Activities Trust Fund;

**Requests** the Secretary-General to:

- (1) Continue leading the implementation of the Action Plan, monitor progress and report to the Executive Council and to Congress;
  - (2) Support constituent bodies and Members, as needed, in the implementation of the Action Plan and the 2020-2023 priorities identified;
  - (3) Maintain statistics on the gender composition of all bodies and structures to inform policies and decision-making.
-



## Annex to Resolution 82 (Cg-18)

### WMO GENDER ACTION PLAN FOR THE EIGHTEENTH FINANCIAL PERIOD

#### RATIONALE

#### *Why pursue gender equality in WMO governance, strategy, programmes and decision-making?*

- **Improves performance**  
Organizations that respect and value gender equality and diversity attract and retain talented staff and improve performance. They boast better employee satisfaction, demonstrate improved governance, and are more conducive to innovation.
- **Fosters innovation and partnerships**  
Gender diverse teams bring more varied perspectives to the discussion, produce a more holistic analysis of issues, and spur greater effort, thus leading to improved decision-making. Gender equality has resulted in effective partnerships with UN agencies and international organizations, academia and other actors. Gender-responsive initiatives between women's and community groups and NMHSs at the field level have also proven to foster innovative and creative ways to adapt services and disseminate them more effectively.
- **Empowers women and values their unique contributions**  
Multiple examples highlight the leadership and important contributions of women in science, climate change adaptation, disaster preparedness and recovery, ocean and natural ecosystem preservation, among others. These initiatives should be appropriately valued and encouraged.
- **Yields people-centred solutions serving all users**  
Gender-responsive weather, hydrological and climate services expand the reach to communities, increase adaptive capacity of those most affected, and have the potential to save lives, livelihoods and assets. They take into account gender-differentiated vulnerabilities, capacities and needs of different groups of women and men.
- **Prepares for more effective response and recovery**  
Equal access, use and benefit from weather, hydrological and climate services allows users to better understand risk, anticipate and manage extreme events or take advantage of favourable climatic conditions, and adapt to change.
- **Has a multiplier effect on other Sustainable Development Goals (SDGs)**  
Gender equality is a cross-cutting issue and gender mainstreaming has the potential to trigger progress on multiple SDGs, including SDG 13 (women's initiatives for mitigation and adaptation to climate change, as well as climate-smart policy and planning), SDG 3 (responding to health-related needs of women during and after disasters), SDG 2 (increasing female smallholder farmers' access and use of adapted agricultural weather information), SDG 14 (supporting women's involvement in ocean observations, science, and preservation) and others.

Note: *proposed priority actions for 2020-2023 are marked in red*; they represent 2016-2019 priorities requiring further effort, actions formulated by the EC Gender Equality Focal Points and activities related to the implementation of SO 5.3 of the Strategic and Operating Plans.

<b>ACTION</b>		
<b>A. WMO SECRETARIAT</b>	<b>B. WMO CONSTITUENT BODIES</b>	<b>C. WMO MEMBERS</b>
<b>1. GOVERNANCE</b>		
<b>1.1. Create inclusive and diverse governance structures</b>		
1.1.1(a) Encourage Members to: (i) nominate female experts to WMO governance bodies and their working structures and (ii) increase the representation of women in delegations to sessions	1.1.1 (b) Encourage Members to: (i) nominate female experts to WMO governance bodies and their working structures and (ii) increase the representation of women in delegations to sessions	1.1.1(c) Increase the participation of women by: (i) identifying and nominating female experts from NMHSs or other national institutions to participate in the work of WMO governance bodies and their working structures and (ii) seeking equality in the composition of delegations to sessions
1.1.2(a) Include gender balance in the Terms of Reference of all constituent bodies, including their management and working structures	1.1.2(b) Strive for gender balance in the membership of all constituent bodies, including their management and working structures	1.1.2(c) Strive for gender balance in the membership of all constituent bodies, including their management and working structures
1.1.3(a) Devise strategies for creating/strengthening female networks of experts in constituent bodies	1.1.3(b) Encourage the active role of female members of all constituent bodies, their management and working structures	1.1.3(c) Encourage and support female networks of experts
<b>1.2 Enhance policy dialogue</b>		
1.2.1(a) Ensure that gender equality is considered in the planning, running and discussions of constituent body sessions	1.2.1(b) Continue addressing gender equality as a permanent item on agendas at least once per financial period	1.2.1(c) Contribute constructively to the review and discussion of gender equality at meetings of all constituent bodies and their working structures

<b>ACTION</b>		
<b>A. WMO SECRETARIAT</b>	<b>B. WMO CONSTITUENT BODIES</b>	<b>C. WMO MEMBERS</b>
1.2.2(a) Systematically advocate for strong language on gender equality in resolutions, decisions and statements, as relevant	1.2.2(b) Adopt or update, as necessary, resolutions and/or decisions on gender equality	1.2.2(c) Undertake steps to implement, in cooperation with relevant stakeholders, the adopted resolutions on gender equality
<b>1.3 Develop and maintain an adequate gender architecture conducive to the implementation of the WMO Gender Equality Policy and Action Plan</b>		
1.3.1(a) Strengthen the work of the Gender Mainstreaming Committee and seek their increased involvement in GAP implementation	1.3.1(b) Ensure that the Executive Council oversees, advises on and contributes to the implementation of the WMO Gender Equality Policy and Action Plan	
1.3.2(a) Assist the work of the new governance body with a mandate on gender equality	1.3.2(b) Designate in each constituent body a gender equality focal point with specific terms of reference and work plans	
1.3.3(a) Develop mechanisms for ensuring that gender equality custodians are assigned by all constituent bodies ahead of meetings	1.3.3(b) Ensure that a gender equality custodian is designated for all meetings to: (i) screen the agenda and documentation, (ii) identify relevant entry points for gender equality and diversity aspects, (iii) ensure their consideration and discussion and (iv) ensure that facilities are gender-friendly	
1.3.4(a) Develop Terms of Reference for NMHS Gender equality Focal Points and request their re-designation		1.3.4(c) Designate NMHS gender equality focal points
1.3.5(a) Strengthen the network of gender equality focal points by means of a periodic exchange of information and requests for targeted action	1.3.5(b) Encourage interaction among the constituent bodies' gender equality focal points, including joint activities	1.3.5(c) Support and empower gender focal points to undertake activities at NMHS level and facilitate GAP implementation, including by providing case studies and exemplars of national Gender Action Plans

<b>ACTION</b>		
<b>A. WMO SECRETARIAT</b>	<b>B. WMO CONSTITUENT BODIES</b>	<b>C. WMO MEMBERS</b>
<b>1.4 Set gender equality as a key deliverable for the Organization</b>		
1.4.1(a) Review and update, as needed, the WMO Gender Equality Policy and/or Gender Action Plan ahead of Cg-19	1.4.1(b) Develop action plans on implementation of the WMO Gender Equality Policy and GAP within respective areas of responsibility	1.4.1(c) Develop, update and implement NMHSs' gender equality policies and action plans linked to the WMO framework or to a national policy on the subject
<b>2. STRATEGIC PLANNING, MONITORING AND COMPLIANCE</b>		
<b>2.1. Integrate gender mainstreaming in strategic planning processes</b>		
2.1.1(a) Ensure that a gender-specific Strategic Objective is maintained in any updates to the Strategic Plan and Operating Plan (2024-2027). This objective shall incorporate a target, to aim for and measure against, of 40% representation of women across all WMO Secretariat grades, constituent bodies and working groups.	2.1.1(b) Ensure that a gender-specific Strategic Objective is maintained in any updates to the Strategic Plan and Operating Plan (2024-2027). This objective shall incorporate a target, to aim for and measure against, of 40% representation of women across all WMO constituent bodies and working groups.	
2.1.2(a) Assist constituent bodies in gender mainstreaming in key regional/technical strategies, policies and plans	2.1.2(b) Highlight gender equality as a priority and mainstream accordingly in strategies, policies and plans	
<b>2.2 Integrate gender mainstreaming in programmes and projects</b>		
2.2.1(a) Continue efforts to ensure that programmes and projects under development consider and integrate gender mainstreaming, including during quality assurance review		2.2.1(c) Collect sex-disaggregated data, conduct gender analysis and address gender considerations in the development of new programme and project proposals
2.2.2(a) Facilitate gender mainstreaming in all stages of the project cycle, in accordance with the Project Management Handbook		2.2.2(c) Integrate gender mainstreaming considerations in programme and project implementation, monitoring and evaluation

<b>ACTION</b>		
<b>A. WMO SECRETARIAT</b>	<b>B. WMO CONSTITUENT BODIES</b>	<b>C. WMO MEMBERS</b>
2.2.3(a) Ensure that, upon completion of projects, reports elaborate on gender marker results, including gender-related outputs, activities, and sex-disaggregated data		2.2.3(c) Ensure that programme and project reports address gender-related results, outputs and activities and present sex-disaggregated data
2.2.4(a) Organize training for Secretariat staff and develop tools on gender mainstreaming in programme and project management		
<b>2.3. Collect, use and analyse sex-disaggregated data</b>		
2.3.1(a) Ensure that all key data is sex-disaggregated, including at the programme and project level, or that there is a specific reason noted for not disaggregating	2.3.1(b) Ensure that all EC Panels and constituent bodies collect and use sex-disaggregated data in the monitoring, evaluation and reporting of their activities	2.3.1(c) Compile sex-disaggregated statistics, especially with respect to governance, human resources and service provision
2.3.2(a) Develop a gender dashboard on the WMO Community Platform providing detailed statistics on the gender composition of all constituent bodies and working structures	2.3.2(b) Compile statistics on the participation of women and men in constituent body sessions, structures and activities	2.3.2(c) Regularly update the NMHS Capacity section on the Country Profile Database, providing sex-disaggregated data on staffing
<b>2.4. Monitor WMO Gender Equality Policy and GAP implementation at all levels</b>		
2.4.1(a) Regularly report to Congress, EC and EC-related bodies on implementation of SO 5.3, the Gender Equality Policy and GAP  Target: at least once every 4 years and 2 years, respectively	2.4.1(b) Report to Congress and EC on progress achieved in the implementation of the Gender Equality Policy and GAP  Target: at least once every 4 years and 2 years, respectively	2.4.1(c) Develop monitoring mechanisms at the national level by (i) adapting the WMO gender monitoring indicators or (ii) using an existing national framework

<b>ACTION</b>		
<b>A. WMO SECRETARIAT</b>	<b>B. WMO CONSTITUENT BODIES</b>	<b>C. WMO MEMBERS</b>
<b>2.5. Evaluate the strengths and challenges of integrating gender equality into WMO systems and operations</b>		
2.5.1(a) Continue gender mainstreaming in all stages of project/programme evaluations (TORs, scope of analysis, method, findings and recommendations) in accordance with the UNEG Norms and Standards	2.5.1.(b) Conduct “deep dives” analysis of the progress achieved in gender mainstreaming of individual constituent bodies, by self-selection, and feed outcomes into next updated GAP	
2.5.2(a) Regularly conduct gender audits (e.g. every 5 years) and assess and highlight risks related to gender equality in other audit engagements, as applicable		
<b>3. CAPACITY DEVELOPMENT<sup>20</sup></b>		
<b>3.1 Assess and develop the capacity of WMO staff, constituent bodies and Members on both technical subjects and gender mainstreaming approaches</b>		
3.1.1(a) Assist constituent bodies, particularly RAs, in the organization of workshops and side events on gender equality, unconscious bias and inclusive leadership aimed at raising the awareness, knowledge and capacity of PRs, NMHS Directors, Chairs, etc.	3.1.1(b) Ensure that workshops and side events on gender equality, unconscious bias and inclusive leadership are organized on the margins of constituent body meetings and events	3.1.1(c) Apply the principles of inclusive leadership and share good practices on the subject
3.1.2(a) (i) Add gender issues to the agenda of every ETR meeting, including Symposium, RTC Directors meeting, Global Campus, courses for trainers, and report on female participants ratio (ii) Run gender related course or support gender-responsive capacity development plan, monitor and report outcome	3.1.2(b) Update the WMO Capacity Development Strategy and Implementation Plan with a view to making it gender-responsive	

<sup>20</sup> Capacity development actions targeted at female and male users as well as service providers and intermediaries are contained in Section 7: Service Provision

<b>ACTION</b>		
<b>A. WMO SECRETARIAT</b>	<b>B. WMO CONSTITUENT BODIES</b>	<b>C. WMO MEMBERS</b>
3.1.3(a) Use the Staff Opinion Survey 2019 to assess staff's capacity vis-à-vis gender equality, diversity and inclusion	3.1.3(b) (i) Add gender-related issues to the Education and Training-related Panel meeting agenda, and to management and train-the-trainer course curriculum; (ii) Increase female participation in Panel and other meetings	3.1.3(c) Assess capacities and needs of NMHS staff, service providers and users for gender-related training
3.1.4(a) Include gender equality (including the WMO Policy, GAP, link to online trainings and gender webpage, information on key activities) in the WMO induction training	3.1.4(b) Include gender equality (including the WMO Policy, GAP, link to online trainings and gender webpage, information on key activities) in the induction of new management groups for constituent bodies	3.1.4(c) Include gender equality (including the WMO Policy, GAP, link to online trainings and gender webpage, information on key activities) in the induction of new PRs and NMHS staff
3.1.5(a) Strengthen the capacity of: (i) staff on gender analysis, the link between gender-WMO mandate, gender mainstreaming in projects, unconscious bias etc. and (ii) senior managers on gender-responsive and inclusive leadership, unconscious bias, etc.	3.1.5(b) (i) Adapt an existing training resource on gender equality and provide to all RTCs; (ii) Include a Gender Policy in RTC review criteria and (iii) Adapt the 2017 SYMET poster on gender and weather impacts to a set of slides and provide to RTCs and other training partners	3.1.5(c) Develop the capacity of NMHS staff on unconscious bias, inclusive leadership, gender mainstreaming, and gender-responsive service delivery through trainings and workshops
3.1.6(a) Conduct anti-harassment training for WMO staff, with a focus on the creation of an enabling environment which promotes a safe, discrimination-free and supportive workplace, on the basis of the results of 2018 UN-wide Safe Space Survey on Sexual Harassment in the Workplace		

<b>ACTION</b>		
<b>A. WMO SECRETARIAT</b>	<b>B. WMO CONSTITUENT BODIES</b>	<b>C. WMO MEMBERS</b>
<b>3.2 Build a pool of female leaders in the WMO community</b>		
3.2.1(a) Continue assisting constituent bodies in developing the leadership capacity of female delegates and professionals from Member States through Women's Leadership Workshops and other events	3.2.1(b) Continue investing in the leadership capacity of female delegates and professionals from Member States, including through Women's Leadership Workshops and other events on the margins of constituent body meetings	3.2.1(c) Nominate more female participants to training events, including Women's Leadership Workshops
3.2.2(a) In correspondence to Members regarding nominations, especially in circular letters, add standard sentence to encourage female participation in fellowships, trainings, workshops, seminars, and monitor and report on female/male participation	3.2.2(b) (i) The RTCs and ETR partners to include in their course and fellowship announcements a statement on gender equality and encouragement of female candidate nominations; (ii) Take into account gender equality in the selection of candidates for education and training opportunities	3.2.2(c) Encourage female access to education and training in meteorology, hydrology, climate and related areas, including through agreements with advanced NMHSs for short-term visiting scientist programmes for female staff
3.2.3(a) Allocate funds for the participation of WMO female professionals in a leadership programme, such as UNSCC Leadership Programme, UN Leaders Programme, UN Emerging Leaders Experience, etc.		
3.2.4(a) Research, design and administer a mentoring programme for WMO mid-level female professionals on a pilot basis to encourage a wider supply of applicants to vacant P5 and above positions	3.2.4(b) Develop a mentoring programme for female professionals with leadership potential, in cooperation with the RTCs	3.2.4(c) Establish a pool of role models and a mentoring programme involving national women leaders
3.2.5 (a) Organize a panel during Cg-19 that showcases and highlights mentoring contributions and activities in the development of women leaders within the WMO community		



<b>ACTION</b>		
<b>A. WMO SECRETARIAT</b>	<b>B. WMO CONSTITUENT BODIES</b>	<b>C. WMO MEMBERS</b>
<b>3.3 Expose youth, especially girls, to the meteorological, hydrological and climatological profession</b>		
3.3.1(a) Produce guidelines and tools for running gender-balanced STEM outreach	3.3.1(b) Invite students from local schools to attend focused sessions on national, regional and international aspects of meteorology, hydrology and climatology on the margins of constituent body meetings and expert workshops	3.3.1(c) Conduct outreach activities such as: (i) School visits to NMHSs and observation sites and (ii) Participation in job fairs at universities
3.3.2(a) Continue collecting good practice from NMHSs and national STEM outreach providers	3.3.2(b) Host a stand on STEM careers in NMHSs at international and regional trade fairs, meteorology/technology events, etc.	3.3.2(c) Develop and implement Model Outreach Programmes for replication by other Members
<b>3.4 Strengthen the capacity of young professionals, especially women</b>		
3.4.1(a) Offer internships, secondments and JPO posts to young professionals, and actively monitor gender equality to ensure parity	3.4.1(b) Encourage Members to nominate women for WMO fellowships, including using as role models others in the constituent body who have completed fellowships	3.4.1(c) Participate in the WMO Fellowship Programme by hosting or nominating fellows, especially women, and consider gender equality in nominations for other education and training opportunities and career development activities
	3.4.2(b) Support and encourage youth collaborative platforms, like Young Earth System Scientists, and promote the active role of female members	3.4.2(c) Offer internships to young professionals, especially female, and secondments of staff from meteorological services on a rotational basis

<b>ACTION</b>		
<b>A. WMO SECRETARIAT</b>	<b>B. WMO CONSTITUENT BODIES</b>	<b>C. WMO MEMBERS</b>
<b>3.5 Develop training and capacity development tools</b>		
3.5.1(a) Work with RTCs on the development of a training module on gender, weather, water, climate and related environmental conditions	3.5.1 (b) Design training modules on gender mainstreaming in weather, water and climate, and on inclusive leadership, and incorporate in courses (RTCs)	3.5.1 (c) Document success stories and related tools at national level and communicate to WMO to enrich materials and tools for use in technical programmes and training
3.5.2(a) (a) Develop guidelines: (i) for Secretariat staff on how to integrate gender mainstreaming in their work and (ii) for Members on how to make weather, hydrological and climate services more gender-responsive		
<b>4. HUMAN RESOURCES</b>		
<p>4.1. Strive towards gender parity at all levels; 4.2. Ensure that WMO recruitment and selection process is gender-responsive; 4.3. Apply gender-responsive employment tools to retention and promotion; 4.4. Create a parent-friendly environment at the workplace; 4.5. Assess the long-term impact of WMO employment policies on diversity, including gender balance</p> <p>Specific actions related to the above strategies are available in a separate document for the WMO Secretariat. In view of the broad and diverse spectrum of policies/processes across regions and countries/territories, Members will formulate and implement related actions based on their needs and context, as appropriate.</p>		
<b>5. COMMUNICATION AND PARTNERSHIPS</b>		
<b>5.1 Highlight the contribution of WMO to gender equality to external audiences (e.g. media, UN partners, general public)</b>		
5.1.1(a) Feature gender-related issues regularly in the WMO Bulletin, MeteoWorld and other communication materials (at least once per year) by: (i) highlighting the role of women in meteorology, hydrology and climatology, (ii) promoting female role models, and	5.1.1(b) Promote the unique contributions of women, including through awards for outstanding achievement in meteorology/ hydrology/climatology for women	5.1.1(c) Use and disseminate widely communication materials and tools developed by the WMO Secretariat through mail lists, links to the WMO website and gender equality webpage, Facebook posts and tweets

<b>ACTION</b>		
<b>A. WMO SECRETARIAT</b>	<b>B. WMO CONSTITUENT BODIES</b>	<b>C. WMO MEMBERS</b>
(iii) advocating for gender-responsive weather and climate services		
5.1.2(a) Continue organizing dedicated Gender Days and other panels, conferences, and side events (both separately and in conjunction with major meetings)	5.1.2(b) Plan and organize panels, conferences, side events and dedicated gender days (both separately and in conjunction with major meetings)	5.1.2(c) (Co-)organize and host gender-related events
5.1.3(a) Develop infographics and multimedia resources (i) highlighting the role of women in meteorology, hydrology and climatology and (ii) the gendered impacts of weather, water and climate and (iii) advocating for gender-responsive weather, hydrological and climate services		5.1.3(c) Develop and disseminate communication materials (i) highlighting the role of women in meteorology, hydrology and climatology, (ii) promoting female role models, and (iii) advocating for gender-responsive weather, hydrological and climate services
5.1.4(a) Continue actively participating in gender equality networks, such as UN-SWAP, International Gender Champions, etc.	5.1.4(b) Explore and engage with gender networks in STEM areas relevant to the work of technical commissions and regional associations	5.1.4 (c) Engage with international organizations field offices, such as UN Women, UNDP, etc.
<b>5.2 Ensure that communication materials/tools highlight gender issues, avoid gender bias and value the experiences of women and men</b>		
5.2.1(a) Use gender-inclusive language in documents, including job descriptions/ advertisements and training for staff and update the WMO Style Guide accordingly		
5.2.2(a) Use gender-inclusive language in documents, including job descriptions/vacancies and training for staff		5.2.2(c) Encourage (where possible) equal representation of men and women in all communications (e.g. photos in press)

<b>ACTION</b>		
<b>A. WMO SECRETARIAT</b>	<b>B. WMO CONSTITUENT BODIES</b>	<b>C. WMO MEMBERS</b>
		releases, promotion of services)
5.2.3(a) Continue compiling images of women working in meteorology, hydrology and climatology, and use as much as possible in communication materials		5.2.3(c) Encourage (where possible) equal representation of men and women in all communication including photos
5.2.4(a) Enhance visibility of female role models, e.g. through web interviews and videos, Inspirational Speakers' programme, focus press releases and internal communication on achievements by staff		5.2.4(c) Promote visibility of female role models and provide information on resulting articles on achievements by women to WMO
5.2.5(a) Work with journalists and weather presenters to communicate gender-related matters better, from education to service delivery		5.2.5(c) Work with journalists and weather presenters to communicate gender-related matters better, from education to service delivery
<b>5.3 Facilitate policy dialogue and implementation through incentives and regular information on gender mainstreaming</b>		
5.3.1(a) Communicate the rationale and benefits of gender mainstreaming in WMO to all responsible Departments, with endorsement from senior managers		5.3.1(c) Promote the rationale for gender mainstreaming in NMHSs through seminars/campaigns, etc. on the benefits of gender equality and gender-responsive climate services, including with the involvement of those who have benefitted from such programmes ("Gender Equality Ambassadors")
5.3.2(a) Continue recognizing Secretariat staff with considerable contribution to the advancement of gender equality by means of the Gender Champion of the Year Award	5.3.2 (b) Create a "Gender Champions" award to be given on quadrennial basis to governance members and/or NMHS(s) having demonstrated leadership, dedication and	

<b>ACTION</b>		
<b>A. WMO SECRETARIAT</b>	<b>B. WMO CONSTITUENT BODIES</b>	<b>C. WMO MEMBERS</b>
	significant progress in advancing gender equality	
5.3.3(a) Compile and disseminate good practices in gender mainstreaming, including in service provision	5.3.3(b) Collect and share case studies and good practices in gender mainstreaming and provide feedback on the application of the WMO gender equality policy, guidelines and action plan	5.3.3(c) Conduct research and provide the Secretariat with case studies, stories and examples of gender mainstreaming, including in service provision, for the development of a compendium of good practices.
<b>5.4 Ensure that communication materials/tools utilize multiple modes, methods and channels appropriate for a gender diverse audience</b>		
5.4.1(a) Update the WMO communications guidance to suggest multiple options for communication channels, methods, modes, etc.		
<b>6. RESOURCE TRACKING AND ALLOCATION</b>		
<b>6.1 Develop and use a financial resource tracking mechanism to quantify disbursement of funds</b>		
6.1.1(a) Ensure compliance with the gender marker in the WMO Electronic Tool for Project Planning and Monitoring (ePM)	6.1.1(b) Use gender marker reports in strategic planning and programming, as applicable	
6.1.2(a) Conduct analysis of the gender marker results and provide inputs into relevant meetings and reports		
6.1.3(a) Develop methods, technical solutions and mechanisms for applying the gender marker to regular budget activities		

<b>ACTION</b>		
<b>A. WMO SECRETARIAT</b>	<b>B. WMO CONSTITUENT BODIES</b>	<b>C. WMO MEMBERS</b>
<b>6.2 Ensure that funding is made available through regular budget planning and voluntary contributions</b>		
6.2.1(a) Ensure a budget allocation in the regular budget for gender activities	6.2.1(b) Ensure a budget allocation in the regular budget for gender activities	6.2.1(c) Contribute to the WMO Gender Activities Trust Fund through voluntary contributions
6.2.2(a) Include gender components in proposals submitted to donors	6.2.2(b) Set a financial benchmark for resource allocation for gender equality and the empowerment of women	
<b>7. SERVICE PROVISION</b>		
<b>7.1 Build understanding of the gender-specific aspects of weather, hydrological, climate and environmental services</b>		
7.1.1(a) (Co-)Organize regional and sub-regional climate and/or hydrological forums or workshops on the gender-specific dimensions of weather, water and climate	7.1.1(b) Organize regional and sub-regional gender equality conferences, forums and events on the gender-specific dimensions of weather, water and climate	7.1.1(c) Replicate the gender equality conferences, forums and events at the national and community level
7.1.2(a) Develop tools and publications on the gendered impacts of weather, water and climate		7.1.2(c) Conduct research and analysis on (i) gendered impacts of weather, water and climate (ii) how women and men access, interpret and use weather, hydrological and climate services and (iii) how weather, water and climate information is used
7.1.3(a) Synthesize publications on the gendered impacts of weather, water and climate		7.1.3(c) Conduct surveys on the gendered impacts of weather, water and climate during seminars held at the community level
<b>7.2 Produce and communicate gender-responsive weather, hydrological, climate and environmental services</b>		
7.2.1(a) Mainstream a gender perspective in components of the Global Framework for Climate Services (GFCS), the Climate Risk and	7.2.1(b) Develop and modify relevant regulatory material	7.2.1(c) Organize trainings, develop communication methods and tools for weather and climate service professionals,

<b>ACTION</b>		
<b>A. WMO SECRETARIAT</b>	<b>B. WMO CONSTITUENT BODIES</b>	<b>C. WMO MEMBERS</b>
Early Warning Systems (CREWS) Initiative, and other relevant programmes		extension and relief workers to ensure that women and men have equal access to weather, hydrological and climate services (through translation in local languages, use of multiple media channels, etc.)
7.2.2(a) Identify strategies and mechanisms for NMHS to integrate gender mainstreaming in service provision	7.2.2(b) Identify strategies and mechanisms to integrate gender mainstreaming into service provision and have them implemented by NMHSs	7.2.2(c) Engage women and men using participatory and gender-responsive tools to collect, record and analyse information
<b>7.3 Ensure equitable access to, interpretation of and use of weather, hydrological, climate and environmental information and services by women and men</b>		
7.3.1(a) Ensure strong participation by both genders in panel discussions and events. This will include a specific effort to also ensure men's participation in meetings and events on gender-related issues	7.3.1(b) Develop and modify relevant regulatory material	7.3.1(c) (i) Customize weather and climate services to the particular needs and roles of women and men and (ii) Provide education and training to target female users in accessing and using weather and climate information and products
	7.3.2(b) Ensure that the WMO Data Policy is gender-responsive	7.3.2(c) Increase women's participation in user forums on service delivery

<b>ACTION</b>		
<b>A. WMO SECRETARIAT</b>	<b>B. WMO CONSTITUENT BODIES</b>	<b>C. WMO MEMBERS</b>
<b>7.4 Ensure increased participation of women in service delivery</b>		
		7.4.1(c) Adopt institutional regulations empowering women in the work place (e.g. flexible working hours, teleworking, maternity/paternity leave)
		7.4.2(c) Seek gender balance in the involvement of women and men in the generation and delivery of weather, hydrological and climate services
		7.4.3(c) Ensure women and men are engaged as part of community disaster-response teams

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## **Resolution 83 (Cg-18)**

### **JOINT INSPECTION UNIT RECOMMENDATIONS**

THE WORLD METEOROLOGICAL CONGRESS,

**Recalling** the WMO procedures on follow-up on JIU reports, approved by the fifty-fourth session of the Executive Council in 2002,

**Noting** with appreciation the work done by the Joint Inspection Unit on strengthening good governance in the United Nations system,

**Having considered** the recommendations addressed to legislative bodies issued by the JIU since Cg-17 and management response to them which are included in [Cg-18/INF. 9.6\(5\)](#),

**Having been informed** that all the recommendations issued by the JIU were submitted to the Audit Committee along with the proposed management action for guidance, and subsequently to the Executive Council,

**Decides** to endorse the management responses to the recommendations except for Recommendation 4 from 2018/4 "Review of whistle-blower policies and practices in the UN system organizations";

**Requests** the Secretary-General to continue providing support to the work of the JIU and provide consideration to the recommendations of the Unit in accordance with the established procedures.

**Further requests** the Secretary General to amend the WMO travel policy to reflect the exceptional use of first class travel in practice and that management, in consultation with the audit committee, further evaluate the implementation of Recommendation 4 from 2018/4 "Review of whistle-blower policies and practices in the UN system organizations" to ensure a separate ombudsman/mediator.

**Also requests** the Executive Council to review and update the WMO travel policy.

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## **Resolution 84 (Cg-18)**

### **ASSESSMENT OF PROPORTIONAL CONTRIBUTIONS OF MEMBERS FOR THE EIGHTEENTH FINANCIAL PERIOD (2020–2023)**

THE WORLD METEOROLOGICAL CONGRESS,

**Noting:**

- (1) Article 24 of the Convention of the World Meteorological Organization,
- (2) Article 8 of the Financial Regulations of the Organization,

- (3) Resolution 75 (Cg-17) – Assessment of proportional contributions of Members for the seventeenth financial period,

**Decides:**

- (1) That the latest United Nations scales of assessments to be approved by the United Nations General Assembly should continue to be used as the basis for the calculation of the WMO scales of assessments, duly adjusted for differences in membership, as specified in Table 1 of the annex to this resolution;
- (2) That the scales of assessments of proportional contributions of Members for the eighteenth financial period (2020-2023) shall be based on the United Nations scales of assessments adopted by the United Nations General Assembly at its seventy-third (2018) and seventy-sixth (2021) sessions, adjusted for differences in membership;
- (3) That the proportional contributions of countries which are not Members but which may become Members shall be assessed as shown in Table 2 of the annex to this resolution;

**Authorizes** the Executive Council:

- (1) To adjust the scales of assessment for the year 2023 using the United Nations scales of assessment to be adopted by the United Nations General Assembly in the year 2021, adjusted for differences in membership provided that, for the WMO scale, the minimum rate shall remain at 0.02% and corrections shall be made to ensure that no Member's rate of assessment would increase to a level which would exceed 200% of the WMO scale in 2022;
- (2) To make a provisional assessment in respect of non-Members in the event of any such non-Members becoming Members, the method of assessment being based on principles similar to those governing the assessments laid down in this resolution.

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Note: This resolution replaces Resolution 75 (Cg-17), which remains in force until 31 December 2019.

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**Annex to Resolution 84 (Cg-18)**

**PROPOSED WMO SCALE OF ASSESSMENT**

**TABLE 1**

**Proportional contributions for the eighteenth financial period**

	<i>Member</i>	<i>Scale of assessment for 2016</i>	<i>Scale of assessment for 2019</i>	<i>Proposed scale of assessment for 2020</i>
1	Afghanistan	0.02	0.02	0.02
2	Albania	0.02	0.02	0.02
3	Algeria	0.14	0.16	0.14
4	Andorra	-	-	0.02
5	Angola	0.02	0.02	0.02
6	Antigua and Barbuda	0.02	0.02	0.02
7	Argentina	0.43	0.86	0.89
8	Armenia	0.02	0.02	0.02
9	Australia	2.04	2.30	2.18
10	Austria	0.79	0.71	0.67
11	Azerbaijan	0.04	0.06	0.05
12	Bahamas	0.02	0.02	0.02
13	Bahrain	0.04	0.04	0.05
14	Bangladesh	0.02	0.02	0.02
15	Barbados	0.02	0.02	0.02
16	Belarus	0.06	0.05	0.05
17	Belgium	0.98	0.88	0.81
18	Belize	0.02	0.02	0.02
19	Benin	0.02	0.02	0.02
20	Bhutan	0.02	0.02	0.02
21	Bolivia, Plurinational State of	0.02	0.02	0.02
22	Bosnia and Herzegovina	0.02	0.02	0.02
23	Botswana	0.02	0.02	0.02
24	Brazil	2.89	3.77	2.90
25	British Caribbean Territories	0.02	0.02	0.02
26	Brunei Darussalam	0.03	0.03	0.03
27	Bulgaria	0.05	0.04	0.05
28	Burkina Faso	0.02	0.02	0.02
29	Burundi	0.02	0.02	0.02
30	Cabo Verde	0.02	0.02	0.02
31	Cambodia	0.02	0.02	0.02
32	Cameroon	0.02	0.02	0.02
33	Canada	2.94	2.88	2.69
34	Central African Republic	0.02	0.02	0.02
35	Chad	0.02	0.02	0.02

	<i>Member</i>	<i>Scale of assessment for 2016</i>	<i>Scale of assessment for 2019</i>	<i>Proposed scale of assessment for 2020</i>
36	Chile	0.33	0.39	0.40
37	China	5.07	7.80	11.82
38	Colombia	0.26	0.32	0.28
39	Comoros	0.02	0.02	0.02
40	Congo	0.02	0.02	0.02
41	Cook Islands	0.02	0.02	0.02
42	Costa Rica	0.04	0.05	0.06
43	Côte d'Ivoire	0.02	0.02	0.02
44	Croatia	0.12	0.10	0.08
45	Cuba	0.07	0.06	0.08
46	Curaçao and Sint Maarten	0.02	0.02	0.02
47	Cyprus	0.05	0.04	0.04
48	Czech Republic	0.38	0.34	0.31
49	Democratic People's Republic of Korea	0.02	0.02	0.02
50	Democratic Republic of the Congo	0.02	0.02	0.02
51	Denmark	0.67	0.58	0.55
52	Djibouti	0.02	0.02	0.02
53	Dominica	0.02	0.02	0.02
54	Dominican Republic	0.04	0.04	0.05
55	Ecuador	0.04	0.07	0.08
56	Egypt	0.13	0.15	0.18
57	El Salvador	0.02	0.02	0.02
58	Eritrea	0.02	0.02	0.02
59	Estonia	0.04	0.04	0.04
60	Eswatini	0.02	0.02	0.02
61	Ethiopia	0.02	0.02	0.02
62	Fiji	0.02	0.02	0.02
63	Finland	0.51	0.45	0.42
64	France	5.51	4.80	4.36
65	French Polynesia	0.02	0.02	0.02
66	Gabon	0.02	0.02	0.02
67	Gambia	0.02	0.02	0.02
68	Georgia	0.02	0.02	0.02
69	Germany	7.04	6.30	6.00
70	Ghana	0.02	0.02	0.02
71	Greece	0.63	0.47	0.36
72	Guatemala	0.03	0.03	0.04
73	Guinea	0.02	0.02	0.02
74	Guinea-Bissau	0.02	0.02	0.02
75	Guyana	0.02	0.02	0.02

	<i>Member</i>	<i>Scale of assessment for 2016</i>	<i>Scale of assessment for 2019</i>	<i>Proposed scale of assessment for 2020</i>
76	Haiti	0.02	0.02	0.02
77	Honduras	0.02	0.02	0.02
78	Hong Kong, China	0.02	0.02	0.02
79	Hungary	0.26	0.17	0.20
80	Iceland	0.03	0.02	0.03
81	India	0.66	0.73	0.81
82	Indonesia	0.34	0.50	0.54
83	Iran, Islamic Republic of	0.35	0.46	0.39
84	Iraq	0.04	0.08	0.12
85	Ireland	0.41	0.34	0.37
86	Israel	0.39	0.42	0.47
87	Italy	4.38	3.70	3.26
88	Jamaica	0.02	0.02	0.02
89	Japan	10.68	9.54	8.44
90	Jordan	0.02	0.02	0.02
91	Kazakhstan	0.12	0.19	0.18
92	Kenya	0.02	0.02	0.02
93	Kiribati	0.02	0.02	0.02
94	Kuwait	0.27	0.28	0.25
95	Kyrgyzstan	0.02	0.02	0.02
96	Lao People's Democratic Republic	0.02	0.02	0.02
97	Latvia	0.05	0.05	0.05
98	Lebanon	0.04	0.04	0.05
99	Lesotho	0.02	0.02	0.02
100	Liberia	0.02	0.02	0.02
101	Libya	0.14	0.12	0.03
102	Lithuania	0.07	0.07	0.07
103	Luxembourg	0.08	0.06	0.07
104	Macao, China	0.02	0.02	0.02
105	Madagascar	0.02	0.02	0.02
106	Malawi	0.02	0.02	0.02
107	Malaysia	0.28	0.32	0.34
108	Maldives	0.02	0.02	0.02
109	Mali	0.02	0.02	0.02
110	Malta	0.02	0.02	0.02
111	Mauritania	0.02	0.02	0.02
112	Mauritius	0.02	0.02	0.02
113	Mexico	1.81	1.42	1.27
114	Micronesia, Federated States of	0.02	0.02	0.02

	<i>Member</i>	<i>Scale of assessment for 2016</i>	<i>Scale of assessment for 2019</i>	<i>Proposed scale of assessment for 2020</i>
115	Monaco	0.02	0.02	0.02
116	Mongolia	0.02	0.02	0.02
117	Montenegro	0.02	0.02	0.02
118	Morocco	0.06	0.05	0.05
119	Mozambique	0.02	0.02	0.02
120	Myanmar	0.02	0.02	0.02
121	Namibia	0.02	0.02	0.02
122	Nauru	-	-	0.02
123	Nepal	0.02	0.02	0.02
124	Netherlands	1.63	1.47	1.34
125	New Caledonia	0.02	0.02	0.02
126	New Zealand	0.25	0.26	0.29
127	Nicaragua	0.02	0.02	0.02
128	Niger	0.02	0.02	0.02
129	Nigeria	0.09	0.18	0.24
130	Niue	0.02	0.02	0.02
131	Norway	0.84	0.84	0.74
132	Oman	0.10	0.11	0.11
133	Pakistan	0.08	0.09	0.11
134	Panama	0.03	0.03	0.04
135	Papua New Guinea	0.02	0.02	0.02
136	Paraguay	0.02	0.02	0.02
137	Peru	0.12	0.13	0.15
138	Philippines	0.15	0.16	0.20
139	Poland	0.91	0.83	0.79
140	Portugal	0.47	0.39	0.35
141	Qatar	0.21	0.26	0.28
142	Republic of Korea	1.96	2.01	2.22
143	Republic of Moldova	0.02	0.02	0.02
144	Republic of North Macedonia	0.02	0.02	0.02
145	Romania	0.22	0.18	0.20
146	Russian Federation	2.40	3.04	2.37
147	Rwanda	0.02	0.02	0.02
148	Saint Lucia	0.02	0.02	0.02
149	Samoa	0.02	0.02	0.02
150	Sao Tome and Principe	0.02	0.02	0.02
151	Saudi Arabia	0.85	1.13	1.16
152	Senegal	0.02	0.02	0.02
153	Serbia	0.04	0.03	0.03
154	Seychelles	0.02	0.02	0.02
155	Sierra Leone	0.02	0.02	0.02
156	Singapore	0.38	0.44	0.48

	<i>Member</i>	<i>Scale of assessment for 2016</i>	<i>Scale of assessment for 2019</i>	<i>Proposed scale of assessment for 2020</i>
157	Slovakia	0.17	0.16	0.15
158	Slovenia	0.10	0.08	0.08
159	Solomon Islands	0.02	0.02	0.02
160	Somalia	0.02	0.02	0.02
161	South Africa	0.37	0.36	0.27
162	South Sudan	0.02	0.02	0.02
163	Spain	2.93	2.42	2.11
164	Sri Lanka	0.03	0.03	0.04
165	Sudan	0.02	0.02	0.02
166	Suriname	0.02	0.02	0.02
167	Sweden	0.95	0.94	0.89
168	Switzerland	1.03	1.12	1.13
169	Syrian Arab Republic	0.04	0.02	0.02
170	Tajikistan	0.02	0.02	0.02
171	Thailand	0.24	0.29	0.30
172	Timor-Leste	0.02	0.02	0.02
173	Togo	0.02	0.02	0.02
174	Tonga	0.02	0.02	0.02
175	Trinidad and Tobago	0.04	0.03	0.04
176	Tunisia	0.04	0.03	0.03
177	Turkey	1.22	1.01	1.34
178	Turkmenistan	0.02	0.03	0.03
179	Tuvalu	0.02	0.02	0.02
180	Uganda	0.02	0.02	0.02
181	Ukraine	0.10	0.10	0.06
182	United Arab Emirates	0.59	0.59	0.61
183	United Kingdom of Great Britain and North	5.10	4.41	4.49
184	United Republic of Tanzania	0.02	0.02	0.02
185	United States of America	21.68	21.67	21.67
186	Uruguay	0.05	0.08	0.09
187	Uzbekistan	0.02	0.02	0.03
188	Vanuatu	0.02	0.02	0.02
189	Venezuela, Bolivarian Republic of	0.62	0.56	0.71
190	Viet Nam	0.04	0.06	0.08
191	Yemen	0.02	0.02	0.02
192	Zambia	0.02	0.02	0.02
193	Zimbabwe	0.02	0.02	0.02
	Total	<u>100.00</u>	<u>100.00</u>	<u>100.00</u>

**Note:** For the year 2023, the United Nations scales to be approved by the seventy-sixth United Nations General Assembly in 2021 would be adopted, duly adjusted for differences in membership.

**TABLE 2**  
**COUNTRIES WHICH MAY BECOME MEMBERS**

<i>Country</i>	<i>Percentage assessment (to be confirmed)*</i>
1 Equatorial Guinea	0.02
2 Grenada	0.02
3 Holy See	0.02
4 Liechtenstein	0.02
5 Marshall Islands	0.02
6 Palau	0.02
7 Saint Kitts and Nevis	0.02
8 Saint Vincent and the Grenadines	0.02
9 San Marino	0.02

\* Based on the decision regarding minimum percentage to be applied

### Resolution 85 (Cg-18)

#### THE WORKING CAPITAL FUND

THE WORLD METEOROLOGICAL CONGRESS,

**Noting:**

- (1) Articles 8 and 9 of the Financial Regulations of the Organization,
- (2) Resolution 42 (Cg-XV) – Working Capital Fund,
- (3) Resolution 15 (EC-LXI) – Financing the shortfall in the capital of the Working Capital Fund,

**Decides:**

- (1) That the Working Capital Fund shall continue to be maintained for the following purpose:
  - (a) To finance budgetary appropriations pending receipt of contributions;
  - (b) To advance such sums as may be necessary to cover unforeseen and extraordinary expenses which cannot be met from current budgetary provisions;
- (2) That the principal of the Working Capital Fund during the eighteenth financial period shall be maintained at CHF 7.5 million;



- (3) That the existing advances of each Member shall, notwithstanding the provisions of Financial Regulation 9.3, continue to be frozen at the level fixed for the fourteenth financial period;
  - (4) That the shortfall of the principal, i.e. CHF 900 000, shall be provided by crediting interest earned on the investment of cash resources of the Working Capital Fund;
  - (5) That advances for new members joining the Organization after 1 January 2020 shall be assessed at the rate established for the scale of assessment for the year of entry.
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## **Resolution 86 (Cg-18)**

### **SECRETARY-GENERAL'S CONTRACT**

THE WORLD METEOROLOGICAL CONGRESS,

**Noting** Article 21(a) of the Convention of the World Meteorological Organization,

**Noting also** Resolution 77 (Cg-17) – Secretary-General's contract,

**Having considered** that effective 1 January 2019, the United Nations General Assembly adopted (A/RES/73/273) a new base salary scale for the staff of the United Nations Common System in the Professional and higher categories and that comparable United Nations agencies, in particular, the International Telecommunication Union and the Universal Postal Union, had adjusted the salaries of their ungraded officials accordingly,

**Having further considered** that in accordance with Article 51(b) of the Regulations of the United Nations Joint Staff Pension Fund, the International Civil Service Commission had issued revised pensionable remuneration scales effective 1 January 2019 and 1 February 2019 and that the United Nations General Assembly (A/RES/73/273) had adopted a revised formula for calculating the pensionable remuneration scale for ungraded officials,

**Decides:**

- (1) To set the annual net base salary for the Secretary-General at US\$ 174,065 with retroactive effect from 1 January 2019;
- (2) To set the representation allowance for the Secretary-General at CHF 29,000 per year for the eighteenth financial period;
- (3) To set the pensionable remuneration scale of the Secretary-General at US\$ 370,827 effective 1 January 2019 and US\$ 378,972 effective 1 February 2019 at an additional annual cost of US\$ 1,795;
- (4) To authorize the Executive Council, during the eighteenth financial period, to carry out any readjustment to the salaries and pensionable remuneration scales of ungraded officials which might become necessary if changes in the salaries of comparable United Nations staff should occur;
- (5) That the terms of the appointment of the Secretary-General should be as set forth in the contract, as annexed to the present resolution.

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Note: This resolution replaces Resolution 77 (Cg-17), which remains in force only until 31 December 2019.

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## **Annex to Resolution 86 (Cg-18)**

### **DRAFT CONTRACT OF THE SECRETARY-GENERAL**

In application of Article 21, paragraph (a) of the Convention of the World Meteorological Organization, prescribing that the Secretary-General shall be appointed by the Congress on such terms as the Congress may approve; and

Having regard to the resolution adopted by the Eighteenth Congress of the World Meteorological Organization approving the terms of appointment included in the present agreement;

It is hereby agreed as follows:

Between the World Meteorological Organization, hereinafter called the Organization, represented by its President, on the one part, and [TITLE] [FIRST NAME] [SURNAME] appointed Secretary-General by the Eighteenth World Meteorological Congress during its meeting of [DAY] June 2019, on the other part,

1. The Secretary-General's term of appointment shall take effect from 1 January 2020.
2. The Secretary-General, at the time of taking up her/his appointment, shall subscribe to the following oath or declaration:

"I solemnly swear (undertake, affirm, promise) to exercise in loyalty, discretion and conscience the functions entrusted to me as an international civil servant of the World Meteorological Organization, to discharge these functions and regulate my conduct with the interests of the Organization only in view, and not to seek or accept instructions in regard to the performance of my duties from any government or other authority external to the Organization".

This oath or declaration shall be made orally by the Secretary-General in the presence of the President and either a Vice-President or another member of the Executive Council. The Secretary General is fully accountable to the President of the WMO for any failure to meet the Organization's objectives.

3. During the term of her/his appointment, the Secretary-General shall enjoy the privileges and immunities in keeping with her/his office which are granted her/him by appropriate agreements entered into by the Organization; she/he shall not engage in any activity that is incompatible with the proper discharge of her/his duties as Secretary-General of the Organization; he/she shall be subject to the Staff Regulations of the Organization in so far as they can be applied to him/her; she/he shall renounce any employment or remunerated activities other than those of Secretary-General of the Organization, except those activities authorized by the Executive Council; she/he shall not accept any honour, decoration, favour, gift or remuneration from any source external to the Organization without first obtaining the approval of the Executive Council and; he/she shall refrain from any action that may present an appearance of a conflict of interest.

4. The Secretary General shall further commit to:

- (a) Consistent application of all relevant regulations, rules, policies and guidelines at all levels throughout the Organization;
- (b) The highest standards of honest and ethical conduct by demonstrating zero tolerance for violations of organization regulations and policies and ensuring that all Secretariat decisions and actions are informed by accountability, transparency, integrity, respect and fairness;
- (c) Responsible stewardship of resources, including:

- (i) Efficient, transparent, and effective use of financial resources in accordance with the Financial Regulations;
- (ii) Skilled management of human resources in alignment with Organization mandates and priorities consistent with the Staff Regulations;
- (iii) Swift implementation of audit recommendations;
- (iv) Timely issuance of official documentation, particularly related to the preparation for governing body meetings;

5. Failure to comply with these standards of conduct should be considered by the President of the WMO who shall take action and report to the Executive Council or Congress, as appropriate.

6. The term of appointment of the Secretary-General shall end:

- (a) By expiration of this agreement on 31 December 2023; or
- (b) By this official's resignation submitted in writing to the President of the Organization, in which case the Secretary-General shall cease her/his functions two months after the date of acceptance of her/his resignation by the Executive Council; or
- (c) By termination for serious failure to carry out her/his duties and obligations, and in particular those set out in paragraphs (2) and (3) and (4) of this agreement. In such case, the Secretary-General shall be heard as of right by the Executive Council; if the Executive Council decides to terminate the appointment, the decision shall take effect two months after the date of pronouncement and on conditions to be determined by the Executive Council. After consultation with the Executive Council, the President of the Organization may suspend the Secretary-General from the exercise of her/his functions pending investigation by the Executive Council and until this Council has taken a decision.

7. The Secretary-General shall receive from the Organization:

- (a) An annual salary of US\$ 174,065 net (after deduction for staff assessment), with the application of the appropriate post adjustment at a rate equivalent to that applied to executive heads of other comparable specialized agencies, salary and post adjustment to be paid in monthly instalments; and
- (b) An annual representation allowance of 29,000 Swiss francs, to be paid in monthly instalments; and
- (c) Other allowances including dependency benefits, education, installation and repatriation grants, payment of removal, if pertinent, and travel and subsistence allowances appropriate and under the conditions applicable to Under-Secretaries of the United Nations.

All the above-mentioned sums will be paid in the currency of the country where the Secretariat is located, unless the Executive Council and the Secretary-General agree to some other arrangement.

The salary and emoluments received from the Organization will be free of tax.

8. The Secretary-General shall be allowed thirty working days' leave each year. In order that the Secretary-General may take her/his annual leave every two years in her/his home country, the Organization shall pay the expenses in connection with the travel of the Secretary-General, her/his spouse and her/his dependent children, under the conditions applicable to Under-Secretaries of the United Nations.

9. The Secretary-General shall participate in any social security scheme established by the Organization, the benefits she/he would receive being not less favourable than those which would accrue in similar circumstances to an official of the next highest rank of the staff covered by the scheme.

10. Any divergence of views concerning the application or interpretation of the present agreement, which it shall not have been possible to settle by direct discussion between the parties, can be submitted by one or the other of the parties to the judgement of the Administrative Tribunal, the competence of which is recognized by the Organization, whose decisions will be final. For any appeals by the Secretary-General against the non-observation of the statutes of the United Nations Joint Staff Pension Fund, of which the Secretary-General shall be a participant in accordance with the regulations and rules of that Fund, the Administrative Tribunal whose jurisdiction has been accepted by the Organization for pension cases is recognized hereby as the competent arbitrator.

Done and signed in duplicate at \_\_\_\_\_ on the \_\_\_\_\_ 2019.

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\_\_\_\_\_  
 ([TITLE] [FIRST NAME] [SURNAME])  
 President of the World Meteorological  
 Organization

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\_\_\_\_\_  
 ([TITLE] [FIRST NAME] [SURNAME])  
 Secretary-General appointed by the  
 Eighteenth World Meteorological Congress

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## Resolution 87 (Cg-18)

### REVIEW OF PREVIOUS CONGRESS RESOLUTIONS

THE WORLD METEOROLOGICAL CONGRESS,

**Recalling** Regulation 136(17) of the General Regulations of the Organization, concerning the review of previous Congress resolutions and Resolution 82 (Cg-17) - Review of previous Congress resolutions,

**Having examined** its previous resolutions still in force [*analysis is provided in [Cg-18/INF. 9.9](#)*],

**Decides:**

(1) To keep in force the following resolutions:

Second Congress (Cg-II)	18
Third Congress (Cg-III)	3, 4
Fifth Congress (Cg-V)	6
Seventh Congress (Cg-VII)	39
Eighth Congress (Cg-VIII)	48
Ninth Congress (Cg-IX)	30
Tenth Congress (Cg-X)	31
Eleventh Congress (Cg-XI)	19, 37
Twelfth Congress (Cg-XII)	21, 35, 40
Thirteenth Congress (Cg-XIII)	25
Fourteenth Congress (Cg-XIV)	5, 6, 24, 46
Fifteenth Congress (Cg-XV)	21, 29, 39, 41, 42, 45
Sixteenth Congress (Cg-XVI)	13, 14, 15, 16, 21, 22, 23, 24, 25, 27 32, 33, 40, 42, 44, 47, 48, 52
Seventeenth Congress (Cg-17)	2, 3, 4, 5, 6, 7, 10, 11, 13, 15,

- 17, 20, 21, 22, 24, 27, 33, 34, 35, 37  
39, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53,  
54, 55, 59, 60, 63, 64, 66, 67, 68, 70, 72,  
73, 74, 75, 76, 78, 79, 81, 83
- Extraordinary Congress (Cg-Ext.(2012)) 1;
- (2) To keep in force the following resolutions until 31 December 2019:
- Sixteenth Congress (Cg-XVI) 43  
Seventeenth Congress (Cg-17) 69, 71, 77;
- (3) Not to keep in force the other resolutions adopted before its eighteenth session;
- (4) To make available the text of resolutions kept in force pursuant to this resolution as well as resolutions adopted by the Eighteenth Congress in the *Resolutions of Congress and the Executive Council* (WMO-No. 508).

Note: This resolution replaces Resolution 82 (Cg-17), which is no longer in force.

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### Resolution 88 (Cg-18)

#### APPOINTMENT OF THE SECRETARY GENERAL AND ELECTIONS OF THE PRESIDENT AND VICE-PRESIDENTS OF THE ORGANIZATION, MEMBERS OF THE EXECUTIVE COUNCIL AND PRESIDENTS AND VICE-PRESIDENTS OF TECHNICAL COMMISSIONS

THE WORLD METEOROLOGICAL CONGRESS,

**Appointed** Professor Petteri TAALAS as the Secretary-General of the Organization for the eighteenth financial period,

**Elected** Professor Gerhard ADRIAN, (Germany) as President of the Organization,

**Elected** Professor Andrea Celeste SAULO (Ms), (Argentina) as First Vice-President of the Organization,

**Elected** Dr Albert Asinto Eleuterio MARTIS, (Curaçao and Sint Maarten) as Second Vice-President of the Organization,

**Elected** Dr Agnes KIJAZI (Ms), (United Republic of Tanzania) as Third Vice-President of the Organization,

**Elected** the following Directors of National Meteorological or Hydrometeorological Services of Members of the Organization as members of the Executive Council in accordance with the provisions of Article 13 (c) of the Convention:

Dr Aderito F. ARAMUGE	(Mozambique)
Dr Mamadou Lamine BAH	(Guinea)
Dr Peter BINDER	(Switzerland)
Brigadier General Silvio CAU	(Italy)
Mr Omar CHAFKI	(Morocco)

Mr Volkan Mutlu COŞKUN	(Turkey)
Professor Penny ENDERSBY	(United Kingdom of Great Britain and Northern Ireland)
Mr Carlos GOMES	(Brazil)
Mr David GRIMES	(Canada)
Dr Andrew JOHNSON	(Australia)
Professor Dr Dwikorita KARNAWATI	(Indonesia)
Mr KIM Jongseok	(Republic of Korea)
Mr Jean-Marc LACAVERE	(France)
Dr Arlene LAING	(British Caribbean Territories)
Ms LIU Yaming	(China)
Mr Miguel Angel LOPEZ GONZALEZ	(Spain)
Professor Sani MASHI	(Nigeria)
Dr Mrutyunjay MOHAPATRA	(India)
Mr Yasuo SEKITA	(Japan)
Dr Ken TAKAHASHI GUEVARA	(Peru)
Dr Sahar TAJBAKSH MOSALMAN	(Iran, Islamic Republic of)
Mr Simplicie TCHINDA TAZO	(Cameroon)
Mr Fetene TESHOME	(Ethiopia)
Dr Louis UCCELLINI	(United States of America)
Mr Franz UIRAB	(Namibia)
Ms WONG Chin Ling	(Singapore)
Mr Maxim YAKOVENKO	(Russian Federation)

**Elected** Mr Michel JEAN (Canada). as President of the Technical Commission for Observation, Infrastructures and Information Systems (Infrastructure Commission),

**Elected** Mr Bruce FORGAN (Australia), Professor Nadia PINARDI (Italy) and Mr Silvano PECORA (Italy) as co-Vice-Presidents of the Technical Commission for Observation, Infrastructures and Information Systems (Infrastructure Commission),

**Elected** Mr Ian LISK (United Kingdom of Great Britain and Northern Ireland) as President of the Technical Commission for Weather, Climate, Water and Related Environmental Services and Applications (Services Commission),

**Elected** Mr Chi-Ming SHUN (Hong Kong, China), Dr Roger STONE (Australia) and Dr Manola BRUNET INDIA (Spain) as co-Vice-Presidents of the Technical Commission for Weather, Climate, Water and Related Environmental Services and Applications (Services Commission).

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**Resolution 89 (Cg-18)****EXTRAORDINARY SESSION OF CONGRESS IN 2021**

THE WORLD METEOROLOGICAL CONGRESS,

**Having examined** Recommendation 26 (EC-70) – Extraordinary session of the World Meteorological Congress in 2021,

**Considering** the high expectations placed on the National Meteorological and Hydrological Services of WMO Members, together with their various international and national partners from public, private and academic sectors, to provide vital support in the pursuit of the global goals established by the United Nations Sustainable Development Goals, the Paris Agreement and the Sendai Framework, and that these expectations require a new level of dynamic consultation and coordination between Members,

**Stressing** the need to enhance and strengthen institutional arrangements to deliver on the WMO mandate related to provision of information and services for sustainable management of water resources,

**Cognizant** of the rapid progress in science and technology which constantly brings opportunities for improvements in the quality of services with benefits to society,

**Recognizing** the need to ensure a similarly rapid uptake of innovation in the evolution of the Organization's main systems for the collection and exchange of observations and predictions, and for service provision, which necessitate expeditious amendments to the framework of the WMO Technical Regulations, development of guidance and capacity-development activities,

**Decides** that an extraordinary session of Congress shall be held in Geneva in June 2021 (duration five days) to: (a) take stock and provide direction to the reform process, (b) reinforce, in the broader WMO interdisciplinary context, the importance of operational hydrology in addressing global water challenges, and (c) determine and maintain a highly relevant Technical Regulations framework;

**Considering** that holding two Congress sessions in the four-year period would offer benefits of more frequent gathering of Members for an effective and inclusive governance and greater engagement of Members in advancing the technical progress and policy-making of the Organization,

**Considering** further that the first session in the four-year cycle would be dedicated to decisions on strategy, policy, budget, structure and elections, while a second and extraordinary session would focus on normative and regulatory issues, progress on strategic objectives and capacity development, and other selected topics, as necessary,

**Requests** the Executive Council, at its seventy-sixth session in 2024 [*or seventy-fourth session in 2022*], to consider the opportunity of convening an extraordinary session of Congress in 2025 as appropriate depending on the matters to be submitted before it.

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## APPENDIX 3. LIST OF PARTICIPANTS

### 1. Officers of the session

David GRIMES	President
Andrea Celeste SAULO	First Vice-President of WMO

### 2. Representatives of WMO Members

#### Afghanistan

Shoaib TIMORY	Principal delegate
Soman FAHIM	Delegate

#### Albania

Ravesa LLESHI	Principal delegate
Bujar BALA	Alternate

#### Algeria

Sem Boudjemaa DELMI	Principal delegate
Brahim IHADADENE	Alternate
Karim ABDELLI	Delegate
Sinda AYAICHIA	Delegate
Abdalah BENCHEBBAKH	Delegate
Amar CHEMAKH	Delegate
Messaoud CHERIEF	Delegate
El-Hassani DJALAL KACIMI	Delegate
Toufik DJOUAMA	Delegate
Djaouida NEGGACHE	Delegate
Salah SAHABI ABED	Delegate

#### Andorra

Carles MIQUEL	Principal delegate
Antoni MOLNE	Alternate

#### Angola

Alberto Samy GUIMARAES	Delegate
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#### Argentina

Andrea Celeste SAULO	Principal delegate
Yamila Paola COSTA	Alternate
Mariano RE	Delegate
Ivan CARROLL	Observer

#### Armenia

Armen DPIRYAN	Principal delegate
Pertch BOSHNAGHYAN	Delegate
Valentina GRIGORYAN	Delegate
Armine PETROSYAN	Delegate

#### Australia

Andrew JOHNSON	Principal delegate
Jonathan Paul GILL	Alternate
Jasmine Louise CHAMBERS	Delegate
Naomi Joy DUMBRELL	Delegate



**Austria**

Michael STAUDINGER	Principal delegate
Gerhard WOTAWA	Alternate
Andreas SCHAFFHAUSER	Delegate
Charline VAN DER BEEK	Delegate

**Azerbaijan**

Umayra TAGHIYEVA	Principal delegate
Aydan MURADOVA	Delegate
Vaqif SADIQOV	Delegate

**Bahamas**

Trevor BASDEN	Principal delegate
Geoffrey GREENE	Delegate

**Bahrain**

Basem ALASFOOR	Principal delegate
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**Bangladesh**

Shamsuddin AHMED	Principal delegate
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**Barbados**

Sonia NURSE	Principal delegate
Shani GRIFFITH-JACK	Delegate

**Belarus**

Yury AMBRAZEVICH	Principal delegate
Vadim PISAREVICH	Alternate
Dmitry NIKALAYENIA	Delegate

**Belgium**

Daniel GELLENS	Principal delegate
Sandrine PLATTEAU	Delegate
Christian TRICOT	Delegate

**Benin**

Joseph AHISSOU	Principal delegate
Kokou Marcellin NAKPON	Alternate
Edgard Pierre Roch QUENUM	Alternate
Armand Philippe ADJOMAYI	Delegate
Jean-Pierre FIOGBE	Delegate
Eloi LAOUROU	Delegate
Eustache POMALEGNI	Delegate
Samou SEIDOU ADAMBI	Delegate

**Bhutan**

Kinga SINGYE	Principal delegate
Rigtsal DORJI	Delegate
Karma DUPCHU	Delegate

**Bosnia and Herzegovina**

Nermina KAPETANOVIC	Principal delegate
Almir BIJEDIC	Delegate
Biljana CAMUR VESELINOVIC	Delegate
Esen KUPUSOVIC	Delegate
Bojan MASIC	Delegate
Mirha OSIJAN	Delegate
Nada RUDAN	Delegate
Tomislav SAJIC	Delegate

**Botswana**

Radithupa RADITHUPA	Alternate
Chandapiwa Peggy SEBEELA	Delegate

**Brazil**

Maria Luisa ESCOREL DE MORAES	Principal delegate
Carlos Edison CARVALHO GOMES	Alternate
Jose Arimatea DE SOUSA BRITO	Alternate
Antonio Divino MOURA	Alternate
Leonardo ABRANTES DE SOUSA	Delegate
Fernando DE ABREU PINTO	Delegate
Oscar DE MORAES CORDEIRO NETTO	Delegate
Felipe DO SOUTO DE SA GILLE	Delegate
Marcelo Jorge MEDEIROS	Delegate
Rodrigo WANDERLEY LIMA	Delegate

**British Caribbean Territories**

Arlene LAING	Principal delegate
David FARRELL	Alternate
Shawn BOYCE	Delegate
Glendell DE SOUZA	Delegate

**Brunei Darussalam**

Muhamad Husani AJI	Principal delegate
Shahalmie EMRAN	Delegate

**Bulgaria**

Hristomir BRANZOV	Principal delegate
Milena MILENKOVA	Delegate
Plamen NINOV	Delegate
Rayko RAYTCHEV	Delegate

**Burkina Faso**

Inoussa BALBONE	Delegate
Kouka Ernest OUEDRAOGO	Delegate

**Cambodia**

Bunchheng SAY	Alternate
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**Cameroon**

Simplice TCHINDA TAZO	Principal delegate
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**Canada**

David GRIMES	Principal delegate
Jenifer COLLETTE	Alternate
Heather AUCOIN	Delegate
Marie-Elaine BOIVIN	Delegate
Jean-Francois CANTIN	Delegate
Brian DAY	Delegate
Michel JEAN	Delegate
Laird SHUTT	Delegate

**Central African Republic**

Athanase Hyacinthe Anaclet YAMBELE	Principal delegate
Jean Mexin ATAZI YEKE	Delegate

**Chile**

Guillermo NAVARRO	Principal delegate
Barbara TAPIA	Delegate
Maximiliano VALDES	Delegate

**China**

Yaming LIU	Principal delegate
Yong YU	Alternate
Mingmei LI	Delegate
Jianjie WANG	Delegate
Jun YANG	Delegate
Heng ZHOU	Delegate

**Colombia**

Natalia PULIDO SIERRA	Principal delegate
Yolanda GONZALEZ HERNANDEZ	Alternate
Pierre GARCIA JACQUIER	Delegate
Yesid Andres SERRANO ALARCON	Delegate

**Comoros**

Yahaya Ahmed MOHAMED	Principal delegate
Hamid MOHAMED	Delegate

**Congo**

Hilaire ELENGA	Principal delegate
Aime Clovis GUILLON	Delegate
Pascal MANANGA	Delegate

**Cook Islands**

Arona NGARI	Principal Delegate
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**Costa Rica**

Juan Carlos FALLAS SOJO	Principal delegate
Jose Alberto ZUNIGA MORA	Delegate

**Côte d'Ivoire**

Kouadio ADJOUMANI	Principal delegate
Daouda KONATE	Alternate
Jean Louis MOULOT	Alternate
Yeboua Koffi Thomas ADAM	Delegate
Saramatou BAHIRE	Delegate
Diakaria KONE	Delegate
Bernard KOUAKOU DJE	Delegate
Karim SILUE	Delegate

**Croatia**

Branka IVANCAN-PICEK	Principal delegate
Gordana BUSELIC	Delegate
Kreso PANDZIC	Delegate
Ines SPREM SCIGLIANO	Delegate
Vlasta TUTIS	Delegate

**Cuba**

Celso PASOS ALBERDI	Principal delegate
Hernandez LUNA	Delegate

**Curaçao and Sint Maarten**

Zita LEITO JESUS	Principal delegate
Albert Asinto Eleuterio MARTIS	Alternate
Emmilou A.J. CAPRILES	Delegate
Joseph ISAAC	Delegate

**Cyprus**

Kleanthis NICOLAIDES	Principal delegate
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**Czech Republic**

Mark RIEDER	Principal delegate
Libor CERNIKOVSKY	Alternate
Jan KARA	Alternate
Jan DANHELKA	Delegate
Jaroslav KINKOR	Delegate
Petr MARTINEK	Delegate
Radim TOLASZ	Delegate
Karel VANCURA	Delegate

**Democratic People's Republic of Korea**

Tae Song HAN	Principal delegate
Myong Hak JONG	Delegate
Kwang Hyok PANG	Delegate

**Denmark**

Marianne THYRRING	Principal delegate
Tania Engbo DYCK-MADSEN	Alternate
Ellen Vaarby LAURSEN	Alternate
Gitte HUNDAHL	Delegate
Kim SARUP	Delegate

**Djibouti**

Mohamed ISMAEL NOUR	Principal delegate
Mouhoumed BOUH GUIRREH	Delegate

**Dominican Republic**

Francisco CARABALLO	Principal delegate
Rawell Salomon TAVERAS ARBAJE	Delegate

**Ecuador**

Emilio IZQUIERDO MINO	Principal delegate
Marcela RIVADENEIRA VALLEJO	Alternate
Alejandro DAVALOS DAVALOS	Delegate

**Egypt**

Ibrahim ATTA	Alternate
Ibtissam HASSAN	Delegate
Mohamed TAWFIK	Delegate

**El Salvador**

Joaquin Alexander Maza MARTELLI	Principal delegate
Gustavo ARGUETA	Delegate

**Estonia**

Taimar ALA	Principal delegate
Andre PUNG	Delegate
Kai ROSIN	Delegate
Kristina UIBOPUU	Delegate

**Ethiopia**

Fetene Teshome TOLA	Principal delegate
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**Fiji**

Misaeli FUNAKI	Principal delegate
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**Finland**

Juhani DAMSKI	Principal delegate
Terhi HAKALA	Delegate
Maria HURTOLA	Delegate
Jussi KAUROLA	Delegate

Johanna KORHONEN	Delegate
Jaakko NUOTTOKARI	Delegate
Harri PIETARILA	Delegate
Jouni PULLIAINEN	Delegate
Vesa PUOSKARI	Delegate
Tarja RIIHISAARI	Delegate
Joanna SAARINEN	Delegate
<b>France</b>	
Jean-Marc LACAVE	Alternate
Matthieu CHEVALLIER	Delegate
Laurence FRACHON	Delegate
Francois GAVE	Delegate
Joel HOFFMAN	Delegate
Marie Pierre MEGANCK	Delegate
<b>French Polynesia</b>	
Patrice COSTON	Principal delegate
<b>Gambia</b>	
James Furmus Peter GOMEZ	Principal delegate
Lamin Mai TOURAY	Alternate
Bamba BANJA	Delegate
<b>Georgia</b>	
Ramaz CHITANAVA	Principal delegate
<b>Germany</b>	
Gerhard ADRIAN	Principal delegate
Michael FREIHERR VON UNGERN-STERNBERG	Alternate
Hans-Peter JUGEL	Alternate
Axel THOMALLA	Alternate
Thorsten BUESSELBERG	Delegate
Karolin EICHLER	Delegate
Barbara FRUH	Delegate
Tobias FUCHS	Delegate
Nicole HAEDICKE	Delegate
Tilman HOLFELDER	Delegate
Charlotte HOPPE	Delegate
Sarah JONES	Delegate
Julia KELLER	Delegate
Harald KOETHE	Delegate
Dagmar KUBISTIN	Delegate
Matthieu MASBOU	Delegate
Michael ROHN	Delegate
Claudia RUBART	Delegate
Klaus-Juergen SCHREIBER	Delegate
Philipp VON CARNAP	Delegate
Henning WEBER	Delegate
<b>Ghana</b>	
Ursula OWUSU-EKUFUL	Principal delegate
Eric ASUMAN	Delegate
Austin HESSE	Delegate
Emmanuel MAMARA KOLUGU	Delegate
Stephen NYARKOTEY QUAO	Delegate
Michael TANU	Delegate

**Greece**

EMMANOUIL ANADRANISTAKIS	Principal delegate
Konstantina MITA	Alternate
Anna KORKA	Delegate
Vassilios SITARAS	Delegate

**Guatemala**

Carla Maria RODRIGUEZ MANCIA	Principal delegate
Alicia Maria MARROQUIN MOGOLLON	Delegate

**Guinea**

Mamadou Lamine BAH	Principal delegate
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**Guyana**

Garvin CUMMINGS	Principal delegate
Bibi Sheliza ALLY	Delegate
John Ronald Deep FORD	Delegate

**Haiti**

Margareth DESMANGLES	Alternate
Max Gedeon BOUTIN	Delegate

**Honduras**

Carlos ROJAS SANTOS	Principal delegate
Giampaolo RIZZO ALVARADO	Alternate
Roberta ORDONEZ SOLANO	Delegate

**Hong Kong, China**

Chi Ming SHUN	Principal delegate
Lap-shun LEE	Alternate

**Hungary**

Kornélia RADICS	Principal delegate
Eszter LÁBÓ	Alternate
András CSÍK	Delegate
Attila SÜTÖ	Delegate
András SZÖRÉNYI	Delegate

**Iceland**

Arni SNORRASON	Principal Delegate
Jorunn HARDARDOTTIR	Delegate

**India**

Rajiv Kumar CHANDER	Principal delegate
Puneet AGRAWAL	Delegate
Basir AHMED	Delegate
Ram Kumar GIRI	Delegate
Gopal IYENGAR	Delegate
Mrutyunjay MOHAPATRA	Delegate
Madhavan Nair RAJEEVAN	Delegate
Kanduri Jayaram RAMESH	Delegate
A. Sudhakara REDDY	Delegate

**Indonesia**

Dwikorita KARNAWATI	Principal delegate
Hasan KLEIB	Alternate
Andi Eka SAKYA	Alternate
A. ADITYAWARMAN	Delegate
Muhammad Ryan FATHONI	Delegate
Anni Arumsari FITRIANY	Delegate
Christian PUTRA	Delegate

A. Fachri RADJAB	Delegate
Bagus Rachmat RIEVAN	Delegate
Awidya SANTIKAJAYA	Delegate
Ardhasena SOPAHEL UWAKAN	Delegate
Evi Rumondang SURYATI SINAGA	Delegate
Edward TRIHADI	Delegate
Lynda K. WARDHANI	Delegate
Anton Sadewa WICAKSANA	Delegate
<b>Iran, Islamic Republic of</b>	
Sahar TAJBAKHSI MOSALMAN	Principal delegate
Farah MOHAMMADI	Alternate
Javad AMIN-MANSOUR	Delegate
Esmail BAGHAEI HAMANEH	Delegate
Ehsan FAZLI	Delegate
Ladan JAFARI TEHRANI	Delegate
<b>Iraq</b>	
Abbas K.O. ABBAS	Principal delegate
Mohanad Saber Mahmo AL-ANI	Delegate
<b>Ireland</b>	
Eoin MORAN	Principal delegate
Fleming GERALD	Delegate
Shay GREENE	Delegate
Oliver NICHOLSON	Delegate
Sarah O'REILLY	Delegate
Josephine PRENDERGAST	Delegate
Amy SHIELS	Delegate
<b>Israel</b>	
Aviva RAZ SHECHTER	Principal delegate
Nir STAV	Alternate
Judith GALILEE METZER	Delegate
Daniela ROICHMAN	Delegate
<b>Italy</b>	
Silvio CAU	Alternate
Angela Chiara CORINA	Alternate
Umberto DOSSELLI	Alternate
Adriano RASPANTI	Alternate
Paolo CAPIZZI	Delegate
Teodoro GEORGIADIS	Delegate
Andrea MERLONE	Delegate
Antonio NAVARRA	Delegate
Silvano PECORA	Delegate
Nadia PINARDI	Delegate
Vito VITALE	Delegate
<b>Jamaica</b>	
Evan THOMPSON	Principal delegate
<b>Japan</b>	
Yasuo SEKITA	Principal delegate
Naoyuki HASEGAWA	Alternate
Hiroya ENDO	Delegate
Jitsuko HASEGAWA	Delegate
Orie HIRANO	Delegate
Yasutaka HOKASE	Delegate
Fumihiko KANEKO	Delegate
Mamoru MIYAMOTO	Delegate

Satoshi OGAWA	Delegate
Kenji OSHIO	Delegate
Yoshihiko TAHARA	Delegate
Miho TANAKA	Delegate
<b>Jordan</b>	
Hussein EL-MOMANI	Principal delegate
Raed RAFID	Alternate
Hatem AL-HALABI	Delegate
Mohammad EREKAT	Delegate
<b>Kazakhstan</b>	
Marat KYNATOV	Principal delegate
Azamat KAIYR	Delegate
Baurzhan RAPIKOV	Delegate
Marina SHMIDT	Delegate
Ayaulym TOREBEKOVA	Delegate
<b>Kenya</b>	
Stella Odero AURA	Principal delegate
Cleopa MAILU	Alternate
Nicholas MAINGI	Delegate
<b>Kuwait</b>	
Khaled ALSHUAIBI	Principal delegate
<b>Kyrgyzstan</b>	
Dilde SARBAGYSHEVA	Principal delegate
Daniyar MUKASHEV	Alternate
<b>Lao People's Democratic Republic</b>	
Kham-Inh KHITCHADETH	Principal delegate
Bounphady INSISIENGMAY	Alternate
Sitsangkhom SISAKETH	Alternate
<b>Latvia</b>	
Janis KARKLINS	Principal delegate
Katrina KOSA-AMMARI	Delegate
<b>Lebanon</b>	
Salim BADDOURA	Principal delegate
Hani CHAAR	Delegate
Rana EL KHOURY	Delegate
Tanit EL KHOURY	Delegate
<b>Lesotho</b>	
Tsukutlane AU	Principal delegate
Refiloe LITJOBO	Alternate
Khomoatsana TAU	Alternate
Nthabiseng M. LELISA	Delegate
Mabafokeng MAHAHABISA	Delegate
Malefetsane MOSALA	Delegate
<b>Lithuania</b>	
Saulius BALYS	Principal delegate
<b>Luxembourg</b>	
Andrew FERRONE	Principal delegate
Martina RECKWERTH	Delegate



**Macao, China**

Iu Man TANG	Principal delegate
Weng Kun LEONG	Alternate
Sau Wa CHANG	Delegate
Ieng Wai LAO	Delegate
Song Mei LO	Delegate

**Madagascar**

Claudia Nambinina RAKOTONDRAHANTA	Principal delegate
Emi-Haulain KOLA	Alternate

**Malawi**

Jolamu NKHOKWE	Principal delegate
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**Malaysia**

Jailan SIMON	Principal delegate
Syed Edwan ANWAR	Delegate
Priscilla Ann YAP	Delegate

**Maldives**

Hala HAMEED	Principal delegate
Hawla Ahmed DIDI	Alternate

**Mali**

Mamadou Henri KONATE	Principal delegate
Djibrilla A MAIGA	Alternate
NAKO Ma TRAORE	Delegate

**Mauritania**

Mohamed Batta Cheikh EL MAMY	Principal delegate
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**Mauritius**

Fee Young LI PIN YUEN	Principal delegate
Premchand GOOLAUP	Alternate

**Mexico**

Socorro FLORES	Principal delegate
Juan R. HEREDIA ACOSTA	Alternate
Alejandro ALBA FERNANDEZ	Delegate
Paulina CEBALLOS ZAPATA	Delegate
Magali ESQUINA GUZMAN	Delegate
Erika MARTINEZ LIEVANO	Delegate
Raul VARGAS JUAREZ	Delegate

**Monaco**

Carole LANTERI	Principal delegate
Johannes DE MILLO TERRAZZANI	Alternate

**Mongolia**

Sevjid ENKHTUVSHIN	Alternate
Nyamjav ACHGEREL	Delegate
Ganjuur SARANTUYA	Delegate

**Montenegro**

Luka MITROVIC	Principal delegate
Milorad SCEPANOVIC	Alternate
Ivana ADZIC	Delegate
Maja JOVOVIC SCHMIDT	Delegate
Biljana KILIBARDA	Delegate

**Morocco**

Omar ZNIBER	Principal delegate
Abderrahim AIT SLIMANE	Alternate
Omar CHAFKI	Alternate
Fatima Zahra BENSAID	Delegate

**Mozambique**

Aderito Celso Felix ARAMUGE	Principal delegate
Amadeu Paulo Samuel DA CONCEICAO	Alternate
Jaime Valente CHISSANO	Delegate
Anacleto DUVANE	Delegate
Agostinho Chuquelane Faduco VILANCULOS	Delegate

**Myanmar**

Kyaw Moe TUN	Principal delegate
Aung Myo MYINT	Alternate
Hla Myat OO	Alternate

**Namibia**

Pendapala Andreas NAANDA	Principal delegate
Franz UIRAB	Alternate
Olga Mathilde KARUNGA	Delegate
Benjamin Kauna SHINGENGE	Delegate

**Nauru**

Roy HARRIS	Principal delegate
Celso DAGEAGO	Delegate
Jefferson WAIDABU	Delegate

**Nepal**

Mani Prasad BHATTARAI	Principal delegate
Ram Gopal KHARBUJA	Alternate
Bhuwan PAUDEL	Delegate
Tirtha Raj WAGLE	Delegate

**Netherlands**

Gerard VAN DER STEENHOVEN	Principal delegate
Hans ROOZEKRANS	Alternate
Rubert KONIJN	Delegate
Jan SONDIJ	Delegate
Jitze VAN DER MEULEN	Delegate
Gé VERVER	Delegate

**New Caledonia**

Catherine BORRETTI	Principal delegate
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**New Zealand**

Peter LENNOX	Principal delegate
Norm HENRY	Alternate
James LUNNY	Alternate
John FENWICK	Delegate

**Nigeria**

Sani Abubakar MASHI	Principal delegate
Ahmed ABDU	Delegate
Jolaade ADELEYE	Delegate
Florence AKINYEMI	Delegate
Adamu ALIERO	Delegate
Mohammed AYUBA	Delegate
Omolola DURODOLA	Delegate
Aishatu IBRAHIM	Delegate

Fatima MOHAMMED	Delegate
Clement NZE	Delegate
John OKOBIA	Delegate
Juddy Ngozichukwuka OKPARA	Delegate
Ibrahim Shehu TURAKI	Delegate
Abdulrasheed Darazo ZAKARIYA	Delegate
<b>North Macedonia</b>	
Ivica TODOROVSKI	Principal delegate
Nina ALEKSOVSKA	Delegate
Burim BILALI	Delegate
<b>Norway</b>	
Roar SKALIN	Principal delegate
Bard FJUKSTAD	Delegate
Oystein HOV	Delegate
Morten JOHNSRUD	Delegate
Vibeke KRISTENSEN	Delegate
Anne-Cecilie RIISER	Delegate
Astrid Thesen TVETERAAS	Delegate
<b>Oman</b>	
Juma AL-MASKARI	Principal delegate
Musallam AL MAASHANI	Delegate
Humaid AL-BADI	Delegate
Said AL-HARTHY	Delegate
Ahmed AL-HARTHI	Observer
<b>Pakistan</b>	
Tahir Hussain ANDRABI	Principal delegate
Farhat AYESHA	Delegate
Hussain MUHAMMAD	Delegate
<b>Panama</b>	
Aída María CLEMENT GUINARD	Principal delegate
Rolando Luis PINZON FUENTES	Delegate
<b>Paraguay</b>	
Raul RODAS FRANCO	Principal delegate
Walter CHAMORRO	Delegate
<b>Peru</b>	
Ken TAKAHASHI	Principal delegate
César ARÉSTEGUI BRAVO	Delegate
Carlos GARCÍA CASTILLO	Delegate
<b>Philippines</b>	
Vicente MALANO	Principal delegate
Evan P. GARCÍA	Alternate
Arnel TALISAYON	Delegate
<b>Poland</b>	
Tomasz WALCZYKIEWICZ	Principal delegate
Janusz FILIPIAK	Alternate
Rafal LEWANDOWSKI	Delegate
Lukasz POCHYLSKI	Delegate
<b>Portugal</b>	
Rui MACIEIRA	Principal delegate
Jorge Miguel MIRANDA	Alternate
Ana BARATA	Delegate

Ricardo DEUS	Delegate
Vânia LOPES	Delegate
Inês MARTINS	Delegate
Nuno MOREIRA	Delegate

**Qatar**

Abdulla Mohammed AL MANNAI	Principal delegate
Khalid AL JAHWARI	Delegate
Haya Fadel AL NAIMI	Delegate
Fatima AL-YAFEI	Delegate
Tamader ALBOININ	Delegate
Fahad HAJI	Delegate

**Republic of Korea**

Jongseok KIM	Principal delegate
Heungjin CHOI	Alternate
Doshick SHIN	Alternate
Dongeon CHANG	Delegate
Hyoseob CHO	Delegate
Yeunsook CHOI	Delegate
Seongan KANG	Delegate
Byoungcheol KIM	Delegate
Hwirin KIM	Delegate
Sung KIM	Delegate
Younghee KIM	Delegate
Hojoon LEE	Delegate
Yongseob LEE	Delegate
Jieun SEO	Delegate

**Republic of Moldova**

Oxana DOMENTI	Principal delegate
Iulian GRIGORITA	Alternate

**Romania**

Eugen Constantin URICEC	Principal delegate
Elena MATEESCU	Alternate
Elena DUMITRU	Delegate
Iuliana-Mona MUNTEANU	Delegate
Marisanda PIRIIANU	Delegate
Adrian Cosmin VIERITA	Delegate

**Russian Federation**

Maxim YAKOVENKO	Principal delegate
Natalia RADKOVA	Alternate
Sergey BORSCH	Delegate
Tatiana DMITRIEVA	Delegate
Alexander GUSEV	Delegate
Vladimir KATTSOV	Delegate
Dmitry KIKTEV	Delegate
Tatiana LABENETS	Delegate
Alexander MAKAROV	Delegate
Maria MAMAEVA	Delegate
Artemiy NIKITOV	Delegate
Ivan NOVIKOV	Delegate
Marina PETROVA	Delegate
Denis POPOV	Delegate
Alexander POSTNOV	Delegate
Yury SPIRIN	Delegate
Anna TIMOFEEVA	Delegate
Sergei VASILIEV	Delegate
Marina VELIKANOVA	Delegate

Roman VILFAND	Delegate
Sergei ZHURAVLEV	Delegate
<b>Saint Lucia</b>	
David FARRELL	Principal delegate
<b>Saudi Arabia</b>	
Ayman Salem GHULAM	Principal delegate
Samirah Mansour M ALASIRI	Delegate
Mohamed ALBAKRI	Delegate
Maha ZEDAN	Delegate
<b>Senegal</b>	
Magueye Marame NDAO	Principal delegate
Cherif DIOP	Delegate
Mariane Diop KANE	Delegate
<b>Serbia</b>	
Jugoslav NIKOLIC	Principal delegate
Milica ARSIC	Delegate
Milos DURDEVIC	Delegate
Danko JOVANOVIC	Delegate
Goran PEJANOVIC	Delegate
Slavimir STEVANOVIC	Delegate
Dejan ZLATANOVIC	Delegate
<b>Seychelles</b>	
Vincent AMELIE	Principal delegate
<b>Sierra Leone</b>	
Julian CLARKE	Delegate
Fatu Maria Wurie CONTEH	Delegate
<b>Singapore</b>	
Chin Ling WONG	Principal delegate
Wei Ming, Eugene CHONG	Delegate
Lesley CHOO	Delegate
Sok Huang TAN	Delegate
<b>Slovakia</b>	
Martin BENKO	Principal delegate
Juraj PODHORSKY	Alternate
Branislav CHVÍLA	Delegate
Anton FRIC	Delegate
Jana POOROVA	Delegate
<b>Slovenia</b>	
Klemen BERGANT	Principal delegate
Mira KOBOLD	Delegate
<b>Solomon Islands</b>	
Alick HARUHIRU	Principal delegate
<b>South Africa</b>	
Nozipho MXAKATO-DISEKO	Principal delegate
Mnikeli NDABAMBI	Alternate
Mphepya JONAS	Delegate
Zoleka MANONA	Delegate
Ezekiel SEBEGO	Delegate
Deon TERBLANCHE	Delegate

**Spain**

Miguel Angel LOPEZ GONZALEZ	Principal delegate
Carmen RUS JIMENEZ	Alternate
Antonio CONESA MARGELI	Delegate
Jose Antonio FERNANDEZ MONISTROL	Delegate
Julio GONZALEZ BRENA	Delegate
Jose Pablo ORTIZ DE GALISTEO MARIN	Delegate
Francisco PASCUAL PEREZ	Delegate
Fernando PASTOR ARGUELLO	Delegate
Ricardo SQUELLA DE LA TORRE	Delegate
Jorge TAMAYO CARMONA	Delegate

**Sri Lanka**

Athula Kumara KARUNANAYAKE	Delegate
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**Sudan**

Osman ABUFATIMA	Principal delegate
Sahar MOHAMMED	Delegate

**Sweden**

Rolf BRENNERFELT	Principal delegate
Ilmar KARRO	Alternate
Cristina ALIONTE EKLUND	Delegate

**Switzerland**

Peter BINDER	Principal delegate
Christof APPENZELLER	Delegate
Bertrand CALPINI	Delegate
Moritz FLUBACHER	Delegate
Estelle GRUETER	Delegate
Manuel KELLER	Delegate
Joerg KLAUSEN	Delegate
Heike KUNZ	Delegate
Nicolas LANZA	Delegate
Jose ROMERO	Delegate
Susanne ROSENKRANZ	Delegate
Patrick SIEBER	Delegate
Karine SIEGWART	Delegate
Andreas STEINER	Delegate

**Tajikistan**

Jamshed KHAMIDOV	Principal delegate
Mahmud JUMAZODA	Delegate

**Thailand**

Phuwieng PRAKHAMMINTARA	Principal delegate
Sanya SAENGPUMPONG	Delegate

**Timor-Leste**

Jose AGUSTINHO DA SILVA	Principal delegate
Francisco FERNANDES	Alternate
Terencio T.T. FERNANDES MONIZ	Alternate
Aurélio BARROS	Delegate
Lauriano CONCEICAO CEPEDA	Delegate
Sebastiao DA SILVA	Delegate
Flaviana FERNANDES PINTO	Delegate
Madalena GOMES DA SILVA	Delegate

**Tonga**

Ofa FA'ANUNU'	Principal delegate
Taniela KULA	Delegate

**Trinidad and Tobago**

Ezekiel SAMPSON Principal delegate

**Tunisia**

Hedi AGREBI JAOUADI Principal delegate  
 Mohamed HAJJEJ Alternate  
 Farhat AOUNALLAH Delegate  
 Fadhel GRAMI Delegate  
 Ahmed HMAM Delegate  
 Abderrahman OUASLI Delegate

**Turkey**

Volkan Mutlu COSKUN Principal delegate  
 Murat ALTINYOLLAR Alternate  
 Ercan BUYUKBAS Alternate  
 Sadik ARSLAN Delegate  
 Ozan CAKIR Delegate  
 Gozde OZTURK Delegate  
 Beliz Celasin RENDE Delegate  
 Veysel YILDIZ Delegate

**Turkmenistan**

Atageldi HALJANOV Principal delegate  
 Ahmetyar KULOV Alternate

**Uganda**

Festus LUBOYERA Principal delegate  
 David BAGOROGOZA Delegate  
 Christopher A. ONYANGA Delegate

**Ukraine**

Mykola KULBIDA Principal delegate  
 Denys BORDIAN Delegate  
 Oleg SKOROPAD Delegate

**United Arab Emirates**

Abdullah A. AL MANDOOS Principal delegate  
 Mohamed A. AL EBRI Alternate  
 Yousef N. AL KALBANI Alternate  
 Khaled Ali AL HEFEITI Delegate  
 Suood AL MAZROUEI Delegate  
 Omar A. AL YAZEEDI Delegate  
 Jaser RABADI Delegate  
 Mohamed SHAMSAN Delegate

**United Kingdom of Great Britain and Northern Ireland**

Penny ENDERSBY Principal delegate  
 Phil EVANS Alternate  
 Stephen BELCHER Delegate  
 Helen BYE Delegate  
 Stephanie DAVIES Delegate  
 Harry DIXON Delegate  
 Simon GILBERT Delegate  
 Chris HEWITT Delegate  
 Gavin ILEY Delegate  
 Alan JENKINS Delegate  
 Will LANG Delegate  
 Karen MCCOURT Delegate  
 Simon MCLELLAN Delegate  
 Cathy MOORE Delegate

Mandy MOORE	Delegate
Nyree PINDER	Delegate
Aileen SEMPLE	Delegate
Jeremy TANDY	Delegate
Jane WARDLE	Delegate

**United Republic of Tanzania**

Atashasta Justus NDITIYE	Principal delegate
Agnes KIJAZI	Alternate
Hamza KABELWA	Delegate
Deusdedit B. KAGANDA	Delegate
George LUGOMELA	Delegate
Neema MANONGI	Delegate
Wilbert MURUKE	Delegate
Monica MUTONI	Delegate
Mohamed NGWALI	Delegate
Emmanuel NTENGA	Delegate
Faiswary Hamza RWEYEMAMU	Delegate

**United States of America**

Louis UCCELLINI	Principal delegate
Mark CASSAYRE	Alternate
Courtney Jeanne DRAGGON	Alternate
Neil Andrew JACOBS	Alternate
Monique BASKIN	Delegate
Fredrick BRANSKI	Delegate
Antonio BUSALACCHI	Delegate
Caroline CORVINGTON	Delegate
Thomas CUFF	Delegate
Jaquelina DALUZ	Delegate
Thomas GRAZIANO	Delegate
Elliott JACKS	Delegate
Hollie MANCE	Delegate
Curtis MARSHALL	Delegate
Ian MCKAY	Delegate
Megan MCPHEE	Delegate
Daniel MULLER	Delegate
Alessandro NARDI	Delegate
Mark PAESE	Delegate
Elizabeth PAGE	Delegate
James PERONTO	Delegate
Kevin PETTY	Delegate
Aaron SALZBERG	Delegate
Kari SHEETS	Delegate
Howard SOLOMON	Delegate
Sezin TOKAR	Delegate

**Uruguay**

Madeleine RENOM	Principal delegate
Silvana ALCOZ	Delegate
Marcelo BARREIRO	Delegate
Natalia GUASCO	Delegate
Valentina SIERRA	Delegate

**Uzbekistan**

Bakhriddin NISHONOV	Principal delegate
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**Vanuatu**

Eslyn GARAEBITI	Principal delegate
Sumbue ANTAS	Alternate



**Viet Nam**

Hong Thai TRAN	Principal delegate
Thai Hung DINH	Delegate
Phuc Lam HOANG	Delegate

**Zambia**

Muyumbwa KAMENDA	Delegate
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**Zimbabwe**

Taonga MUSHAYAVANHU	Principal delegate
Rebecca MANZOU	Alternate
Gilbert MAWERE	Delegate
Diamond NJOWA	Delegate

**3. Representatives of non-WMO Members****Holy See**

Elisabetta CORSI	Observer
Massimo DE GREGORI	Observer
Andrea MASULLO	Observer

**4. Invited experts**

Laura TUCK	
Robert A VARLEY	

**5. Representatives of international organizations and other bodies****ACMAD**

Andre KAMGA FOAMOUHOUE	Observer
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**AU**

Georges Remi NAMEKONG	Observer
Olushola OLAYIDE	Observer
Jolly WASAMBO	Observer

**CIIFEN**

Rodney MARTINEZ	Observer
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**CILSS**

Djime ADOUM	Observer
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**CTBTO**

Pierre BOURGOUIN	Observer
Pierrick MIALLE	Observer

**ECMWF**

Andrew BROWN	Observer
Matteo DELL'ACQUA	Observer
Florence RABIER	Observer

**ECOMET**

Willie MCCAIRNS Observer

**EUMETNET**

Eric PETERMANN Observer

Jacqueline SUGIER Observer

Bruce TRUSCOTT Observer

**EUMETSAT**

Paul COUNET Observer

Vincent GABAGLIO Observer

Alain RATIER Observer

Joachim SAALMUELLER Observer

Anne TAUBE Observer

**FAO**

Wirya KHIM Observer

**GCC**

Said Hamed ALSARMI Observer

**GWP**

Frederik PISCHKE Observer

Monika WEBER-FAHR Observer

**HMEI**

Daisuke ABE Observer

Ahmed AL-HARTHI Observer

Matthew ALTO Observer

Sergiy BRAYLYAN Observer

Joshua CAMPBELL Observer

Arnaud COLLET Observer

Brian DAY Observer

Alan DECIANTIS Observer

Bryce FORD Observer

Jeannine HENDRICKS Observer

Kenneth HORHAMMER Observer

Alexander KARPOV Observer

Dmitri KAZUTO Observer

Foeke KUIK Observer

Wing Chi LEE Observer

Alessandra LIBERTO Observer

John MCHENRY Observer

Akihiro NAKAZATO Observer

Samir PALACIOS Observer

Ashish RAVAL Observer

Lothar SCHULTE-SASSE Observer

Maik SCHURMANN Observer

Anais SERRANO Observer

Shoichi TATENO Observer

Robyn THOMAS Observer

Tokiyoshi TOYA Observer

Jean-Yves VAN KEMPEN Observer

Damien VIGNELLES Observer

Andre WEIPERT Observer

Alan WILLIARD Observer

**IABM**

Erica GROW Observer

Tomas MOLINA Observer

Jay TROBEC Observer

**ICAO**

Y. WANG Observer

**IFMS**

Harinder P.S. AHLUWALIA	Observer
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**IFRC**

Tessa KELLY	Observer
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**ITU**

Vadim NOZDRIN	Observer
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**IUGG**

Arthur ASKEW	Observer
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Christophe CUDENNEC	Observer
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Charles FIERZ	Observer
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Roger PULWARTY	Observer
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**UNEP**

Maarten KAPPELLE	Observer
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Jian LIU	Observer
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Ying WANG	Observer
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**UNESCO**

Albert Sok FISCHER	Observer
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Vladimir RYABININ	Observer
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**WFEO**

Yvette RAMOS	Observer
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Denisse SALAS	Observer
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**World Bank**

Naohisa KOIDE	Observer
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Haleh KOOTVAL	Observer
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Daniel KULL	Observer
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David ROGERS	Observer
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Makoto SUWA	Observer
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Vladimir TSIRKUNOV	Observer
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## 6. Presidents of constituent bodies and Chairs of other bodies reporting to Congress

Abdullah Ahmed AL MANDOOS	President of RA II
Manola BRUNET	President of CCI
'Ofa FA'ANUNU	President of RA V
Juan Carlos FALLAS SOJO	President of RA IV
Oystein HOV	President of CAS
Michel JEAN	President of CBS
Daouda KONATE	President of RA I
Ian LISK	President of CAeM
Guillermo NAVARRO	President of RA III
Nadia PINARDI	Co-president of JCOMM
Laxman Singh RATHORE	Acting Chair of IBCS
Michael STAUDINGER	President of RA VI
Roger STONE	President of CAgM

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For more information, please contact:

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