**ANNEX 5**

**DRAFT DECISIONS, RESOLUTIONS AND RECOMMENDATIONS PROPOSED**

**TO BE SUBMITTED TO CG-18 AND EC-71**

**DRAFT RESOLUTIONS**

**Draft Resolution 6.1(2)/XX (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 40 (Cg-17) – WMO polar and high-mountain activities,

(2) Resolution 41 (Cg-17) – Antarctic Observing Network,

(3) Resolution 48 (Cg-17) – Global Integrated Polar Prediction System,

(4) Resolution 49 (Cg-17) – Year of Polar Prediction,

(5) Resolution 43 (Cg-17) – Global Cryosphere Watch,

(6) The WMO Strategic Plan,

(7) 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,

**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) That considerations 1 to 11 of Resolution 40 (Cg-17) with regard to the rationale for WMO polar and high-mountain activities remain valid,

(2) The societal needs in both polar and high-mountain regions related to weather, water and a changing climate, and the risks to society related to water scarcity and disaster resilience in high-mountain regions,

(3) 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,

(4) 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, 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 and Climate Research Programmes 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 Decision 43 (EC-70) and strongly endorses 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 a coordination mechanism 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, hydrology 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;

**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 promote the coordination of weather, climate, hydrology and related environmental activities in polar and high-mountain regions and facilitate execution of this Resolution,

(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 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 and the research board to support WMO polar and high-mountain activities;

**Requests** the Secretary-General

(1) to ensure adequate secretariat support Polar and High Mountain activities, including connecting in a meaningful manner with partners and policy makers (ii) Recognizing the cross-cutting nature of these activities, to develop a WMO Polar and High Mountain Collaborative Framework as a planning tool to ensure implementation;

(2) to bring the present resolution to the attention of all concerned.

Note: This resolution replaces Resolution 40 (Cg-17), which is no longer in force.

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**Annex to draft Resolution 6.1(2)/XX (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:

|  |  |  |
| --- | --- | --- |
| *No.* | *Activity* | *Strategic Goals* |
| 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[[1]](#footnote-1)**

* 1. 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;
  2. Integration of the Antarctic Observing Network (AntON) into Global and Regional Basic Observing Networks (GBON, RBON);
  3. Assess and evaluate community-based observations as a mechanism to support WMO Earth System modelling framework;
  4. Better utilization of satellite data and products over polar and high mountain regions in order to address identified gaps, and advocacy of critical satellite missions. 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 Services1**

1. Addressing the requirements defined in the WMO Strategy for Service Delivery across a range of time scales, applied to Polar and High Mountain regions, and impact-based forecasts;
2. 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;
3. 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);
4. 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**

1. Responding to Resolution 6.1(2)/XXX on the GCW Pre-Operational Phase.

**Activity 4 - High-Mountain Activities (grand challenges)**

1. 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;
2. Develop global mountain earth system forecasting and prediction systems to inform mountain communities of policy options to become resilient and to reduce and manage risk from mountain-based extreme events and climate change, both in the mountain headwaters and downstream;
3. Address socially relevant user-led and rights-holders led questions 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’;
4. 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**

1. 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 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);
2. Improved characterization of societal risks and opportunities in polar and high mountain regions, where WMO can add value;
3. 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 skillful current and future characterization of the earth system including the ocean, atmosphere, cryosphere, hydrosphere and biosphere, improvement. Continue focus on Polar Prediction Project (PPP) (long term goals 2 and 3), plan for its legacy. Advocacy of data assembly, availability and dissemination will be critical;
4. 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;
5. Ensure meaningful engagement with early career scientists (e.g. APECS).

**Activity 6 - Resources and Partnership**

1. 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:
   * 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), and how WMO will be engaging with these groups,
   * Intergovernmental and research 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), etc.;
   * Private sector: tourism, shipping, fisheries, natural resource extraction;
   * Indigenous communities;
   * Non-Governmental Organizations (NGOs);
2. Seek efficient use of resources, working on synergies, coordination and co-design, towards common goals.

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**Draft Resolution 6.1(2)/XXX (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) Draft Resolution 6.1(1)/1 (Cg-18) – Global Basic Observing Network,

(4) Draft Resolution 6.1(1)/3 (Cg-18) – Amendments to Technical Regulations (WMO-No. 49), Volume I, Part I WMO Integrated Global Observing System,

(5) Draft Resolution 6.1(1)/4 (Cg-18) Amendments to Technical Regulations (WMO-No. 49)- Manual on the WMO Integrated Global Observing System (WMO-No. 1160),

**Having considered** the recommendations 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), 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 significantly 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 decision, in the Global Basic Observing Network (GBON) and the Regional Basic Observing Network (RBON);

**Requests** the Commission on Infrastructure

1. to assure that feedback on the impact of Antarctic observing stations in RBON and GBON 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 consider their observing stations for inclusion into the GCW observing network based on its selection criteria;
4. 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;
5. 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;
6. 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;
7. 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;
8. 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;
9. 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;
10. To incorporate existing research and new installations in Antarctica into GBON and RBON;
11. 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.

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This Resolution replaces Resolution 41 (Cg-17), which is no longer in force.

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**Annex to draft Resolution 6.1(2)/XXX (Cg-18)**

**Antarctic Observing Stations in GBON and RBON**

Suggested Antarctic stations to be considered to be part of RBON.

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| --- | --- | --- | --- | --- |
| ***WIGOS ID[[2]](#footnote-2)*** | ***Station*** | ***Operator*** | ***RBON*** | ***GBON*** |
| 88963 | Esperanza | Argentina | X |  |
| 88968 | Orcadas | Argentina | X |  |
| 88986 | South Thule Island | South Africa |  |  |
| 89002 | Neumayer | Germany | X |  |
| 89003 | Halvfarryggen EP11 | Netherlands |  |  |
| 89004 | S.A.N.A.E. AWS | South Africa | X |  |
| 89009 | Amundsen-Scott | USA | X |  |
| 89011 | Soeerasen | Germany | X |  |
| 89013 | Baldrick AWS | UK | X |  |
| 89014 | Nordenskiold Base | Finland | X |  |
| 89016 | Wasa ep5 | Netherlands |  |  |
| 89020 | Brunt AWS | UK |  |  |
| 89022 | Halley | UK | X |  |
| 89034 | Belgrano II | Argentina | X |  |
| 89049 | AGO-2 | USA |  |  |
| 89050 | Bellingshausen | Russia | X |  |
| 89053 | Jubany | Argentina | X |  |
| 89054 | Dinamet-Uruguay | Uruguay |  |  |
| 89055 | Marambio | Argentina | X |  |
| 89056 | Frei | Chile | X |  |
| 89057 | Arturo Prat | Chile | X |  |
| 89058 | Great Wall | China | X |  |
| 89059 | Bernardo O'Higgins | Chile | X |  |
| 89061 | Palmer Station | USA | X |  |
| 89062 | Rothera | UK | X |  |
| 89063 | Vernadsky | Ukraine | X |  |
| 89064 | Juan Carlos I AWS | Spain | X |  |
| 89065 | Fossil Bluff | UK | X |  |
| 89066 | San Martin | Argentina | X |  |
| 89087 | Thiel Mountains AWS | UK |  |  |
| 89108 | Henry | USA | X |  |
| 89132 | Russkaja | Russia |  |  |
| 89251 | King Sejong | South Korea | X |  |
| 89252 | Comandante Ferraz | Brazil |  |  |
| 89253 | Joinville Island | Brazil |  |  |
| 89257 | Limbert AWS | UK | X |  |
| 89262 | Larsen Ice Shelf | UK | X |  |
| 89266 | Butler Island | UK | X |  |
| 89269 | Bonaparte Point | USA |  |  |
| 89272 | Sky-Blu | UK | X |  |
| 89314 | Theresa | USA | X |  |
| 89324 | Byrd Station | USA | X |  |
| 89327 | Mount Siple | USA |  |  |
| 89329 | Harry | USA | X |  |
| 89332 | Elizabeth | USA | X |  |
| 89345 | Siple Dome | USA | X |  |
| 89376 | Gill | USA | X |  |
| 89377 | Lettau | USA | X |  |
| 89504 | Troll | Norway | X |  |
| 89507 | Kohnen | Netherlands | X |  |
| 89512 | Novolazarevskaja | Russia | X |  |
| 89514 | Maitri | India | X |  |
| 89528 | AGO-3 | USA |  |  |
| 89532 | Syowa | Japan | X |  |
| 89536 | Plateau Station | Netherlands |  |  |
| 89542 | Molodeznaja | Russia | X |  |
| 89558 | Pole of Inaccessibility | Netherlands |  |  |
| 89564 | Mawson | Australia | X |  |
| 89570 | Davis (whoop whoop) | Australia | X |  |
| 89571 | Davis | Australia | X |  |
| 89573 | Zhongshan | China | X |  |
| 89574 | Progress | Russia | X |  |
| 89575 | Druzhnaya-4 | Russia | X |  |
| 89577 | Dome A | Australia | X |  |
| 89578 | Eagle | Australia | X |  |
| 89586 | Mount Brown | Australia |  |  |
| 89592 | Mirnyj | Russia | X |  |
| 89598 | AGO-4 | USA | X |  |
| 89601 | Oazic Bangera | Russia | X |  |
| 89606 | Vostok | Russia | X |  |
| 89610 | Cape Poinsett | Australia |  |  |
| 89611 | Casey | Australia | X |  |
| 89614 | Wilkins Runway West | Australia | X |  |
| 89615 | Wilkins Runway East | Australia | X |  |
| 89625 | Concordia | Italy | X |  |
| 89628 | AGO-1 | USA |  |  |
| 89642 | Dumont D'Urville | France | X |  |
| 89643 | Port Martin | USA |  |  |
| 89646 | Sitry Point | Italy | X |  |
| 89648 | Mid Point | Italy | X |  |
| 89657 | Leningradskaja | Russia |  |  |
| 89659 | Priestley Glacier | Italy | X |  |
| 89661 | Cape Phillips | Italy | X |  |
| 89662 | Mario Zuchelli Station | Italy | X |  |
| 89664 | Mcmurdo | USA | X |  |
| 89666 | Cape Ross | Italy | X |  |
| 89667 | Pegasus North | USA |  |  |
| 89734 | Dome Fuji | USA | X |  |
| 89744 | Relay Station | USA | X |  |
| 89767 | G3 | Australia | X |  |
| 89768 | Minna Bluff | USA | X |  |
| 89769 | Linda | USA | X |  |
| 89799 | Nico | USA | X |  |
| 89776 | Bharati | India | X |  |
| 89807 | Snyder Rocks | Australia | X |  |
| 89809 | Casey Skiway South | Australia | X |  |
| 89811 | Law Dome Summit | Australia | X |  |
| 89815 | Haupt Nunatak | Australia | X |  |
| 89817 | Bunger Hills | Australia | X |  |
| 89828 | Dome C II | USA | X |  |
| 89832 | D-10 | USA | X |  |
| 89834 | D-47 | USA | X |  |
| 89836 | D-85 | USA |  |  |
| 89859 | Jang Bogo | South Korea | X |  |
| 89864 | Manuela | USA | X |  |
| 89865 | Whitlock | USA | X |  |
| 89866 | Marble Point | USA | X |  |
| 89868 | Schwerdtfeger | USA | X |  |
| 89869 | Marilyn | USA | X |  |
| 89872 | Ferrell | USA | X |  |
| 89873 | Elaine | USA | X |  |
| 89879 | Possession Island | USA | X |  |

Suggested sub-Antarctic stations to be considered to be part of RBON.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ***WIGOS ID1*** | ***Station*** | ***Operator*** | ***RBON*** | ***GBON*** |
| 61997 | Crozet | France | X |  |
| 61998 | Kerguelen | France | X |  |
| 68906 | Gough island | South Africa | X |  |
| 68992 | Bouvet island | Norway |  |  |
| 68994 | Marion island | South Africa | X |  |
| 85934 | Punta arenas | Chile | X |  |
| 87925 | Rio Gallegos aero | Argentina | X |  |
| 87934 | Rio Grande b.a. | Argentina | X |  |
| 87938 | Ushuaia aero | Argentina | X |  |
| 88878 | Pebble island | UK | X |  |
| 88883 | Weddell island | UK | X |  |
| 88889 | Mount Pleasant Airport | UK | X |  |
| 88897 | Sea Lion Island | UK | X |  |
| 88900 | Bird Island South Georgia | UK | X |  |
| 88903 | Grytviken South Georgia | UK | X |  |
| 93929 | Enderby Island AWS | New Zealand | X |  |
| 93947 | Campbell Island AWS | New Zealand | X |  |
| 94997 | Heard Island (the spit) | Australia |  |  |
| 94998 | Macquarie Island | Australia | X |  |
| 95997 | Heard Island (atlas cove) | Australia |  |  |

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# GLOBAL CRYOSPHERE WATCH

# DRAFT RESOLUTIONS

## Draft Resolution 6.1(4)/1 (Cg-18)

**PRE-OPERATIONAL PHASE OF THE GLOBAL CRYOSPHERE WATCH (GCW)**

THE WORLD METEOROLOGICAL CONGRESS,

**Recalling**

(1) Resolution 43 (Cg-17) – Global Cryosphere Watch,

(2) Resolution xxx (Cg-18) – WMO Governance Reform,

(3) Resolution xxx (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,

**Noting**

(1) 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).

(2) that GCW is a contributor to the Global Framework for Climate Services (GFCS) and the Global Climate Observing System (GCOS),

**Noting also**:

1. 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 from polar and high-mountain regions 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,
3. that the cryosphere is one of the most under-sampled and least understood component of the Earth system,
5. the need for further development of technical standards and guides for best practices to support Members with their operational cryosphere services;

**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. water resource management, disaster risk reduction), with a special focus on developing countries and 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, and to coordinate with Technical Commissions and the Research Board the integration of GCW elements within the working structure of WMO;

(2) to ensure the representation of partners undertaking cryosphere related activities, including within the framework of the 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 engage their Members regarding their specific cryosphere related service priorities, within the framework of GCW, addressing WMO Strategic objectives;

(2) to collaborate with GCW organizing workshops including capacity development and outreach activities;

**Further requests** Technical Commissions and the Research Board

1. to integrate the GCW components within their structure, 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 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;

Annex: 1

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Note:This resolution replaces Resolution 43 (Cg-XVII), which is no longer in force.

## Annex to draft Resolution 6.1(4)/1 (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:

* 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 space-based observation of the cryosphere.
* 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;
* Establishing the GCW Data Portal as a Data Collection or Production Centre (DCPC) in the WMO Information System (WIS), for facilitating the standardization, access to, and quality management of current and past cryosphere data, information, and products;
* Fostering the development and publication of relevant value-added cryosphere products based on in-situ, space-based, and airborne observations, as well as models;
* Fostering collaboration through partnerships between operational and scientific communities to expand the availability and access to cryosphere data and information;
* Supporting Members in implementing GCW deliverables at national level, including capacity development (monitoring, data, research, prediction, dissemination, etc).
* A special focus will be given to strengthening the links between cryosphere and hydrological services;

The draft GCW Pre-operational phase plan is available in INF 6.1(4)/1

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**Draft Resolution XX (EC-71)**

**EXECUTIVE COUNCIL PANEL OF EXPERTS ON POLAR AND HIGH MOUNTAIN OBSERVATIONS, RESEARCH AND SERVICES**

THE EXECUTIVE COUNCIL,

**Noting**

(1) Resolution XXX on WMO Reform,

(2) Resolution 6.1(2)/XXX (Cg-18) – Key directions of the polar and high-mountain agenda for the next WMO financial period (2020–2023),

(3) Resolution 6.1(4)/1 (Cg-18) - Pre-Operational Phase of the Global Cryosphere Watch (GCW),

(4) The report of the Joint Meeting of the Presidents of Regional Associations and the Presidents of Technical Commissions with the Constituent Bodies Reform Task Force (Geneva, 29-31 January 2019), which favored placing a Cold Regions and Cryosphere Panel under the Executive Council,

**Recalling** Resolution 27 (EC-70) – Terms of Reference of the Executive Council Panel of Experts on Polar and High-mountain Observations, Research and Services,

(2) Resolution 29 (EC-70) – Global Cryosphere Watch Surface Observing Network,

(3) Decision 46 (EC-69) – Development and implementation of the Arctic Polar Regional Climate Centre Network and of Polar Regional Outlook Forums,

(4) Decision 47 (EC-70) – Polar Regional Climate Centres and Regional Climate Outlook Forums,

(5) The report of the Executive Council Panel of Experts on Polar and High-mountain Observations, Research and Services (EC-PHORS) at its ninth session (Geneva, Switzerland, 27-29 March 2019), with proposed terms of reference of the Executive Council Panel of Experts on Polar and High-mountain Observations, Research and Services (EC-PHORS),

(6) *Basic Documents No. 1* (WMO-No. 15),

**Considering**:

(1) That considerations expressed under Resolution 16 (EC-69) remain valid,

(2) That the polar regions, in particular the Arctic, are experiencing an increase in human presence and activities, requiring new or enhanced services linked to weather, climate, water and related environmental matters,

(3) The role of the oceans with regard to changes in the polar regions,

(4) That the Year of Polar Prediction (YOPP) is a good example of an international initiative that is bringing the polar research, services and operations communities together,

**Recognizing**:

(1) That in 2017 WMO received observer status to the Arctic Council, and has for several years been an active invited expert to the Antarctic Treaty and Committee for Environmental Protection,

(2) The recent high-level engagement of WMO with the Arctic Council and its working groups, in particular during the Senior Arctic Officials meetings and meetings of the Arctic Council Working Groups, including the Arctic Contaminants Action Programme, the Arctic Monitoring and Assessment Programme and the Protection of the Arctic Marine Environment,

(3) The contribution of WMO to the Sustained Arctic Observing Networks,

(4) That the Arctic Council at its tenth Ministerial Meeting (Fairbanks, Alaska, United States of America, 11 May 2017) announced the “Agreement on Enhancing International Arctic Scientific Cooperation, the third legally binding agreement negotiated under the auspices of the Arctic Council, which will help increase effectiveness and efficiency in the development of scientific knowledge about the region as well as strengthen scientific cooperation in the Arctic region, and encourage its implementation by all parties following its entry into force” (paragraph 33 of the Fairbanks Declaration 2017),

(5) That EC-PHORS at its last sessions recognized the need to improve the gender balance in the membership of EC-PHORS and the Global Cryosphere Watch (GCW),

(6) The excellent contribution of Finland to WMO in promoting meteorological cooperation as one of the four priority areas during its period as Chair of the Arctic Council, and the hosting by Finland of the Arctic Meteorology Summit on 20 March 2018 at the side of the Senior Arctic Officials meeting,

(7) That the Arctic RCC-Network has commenced its demonstration phase to seek WMO designation and has so far conducted three Pan-Arctic Regional Climate Outlook Forum (PARCOF) sessions and that there has been progress in the development of Third Pole and Antarctic RCC-Networks which will need continued guidance to be fully established,

**Decides** to re-establish the Executive Council Panel of Experts on Polar and High-mountain Observations, Research and Services (EC-PHORS) with the terms of reference given in the annex to the present resolution;

**Invites** Members:

(1) To take into account the importance of the gender-balance policy with regard to nominating experts in EC-PHORS and GCW working structures;

(2) To ensure that YOPP observation and numerical weather prediction data continue to be available for research and model verification purposes for up to 10 years after the YOPP core phase has completed; this period is required to ensure that full value can be obtained from the investment in developing and collecting the data (see EC-70/INF. 9 for detailed information);

**Requests** EC-PHORS:

(1) taking into account the outcome of the High Mountain Summit 2019, to investigate future evolution of its mandate in the view to recommend simplified Terms of Reference of the Panel and possible name change of the Panel, and bring focus on the strategic, partnership facilitator, and advocacy role of the Panel, while advising the Executive Council on other aspects of Polar and High Mountain activities undertaken by the Technical Commissions, the Research Board and other Executive Council Bodies such as the joint Hydrological Working Group of Congress and Executive Council;

(2) to closely liaise with Technical Commissions and other relevant WMO bodies in guiding polar RCCs to attain WMO designation and effectively contribute to the development of climate services, particularly on cryospheric aspects;

**Requests** the Secretary-General:

(1) To formally invite the Arctic Council Arctic Monitoring and Assessment Programme, the International Arctic Science Committee, the Scientific Committee on Antarctic Research, and the Intergovernmental Oceanographic Commission of UNESCO to participate in EC-PHORS as members;

(2) To provide the necessary support to activities and sessions of the Panel, as well as for the GCW working structure and PSTG, and liaise with relevant international organizations, programmes and bodies;

(3) To provide appropriate support to PSTG activities in coordination with GCW Project Office, including by facilitating the engagement of new member agencies;

(4) To engage the Polar Regional Climate Centres, Regional Specialized Meteorological Centres, GCW, PSTG, and groups undertaking operational observation network design to participate in the consolidation phase of YOPP to ensure seamless transition to operations.

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**Note:** The present resolution replaces Resolution 27 (EC-70), which is no longer in force.

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**Annex to Resolution XXX (EC-71)**

**Terms of reference of the Executive Council Panel of Experts on Polar and High-mountain Observations, Research and Services**

The Executive Council Panel of Experts on Polar and High-mountain Observations, Research and Services (EC-PHORS) shall be composed of expert-members identified by the Executive Council and endorsed by the Permanent Representatives of the concerned Members with WMO, including Parties to the Arctic Council (e.g. indigenous interest), the Antarctic Treaty, and participants from other organizations that have active meteorological, hydrological, oceanographic or cryospheric programmes, in particular in the polar and high-mountain regions.

Observers from other groups may be invited to attend meetings of the Panel.

The Panel is authorized to establish subgroups and task teams as and when required, including, in particular, a Management Group, an Antarctic Task Team, a High-mountain Task Team, a Polar Space Task Group, a Services Task Team and a GCW Steering Group.

The Panel shall:

(1) Operate under the general terms of reference of Regional Associations with regard to the WMO activities in Antarctica as spelled out in Annex II of Basic documents No. 1 (WMO-No. 15);

(2) Continue advancing the following initiatives under the WMO polar and high-mountain regions activities: (a) Antarctic observing stations as part of RBON/GBON; (b) the polar Regional Climate Centres and polar Regional Climate Outlook Forums; (c) the Global Cryosphere Watch (GCW) and the relevant HYCOS initiatives; (d) High-mountain region activities; and (e) the Global Integrated Polar Prediction System (GIPPS), including the Polar Prediction Project, and YOPP, as well as relevant research activities under the World Climate , the World Weather Research Programmes (WCRP and WWRP) and the Global Atmosphere Watch (GAW);

(3) Emphasise, compile and maintain information on the socioeconomic benefits and cost–benefit aspects of WMO polar and high-mountain regions activities in particular through outreach activities and by attracting expertise in this field, and engaging and aligning with existing mechanisms, such as the Societal and Economic Research and Applications subcommittee of the Polar Prediction Project, the Research Board and Technical Commissions;

(4) Explore mechanisms to actively engage early career scientists in the delivery of results, including in collaboration with Association of Polar Early Career Scientists (APECS);

(5) Invite presidents of Technical Commissions, the Research Board, and the joint Hydrological Working Group of Congress and Executive Council, to participate in EC-PHORS discussions as appropriate,

(6) re-establish the GCW Steering Group, as a mechanism to steer and monitor the activity during the pre-operational phase of GCW and for coordinating with Technical Commissions and the Research Board the integration of GCW components within the working structure of WMO;

(7) oversee and guide the activity of the Polar Space Task Group, which provides coordination across Space Agencies to facilitate the acquisition and distribution of fundamental satellite datasets, and to contribute to or support the development of specific derived products for cryospheric, polar, and high-mountain scientific research and applications, including by facilitating the development of a revised set of strategic goals for PSTG based on the outcome of World Meteorological Congress Cg-18 and with a clear, renewed operating mandate of the PSTG though Cg-19.

The Panel will undertake:

***For Polar Regions:***

(a) To develop and promote an integrated approach to understanding the global impact of changes in polar regions so that the required services may be provided to users and governments may be advised on aspects of adaptation;

(b) To ensure that operational and research observing networks in polar regions (including RBON/GBON) are integrated within the framework of WIGOS and WIS and are enhanced to include cryosphere-related variables;

(c) To engage in a concerted effort to involve Members, technical commissions and regional associations, as well as relevant research and international organizations and bodies, in improving predictive capability in polar regions on timescales from hours to centuries;

(d) To coordinate WMO interests with other international organizations focused on polar science and observations, and to work collaboratively as appropriate;

(e) Where other initiatives are identified as aligned with the WMO goals, to engage and assess their validity and make recommendations to the Executive Council for further consideration;

(f) To oversee and guide the implementation of GCW pre-operational phase in collaboration with technical commissions, regional associations and relevant WMO and international programmes, organizations, institutions and bodies;

(g) To oversee and guide the Polar Space Task Group, which provides coordination across space agencies to facilitate acquisition and distribution of fundamental satellite datasets, and to contribute to or support development of specific derived products for cryospheric scientific research and applications;

(h) To guide the development of the Global Integrated Polar Prediction System (GIPPS) in collaboration with technical commissions, regional associations and relevant international programmes, organizations and bodies;

(i) To guide the implementation of polar RCCs and RCOFs with a special focus on cryospheric products, and facilitate their operational coordination with other entities like GCW, YOPP, IICWG, PSTG, etc.

(j) To provide WMO participation in the implementation of the Arctic Council Agreement on enhancing international Arctic scientific cooperation;

(k) To facilitate the acquisition, exchange and archiving of observational data from polar regions in compliance with WIGOS requirements related to instruments, data exchange and the WMO Quality Management Framework to underpin the provision of services required for the polar regions;

(l) To provide a forum for discussion of relevant scientific issues and make recommendations on meteorological, hydrological, oceanographic and cryospheric research and operations related to the polar regions;

(m) To provide regular input on issues related to polar meteorology, hydrology, oceanography and the cryosphere to support the activities of relevant groups or bodies, such as the World Climate Programme, which includes the Global Climate Observing System (GCOS), the World Climate Research Programme (WCRP) and the World Climate Services Programme (WCSP); the Global Ocean Observing System (GOOS), the Global Atmosphere Watch (GAW); the World Weather Research Programme (WWRP); the Global Framework for Climate Services (GFCS); and technical commissions, regional associations and programmes;

(n) To ensure close collaboration with and contribute to other international organizations, committees and programmes concerned, such as the Antarctic Treaty Consultative Meeting, the Arctic Council, the Scientific Committee on Antarctic Research, the International Arctic Science Committee, the International Association of Cryospheric Sciences and other relevant associations of the International Union of Geodesy and Geophysics, the Council of Managers of National Antarctic Programmes, the Forum of Arctic Research Operators, the Intergovernmental Oceanographic Commission of the United Nations Educational, Scientific and Cultural Organization (UNESCO), and the International Hydrological Programme of UNESCO.

***For the Antarctic:***

The Panel should cooperate, as appropriate, with other relevant international and regional entities:

(a) To promote the implementation of the resolutions of Congress and the Executive Council in the area from 60ºS to 90ºS;

(b) To coordinate programmes of surface and upper-air meteorological observations in the Antarctic, working with relevant international scientific organizations, and liaise with regional associations in relation to sub-Antarctic observations;

(c) To coordinate the design of the Antarctic component of the Global and Regional Basic Observing Networks (GBON and RBON), comprising surface and upper-air stations, including the GCOS Surface Network, GCOS Upper-air Network, Global Atmosphere Watch and other relevant observing components;

(d) To coordinate standardization of observing, coding, data exchange and data management practices applied to the Antarctic;

(e) To coordinate scientific activities in the Antarctic and Southern Ocean region, in cooperation with other scientific organizations such as SCAR when appropriate;

(f) To propose recommendations to the Parties of the Antarctic Treaty System and Members of the Committee for Environmental Protection of the Antarctic Treaty;

(g) To scope the potential structure and operational arrangements for the Antarctic RCC-Network in close consultation with all the relevant stakeholders, guide its progress towards WMO designation and initiate the setting up of an Antarctic RCOF process.

***For the Arctic (including boreal regions):***

(a) To promote WMO engagement with the Arctic Council and its Working Groups, in particular for providing appropriate observations and Earth system modelling frameworks in the Arctic region, supporting climate resilience and adaptation policies, advancing hydrology and water resources services, and understanding changes in the oceans;

(b) While appropriate functions are covered by the respective regional associations, the Panel may liaise with them in defining components of Arctic observing systems and services;

(c) To guide, in collaboration with the joint Hydrological Working Group of Congress and Executive Council, the further development of the Arctic Hydrological Cycle Observing System project;

(d) To hold a third YOPP Special Observing Period (SOP) for the Arctic in the period February 2020 to March 2020, taking into account lessons learned from first YOPP SOP, to complement the MOSAiC (Multidisciplinary drifting Observatory for the Study of Arctic Climate) project and benefit from the extensive observations during Arctic winter;

(e) To guide the further progress of Arctic RCC-Network towards WMO designation and its sustained operations including PARCOF sessions, and promote effective uptake of their products and services by NMHSs and end-users.

***For the High-Mountain regions:***

(a) To contribute to the work of regional associations, technical commissions and programmes in defining appropriate components of hydrometeorological and cryospheric observing systems and services in high mountain regions,

(b) To develop a strategy on WMO high mountain regions focused activities, including by considering an initiative similar to YOPP for the next financial period to be submitted to the Executive Council for its consideration,

(c) To guide the implementation of the Third Pole RCC-Network in close consultation with RA II, and facilitate its operations to take into account the outcomes of the High Mountain Summit.

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1. 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). [↑](#footnote-ref-1)
2. Note : Only the “Issue Number” 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> [↑](#footnote-ref-2)