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| **World Meteorological Organization** | **Cg-17/Doc. 4.2.2(1)** | |
| **SEVENTEENTH CONGRESS** | Submitted by: | Secretary-General |
| Date: | 1.XII.2014 |
| Geneva, 25 May to 12 June 2015 | Original Language: | English |
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# EXPECTED RESULT 4

## AGENDA ITEM 4: Advancing Scientific Research and Application, as well as Development and Implementation of Technology

## AGENDA ITEM 4.2: WMO Integrated Global Observing System (WIGOS) and WMO Information System (WIS) – Priority

**(Agenda 4.2.2) WMO INTEGRATED GLOBAL OBSERVING SYSTEM (WIGOS)**

# SUMMARY

### DECISIONS/ACTIONS REQUIRED:

(a) Adopt the text in Appendix A;

(b) Adopt draft Resolutions: 4.2.2(1)/1, 4.2.2(1)/2; 4.2.2(1)/3

(c) Financial implication: None.

### CONTENT OF DOCUMENT:

The Table of Contents is available only electronically as a Document Map[[1]](#footnote-2)\*.

# **APPENDIX A:**

# **DRAFT TEXT FOR INCLUSION IN THE GENERAL SUMMARY**

**4 ADVANCING SCIENTIFIC RESEARCH AND APPLICATION, AS WELL AS DEVELOPMENT AND IMPLEMENTATION OF TECHNOLOGY**

## WMO Integrated Global Observing System (WIGOS) and WMO Information System (WIS) – Priority

## **4.2.2(1) WMO INTEGRATED GLOBAL OBSERVING SYSTEM (WIGOS) (Agenda 4.2.2)**

***Implementation of the WMO Integrated Global Observing System***

### 4.2.2(1).1 Congress recalled its decision to implement WIGOS (Resolution 50 (Cg-XVI)) and was pleased to note the successful completion of the most critical activities for the global WIGOS Framework to be implemented by 2015 in accordance with Resolution 10 (EC-64) – WIGOS Framework Implementation Plan (WIP). In this regard, Congress expressed its appreciation of the significant accomplishments since Cg-XVI and thanked all experts involved for their work, effort and time.

4.2.2(1).2 Congress appreciated the successful collective work of the Executive Council, its Inter-commission Coordination Group on the WMO Integrated Global Observing System (ICG-WIGOS), Members, regional associations (RAs), technical commissions (TCs), partner organizations and the Secretary-General for implementing WIGOS.

4.2.2(1).3 Great appreciation was expressed to Members such as Australia, China, Germany, Norway, the United Kingdom of Great Britain and Northern Ireland, the United States of America, and other Members who have contributed to the implementation of WIGOS during the current financial period. In particular, the support from Switzerland for developing and hosting the WIGOS Information Resource (WIR) and the Observing System Capabilities Analysis and Review Tool (OSCAR) was noted with appreciation.

4.2.2(1).4 Congress further appreciated the progress achieved in the Regional WIGOS Implementation Plans (R-WIP). It was noted that all regional associations already adopted their R-WIP taking into account regional and subregional needs, requirements and priorities.

4.2.2(1).5 Congress agreed with the Council that the implementation of the WIGOS Framework had approached such a level of maturity where WIGOS enables the development and deployment of its component systems. With the key initial building blocks of the WIGOS Framework in place by the end of 2015, the prerequisites are available for a Pre-operational Phase of WIGOS from 2016 to 2019.

***WIGOS Regulatory Material and Guidance***

4.2.2(1).6 Congress noted with appreciation the revision of the WMO Technical Regulations done by ICG-WIGOS that reflect the implementation of WIGOS and document the WIGOS concept of operations and contributions of all observing components. Congress urged Members to implement and operate their observing networks and systems in accordance with the *WMO Technical Regulations* (WMO-No. 49), Vol. I, Part I – WIGOS and its *Manual on WIGOS*.

***WIGOS Information Resource (WIR)***

4.2.2(1).7 Congress noted with appreciation the successful development and implementation of the Observing System Capability Analysis and Review Tool (OSCAR). Congress recognized that Members will have to submit WIGOS metadata needed for OSCAR following the regulations specified in the Manual on WIGOS and it urged Members to nominate national focal points responsible for providing the required WIGOS metadata to OSCAR. It further urged Members to contribute to the WIGOS Trust Fund to support further development and subsequent sustainable operation and maintenance of the OSCAR.

4.2.2(1).8 Congress also recognized that the remaining parts of the WIR yet to be fully developed, e.g. the portal and the “Standardization of Observations” Reference Tool (SORT), are critical for WIGOS and will require substantial resources for their development and subsequent operation. It therefore urged Members to consider providing assistance for their development and future operations. Congress requested the Secretary-General to continue with the development of WIR.

4.2.2(1).9 Congress re-emphasized the need to register all observing stations across all WIGOS component observing systems operating to WMO standards within their territories, providing the correct and complete coordinates of their observing stations, and to make their observations available in real-time. Congress also encouraged Members to make station identifiers available to potential non-NMHS contributors to WIGOS observations.

***Pre-operational Phase of WIGOS (2016 - 2019)***

4.2.2(1).10 Congress decided that the development of WIGOS will continue during its Pre-Operational Phase in the Seventeenth Financial Period building upon and adding to those key building blocks of the WIGOS Framework that have already been implemented, while shifting the emphasis from the global level toward implementation activities at the regional and national levels. The goal is to have Members and their partners benefit from a fully operational system from 2020. The WIGOS Pre-Operational Phase should focus on: (i) full integration of all WMO observing systems into the WIGOS framework; (ii) meeting the observational data requirements of the GFCS and other WMO priorities at a global level; (iii) operational deployment of the WIGOS Information Resource, in particular the OSCAR databases; (iv) enhanced regional WIGOS support and coordination, helped by WIGOS Regional Centres; and (v) national WIGOS implementation.

4.2.2(1).11 Congress acknowledged a key integrating role that NMHSs should play at a national level in the WIGOS implementation, strengthening national observing system, building national partnerships and providing leadership on the implementation of GFCS, weather and disaster risk reduction services, aviation services and other WMO key priorities. Congress also affirmed that WIGOS together with WIS are key enablers in delivering benefits and in building capabilities to respond to national priorities and challenges.

4.2.2(1).12 Congress reaffirmed the need to enhance service-driven observing networks and systems through an integrated effort of NMHSs and their partners. Particular attention should be paid to sustainability of observations at the country level, especially in developing and less developed countries. Congress urged Members to follow the Observing System Network Design (OSND) principles specified in the *Manual on WIGOS* when designing and implementing their observing systems.

***Data Framework***

4.2.2(1).13 Congress affirmed that the WIGOS Framework provides a new approach for WMO to define and manage the weather, water and climate observations required to support its programmes. In particular, the Framework promotes and enables the integration of observations from a diversity of observing systems, both NMHS and non-NMHS owned, into a composite set of observations to support a broad range of WMO application areas.

4.2.2(1).14 Recognizing the need for guidance and best practices and procedures on (1) the establishment of partnerships and arrangements with different data providers and (2) the management of WIGOS data, especially from non-traditional sources of observations, Congress requested ICG-WIGOS to submit a draft WIGOS Data Policy Framework to EC-68 (2016) for endorsement.

4.2.2(1).15 Congress requested the Council to continue to provide oversight on the implementation of WIGOS as one of the key priorities of the Organization, to re-establish the Inter-Commission Coordination Group on WIGOS (ICG-WIGOS) and update its Terms of references accordingly.

***WIGOS Data Management***

4.2.2(1).16 Congress recognized that the WIGOS Data Management needs a special focus and attention. It should be considered in the broader WMO context and should, in due course, be adequately reflected in the WMO Technical Regulations (WMO-No. 49), Vol. I, with clearly defined areas of responsibilities of all concerned. Congress requested all relevant technical commissions, under technical leadership of CBS and CIMO to close collaborate and cooperate on it.

***Resources***

4.2.2(1).17 Congress stressed that WIGOS is not optional but is a necessity and it is relevant to all Members. Commitment by Members to WIGOS is essential. Therefore Congress urged Members to fully support implementation of WIGOS in their Region, including providing sufficient resources.

4.2.2(1).18 Congress further agreed that the timely completion of the WIGOS Pre-operational Phase implementation activities in the seventeenth financial period directly depended on the available resources. Congress assigned a high priority to the proposed budget allocations for WIGOS activities. Congress also urged Members to continue to provide resources (seconded experts to the WIGOS Project Office and/or donation to the WIGOS Trust Fund) to help support the implementation of WIGOS.

***Capacity development***

4.2.2(1).19 Congress stressed that the priority must be given to the activities that would assist Members in implementing their WIGOS national plans, with a special focus on the less and least developed countries (LDCs, LLDCs and SIDS) where the needs are the highest.

***WIGOS Partnerships***

4.2.2(1).20 Congress re-emphasized that enhanced collaboration and cooperation among Members were needed to meet the WIGOS requirements. Congress further highlighted the importance of third-party (non-NMHS) observations for Members to provide enhanced services and noted that the WIGOS integration of these data is a critical contribution to WMO, its Members and its application areas.

***Communications and Outreach***

4.2.2(1).21 Congress stressed that Communications and Outreach (C&O) should play key roles during the WPP, both internally and externally. Internally to the WMO community, there is a continuing need for interaction with WMO Members as WIGOS matures and gains visibility; to keep them abreast of WIGOS developments; 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 WIGOS development and to foster the development of partnerships at all levels.

***Centennial observing stations***

4.2.2(1).22 Congress recognized the particular importance of long-term observations, such as from centennial observing stations with good quality time series of meteorological parameters. It recognized the invaluable source of information which can be derived from these stations for climate change monitoring and adaptation. Return periods of climate extremes, for example, can span decades or more, and accordingly require long-term time series for their calculation, analysis and applications. It noted that some of these observing stations are being at risk due to significant changes in the surrounding environment (e.g. artificial structures) or due to enforced closure or relocation as a result of competing societal interests. Congress urged Members to make their utmost efforts to preserve these stations and continue to make observations in the current locations of these stations, with maintaining the observational environment as much as possible and avoiding changes to the locations of the observation stations of all classes.

4.2.2(1).23 Congress noted the request of the WMO Executive Council at its sixty-fifth session to investigate site certification mechanisms, network criteria and monitoring principles and to set-up an appropriate WMO mechanism for the recognition of centennial observing stations based on a minimum set of objective assessment criteria. The recognition mechanism is expected to raise the profile of the centennial observing stations and contribute to Members’ efforts to maintain such stations under the most preferable conditions. In light of the support expressed by CCl at its 16th session and by CBS at its extraordinary session in 2014, and CIMO at its 16th session, Congress adopted Resolution 4.2.2(1)/3 (Cg-17) Recognition of Long-term Observing Stations.

***WIGOS component systems: Global Observing System of WWW***

4.2.2(1).24 Congress noted that while there have been some improvements in recent years, notably in RA III upper air observations, the implementation of stations and the availability of reports from RA I Regional Basic Synoptic and Climatological Networks (RBSN/RBCN) continued to remain low. It reaffirmed, that a concentrated effort on the part of the international community is needed to assist RA I Members in implementation and operation of RBSN/RBCN stations, noting that reduced availability of, especially, upper-air data over Region I has a negative impact on the quality of medium-range forecast products over all Regions, not just over Region I itself.

4.2.2(1).25 Congress, while noting that WMO Polar activities were addressed under items 4.2.2(1) to 4.2.2(5), acknowledged the important contributions that CBS and other technical commissions provided in support of the WMO Polar and High Mountain activities and for the development of the Global Cryosphere Watch, observing component of which became one of the four WIGOS component observing systems.

4.2.2(1).26 Congress recognized with concern that the implementation of marine meteorological and oceanographic observing systems as coordinated by JCOMM has not substantially evolved since the last Congress, and remains far from the initial implementation targets, in particular for some of its component observing networks. It requested Members to contribute to the JCOMM Observations Programme Area Implementation Goals and to sustain the marine meteorological and oceanographic observing system as a top priority. In particular, Congress requested Members to fund and install barometers on all newly deployed drifters.

4.2.2(1).27 Noting the on-going development of the Tropical Pacific Observing System (TPOS) and related observing system network design activities, Congress urged Members to enhance through partnership their contributions in support of the implementation and operations of the tropical moored buoy arrays, in particular in the Tropical Pacific Ocean, where data availability has dropped substantially in the last two years. Of particular interest is the provision of ship time to assist in the deployment and servicing of tropical moored buoys.

4.2.2(1).28 Congress recalled the importance of addressing the issue of ship security and piracy, which is impacting the implementation of the Voluntary Observing Ship Scheme and the deployment of instruments at sea and the importance of preventing vandalism to data buoys, and requested the Secretary General to organize a second WMO-IMO high level meeting in the next two years to safeguard the buoys at sea. Recalling the Resolution 25 (Cg-16), Congress further urged Members to follow the recommendations of the Data Buoy Cooperation Panel (DBCP) Technical Document No. 41, Ocean Data Buoy Vandalism –Incidence, Impact and Responses and appreciated the advances member states have made in data buoy vandalism prevention.

4.2.2(1).29 Congress recognized the successful transition of programmatic responsibility for the AMDAR programme from the WMO AMDAR Panel to the WMO Technical Commissions, CBS and CIMO, and that the AMDAR Panel had ceased all activities in November 2012. In this regard, Congress acknowledged the work of the AMDAR Panel over its fifteen year existence, recognising its achievements in guiding the development and expansion of the AMDAR programme.

4.2.2(1).30 Congress, noting the WMO Aircraft Based Observations Programme Strategy and Implementation Plan developed jointly by CBS and CIMO, requested Regional Associations to collaborate with CBS and CIMO in developing, maintaining and implementing Regional Plans for the enhancement and expansion of aircraft-based observations and AMDAR under the respective Regional WIGOS Implementation Plans of each Regional Association. Congress also urged Members to continue providing contributions to the AMDAR Trust Fund for the support of on-going technical developments and capacity-building activities related to AMDAR.

4.2.2(1).31 Congress noted with appreciation, the work and contribution by the Turkish State Meteorological Service (TSMS) in establishing the WMO Weather Radar Database (WRD) and undertaking to maintain this facility for the benefit of all Members. While acknowledging that the WRD now contained metadata for nearly 1000 operational weather radars of around 80 WMO Members, Congress urged all Members to cooperate in the provision of their radar information through the nomination of focal points, thereby ensuring that the WRD could fulfil its vital role in the provision of metadata in support of WIGOS critical activities, such as the Rolling Review of Requirements, Observing System Capability and Review Tool, meteorological radio frequency protection, and public radar product availability advisement.

4.2.2(1).32 Congress requested Members, in collaboration with partner organizations, and identified agents in the new Implementation Plan for the Evolution of Global Observing Systems (EGOS-IP), to address the 115 actions listed in the Plan in order to address the identified observational gaps with regard to the observational user requirements of WMO Application Areas.

4.2.2(1).33 Congress also requested Members who have not as yet nominated National Focal Points for the monitoring at the national level of actions of the EGOS-IP to do so. It requested CBS to find ways of improving the engagement of Members and Regions in completing the EGOS-IP actions and urged Members, to mobilize resources to drive these activities forward.

4.2.2(1).34 Congress recommended enhanced contributions of Members to continue with the development and research of adjoint-based observation impact assessment tools as a complement to traditional Observing System Experiments (OSEs), to undertake OSEs for the optimization of regional composite networks, and to conduct OSEs and Observing System Simulation Experiments (OSSEs) to address the specific science questions proposed by the CBS.

4.2.2(1).35 In conclusion, Congress agreed that WIGOS, supported by WIS, should continue as one of the seven WMO key priorities for the next financial period. Noting the difficulties in implementing WIGOS in some of the developing and least developed countries, Congress agreed that increased priority be given to supporting the capacity development for WIGOS in these areas. It requested the Executive Council, RAs and TCs involved in the WIGOS implementation to give particular attention to work together in providing assistance and technical support to NMHSs of LDCs, LLDCs and SIDS.

4.2.2(1).36 Congress adopted Resolution 4.2.2(1)/1 (Cg-17) – Pre-operational Phase of WIGOS.

4.2.2(1).37 Congress further adopted Resolution 4.2.2(1)/2 (Cg-17) - Report of the Extraordinary Session (2014) of the Commission for Basic Systems Relevant to WMO Technical Regulations concerning the WMO Global Integrated Observing System.

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**APPENDIX B:**

**DRAFT RESOLUTION**

## **Draft Resolution 4.2.2(1)/1 (Cg-17)**

## Pre-operational Phase of WIGOS

THE WORLD METEOROLOGICAL CONGRESS,

**Noting:**

(1) Articles 2 of the Convention of the World Meteorological Organization,

(2) Resolution 50 (Cg-XVI) – Implementation of the WMO Integrated Global Observing System,

(3) The WMO Strategic Plan 2016 - 2019

**Noting further:**

(1) That with the key initial building blocks of the WIGOS Framework in place by the end of 2015, the prerequisites are available for a Pre-operational Phase of WIGOS from 2016 to 2019,

(2) The importance of WIGOS to the implementation of the Global Framework for Climate Services (GFCS), weather and disaster risk reduction services, aviation services and other WMO key priorities,

(3) ....

**Recognizing:**

(1) That WIGOS is one of key priorities of the Organization empowering Members to effectively and timely provide quality observations and services that meet users’ needs.

(2) That WIGOS together with WIS are key enablers in delivering benefits and in building capabilities to respond to national priorities and challenges,

(3) That WIGOS is not optional but is a necessity and it is relevant to all Members and therefore commitment by Members to WIGOS is essential.

(4) That NMHS should pay a key integrating role at a national level in the WIGOS implementation, strengthening national observing system, building national partnerships and providing leadership on the implementation of GFCS, weather and disaster risk reduction services, aviation services and other WMO key priorities,

(5) That delivering of WIGOS increasingly depends on data policies, robust data management and effective and full integration and sharing of observations from non-WMO sources,

(6) That the timely completion of the WIGOS Pre-operational Phase implementation activities in the seventeenth financial period is directly depended on the available resources,

**Decides that** the implementation of WIGOS will continue during its Pre-operational Phase in the seventeenth financial period and will focus on a full integration of all WMO observing systems, meeting the observation needs and requirements of the GFCS, weather and disaster risk reduction services, aviation services and other WMO key priorities.

**Decides further that:**

(1) A high priority be assigned to the proposed budget allocations for WIGOS activities;

(2) The WIGOS Pre-Operational Phase should focus on:

1. Full integration of all WMO observing systems into the WIGOS framework;
2. Development and implementation of a WIGOS Data Quality Monitoring System for all WIGOS components;
3. Operational deployment of the WIGOS Information Resource, in particular the Observing System Capability Analysis and Review Tool (OSCAR) and the “Standardization of Observations” Reference Tool (SORT) databases;
4. Optimized regional network design;
5. Establishment and functionality of WIGOS Regional Centres, with a special focus on Regions where the need is high;
6. National WIGOS implementation;
7. Development of the Guide to WIGOS and other WIGOS related non-regulatory material, to facilitate the implementation of the WMO *Technical Regulations* (WMO-No. 49), Volume I, Part I - WIGOS, and *Manual on WIGOS* by Members;
8. Enhanced support for coordination and development of governance mechanisms and partnership arrangements at regional and national levels to support the incorporation of observations (WMO and partners) across all WIGOS component systems
9. Update of WIGOS regulatory material;

(2) The priority must be given to the activities that would assist Members in implementing their WIGOS national plans, with a special focus on the less and least developed countries (LDCs, LLDCs and SIDS) where the needs are the highest;

**Requests** the Executive Council**:**

(1) To monitor, guide and support the implementation of WIGOS;

(2) To re-establish an Inter-Commission Coordination Group on WIGOS (ICG-WIGOS);

**Requests** the regional associations:

(1) To continue to implement WIGOS accordance to their updated regional WIGOS implementation plans;

(2) To coordinate WIGOS implementation activities with the implementation of the other WMO key priorities in their operating plans and work programmes;

(3) To provide regional support to Members in accordance with the respective regional WIGOS implementation plan and in a response to their requests (subject to availability of resources/funds);

(4) To continue to promote capacity development, communications and outreach activities to assist Members in the implementation of WIGOS;

**Requests** the technical commissions:

(1) To provide technical guidance and advice to Members and the regional associations on

WIGOS;

(2) To develop technical guidelines and related guidance material, including the Guide to WIGOS, to assist Members in implementing and operating their observing networks and systems in accordance with the WMO *Technical Regulations* (WMO-No. 49);

(3) To develop technical standards to support WIGOS in collaboration with partner organizations and programmes and update WIGOS regulatory material;

(4) To provide the technical lead for WIGOS through the Commission for Basic Systems (CBS)

and the Commission for Instruments and Methods of Observation (CIMO);

**Urges** Members:

(1) To develop their national observing strategy and national WIGOS implementation plan;

(2) To establish a national WIGOS coordination and implementation mechanisms and team, and nominate their national WIGOS focal points;

(3) To implement and operate their observing networks and systems in accordance with the WMO *Technical Regulations* (WMO-No. 49);

(4) To coordinate their WIGOS implementation activities with the implementation of the other WMO key priorities;

(5) To provide experts to participate in the WIGOS-related work of the Region and relevant technical commissions;

(6) To support regional and global WIGOS implementation activities, including providing sufficient resources;

(7) To share relevant experience and cooperate with one another in implementing WIGOS,

including assistance to Members with specific WIGOS implementation needs;

(8) To keep the Secretary-General informed about their WIGOS implementation activities;

**Requests** the Secretary-General:

(1) To provide the necessary assistance and Secretariat support for the implementation of WIGOS, including for the WMO Regional Offices and WIGOS Regional Centres, subject to availability of resources;

(2) To assign high priority to the continued development of the WIGOS Information Resource.

(3) To coordinate and collaborate WIGOS activities with United Nations system organizations

and other relevant international organizations and programmes;

**Invites** the Partners to participate in relevant WIGOS implementation activities during the WIGOS Pre-operational Phase.

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Note: This resolution replaces Resolution 50 (Cg-XVI), which is no longer in force.

## **Draft Resolution 4.2.2(1)/2 (Cg-17)**

**REPORT OF THE EXTRAORDINARY SESSION (2014) OF THE COMMISSION FOR BASIC SYSTEMS RELEVANT TO WMO TECHNICAL REGULATIONS CONCERNING THE WMO GLOBAL INTEGRATED OBSERVING SYSTEM**

THE WORLD METEOROLOGICAL CONGRESS,

**Having considered** the Abridged Final Report with Resolutions and Recommendations of the Extraordinary Session 2014 of the Commission for Basic Systems, WMO-No. 1140,

**Noting**:

1. Recommendation 2.4/1 (CBS-Ext.(2014)) – Revised Manual of the Global Observing System,
2. Recommendation 3.1(1)/2 (CBS-Ext.(2014)) – Enhancement and Expansion of Aircraft-Based Observations,
3. Recommendation 3.1(1)/3 (CBS-Ext.(2014)) – Support of Members to the Implementation Plan of the Marine Meteorological and Oceanographic Observing System in Support of NWP,

**Decides** to take action on each of the above Recommendations as follows:

1. **Recommendation 2.4/1 (CBS-Ext.(2014)) – Revised Manual on the GOS**
   1. Approves this recommendation with the same effect as for Manual on WIGOS,
   2. Requests the Secretary-General to make the amendments, as given in the Annex to this recommendation, to the Manual on the Global Observing System,
   3. Authorize the Secretary-General to make any subsequent purely editorial amendments;
2. **Recommendation 3.1(1)/2 (CBS-Ext.(2014)) – Enhancement and Expansion of Aircraft-Based Observations**
3. Approves this recommendation,
4. Requests the Secretary-General:
5. To invite Regional Associations to consider further development of aircraft-based observations, primarily through wider implementation of the AMDAR programme,
6. To invite Regional Associations to develop, maintain and implement regional plans for the enhancement and expansion of aircraft-based observations and AMDAR,
7. To provide support for the coordination of the development and maintenance of these planning and implementation activities through appropriate promotion to Members and at each regional association session;
8. **Recommendation 3.1(1)/3 (CBS-Ext.(2014)) – Support of Members to the Implementation Plan of the Marine Meteorological and Oceanographic Observing System in Support of NWP**
   1. Approves this recommendation,
   2. Requests the Secretary-General:
9. To invite Members to contribute to the DBCP Implementation Strategy, and commit appropriate resources to the barometer drifter, and the tropical moored buoy arrays,
10. To invite NMHSs to collaborate with partner organizations, and use the opportunity of the DBCP barometer drifter upgrade scheme,
11. To bring this recommendation to the attention of Members.

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## **Draft Resolution 4.2.2(1)/3 (Cg-17)**

**RECOGNITION OF LONG-TERM OBSERVING STATIONS**

THE WORLD METEOROLOGICAL CONGRESS,

**Noting:**

1. The Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report confirms that it is extremely likely that human influence has been the dominant cause of the observed warming since the mid-20th century. The evidence for this has grown, thanks to more and better observations, an improved understanding of the climate system response and climate models. Warming of the climate system is unequivocal, and since 1950 many of the observed changes are unprecedented over decades to millennia.
2. The request of the WMO Executive Council at its sixty-fifth session to the Commission for Climatology (CCl) jointly with the Global Climate Observing System (GCOS) programme and Commission for Instruments and Methods of Observation (CIMO) to investigate site certification mechanisms, network criteria and monitoring principles and to set-up an appropriate WMO mechanism for the recognition of centennial observing stations based on a minimum set of objective assessment criteria,
3. That both CCl during its sixteenth session and CBS during its extraordinary session 2014 expressed support to this initiative; and that CIMO during its sixteenth session adopted Recommendation 7 (8)/1 Recognition of Centennial Observing Stations.

**Recognizing:**

(1) The importance of long-term observations and in particular those from observing stations that provide continuous data for 100 years or more (centennial observing stations), for documenting and analysing long-term variations on multi-decadal to centennial timescale, of the Earth’ climate,

(2) Members interest in protecting well-sited long-term observing stations, including centennial observing stations, with good quality time series of meteorological parameters,

**Considering**:

(1) The need to raise Governments awareness on the purpose and role of the long-term observing stations such as centennial stations,

1. That a formal WMO recognition of these stations is expected to raise the profile of long-term observing stations and specifically centennial observing stations and thus would contribute to Members’ efforts in operating and maintaining such stations under the most preferable conditions,
2. That the recognition mechanism will greatly promote the application of the CIMO Siting Classification for Surface observing Stations on Land,

**Decides** to define and implement a recognition mechanism for long-term observing stations, including centennial observing stations,

**Urges** Members to preserve long-term observing stations and continue to make observations in the current locations of these stations, with maintaining the observational environment as much as possible and avoiding changes to the locations of the observation stations of all classes.

**Requests:**

1. CCl, CBS and CIMO, in close collaboration with GCOS, to submit through ICG-WIGOS a list of designation criteria and a recognition mechanism for long-term observing stations for approval by the Executive Council,
2. The Secretary-General to provide support to this initiative.

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**APPENDIX C:**

**PROGRESS REPORT FOR INFORMATION –**

**NOT TO BE INCLUDED IN THE GENERAL SUMMARY**

### **WMO INTEGRATED GLOBAL OBSERVING SYSTEM (WIGOS)**

### References:

* + - 1. [Sixteenth World meteorological Congress (2011) (WMO-No. 1077)](http://library.wmo.int/opac/index.php?lvl=notice_display&id=6907)
      2. [Executive Council - Sixty-fourth session (2012) (WMO-No. 1092)](http://library.wmo.int/opac/index.php?lvl=notice_display&id=12753)
      3. [Executive Council - Sixty-fifth session (2013) (WMO-No. 1118)](http://library.wmo.int/opac/index.php?lvl=notice_display&id=15859)
      4. [Executive Council - Sixty-sixth session (2014) (WMO-No. 1136)](http://library.wmo.int/opac/index.php?lvl=notice_display&id=16315)
      5. [Final Report from the Second Session of the Inter-Commission Coordination Group on WIGOS (ICG-WIGOS), Geneva, 18-22 March 2013](http://www.wmo.int/pages/prog/www/WIGOS-WIS/reports.html)
      6. [Final Report from the Third Session of the Inter-Commission Coordination Group on WIGOS (ICG-WIGOS), Geneva, 10-14 February 2014](http://www.wmo.int/pages/prog/www/WIGOS-WIS/reports.html)
      7. [Final Report from the Fourth Session of the Inter-Commission Coordination Group on WIGOS (ICG-WIGOS), Geneva, 17-20 February 2015](http://www.wmo.int/pages/prog/www/WIGOS-WIS/reports.html)
      8. [Final Reports from the sessions of ICG-WIGOS TT-WRM and TT-WMD](http://www.wmo.int/pages/prog/www/WIGOS-WIS/reports.html)
      9. [WIGOS Framework Implementation Plan (WIP), version 3.0, adopted by EC-66](http://www.wmo.int/pages/prog/www/wigos/documents.html)
      10. [Abridged Final Report with Resolutions and Recommendations of the Extraordinary Session 2014 of the Commission for Basic Systems (WMO-No. 1140)](http://cbs-ext2014.wmo.int/documents-english)
      11. Cg-17/Doc. 4.2.2(2)
      12. Cg-17/Doc. 4.2.2(3)
      13. Cg-17/Doc. 4.2.3(1)
      14. Cg-17/Doc. 4.2.5(1) (HQ GDMFC)
      15. Cg-17/Doc.10.1

Introduction

**[The text is to be as short and concise as possible, pertinent to decisions required, and with link to web-based reports and source documents.]**

***Implementation of WIGOS***

Following the Resolution 50 (Cg-XVI) (2011) to proceed with the implementation of the WMO Integrated Global Observing System (WIGOS), and in accordance with Resolution 4 (EC-LXIII), the Inter-Commission Coordination Group on the WMO Integrated Observing System (ICG-WIGOS) coordinated and prioritized WIGOS-related activities, provided technical guidance on the further development and implementation of WIGOS and addressed major issues identified by the Executive Council.

**Global Observing System of WWW**

The surface-based observing system includes about 11500 land stations making at least three-hourly and often hourly observations of meteorological parameters, 1000 weather radars, 1300 upper air stations plus about 15 ships making upper air profiles over the ocean, over 3500 automatic observing systems on-board aircrafts, 4000 routinely reporting ships, 1250 drifting buoys, more than 500 moored buoys, and many other types of observing stations (e.g. wind profilers, lightning detection systems, tide-gauges, etc.). Some 4000 of the land stations comprise the Regional Basic Synoptic Networks and over 3000 stations comprise the Regional Basic Climatological Networks both drawn up by the six WMO Regional Associations. A subset of these surface stations are used in the Global Climate Observing System (GCOS) Surface Network (GSN) and a subset of the upper-air stations comprise the GCOS Upper Air Network (GUAN).

1. Performance monitoring[[2]](#footnote-3) indicates an increase in the implementation of the surface-based subsystem of the GOS over the intersessional period. Globally, the percentage of SYNOP, TEMP and CLIMAT reports available at MTN centres in comparison with the number of reports required from the RBSN/RBCN and AntON stations had not significantly changed during the period 2010-2013. Nevertheless, there were still deficiencies in the availability of reports from certain areas, in particular in Region I revolving around 57 per cent for SYNOP, 28 per cent for TEMP and 30 per cent for CLIMAT. Improvements were observed notably in RA III TEMP reporting, from around 50 per cent in the previous years up to 60 per cent in last year.

***Marine meteorological and oceanographic observations***

1. JCOMM Observations Programme Area (OPA) Implementation Goals[[3]](#footnote-4) are aligned with the ocean chapter of the GCOS Implementation Plan for the Global Observing System for Climate, in support of the UNFCCC (GCOS-138 in its 2010 update). Although the baseline system proposed under the Implementation Goals was designed to meet climate requirements, non-climate applications such as NWP, prediction of hurricanes (especially those observations that provide upper ocean thermal profiles, sea surface temperature, and sea level pressure), global and coastal ocean prediction, and marine services in general, will be improved by implementation of the systematic global observations of Essential Climate Variables (ECVs) called for by the GCOS-138 plan.
2. Some of the components observing systems, overseen by JCOMM, were completed and are being sustained (e.g. Argo profiling float programme with 300 units). However, JCOMM is facing the following difficulties regarding the implementation of marine meteorological and oceanographic observing systems:

* Globally, the ocean *in situ* observing system is now 62% implemented, although no substantial progress according to the completion targets has been noticed in the last few years.
* Data availability for the tropical moored buoy arrays has dropped in the last two years due to vandalism on the data buoys, and difficulties to assure maintenance due to the cost of ship time, and piracy. This was particularly the case in the Pacific Ocean where a drastic decrease in the 2013 data return dropped to 40%. In order to address this issued and the need for a broad engagement in the design and implementation of the Tropical Pacific Observing System, the Ocean Observing Panel for Climate (OOPC), is leading, in coordination with the JCOMM OPA, a process to evaluate the broad requirements for sustained observations, and how existing and new technologies can be used in combination to meet these needs. This process will serve as a model for future planning and evaluations of global ocean observations.
* According to impact studies, Sea Level Pressure observations from drifters have been shown to have substantial positive impact in particular for global NWP on a per observation basis. While SLP cannot be observed adequately from space, SLP from drifters complement observations made from other platforms (ships, moored buoys and satellites), is cost effective (about USD 0.11 per observation). Most of the barometers installed in drifting buoys are currently funded by research, and this funding is currently at risk of being substantially reduced. The operational community (i.e. NMHSs) is invited to increase its contribution to the funding of the barometers on drifters.

**Aircraft-based Observations**

1. A significant development was made expanding the aircraft-based observations in support of the WMO Global Observing System. The programmatic responsibility for the AMDAR programme had been successfully transferred from the WMO AMDAR Panel to the CBS and CIMO, with the AMDAR Panel ceasing all activities subsequent to its fifteenth session in November 2012. Under this new structure, which includes responsibility for management and operation of the AMDAR Trust Fund, the CBS OPAG-IOS Expert Team on Aircraft-based Observing Systems (ET-ABO) and the CIMO Expert Team on Aircraft-based Observations (ET-AO) are jointly providing support to the Aircraft-based Observations program (ABOP).
2. In 2013, CBS and CIMO completed the development of the *ABOP Strategy and Implementation Plan to 2025, Including Development and Expansion of AMDAR*, which incorporates a global strategy and detailed plan for addressing the actions relevant to aircraft-based observations of the CBS Implementation Plan for Evolution of Global Observing Systems (EGOS-IP). In line with its strategy to work with the WMO Regional Associations on aircraft-based observations and AMDAR expansion, ET-ABO commenced the development of six ABOP Regional Implementation Plans (A-RIPs), expected to eventually be incorporated into the respective Regional WIGOS Implementation Plans. CBS at the Extraordinary Session in 2014, endorsed the collaborative approach between CBS and WMO Regional Associations CBS in the enhancement and expansion of the aircraft-based observations.
3. The WMO global AMDAR observing system now consists of 11 national and regional programs, around 40 airlines and more than 3500 aircraft which provide more than 600,000 observations per day of high quality wind, temperature and, increasingly, humidity. More than 100 aircraft have been equipped for reporting of water vapour, predominantly in the USA, which has provided the opportunity to demonstrate the significant positive impact of the addition of humidity measurement to the AMDAR platform. At the Fifth WMO Workshop on the Impact of various Observing Systems on NWP (Sedona, 2012), aircraft-based observations were shown to have significant positive impact on all numerical weather prediction systems that assimilated such data. Studies have also shown that these data have by far the largest impact per unit cost when compared with other conventional observing systems.
4. The following are the major activities and achievements in the area of aircraft-based observations:

* Two meetings of the WMO AMDAR Panel and two meetings of technical commission expert teams on aircraft-based observations. A regional technical workshop on AMDAR was held in Mexico City, Mexico (November 2011).
* The recruitment of several new airlines to the program, the commencement of a new national program and the commencement of the new plans for implementation of national programs by several Member countries.
* Commissioning of two papers for the Bulletin of the American Meteorological Society on the impact and benefits of AMDAR and AMDAR water vapour measurement (Quarter 1, 2015).
* Completed a CIMO Instruments and Observing Methods report.
* Revised the aircraft-based observations material, drafting revisions and updates for the relevant manuals and guides (Q4 2014).
* Publication of the AMDAR Onboard Software Functional Requirements Specification (AOSFRS), as CIMO IOM Reports 114 (version 1, July 2013) and 115 (version 1.1, June 2014).
* Publication of WIGOS Technical Report TR 2014-1, Benefits of AMDAR Meteorology and Aviation, February 2014.
* Publication of WIGOS Technical Report TR 2014-2, Requirements for the Implementation and Operation of an AMDAR Programme, March 2014.
* Publication of a report on AMDAR Coverage and Targeting for Future Airline Recruitment, February 2013.
* The Workshop on Aircraft Observing System Data Management was held in Geneva, Switzerland, June 2012.
* Successful completion of the WIGOS Pilot Project on AMDAR.
* Establishment and publication of 8 volumes of the WMO AMDAR Observing System Newsletter.
* Continued maintenance of AMDAR standards within the Airlines Electronic Engineering Committee (AEEC).

**Surface-based Observations**

1. In September 2009, the Commission for Instruments and Methods of Observation (CIMO) Expert Team on Operational Remote Sensing (ET-ORS) undertook a questionnaire of WMO Members in order to determine the global status and future plans for the utilisation of weather radars and also to obtain data towards the establishment of a global database of weather radars operated by WMO Members and their partner organizations. The Turkish State Meteorological Service (TSMS), in consultation with CBS and CIMO took the lead in developing and establishing an online database of world weather radars based on the data gathered in the 2009 questionnaire on weather radars. In 2012, the TMS undertook to maintain the WMO Radar Database (WRD) on behalf of WMO Members in an operational capacity. The WRD has been recognised as a critical tool in the provision of metadata in support of critical WIGOS needs.
2. In collaboration with ICG-WIGOS and IPET-WIFI, CBS coordinated the WIGOS Workshop on Quality Monitoring and Incident Management (Geneva, Switzerland, December, 2014). The workshop developed a proposal for future consideration by CBS for a modernized observational data quality monitoring system for WIGOS land surface systems that would be expected to incorporate improved fault rectification regulations and processes for observing systems.
3. In November 2014, CBS held an expert team meeting drafting revised and new WIGOS regulatory and guidance material with particular emphasis on Automatic Weather Stations (AWS) and remotely-sensed observing systems. This material will be considered by CBS and ICG-WIGOS for inclusion in the WIGOS regulatory material.
4. In April 2013 the UK Met Office hosted a WMO Workshop on the Regional and Global Exchange of Weather Radar Data as an initial response to action G48 of the EGOS-IP calling for wider international exchange of weather radar data. A significant outcome of the workshop was the clear need to develop and implement an international data model and protocols for regional and global data exchange. As a result a Task Team has been formed within CBS to address these issues
5. In 2013, CBS/ET-SBO finalized and activated a questionnaire of WMO Members on their utilization of wind profiler radar (WPR) systems. The report of the outcome of the questionnaire highlighted the progressive adoption of this technology for upper-air observing by Members with 17 respondents operating WPRs while 16 Members intended to introduce WPR networks in the coming years. The report of the WPR survey has been published as WIGOS Technical Report 2014-3.

***Evolution and design of global observing systems***

1. The EGOS-IP, which is responding to the “Vision for the GOS in 2025”[[4]](#footnote-5) and to the needs of WIGOS, has been approved by EC-65 (Geneva, 2013). The document is available in four languages[[5]](#footnote-6). The EGOS-IP is a key document providing Members with clear and focused guidelines and recommended actions in order to stimulate cost-effective evolution of the observing systems to address in an integrated way the requirements of WMO programmes and co-sponsored programmes. It represents a major achievement under the umbrella of WIGOS. The EGOS-IP includes 115 actions. One of the key roles of the CBS will be to promote the undertaking of the EGOS-IP actions by the identified agents, and to monitor progress against these actions. A network of National Focal Points exists for that purpose, but unfortunately, not all Members have nominated focal points.
2. The CBS has initiated the development of observing systems network design (OSND) principles and guidance, and developed a roadmap for such development taking into account ICG-WIGOS guidance. According to the roadmap, OSND principles could be finalized and included in the first version of the Manual on WIGOS. Guidance materials will be developed during the next intersessional period.

***Vision for WIGOS component observing systems in 2040***

1. EC-66 requested CBS to take the lead in developing a Vision for WIGOS in 2040, which will include a “Vision for the WIGOS component observing systems in 2040”, with involvement of the other technical commissions and requested OPAG-IOS to take steps to start develop such a document, with a view toward submission to Cg‑18 in 2019.

***Observing System Experiments (OSEs) and Observing System Simulation Experiments (OSSEs)***

1. Good progress was made regarding impact studies and there is a need to address the specific science questions listed in the Annex to paragraph 3.1.1.27 of the General Summary of CBS-Ext.(2014).
2. Noting the growing visibility of the WMO Impact Workshops, the last of which took place in Sedona 2012, and recalling the guidance from EC-66 that the model for impact assessment employed by these highly successful Workshops be broadened to include additional application areas, the CBS-Ext.(2014) requested its Management Group to initiate preparations for a Sixth WMO Impact Workshop, tentatively to be convened during the first half of 2016
3. CBS-Ext.(2014) recognized the availability of various tools to perform impact studies on a relatively cost-effective basis; it encouraged observing programmes managers/operators to propose specific questions regarding the impacts of observations on NWP through IPET-OSDE.

***Observing System Capability Analysis and Review Tool (OSCAR)***

1. The Observing System Capability Analysis and Review Tool (OSCAR) is used to record observational user requirements in a quantitative way, together with observing systems capabilities. OSCAR is also meant to be the repository of the WIGOS metadata required for international exchange thus replacing in the near future existing Publication WMO-No.9, Volume A, Weather Reporting.
2. The WMO Secretariat has completed through Memorandum of Understanding (MoU) negotiations with MeteoSwiss for the development an operational version of OSCAR, on operating it within the MeteoSwiss IT infrastructure, on developing the surface-based observing systems capability module of OSCAR, and for establishing a long-term partnership for the OSCAR Platform operations and maintenance. It was planned to undertake the necessary developments in two phases:

* Phase 1 (by Cg-17, May 2015) for essentially developing the surface-based observing systems capabilities component of OSCAR for recording WIGOS metadata of basic observing platform types; and allowing a critical review (analysis) to identify the gaps;
* Phase 2 (by 2017) for (i) adapting the existing space-based observing systems capability component of OSCAR to the MeteoSwiss environment; (ii) complementing the surface-capabilities with the missing observing platform types; and (iii) integrating the Space and Surface into the critical review module.

22. CBS and ICG-WIGOS recognized that OSCAR is an important component of WIGOS and has gained enormous visibility. It is becoming widely known and used in the community and should be promoted as the unique repository of WMO requirements for observational data. OSCAR is one of the tangible and visible successes of WIGOS to date, and therefore continuous support must be secured.

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1. \* In MS Word 2007 or 2003, go to “View” > “Document Map”. In MS Word 2010, go to “View” > “Navigation Pane”.   
   In MS Word on a Mac, go to “View” > “Navigation Pane”, select “Document Map” in the drop-down list on the left. [↑](#footnote-ref-2)
2. http://www.wmo.int/pages/prog/www/ois/monitor/index\_en.html [↑](#footnote-ref-3)
3. <http://www.jcomm.info/index.php?option=com_oe&task=viewDocumentRecord&docID=8930> [↑](#footnote-ref-4)
4. <http://www.wmo.int/pages/prog/www/OSY/gos-vision.html> [↑](#footnote-ref-5)
5. <http://www.wmo.int/pages/prog/www/wigos/wir/egos-ip.html> [↑](#footnote-ref-6)