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**WIGOS Pre-Operational Phase (2016-2019)**

*(Submitted by the WMO Secretariat)*

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| **Summary and purpose of document**This document provides the rationale and priorities for the 2016-2019 WIGOS Pre-Operational Phase. |

**Reference:**

1. [Executive Council - Sixty-sixth session (2014) (WMO-No. 1136)](http://library.wmo.int/opac/index.php?lvl=notice_display&id=16315)
2. [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)

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Appendix I (Draft Plan for the WIGOS Pre-Operational Phase)

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**EXECUTIVE SUMMARY**

The implementation of the WIGOS Framework has now reached a level of maturity where WIGOS is enabling the further 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 WIGOS Pre-operational Phase (WPP). However, there remain gaps and challenges that will need to be addressed during the next phase of WIGOS in order for the system to be fully operational from 2020.

The development of WIGOS will thus continue during its Pre-operational Phase in the Seventeenth Financial Period (2016-2019), building upon and adding to those key building blocks of the WIGOS Framework that have already been implemented, while gradually shifting the emphasis from the global level toward implementation activities at the regional and national levels.

In addition to the steps completed during the 2012-2015 Financial Period, the WIGOS Framework Implementation Plan (WIP) listed a number of additional activities that were intended to further prepare for the operational deployment of WIGOS. However, due to a lack of resources, these activities could not be completed. This has been taken into account and incorporated into the plan for the Pre-Operational Phase.

Given the substantial resources invested in the development of the WIP, in making all WMO Members familiar with it, and in the subsequent development and approval cycle of the Regional WIGOS Implementation Plans (R-WIPs) derived from it, it has been decided to closely align the plan for the next Phase of WIGOS with the structure of the current WIP. A proposed updated version of this document (based on Version 3.0, as endorsed by EC-66) covering the next phase of WIGOS is therefore submitted to ICG-WIGOS for consideration. This document, entitled “Draft Plan for the WIGOS Pre-Operational Phase”, is included here as is Appendix I.

1. **INTRODUCTION AND BACKGROUND**

With the completion of the draft regulatory material, draft metadata standards, WIGOS station identifiers, and with all OSCAR databases soon to be available at least in prototype versions, the implementation of the WIGOS Framework has now reached a level of maturity where WIGOS is enabling the further development and deployment of its component systems. While these building blocks form a solid foundation for the further development of WIGOS, a substantial amount of work remains to be done in areas such as development of guidance material, quality management, education and training and overall capacity development Members can fully benefit from a fully operational system. This work will proceed during the WIGOS Pre-operational Phase (WPP) in the 2016-2019 Financial Period,

The development of WIGOS will thus continue during its Pre-operational Phase in the Seventeenth Financial Period (2016-2019), 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.

This WIGOS Pre-Operational Phase will focus on: (1) Full integration of all WMO observing systems into the WIGOS framework; (2) Development and implementation of a data availability and data quality monitoring system for all WIGOS components; (3) Operational deployment of the WIGOS Information Resource, in particular the OSCAR databases; (4) Enhanced regional WIGOS support and coordination, helped by WIGOS Regional Centres; (5) National WIGOS implementation.

Central guidance provided by ICG-WIGOS and support provided by the WIGOS Project Office will continue to be important. However, during this period, National Meteorological and Hydrological Services (NMHSs) are expected to take on more of the responsibility for WIGOS. In particular they are expected to become the key integrators at the national level, both by strengthening their own observing systems according to the guidance provided by the WIGOS framework, and by building national partnerships and providing national leadership based on their experience in the acquisition, processing and dissemination of observational data for environmental monitoring and prediction purposes.

The Plan for the WIGOS Pre-operational Phase (PWPP) will guide the development of WIGOS over the coming four years, especially at the regional and national levels and will assist in defining priorities and targets.

1. **KEY DELIVERABLES AND OUTCOMES OF WPP**

The work to be undertaken in the 2016-2019 Financial Period is defined by the goal of having WIGOS fully operational from 2020. What a fully operational WIGOS implies can be considered from the following two perspectives:

1. ***Expected deliverables***: Which elements must be completed, and what are the necessary operational functionalities, and
2. ***Expected outcomes***: What is the expected impact of WIGOS, and in particular what are the expected benefits to the WMO Members.

2.1 Deliverables

The following elements of the WIGOS framework must be completed and implemented:

1. Regulatory Material, supported by guidance material, including the WIGOS Metadata Standard, WIGOS Station Identifiers, OSCAR user guides, etc.
2. The WIGOS Information Resource (WIR), including the Portal, OSCAR/Requirements, OSCAR/Space, OSCAR/Surface, with the latter replacing WMO Publication No. 9, Volume A, Observing Stations; and SORT.
3. WIGOS Data Quality Monitoring System (for both data availability and quality).
4. Establishment and functionality of WIGOS Regional Centres with a special focus on Regions where the need is high.
5. Enhanced regional and national coordination, and governance mechanism and methodologies in place for incorporating observations across all WIGOS component observing systems (WMO and partners).
6. RBON concept based on WIGOS Observing System Network Design Principles.

2.2 Outcomes

1. Significantly enhanced and synergistic WMO Integrated Global Observing System delivering better and better documented observational input to support all WMO Programmes and application areas in a cost-effective way.
2. Increased visibility and strengthened role of NMHS’s at their national level,
3. Significantly improved registration of all observing stations across all WIGOS components.
4. Increased integration and open sharing of observations from WMO and non-WMO sources across national and regional boundaries.
5. Enhanced cooperation with partners at the national and regional levels.
6. Enhanced culture of compliance with WMO Technical Regulations.
7. Improved human and technical capacity of all WMO Members for planning, implementation and operation of WIGOS.
8. WIGOS incorporated in the WMO basic infrastructure as a WMO Programme or Programme element established by Cg-18 in 2019.
9. **PRIORITY AREAS**

In order to achieve the outcomes and provide the deliverables listed in Section 2, five areas must be addressed as a matter of paramount importance. These will be the main priority areas for WIGOS in the Pre-operational Phase. Figure 1 shows a graphical representation of a road map for the Pre-operation Phase priority areas.

***3.1 WIGOS Regulatory Material, supplemented with necessary guidance material, focusing on providing Members with those technical details that are required for the implementation***

The detailed plans and time table for the development of various documents will continue to evolve, but the following key items with tentative time lines are foreseen at the time of writing:

1. Guide to WIGOS developed by Cg-18, including guidelines on WIGOS Metadata, Station Identifiers, OSCAR/Surface and WIGOS Data Quality Monitoring;
2. Guideline on National WIGOS Development and Partnerships, end of 2016;
3. Standards and recommendations supported by best practices and procedures for surface-based remote sensing (mainly weather radars and wind profilers) by 2017;
4. Standards and recommendations supported by best practices and procedures for improving observational data and products quality by 2017;
5. Updated Manual on WIGOS by Cg-18.

Priority area 3.1 will be addressed by one or more ICG-WIGOS Task Teams and other relevant experts, supported by the WIGOS Project Office and supplemented with consultancy if necessary and resources permitting.

***3.2 WIGOS Information Resource (WIR), including the OSCAR and SORT databases***

The central piece of the WIR will be a living, robust, modern, electronic inventory of all observing assets within WIGOS, including all relevant metadata. No meaningful network design activities, gap mitigation or resource optimization can take place without such an inventory. Accordingly, the development, operational deployment and operational uptake of OSCAR/Surface is assigned very high priority for WIGOS in the coming Financial Period. It should be noted that while the initial development of this system is done primarily in collaboration between MeteoSwiss and WMO, the subsequent population of the system with station and metadata information will involve all WMO Members, and that very substantial human and financial resources will be needed to support this. Subsequent development of the WIR will address the migration and further development of the other two OSCAR databases, the development of the Gap Analysis Module, the Standardization of Observations Reference Tool (SORT), and the WIGOS Web Portal.

The following key items with milestones are proposed:

1. Web-based portal preliminary operation by 2016;
2. OSCAR/Capabilities migration by 2016;
3. OSCAR/Space migration by 2017;
4. SORT initial capability by 2017;
5. OSCAR/Surface fully populated by 2018.

***3.3 WIGOS Data Quality Monitoring System (WDQMS)***

The key priority is the development of a modern and efficient performance monitoring system for data availability and data quality. This is essential for measuring the effectiveness or impact of WIGOS, and for developing robust fault management practices that will lead to improved data quality. This priority area is being addressed by a group of international experts – initially mainly from CBS - under the auspices of ICG-WIGOS/TT-WQM, and progress is being made in particular on modernizing the NWP-based monitoring of the surface-based GOS components of WIGOS. Substantial resources will be needed in order to develop the initial ideas into an actual system, to bring in the space-based component of the GOS, and to broaden the concept to the other WIGOS component systems. While the WIGOS monitoring is not fundamentally different in scope from already existing monitoring activities of the NWP centres, incremental IT resources will be required to support the generation, storage and analysis of WIGOS-specific deliverables.

The following key items with milestones are proposed:

1. Initial WIGOS (GOS surface-based components) monitoring capability at ECMWF, NCEP and/or other NWP centres by mid-2016;
2. Full WIGOS (GOS surface-based components) operational monitoring and reporting functionality by 2018;
3. Monitoring Workshop(s) for GAW, GCOS, GCW and hydrology components of WIGOS in 2016;
4. Initial monitoring capability for all WIGOS components by mid-2017;
5. Mechanisms for routine reporting of monitoring results to EC, Regional Associations and Members by mid-2016;
6. Mechanisms and regional structures in place to handle incident management actions and support Members in improving the data availability and quality by 2017.

***3.4 WIGOS Regional Centres***

Regional guidance, oversight and support for national WIGOS implementation efforts will be major item of priority. Many WMO Members are already now requesting guidance and support for their implementation efforts, and this can be provided better and more efficiently via a regional support structure rather than in direct interaction between the WMO Secretariat and individual Members.

The following key items with milestones are proposed:

1. Initial establishment of WIGOS Regional Centres in pre-operational mode by mid-2016, in some regions/sub-regions
2. Establishment of WIGOS Regional Centres covering all WMO Regions no later than 2018
3. Operational phase of initial WIGOS Regional Centres beginning mid-2018, after successful completion of two-year pre-operational phase.

The WIGOS Regional Centres will work closely with the WIGOS Project Office as well as with the WMO Members in their Region (or sub-Region) on their implementation activities. A draft concept note describing the main functionalities and Terms of Reference for such Centres is included as Appendix II to this document. This document is intended to be further developed in discussions with the Regional Associations, DRA and other departments and will be submitted for final approval by ICG-WIGOS-5.

***3.5 Regional and national coordination and governance mechanisms***

The leadership role of NMHSs in integrated observing systems and is central to the success of WIGOS implementation. The development and promulgation of practical tools, templates, guidance and case studies will help Members to develop their national WIGOS plans, to establish appropriate governance and coordination systems, to build the relationships and partnerships that will help expand and share their national and regional observations to meet needs across relevant disciplines and communities, and to implement modern data management practices to ensure they extract full value from their observational investments.

The following key items with milestones are proposed:

1. Guidance to assist Members to access, share and integrate WIGOS data from all sources; to be made available progressively from mid-2016;
2. Guidance on governance mechanisms and partnership arrangements to support the incorporation of observations (WMO and partners) across all WIGOS component observing systems; available by 2017;
3. Tools and guidance for Members to plan, deliver, expand and evolve their national WIGOS implementation; available by 2018.



*Figure 1: Road map for the Pre-operation Phase priority areas*

**4.** **ACTIVITIES**

Following the structure of the current WIP, a number of specific activities within the priority areas listed in Section 3 are planned for the 2016-2019. Details of these activities are found in Appendix I, “Draft Plan for the WIGOS Pre-Operational Period” (TBC).

1. **CAPACITY DEVELOPMENT**

Capacity development (CD) will be a critical activity area during the WPP, and regional and national needs in this area will be one of the main drivers of the expenditure of resources during this phase.

It should be noted that it is difficult to distinguish between CD efforts and WIGOS as a whole, since many over-arching WIGOS activities (development and dissemination of standards and guidance material, training, support through WIGOS Regional Centres) are in effect capacity development efforts.

The over-arching goal of the WIGOS CD effort is to help equip the staff of the NMHS with the requisite understanding, skills, information and knowledge to enable them to implement WIGOS at a national level, including the development of national partnerships. This will be supported both through the development of guidance material listed in Section 3.1 and via the outreach efforts outline in Section 6.

An effective NMHS staff training supported by a set of training packages yet to be developed must be provided by all WMO technical commissions with the organizational and logistics support of the WMO Regional Offices, Regional Training Centres, WIGOS Regional Centres, and the WMO Secretariat.

Close collaboration with international, regional and sub-regional development organizations (e.g. the World Bank, GEF, ADB, …) is needed in order to ensure that donor funds will benefit from and provide benefit to WIGOS.

1. **COMMUNICATIONS AND OUTREACH**

Communications and Outreach (C&O) will play key roles during the WPP, both internally and externally.

Internally to the WMO community, there is a continuing need to educate and interact with the Permanent Representatives, partly due to natural turn-over, partly due to the fact that as WIGOS matures and gains visibility, the expectations from the WMO Members tend to increase. In addition to the PRs, there is also a need to engage with their observing system managers, partly to keep them abreast of WIGOS developments, partly to learn from their experiences with national and regional WIGOS development and implementation efforts.

Externally, it is important to engage with partners, e.g. other international organizations, NGOs and commercial entities, both to keep them informed about WIGOS development and to foster the development of partnerships at all levels.

A number of generic C&O activities are planned for the WPP:

* A WIGOS newsletter will be developed and disseminated on a regular (tentatively quarterly) schedule, targeting a broad audience with varying levels of technical knowledge. A prototype newsletter has been developed for consideration by ICG-WIGOS.
* As far as possible, WIGOS Side Events will be arranged at all WMO Constituent Body Sessions.
* An updated set of WIGOS posters are under development to be showcased at a variety of events (WMO Constituent Body Sessions, national and international scientific conferences, meetings of GEO, GFCS and similar structures …).
* A hot-line will be established through which WIGOS-PO will respond to phone calls and e-mails about WIGOS-related issues.
* Continuous updates of the WIGOS portal with presentations, articles, publications, examples of success stories, case studies, lessons learned, and other material for use by Members and their partners.

In addition, a number of specific C&O activities will be organized for particular purposes, e.g.:

* CBS-Ext.(2018) TECO on WIGOS.
* A series of regional/sub-regional Training Workshops on OSCAR/Surface, aimed at educating National WIGOS Focal Points about the capabilities of the system and the requirements for input.
* A series of regional/sub-regional Workshops on specific WIGOS components (e.g. AWS, AMDAR, …)
* A series of national WIGOS Workshops, to stimulate national implementation efforts where circumstances warrant.
1. **Governance, Management and Execution of the WIGOS Pre-Operational Phase**

Similar to the WIGOS Implementation Phase, the development during the Pre-operational Phase will follow the decision by the World Meteorological Congress, with subsequent governance assigned to the Executive Council. The Council is expected to re-establish the Inter-Commission Coordination Group on WIGOS to provide more detailed guidance and oversight. Reflecting the nature of WIGOS as a cross-cutting basic infrastructure element supporting all WMO Programmes, this body consists of a number of EC Focal Points and has representation from all Regional Association and Technical Commissions as well as associated program areas such as the Global Cryosphere Watch and the Global Climate Observing System.

In addition, both the Regional Associations and the Technical Commissions themselves will be playing increasingly important roles in the WIGOS development. All RAs and TCs now have WIGOS teams within their respective working structures and these are expected to evolve, following the guidance provided by ICG-WIGOS through their respective representative. The Regional Associations in particular will be critical in terms of providing oversight of the WIGOS Regional Centres and other regional structures. The overall governance and management structure is depicted in Figure 2.



*Figure 2: Schematic of WIGOS Governance, Management and Execution*

# 7.1 Global level

WMO Congress and Executive Council has delegated the detailed governance and oversight to WIGOS to ICG-WIGOS. The management function is carried out by the WMO Secretariat, primarily within the Observing and Information Systems Department, and the WIGOS Project Manager under the supervision of the (D/OBS) manages the day to day WIGOS development. It should be noted that all Technical Departments within the Secretariat are involved in the WIGOS development and are expected to continue their support of this effort.

* 1. **Regional Level**

All Regional Associations are expected to establish Regional Task Teams on WIGOS to provide governance and oversight at the regional level. Specific roles of the TT-WIGOS:

* Regularly (at least annually) review the WIGOS implementation efforts in their respective Region.
* Guide and prioritize the activities listed in the R-WIP.
* Facilitate and coordinate regional WIGOS projects.
* Submit updates to the R-WIP to the Regional Association for approval.
* Oversee the work of WIGOS Regional Centre(s) established in the respective Region.
* Provide regional support to Members in accordance with the R-WIP and in a response to their requests (subject to availability of resources/funds).

The management functions at the regional level are carried out by the WIGOS Regional Centres described in Appendix II to this document.

* 1. **National Level**

The following activities are envisaged to take place at the National level:

* Development of a National Observing Strategy.
* Development of a National WIGOS Implementation Plan (N-WIP), building on the National Observing Strategy,
* Establishment of coordination and implementation mechanisms and team.
* Identification and mitigation of critical gaps in the WIGOS component observing systems (national RRR process implementation).
* Sustained and standardized operation of national observing networks/systems.
* Populating of the OSCAR/SURFACE
* Trained and qualified staff to operate observing networks/systems.
* Operational implementation of WIGOS Metadata Standards.
* Development of national partnerships.

It is recommended that National WIGOS Implementation Teams are formed to oversee and guide these activities. The teams should be led by National Focal Points, but should include enough relevant expertise to cover all areas listed above.

The management functions are carried out by a notional “National WIGOS Center” as shown in Figure 2. While the details on how to implement this is left up to the decision of the individual Member, it is important to point out that managing WIGOS is distinct from providing guidance and oversight. The National WIGOS Implementation Team may be a board that meets on an annual or semi-annual basis, whereas the National WIGOS Center in most cases will require committed staff on an every-day basis.

1. **MONITORING AND EVALUATION OF WPP IMPLEMENTATION**

The WIGOS Project Manager has the routine responsibility for monitoring and evaluating the WPP implementation, and for reporting to the Director of the Observing and Information Systems Department (D/OBS) and ICG-WIGOS.

He is also responsible for updating the procedures and practices if and when needed. The monitoring and evaluation process should demonstrate the progress achieved as well as identify risks, encountered problems and difficulties, and the need for adjustment of the PWPP accordingly.

Specific criteria should be defined for the monitoring and evaluation of any WPP projects proposed by Regions or Members.

1. **RESOURCES**

Completion of the tasks listed in the Plan for the WIGOS Pre-Operational Phase will depend on the available resources. It is therefore recommended that Congress assign high priority to the proposed budget allocations for WIGOS activities. Congress is also requested to urge Members to continue to provide resources to support the implementation of WIGOS.

Setting aside adequate resources for fully implementing WIGOS should be given a high priority in the budget and planning processes of the WMO Members. Extra resources will need to be provided to the WMO Secretariat for both staff and non-staff costs for implementation and coordination efforts going beyond the normal programmatic activities of the Secretariat. To ensure the funding needed for WIGOS implementation, provision of the following resources should be considered:

1. WMO Regular Budget for WIGOS implementation support activities;
2. WIGOS Trust Funds to supplement the WMO Regular Budget;
3. In kind contributions;
4. Staff secondments;
5. Voluntary Cooperation Programme funds for WIGOS related technical cooperation and capacity-development activities;
6. Regional fund-raising activities to support WIGOS; and
7. Operational hosting of information systems (e.g. WIR, OSCAR, WIGOS Monitoring, ...)

**Appendix I**

**Draft Plan for the WIGOS Pre-Operational Phase**

*(See a separate document: Doc-9.1\_Appendix-I\_PWPP.docx)*

**Appendix II**

**WIGOS Regional Centres**

*(See a separate document: Doc-9.1\_Appendix-II\_WRC.docx)*