

**WORLD METEOROLOGICAL ORGANIZATION**

**EXECUTIVE COUNCIL WORKING GROUP  
ON WMO INTEGRATED GLOBAL OBSERVING SYSTEM  
AND WMO INFORMATION SYSTEM**

***Second Session***

Geneva, Switzerland, 6-8 May 2009

**FINAL REPORT**



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## AGENDA

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## EXECUTIVE SUMMARY

The second session of the Executive Council Working Group on the WMO Integrated Global Observing System and the WMO Information System (EC-WG/WIGOS-WIS) was held at the WMO Secretariat in Geneva, Switzerland, from 6 to 8 May 2009, and was chaired by Prof A. Divino Moura (Brazil), Third Vice-President of the WMO and Chair of EC WG.

EC-WG/WIGOS-WIS was briefed on major deliberations of the first session of its Subgroup on the WMO Integrated Global Observing System (SG-WIGOS-1) Geneva, Switzerland, 10 - 13 November 2008; the CBS Technical Conference on WIGOS (TECO-WIGOS) (Dubrovnik, Croatia, 23-24 March 2009); and the fourteenth session of the Commission for Basic Systems (CBS-XIV) (Dubrovnik, Croatia, 25 March - 2 April 2009).

EC-WG/WIGOS-WIS was briefed on the status of:

- (a) Implementation of the WIS Project and its Implementation Plan;
- (b) WIGOS Pilot and Demonstration Projects;
- (c) Review of the WIGOS Concept of Operation (CONOPS);
- (d) Implementation of WIGOS Development and Implementation Plan (WDIP) and its corresponding update;
- (e) Monitoring of the implementation of WIGOS and WIS through Rolling Requirements Review;
- (f) Revision of WMO Technical Regulations related to WIGOS and WIS implementation.

Based on the outcomes of the consideration of the individual Agenda Items, EC-WG/WIGOS-WIS articulated its guidance, advice and recommendations regarding the further development of the implementation of WIS, WIGOS concept, coordination of WIGOS and WIS plans; it agreed on the versions of CONOPS ([Appendix II](#)) and WDIP ([Appendix III](#)) to be submitted to EC-LXI for consideration and endorsement.

In this regard, the WIGOS integrated observation approach will support WMO Members' NMHSs and other relevant Institutions in the fulfilment of their mandates including response to natural hazards, hydrological and environmental monitoring, climate services, adaptation to climate-change and human-induced environmental impacts, addressing "Better climate information for better future" of the World Climate Conference-3.

Specific attention was paid to the further development of WIGOS pilot and demonstration projects. EC-WG/WIGOS-WIS noted that WIGOS Projects would provide a valuable learning experience which could validate approaches to integration, identify problematic areas, help to understand the benefits and provide clarification of the more effective ways forward. Evaluation of the lessons learned could provide valuable feedback for the WIGOS planning and development, for the continuing development of CONOPS, WDIP and other documentation, and for other implementation projects and activities.

EC-WG/WIGOS-WIS formulated its Report to EC-LXI that was reflected in the draft text related to the integration of WMO Observing Systems for inclusion in the general summary of EC-LXI where it specified the guidance and recommendations regarding the WIGOS development and WIS implementation for the period until June 2010. It further elaborated its Future Work Programme and Action Plan ([Appendix IV](#)).

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## **GENERAL SUMMARY**

### **1. ORGANIZATION OF THE SESSION**

#### **1.1 Opening of the meeting**

1.1.1 The second session of the Executive Council Working Group (EC WG) on the WMO Integrated Global Observing System and the WMO Information System (EC-WG/WIGOS-WIS) was opened by its Chair, Prof A. Divino Moura, Third Vice-President of WMO, at 10:00 hours on Wednesday, 6 May 2009, at the WMO Headquarters in Geneva, Switzerland.

1.1.2 Following the opening of the session, Dr W. Zhang, D/OBS welcomed the participants to Geneva on behalf of the Secretary-General of WMO. He underlined that there are several demanding tasks that must be addressed for the further WIGOS concept development, such as: defining WMO Members' and WMO Partners' requirements for WIGOS; analyzing possible impacts of integration processes on WMO Members and the WMO Secretariat, on the WMO Partners responsible for co-sponsored observing systems, on national agencies charged with national observing networks and systems; describing the benefits of WIGOS to all concerned; elaborating a comprehensive costed development and implementation strategy for WIGOS, as recommended by the fourteenth session of the Commission for Basic Systems (CBS-XIV) (Dubrovnik, Croatia, 25 March - 2 April 2009), which takes WIGOS from concept to reality; specifying requirements for resources needed for development and implementation of WIGOS.

1.1.3 He further highlighted the most important topics the meeting was expected to address, namely the issues related to: (a) The status of Implementation of the WIS Project and its Implementation Plan; (b) The status of the WIGOS Pilot and Demonstration Projects and recommendations from lessons learned; (c) Review of the updated version of CONOPS; (d) The status of implementation of WDIP and its corresponding update; and (e) Deliberations of the first session of the Subgroup on WIGOS (November 2008), the CBS Technical Conference on WIGOS (TECO-WIGOS) (Dubrovnik, Croatia, 23-24 March 2009) and CBS-XIV and to formulate guidance, advice and recommendations regarding the further development of the WIGOS concept, implementation of WIS, and coordination of WIGOS and WIS plans.

1.1.4 In closing, Dr W. Zhang wished for a successful and productive session and an agreeable stay in Geneva.

1.1.5 The list of participants is given in [Appendix I](#).

#### **1.2 Adoption of the agenda**

EC-WG/WIGOS-WIS adopted the [Agenda](#) for the meeting, which is reproduced at the beginning of this report.

#### **1.3 Working arrangements**

EC-WG/WIGOS-WIS agreed on its working hours and adopted a tentative work plan for consideration of the various agenda items.

### **2. REPORT OF THE CHAIRPERSON**

2.1 The chair of EC WG summarized the activities of the group since its first session in December 2007. In this regard he recalled the Terms of Reference (TOR) as well as the membership of EC WG.

2.2 Further he referred to the activities the members of EC WG were involved in, specifically: guidance and recommendations related to the WIGOS development and WIS implementation provided

for EC-LX; involvement in the preparation and running TECO-WIGOS as well as delivering of several presentations at the Conference; contributions and guidance for preparation of the draft summary text for forthcoming EC-LXI.

### **3. REVIEW OF GUIDANCE AND RECOMMENDATIONS ADOPTED BY EC-LX**

3.1 EC-WG/WIGOS-WIS was briefed on the guidance and recommendations of EC-LX regarding the further development and implementation of WIGOS as well as on the status of these activities. They were related to the updates of the WIGOS Concept of Operations, WIGOS Development and Implementation Plan, the pilot and demonstration projects initiated by relevant technical commissions (TCs) and NMHSs, respectively; revision and update of the WMO technical regulations in the context of WIGOS and WIS; the leading role that CBS should play in the WIGOS development and implementation; experiences and lessons learned from EUMETNET - EUCOS.

### **4. STATUS OF IMPLEMENTATION OF THE WIS PROJECT AND IMPLEMENTATION PLAN**

4.1 EC-WG/WIGOS-WIS was briefed on the status of implementation of the WIS Project and Implementation Plan. It noted that the planning and implementation of WIS is progressing on schedule and will be able to support the development and implementation of WIGOS in time.

4.2 Noting WIS implementation is in two parts:

- Part A being the continued improvement of GTS and opening up access to the GTS for all WMO programmes, and
- Part B being the new functionality provided by WIS such as the Information Discovery, Access and Retrieval;

EC-WG/WIGOS-WIS was pleased to see that the utilization of both the existing and the new functionality of WIS are being addressed across the pilot and demonstration projects of WIGOS. EC-WG/WIGOS-WIS supported the suggestion of the ICG on WIS that WIGOS pilot and demonstration projects would benefit from WIS training workshops aimed at building capacity of participating Members, especially in the creation and management of the necessary metadata and how to benefit from the new functionality of WIS.

4.3 EC-WG/WIGOS-WIS supported the priority for the Inter-Commission Coordination Group on WIS (ICG on WIS) to develop the key WIS documentation such as a Manual on WIS, noting that these will contribute to a combined WIGOS-WIS review of technical regulations.

4.4 EC-WG/WIGOS-WIS agreed that the WIS Rolling Requirements Review (RRR) should be provided with information on the likely future information exchange volumes and timeliness requirements of WIGOS as this information is necessary to identify future WIGOS information exchange requirements on WIS. It also noted the importance of including WIGOS contributing and partner organizations into the WIS RRR process to ensure WIS also meets the needs of this wider community.

### **5. REPORT OF SUB-GROUP ON WIGOS**

5.1 Dr J. Nash, Chair of the Subgroup on WIGOS (SG-WIGOS) briefed EC-WG/WIGOS-WIS on major deliberations of the first session of its Subgroup on the WMO Integrated Global Observing System (SG-WIGOS-1) Geneva, Switzerland, 10 - 13 November 2008. EC-WG/WIGOS-WIS considered and agreed with the recommendations of the SG-WIGOS-1.

5.2 All WIGOS projects require active coordination and support from the WIGOS Planning Office;

therefore a suitable project management function needs to be established. This will also allow for better interaction between the Project Team responsible for the Project and the SG-WIGOS and the respective technical commission working bodies. For each WIGOS project, a detailed Implementation Plan and Project Team Work Plan should be available to the WIGOS Planning Office for planning required support and resources, and monitoring activities planned.

5.3 Regular updates of progress and issues encountered should be also available to the WIGOS Planning Office; only when having relevant information on the status of the projects, progress achieved and issues encountered, advice and help can be provided.

5.4 EC-WG/WIGOS-WIS expressed its concern regarding time frame for testing the concept and very limited resources provided through secondment of experts and contribution to the WIGOS Trust Fund and/or redirection of existing WMO Secretariat resources in a contrast to the request of EC-LX.

5.5 EC-WG/WIGOS-WIS agreed with the recommendation of SG-WIGOS-1 that current process should be focused on test-of-concept phase, building on development and implementation of pilot and demonstration projects; the later "implementation" phase will be developed in conjunction with the finalisation of, and feedback from the pilot and demonstration projects.

5.6 Other recommendations of SG-WIGOS-1 were considered in detail under relevant Agenda Item.

## **6. REPORT ON CBS TECO-WIGOS STATEMENT AND RECOMMENDATIONS ADOPTED BY CBS-XIV**

6.1 EC-WG/WIGOS-WIS was briefed on the TECO-WIGOS Statement and the recommendations by CBS-XIV regarding the further development and implementation of the WIGOS initiative.

6.2 EC-WG/WIGOS-WIS noted, appreciated and endorsed the TECO-WIGOS Statement (see [Annex](#) to this paragraph) as well as recommendations by CBS-XIV relevant to WIGOS. They were taken into account while updating the WIGOS Concept of Operations and developing the Future Work Programme and Action Plan of EC WG (see agenda Item 14).

6.3 EC-WG/WIGOS-WIS was pleased to note that CBS responded to the WIGOS initiative by relevant adjustment of its future working structure and by adopting new TOR of its OPAGS, ETs and rapporteurs addressing requirements for WIGOS.

6.4 In this regard, EC-WG/WIGOS-WIS requested the CBS president that CBS expert teams would address several tasks of the Future Work Programme and Action Plan of EC WG, relevant to CBS ([Appendix IV](#)).

## **7. WIGOS CONCEPT OF OPERATIONS (CONOPS)**

7.1 EC-WG/WIGOS-WIS welcomed the detailed update of the WIGOS concept of operations (CONOPS) elaborated by SG-WIGOS-1 and appreciated a good progress achieved in the further development of the WIGOS concept; it also agreed with the replacement of "levels of integration" by "areas of standardisation" that are key features of any observing system.

7.2 EC-WG/WIGOS-WIS further revised and agreed on the version ([Appendix II](#)) to be submitted to EC-LXI for consideration and endorsement.

7.3 It further agreed that the end-product quality assurance process is tied up with the quality of end-user products; therefore this issue should not be addressed and worked on just under the WIGOS umbrella. EC-WG/WIGOS-WIS was of the opinion that the EC Inter-Commission Task Team on Quality Management Framework must cooperate on it as well.



7.4 EC-WG/WIGOS-WIS further agreed that SG-WIGOS, in accordance with its terms of reference should continue in updating of CONOPS; more attention should be paid, *inter alia*, to the further elaboration of the WIGOS Vision and clarification of the term “integration”; the versioning control should be added at the beginning, too. According to the Future Work Programme and Action Plan of EC WG ([Appendix IV](#)), EC-WG/WIGOS-WIS-3 will agree on the final version of CONOPS for submission to EC-LXII (June 2010).

7.5 EC-WG/WIGOS-WIS discussed the acronym WIGOS and agreed that it should be used in agreement with the recommendation of Cg-XV as the WMO Integrated Global Observing System. In this regard, EC-WG/WIGOS-WIS agreed that the concept of WIGOS could be described as a “framework” (rather than system of systems) for integration of the components of global observing systems across WMO and relevant co-sponsored systems in collaboration and cooperation with WMO Partners, taking into account the multiplicity of perspectives and observing domains covered by WIGOS.

## **8. STATUS OF WIGOS PILOT AND DEMONSTRATION PROJECTS**

EC-WG/WIGOS-WIS considered the status of the implementation of WIGOS Pilot and Demonstration Projects paying attention to the experiences gained, problems occurred and projects implementation constraints; when doing so, EC-WG/WIGOS-WIS took into account the recommendations of SG-WIGOS-1, deliberations of TECO-WIGOS and CBS-XIV.

### **8.1 Status of the WIGOS pilot projects**

8.1.1 EC-WG/WIGOS-WIS noted that despite the good progress evident in three of the pilot projects (AMDAR, CIMO and JCOMM), and some good developments and initiatives in the other pilot projects, only about 2/3 of the scheduled goals had been completed so far.

8.1.2 The vice-president of the Commission for Hydrology (CHy) re-affirmed the commitment of CHy to the WIGOS/WIS concept and contribution of pilot projects. He informed EC-WG/WIGOS-WIS that the WIGOS initiative and possible contribution of CHy was considered by the thirteenth session of CHy (CHy-XIII, November 2008) and by the CHy-AWG-1 (February 2009). The CHy, among others, decided on adoption of a scientific framework for a package of approaches for WIGOS/WIS pilot projects and emphasized the need for: (a) near-real-time hydrometric data quality assurance, and (b) a plan for sustaining stations in the proposed pilot projects.

8.1.3 EC-WG/WIGOS-WIS was further informed that CHy-AWG-1 decided to propose the integration of the SADC-HYCOS and Flash Flood Guidance System in Southern Africa as pilot projects under WIGOS/WIS in place of HARON, which had been proposed earlier. It is due to the realization that HARON might not be able to comply with the targets of a WIGOS/WIS pilot project due to resource and time frame constraints. It was emphasized that these two proposed pilot projects were not exclusive and would not preclude any suitable project in the future as a possible WIGOS/WIS pilot project.

8.1.4 The AMDAR representative, also being the Chairman of the CBS ET-AIR, noted that the success of the WIGOS Pilot Project for AMDAR was mainly thanks to the level of cooperation between the operational AMDAR Programmes and the dedication of the persons involved. Those involved in the WIGOS AMDAR Pilot Project are fully aware of the benefits that WIGOS can provide, both for the meteorological user community and the aviation industry, of well structured and standardized operational AMDAR programmes.

8.1.5 EC-WG/WIGOS-WIS agreed that the pilot projects initiated by AMDAR and JCOMM have been very successful in bringing international partners into WIGOS. It was noted that JCOMM provides the mechanism for close collaboration and cooperation between WMO and IOC; and as a joint technical commission has proven an effective tool in promoting WIGOS so far; it is exemplified by the

fact that IOC is involved in the Pilot Project and will likely be co-funding it. EC-WG/WIGOS-WIS agreed that this asset or at least this joint mechanism should be maintained in the future.

8.1.6 It was noted that the GAW Pilot Project added a component of “Improvement of Interoperability of GAW World Data Centres with WIS and Establishment of Prototype Services to Facilitate User Access to GAW Data”.

8.1.7 EC-WG/WIGOS-WIS agreed that the development of the pilot projects already permitted (i) to better understand and refine the concept of integration, address lessons learned, and feed into CONOPS and WDIP; (ii) to demonstrate that parent organizations could be fully engaged in the process; (iii) to identify benefits of WIGOS reflected in the TECO-WIGOS Statement; and (iv) to start testing concept and implement some practical measures. Amongst lessons learned, EC WG identified the following:

- There is a foundation role of the GOS, the WIS, and the CBS;
- CIMO plays a cross-cutting role;
- WIGOS needs appropriate WIS functionality in place but there are components of WIGOS that do not require a fully implemented WIS (e.g. instrument best practices issues). There is no reason to delay WIGOS because of WIS developments;
- The benefits will include reduced financial demands on Members, increased availability of required information, improved access, higher data quality standards, archiving and technical innovations;
- International Organizations can accept WIGOS as long as it is recognized upfront that they have ownership in WIGOS including for data and standards, and understand that the goal of WIGOS is to work and coordinate with partners in order to develop common standard practices and procedures for improving availability, access and quality of observational data and associated metadata for all users;
- Non-NMHS partners can accept WIGOS as they understand the benefits of WIGOS and mutual support, expect to gain better access to weather, water, climate, and other related environmental data, as well as better visibility.

8.1.8 EC-WG/WIGOS-WIS supported two new Pilot Projects, i.e. “The Global Space-based Inter-Calibration System Pilot Project for WIGOS (GSICS Pilot Project)”; and “The Project for the implementation of the GCOS Reference Upper-Air Network” (GRUAN Pilot Project). EC-WG/WIGOS-WIS noted that the new projects as well as a new component of the GAW PP would not require substantial additional resources and that they would add value to the process and contribute to NWP and climate monitoring, and improve documentation.

## **8.2 Status of the WIGOS demonstration projects in the selected NMHSs**

8.2.1 EC-WG/WIGOS-WIS welcomed with appreciation the progress achieved by the WIGOS Demonstration Projects being undertaken by NMHSs within each Regional Association (RA); it noted that they all provided useful perspectives on the potential impact and value at the national and/or regional level of the concept of WIGOS integration within the WIGOS framework. However, a concern was expressed regarding availability of detailed project documentation for planning and monitoring purposes as well as support needed by the WMO Secretariat to the demonstration projects.

8.2.2 It was noted that at this stage of the WIGOS development and implementation, demonstration projects could not demonstrate all aspects of the WIGOS integration process due to lack of the WIGOS project documentation. Further, for the accomplishment of the demonstration projects, relevant WIS functionality must be established. Therefore, demonstration projects could focus currently only on some specific aspects of the WIGOS concept and to be used to highlight some challenging areas of the integration process.

8.2.3 EC-WG/WIGOS-WIS noted the importance of regular progress reports and considered a progress reporting mechanism for implementation of the demonstration projects. It was recommended that the demonstration project focal point should submit a progress report to the Secretariat every three months; the report will be available at the WMO web site. In this regard, EC-WG/WIGOS-WIS was of the opinion that the scope and time frame of the demonstration projects should not be limited; it is up to the decision of those NMHSs that have initiated the projects.

### **8.3 *Guidance and recommendations for WIGOS projects***

8.3.1 EC-WG/WIGOS-WIS considered the status of the initially proposed and agreed Pilot and Demonstration Projects. It recalled the reasons for, and considered potential benefits from them.

8.3.2 EC-WG/WIGOS-WIS requested the technical commissions (TCs) responsible for the relevant pilot project and encouraged the NMHSs undertaking demonstration projects to elaborate a detailed project implementation plan and work plan with specified tasks, activities, and achievable deliverables as soon as possible, taking into account the guidance provided by EC WG ([Appendix IV](#)).

8.3.3 Planning documents and regular updates of the progress and issues encountered should be supplied to the WIGOS Planning Office for planning and monitoring purposes as well as for ensuring that appropriate support is provided. The Secretariat ensures that such documentation will be available on the WIGOS web site. Sharing the experiences and lessons learned have significant capacity building aspect and will help other WMO Members and WMO Partners to understand the WIGOS concept and its benefit.

8.3.4 It was further noted that WIGOS Projects would provide a valuable learning experience which could validate approaches to integration, identify problematic areas, help to understand the benefits and provide clarification of the more effective ways forward. Evaluation of the lessons learned could provide valuable feedback for the WIGOS planning and development, for the continuing development of CONOPS, WDIP and other documentation, and for other implementation projects and activities.

8.3.5 In this regard, EC-WG/WIGOS-WIS identified that there is a need for the development of an evaluation process to capture lessons learned, problems identified, scope of challenge, technical level, areas of integration, practical management and governance aspects, working with partners, within and external to WMO. The findings will benefit actual WIGOS implementation, coordination and communication.

8.3.6 These benefits would accrue to the all planners, developers and implementers of WIGOS, EC WG, its SG-WIGOS, TCs, RAs, WMO Member countries, and WMO Partners involved with co-sponsored systems as well as any other organizations that might chose to utilize the WIGOS framework.

8.3.7 It was also noted that some other activities and projects were either getting ready to start, were underway or planned that could or should be brought into the WIGOS. Having projects or activities undertaken by each of the TCs and RAs would help move the overall WIGOS implementation process forward. This has the potential to improve existing or ready to implement observing programs and contribute to the WIS effort by improving metadata availability and exercising WIS data exchange mechanisms. There is also a significant capacity building element inherent in several projects.

8.3.8 EC-WG/WIGOS-WIS felt it very important to encourage these activities and projects with support of RAs, and TCs taking into account limited capabilities of EC WG and its SG-WIGOS as well as the Secretariat staff involved in the WIGOS development and implementation.

8.3.9 While considering the development of new projects, EC-WG/WIGOS-WIS recommended that WIGOS activities undertaken by TCs, RAs and Member countries should be welcome and encouraged as much as possible, whether they are formally adopted as WIGOS projects or not, especially when sponsored and resourced by TCs, RAs, WMO Members or Partners.

8.3.10 The WIGOS Planning Office was tasked to collect information on such activities. EC-WG/WIGOS-WIS expressed the need for caution against over-stretching resources when including new WIGOS projects. Limited assistance can be provided taking into account resources available and keeping in mind that a primary role of this test-of-concept phase is the development of the WIGOS framework, CONOPS, WIDP, Technical Regulations, guidance and support given to the identified projects. As this work matures, the resources focused on this purpose can turn to provide greater support to other WIGOS implementation activities.

## 9. WMO SURVEY ON WIGOS ACTIVITIES IN NMHS

9.1 EC-WG/WIGOS-WIS considered the results of the initial Survey on WIGOS activities in National Meteorological and Hydrological Services (NMHSs) the WMO Secretariat conducted in November 2008. It noted that the initial survey indicated that the concept of WIGOS was not well understood. It suggested that a new survey should be undertaken in due course in order to receive appropriate feedback by Cg XVI.

9.2 EC-WG/WIGOS-WIS further emphasized that the SG-WIGOS should work with the Secretariat to produce a new questionnaire in consultation with CBS and CIMO. It was also noted that the survey's objectives should be well understood by recipients; it was recommended that the questionnaire should be simple and address only key questions. Findings from surveys should feed into the WIGOS planning.

## 10. MONITORING OF THE IMPLEMENTATION OF WIGOS AND WIS THROUGH RRR PROCESS

10.1 EC-WG/WIGOS-WIS was briefed on the current status of the main components of the Rolling Requirements Review (RRR) process, which is led by CBS through the ET-EGOS:

- **Capturing observing requirements:** Technology-free requirements are expressed by experts from different application areas from WMO Programmes, co-sponsored programmes, and other UN organizations. At present, there are 632 requirements addressing more than 120 geophysical parameters, 23 application areas, each requirement being characterized by a "goal", "breakthrough" and "threshold" value of horizontal/vertical/temporal resolution, accuracy and timeliness. They are regularly updated and recorded in an on-line database;

- **Monitoring observing capabilities:** Monitoring the performance of existing and planned surface-based capabilities is complicated by the multiplicity of networks and stakeholders. For space-based capabilities, the status and plans are recorded in the "Dossier on the space-based GOS", which is available on line and describes satellite instrument plans up to the next two decades. This information is however not incorporated in the database, the maintenance of which poses a resource issue;

- **Review and guidance:** Reviewing the adequacy of observing capabilities, analyzing the gaps and formulating recommendations for the evolution of the GOS. This has been regularly performed, with Statements of Guidance being available on line for 10 different WMO application areas, in addition to the GCOS adequacy reports, and an Implementation Plan being maintained by ET-EGOS;

- **Long-term vision:** A new Vision for the GOS in 2025 was approved by CBS-XIV and recommended to EC-LXI for adoption.

10.2 EC-WG/WIGOS-WIS stressed the importance of the RRR process as the backbone of the evolution of the GOS and acknowledged that the RRR was already addressing requirements from most if not all WIGOS target application areas. It noted that the mechanism for monitoring capabilities and analyzing gaps was also in place, although it needed to be strengthened and supported with adequate resources, and stressed the importance of the RRR activities for WIGOS.

10.3 It was also highlighted that this RRR process provided the opportunity to seek convergence among the observing needs of different applications, with the aim to optimize observing systems

through widening their user basis and usefulness. This required however a careful case-by-case basis analysis to ensure that such convergence is meaningful and more cost-effective than parallel dedicated capabilities. While such analysis was regularly performed for space-based missions, it was very challenging to perform it for surface-based systems because of the diversity of measuring techniques that introduced multiple degrees of freedom.

10.4 EC-WG/WIGOS-WIS was further briefed on the applicability of the RRR process for WIS, with reference to the action from EC-WG/WIGOS-WIS-1 that requested to add data exchange requirements to the observing requirements database.

10.5 The Secretariat indicated the possibility to include in the database a rough indication of data volume and data rate for every parameter, calculated on the basis of the required resolution, coverage, accuracy and timeliness. This theoretical calculation would yield an index allowing comparing the impact of various datasets on the telecommunications. It was stressed however that such an index would rely on rough approximations and might be of limited relevance for WIS planning purpose, because of substantial differences between observation needs and telecommunication needs, noting in particular that:

- The RRR process for observation does not consider the number of users nor their locations, while these are important factors for telecommunication planning; and
- The RRR process for observation considers only geophysical parameters, while RRR for data exchange needs should consider a range of data levels, from raw data to processed products, depending on the user profile.

10.6 While noting that WIS requirements could be better captured through a dedicated approach based on direct enquiry with the users, as initiated by WIS and by the IGDDS project at regional level, EC-WG/WIGOS-WIS nevertheless welcomed this addition to the RRR. Despite the limitations identified, it would fill a gap in the long term planning of WIS capacity requirements by feeding into the Members planning processes for communications and computing systems replacement cycle.

## **11. REVISION OF WMO TECHNICAL REGULATIONS RELATED TO WIGOS AND WIS IMPLEMENTATION**

11.1 EC-WG/WIGOS-WIS reviewed a list of technical regulations, manuals and technical documents relating to WIS and WIGOS. It noted the approach of the ICG on WIS in the preparation of a series of documents including the WIS Functional Architecture, the WIS Technical Compliance Specifications for GISC, DCPC and NC, and the Governance Procedures for Nomination and Selection of GISC, DCPC and NC that will form part of a new publication titled Guidelines on WIS. It endorsed this approach and noted that the Guidelines on WIS will be a significant start to the Manual on WIS required by Congress.

11.2 EC-WG/WIGOS-WIS recommended that a similar approach should be applied to WIGOS documents with the plan to prepare an informative concise introductory document on WIGOS that would lead to a Guide on WIGOS ([Appendix IV](#)) providing the background and aims of WIGOS that will complement existing guidelines and manuals such as the Guide on the Global Observing System (WMO-No. 488) and the Guide to Meteorological Instruments and Methods of Observation (WMO-No. 8).

11.3 It was also noted that the WMO Technical Regulations and related publications should continue to be updated and reviewed taking into account current operational needs and practices, and that the new guidelines on WIS and WIGOS would eventually be incorporated into this process rather than persisting as additional documents.

11.4 EC-WG/WIGOS-WIS further noted the recommendation of CIMO Management Group that CIMO should consider development of the CIMO Manual that would be an Annex to the WMO Technical Regulations in which the agreed upon standards would be published, while ensuring that the chosen standards are affordable to Members. A proposal to this effect is being submitted to the

Executive Council for approval.

## **12. STATUS OF IMPLEMENTATION OF THE WIGOS DEVELOPMENT AND IMPLEMENTATION PLAN (WDIP)**

12.1 EC-WG/WIGOS-WIS considered the status of WDIP and accomplishments achieved by April 2009 and updated the current phase of it by indicating the status of the actions. The new version of the WDIP ([Appendix III](#)) will be submitted to EC-LXI for consideration and adoption.

12.2 Based on the discussion about Future Work Programme and Action Plan of EC WG (Item 14), planning Phase III. EC-LXI (June 2009) - EC-LXII (June 2010) was updated accordingly.

## **13. REPORT TO EC-LXI**

13.1 EC-WG/WIGOS-WIS discussed the issues to be submitted to EC-LXI for information and consideration. Those relate to the Implementation of the WIGOS Concept, WIGOS Concept of Operations and Development and Implementation Plan, WIGOS Demonstration (WDP) and Pilot Projects (WPP), and QMF in the WIGOS context.

13.2 EC-WG/WIGOS-WIS welcomed a decision of CBS-XIV to have a leading role in the WIGOS development and implementation. It supports recommendation of CBS-XIV to EC-LXI that the CBS president be, ex officio, a member of EC WG as well as its SG-WIGOS.

13.3 EC-WG/WIGOS-WIS requested EC-LXI to adopt new versions of the WIGOS Concept of Operations (CONOPS) and the WIGOS Development and Implementation Plan (WDIP) as presented in [Appendix II](#) and [Appendix III](#), respectively.

13.4 EC-WG/WIGOS-WIS requested EC-LXI to urge Members and technical commissions responsible for WDP and WPP to elaborate a detailed project implementation plan and work plan with specified tasks, activities, and achievable deliverables taking into account the guidance provided by EC WG.

13.5 EC-WG/WIGOS-WIS recommended that the current process of implementing the WIGOS concept should focus on the test-of-concept phase, building on development of WDPs and WPPs initiated by NMHSs and technical commissions respectively; the later "implementation" phase would be developed in conjunction with the finalisation of, and feedback from, WDPs and WPPs, based on appropriate evaluation criteria and agreed consolidation/implementation process.

13.6 EC-WG/WIGOS-WIS agreed on two additional WIGOS Projects: (a) the Global Space-based Intercalibration System (GSICS) as a joint initiative of WMO and the Coordination Group for Meteorological Satellites (CGMS), and (b) project for the implementation of the GCOS Reference Upper-Air Network (GRUAN).

13.7 EC-WG/WIGOS-WIS expressed its deep concern about the very limited resources provided through contribution to the WIGOS Trust Fund so far and requests Members to support WIGOS WPPs/WDPs by contribution to the WIGOS Trust Fund, and to support WIGOS Planning Office by secondment of experts to speed up WIGOS development and implementation.

13.8 EC-WG/WIGOS-WIS requests EC-LXI to task the EC Intercommission Task Team on Quality Management Framework to provide guidance on the development of the quality management framework for WIGOS.

13.9 EC-WG/WIGOS-WIS recommended that the following paragraph be included in the summary

text for EC-LXI as paragraph 3.4.44 of the draft text (*Guidance for the future development of WIGOS*): 3.4.44 In light of its review of the advice from EC-WG/WIGOS-WIS-2, the EC reaffirmed its strong support for the further development of the WIGOS concept and its implementation, following Cg-XVI endorsement, in collaboration with WMO's partner organizations and the observing systems. It requested the RAs, TCs, WMO Members and Secretary-General to provide all possible support for the actions needed to progress WIGOS from concept to reality.

#### **14. FUTURE WORK PROGRAMME AND ACTION PLAN OF EC WG**

14.1 EC-WG/WIGOS-WIS considered a List of Activities related to WIGOS development and implementation that was compiled from the already approved documents, terms of reference of EC WG and its SG-WIGOS, as well as from the deliberations of TECO-WIGOS and CBS-XIV.

14.2 EC-WG/WIGOS-WIS found that listed actions could not be achieved taking into account limited period of time for addressing associated issues and limited resources that would be made available for the WIGOS development and implementation. It, therefore, decided to review all activities and concentrate on those that are absolutely necessary for the preparation of guidance to EC-LXII and Cg-XVI on the WIGOS concept and for the preparation of a draft Comprehensive, Costed Development and Implementation Strategy.

14.3 Deadlines of actions were proposed on the assumption that the draft Comprehensive, Costed Development and Implementation Strategy should be ready to EC-LXII (June 2010) for approval and submission to Cg-XVI. The WIGOS Planning Office will regularly monitor the progress achieved and inform chairs of EC WG and SG-WIGOS to take actions as appropriate.

14.4 EC-WG/WIGOS-WIS agreed on responsibilities for individual actions, however, noted that consultants or seconded experts would be needed to assist EC WG and its SG-WIGOS to finalize some of the critical tasks. WIGOS Planning Office will have the overall responsibility for pursuing all defined activities in collaboration with the responsible bodies identified in the WIGOS Implementation Activities.

14.5 The approved WIGOS Implementation Activities listed in the [Appendix IV](#) constitutes the Future Work Programme and Action Plan of EC WG with a view to steering and monitoring all WIGOS activities.

#### **15. ANY OTHER BUSINESS**

15.1 Chair of EC WG, the Presidents of CBS and CIMO and D/OBS met with the Secretary-General of WMO to brief him on major outcomes of EC-WG/WIGOS-WIS-2 and discuss how to mobilize resources for WIGOS and WIS activities.

15.2 EC WG agreed that a next meeting will hold in Geneva, the WMO Headquarters in February - March 2010.

#### **16. CLOSURE OF THE SESSION**

16.1 The session closed at 16.45 hours on Friday, 8 May 2009.

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## CONCEPT OF OPERATIONS (CONOPS)

(Version 1.2 updated by EC-WG/WIGOS-WIS-2, May 2009)

### Foreword

There is a broadly recognized need for the integration of diverse space- and surface-based observing systems in a holistic approach. Various observing systems throughout WMO Programmes and WMO partner organizations have been developed, funded, managed and operated to meet their own specific purposes. By adopting the **WMO Integrated Global Observing System (WIGOS)** strategy, the Fifteenth World Meteorological Congress wished to establish a comprehensive, coordinated and sustainable system of observing systems in order to satisfy the observational requirements of all WMO and WMO co-sponsored Programmes in a cost-effective manner. Close cooperation and active collaboration is therefore needed among all partners to accomplish the broad integration objectives.

With this aim in view, WIGOS should define organizational, programmatic, procedural, and governance structures enabling a common standardized approach with uniform implementation of WMO regulations and practices, in order to ensure data integration and interoperability across all WMO observing systems. WIGOS should also provide a mechanism for interactions with WMO co-sponsored observing systems, respecting partnership, ownership and data-sharing policies of all observing components and partner organizations. WIGOS should significantly improve availability of observations and provide easier and wider access through the WMO Information System (WIS).

WIGOS will build on and add value to WMO's existing observing systems by coordinating their efforts, addressing shortcomings, supporting their interoperability, while meeting user requirements.

The WIGOS concept development and coordination initiative will stimulate the integration of WMO Member countries' observing capabilities into a worldwide composite system and architecture that improves overall system performance and efficiency.

The WIGOS integrated observation approach will provide a framework to support WMO Members' NMHSs and other relevant Institutions in the fulfilment of their national mandates including response to natural hazards, hydrological and environmental monitoring, climate observation, and adaptation to climate-change and human-induced environmental impacts. Together with WIS, WIGOS will significantly enhance Members' capabilities implementing WMO Programmes in developing and Least Developed Countries.

WIGOS development and implementation will proceed concurrently with the planning and implementation of WIS. The combination of both efforts will allow for an integrated WMO end-to-end system of systems designed to improve Members' capability to effectively provide a wide range of services and to better serve research programme requirements.

The agreed-upon standards and recommended practices, and procedures will apply to all WMO observing systems and Programmes. WMO will work with partner organizations to achieve maximum commonality of standards and practices across the co-sponsored observing systems. Strong cooperation and collaboration is needed among all partners. If WIGOS is to work for everyone, all relevant parties must work together in the implementation of the WIGOS concept.

The following Concept of Operations describes the end state of a fully operational WIGOS; it establishes the overall goals for WIGOS. In order to achieve them, a detailed WIGOS Development and Implementation Plan (WDIP) is being developed to provide for a logical transition from initial to full operational capabilities. To fully understand the WIGOS concept, these two principal documents must be considered together.

## **1. INTRODUCTION**

### **1.1 Vision**

WIGOS will benefit society through enhanced availability and integration of global weather, climate and water observations contributed by constituent systems.

### **1.2 Purpose**

The purpose of WIGOS is to create an effective organizational, programmatic, procedural and governance structure that will significantly improve the availability, usefulness, quality and utilization of observational data and products through a single focus for the operational and management functions of all WMO observing systems as well as a mechanism for interactions with WMO co-sponsored observing systems. Integration will lead to efficiencies and cost savings that can be reinvested to overcome known deficiencies and gaps in the present structure and working arrangements. In this way WIGOS will provide the capability to better utilize existing and emerging observation capabilities and so lead to:

- Improved availability of existing and future observational data;
- More, higher quality and a wider range of observations, environmental data and products;
- More efficient delivery of observational data and products to users;
- Maximising the return on investments in observations; and
- Optimization and full utilization of developments in future observing systems.

### **1.3 Integration**

1.3.1 Integration in the context of WIGOS should be defined as establishment of a comprehensive, coordinated and sustainable system of observing systems, ensuring interoperability between its component systems. It will be an organizational framework facilitating standardization and interoperability and ensuring availability and utilization of, and access to, good-quality data and products, and associated metadata.

1.3.2 The integration process should encompass four broad objectives:

- (a) Addressing the needs of the atmospheric, hydrologic, oceanographic, cryospheric and terrestrial domains within the operational scope of a comprehensive integrated system through standardization and network optimization;
- (b) Increasing interoperability between systems with particular attention given to space-based and *in-situ* components of the systems;
- (c) Ensuring that broader governance frameworks (e.g. inter-agency co-sponsorship of systems) and relationships with other international entities are sustained and strengthened;
- (d) Improving WMO management and governance (use of resources, planning, institutional and programme structures, and monitoring).

## **2. OVERVIEW**

### **2.1 Aim**

WIGOS aims to:

- (a) Address in the most cost-effective approach WMO Programme requirements with a view toward reducing the financial burden on Members, while maximizing administrative and operational efficiencies;

- (b) Ensure the availability of all required information produced within the various WMO observing systems (e.g. GOS, GAW, WHYCOS, etc.), and WMO components of co-sponsored systems (e.g. GCOS, GOOS, GTOS, etc.) including emphasis on information generated by satellite, radar, wind-profilers, airborne systems, *in-situ* ocean platforms, and other existing and future observing systems;
- (c) Facilitate the access, in real-time, near-real-time and delayed mode, of observations required to meet the needs of Members through WMO and WMO co-sponsored programmes, as well as relevant international conventions;
- (d) Ensure required data quality standards are met and sustained for all programme requirements;
- (e) Facilitate improved data management including archival and data retrieval capabilities;
- (f) Facilitate technological innovation opportunities;
- (g) Ensure collaboration with instrument manufacturers and scientific institutes in the development and testing of next generation observation instruments;
- (h) Develop appropriate regulatory documentation including organization and recommended practices, procedures and guidelines;
- (i) Link existing technologies in an integrated manner to provide societal benefits.

## 2.2 Characteristics

2.2.1 The concept of WIGOS is based on the premise that the general standards and recommended practices, as agreed-upon for WIGOS, will apply to all WMO observing systems and Programmes. WIGOS will foster increased collaboration with partner organisations towards the objective of harmonized standards including interoperability across all WMO co-sponsored observing systems.

2.2.2 The success of WIGOS will depend on data and metadata producers (i.e. mainly NMHSs) that are fully responsible for the quality of their own data and metadata, accepting and implementing a set of interoperability arrangements, including technical specifications for acquisition, collection, processing, management, storing, disseminating, and archiving shared data, metadata, and products. The owner of the observing system must accept the responsibility for implementing a quality management system that shall operate continuously at all points of the whole system, from planning and installation, operations, maintenance and inspection, test and calibration, quality and performance monitoring, evaluation and remedial procedures, training, to data pre-processing, dissemination, processing, management and archiving; performance monitoring, evaluation, feedback and follow-up actions are inseparable parts of this chain.

2.2.3 WIGOS characteristics include:

WIGOS will:

- Develop strategies to satisfy observational requirements of WMO Programmes and international partners through the WMO Rolling Requirements Review (RRR) Process;
- Develop strategies to guarantee system interoperability, including meeting documented standards for data quality of observing systems and instruments;
- Develop a strategy for the production, editing and management of metadata, including instrumentation/platform and data discovery;
- Evaluate existing and emerging capabilities before developing, acquiring, and or deploying new observing systems or sensors, and in the design of cost-effective composite observing systems;
- Exploit existing platforms and employ multi-sensor platform concept to the maximum possible extent;

- Coordinate the response to requirements, plans and activities with all technical commissions, regional associations and Programmes;
- Be built initially upon existing observing systems and provide an interoperable framework for new systems.

All WIGOS observational data, metadata and processed observational products will:

- Be exchanged via WIS using agreed upon data and metadata representation forms and formats;
- Use WIGOS compatible hardware and software;
- Adhere to WIGOS standards for instruments and methods of observation as well as standard observing network practices and procedures; and
- Be archived in WIGOS approved forms and resolutions at WMO agreed upon archival centres.

2.2.4 It must be emphasized that observing programmes of the WMO are actually carried out by WMO Member countries, either individually, or in some instances (notably for some satellite systems and oceanographic observing systems) cooperatively with consortia of countries operating a system jointly. Integration therefore will have a direct relationship to national programmes and activities as well as on coordination through the international organization.

### **3. ASSUMPTIONS**

#### **3.1 General**

WIGOS will provide a sustainable framework for the improvement of operations towards an integrated approach in support of WMO Member countries' national mandates including response to natural hazards, environmental monitoring, adaptation to climate change and man-made environmental impacts. It is consistent with the decision of the Fifteenth WMO Congress concerning enhanced integration between WMO Observing Systems and the WMO Strategic Plan.

#### **3.2 Key areas of standardization**

A key requirement for integration within a system of systems construct will be standardization in three key areas as shown schematically in Figure 1:

- Standardization of instruments and methods of observation;
- WIS information infrastructure;
- End-product quality assurance.

##### **3.2.1 Standardization of instruments and methods of observation**

WIGOS should encompass homogeneity, interoperability and, compatibility and traceability of observations from all WIGOS constituent observing systems. This should be based on guidance and studies and achieved through implementation of recommendations on methods of observation by the Instruments and Methods of Observation Programme (IMOP) and related programmes of partner organization within WIGOS constituent networks including tests, calibration and intercomparisons.

##### **3.2.2 WIS Information infrastructure**

3.2.2.1 The planning and implementation of WIGOS shall be coordinated with the WMO Information System (WIS). This will be accomplished through:

- Activities of the EC WG on WIGOS-WIS;
- EC WG on WIGOS-WIS Sub-Group on WIGOS (SG-WIGOS);



- Input from regional associations and technical commissions;
- Coordination role of the Secretariat, including the WIGOS Project Office.

3.2.2.2 Technologically, the key action leading to the desired integrated networks will be the generation of data and information from WIGOS constituent networks using a comprehensive, standardized data representation in compliance with WIS information exchange requirements for all WMO Programmes.

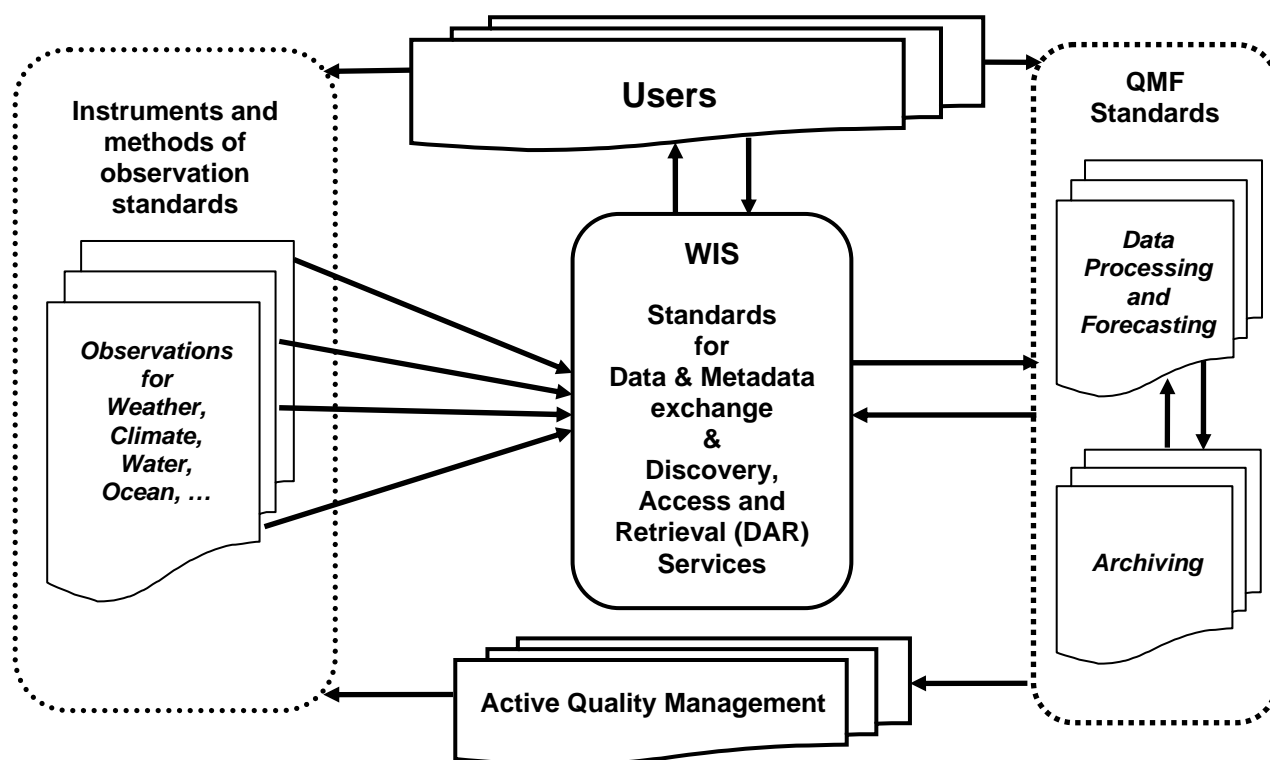
3.2.2.3 A role of WMO Information System (WIS) will be as follows:

- It will be used in the collection and sharing of information for all WMO and related international programmes;
- It will provide a flexible and extensible structure that will allow participating centres to enhance their capabilities as their national and international responsibilities grow;
- Implementation will build upon the most successful components of existing WMO information systems in an evolutionary process;
- Development will pay special attention to a smooth and coordinated transition;
- Communication networks will be based on communication links used within the World Weather Watch (WWW) for distribution of high priority real-time data;
- It will utilize international agreed-upon standards for protocols, hardware and software.

### **3.2.3 End-product quality assurance**

The third key area of standardization for WIGOS should embrace a quality management framework (QMF) and updated technical regulations to ensure the best possible products to be delivered to end users. This should be based on agreed-upon quality assurance and quality control standards, with the following goals:

- To ensure integrated/coordinated data acquisition efforts among NMHSs and other operators to minimize duplication;
- To reduce costs and maximize data and products availability and quality;
- To develop an integrated quality management system that delivers reliable and timely data streams with adequate quality control and relevant metadata.



**Figure 1: Key areas of WIGOS standardization**

The three areas of standardization of the WMO and co-sponsored observing systems contributing to WIGOS: standardization of instruments and methods of observation, WIS information infrastructure; and end product quality assurance.

**The first area of standardization:** a sustained, optimized, end-to-end WMO Integrated Global Observing System should encompass homogeneity, interoperability, compatibility, and traceability of observations from all WIGOS constituent observing systems. This should be achieved through meeting the requirements for instruments and methods of observation established by the Commission for Instruments and Methods of Observation (CIMO) and those promulgated by partner organizations including tests, calibration and intercomparisons.

**The second area of standardization:** Data and information generated by all WIGOS constituent networks should meet a comprehensive, standardized set of WIS data and metadata exchange requirements for all WMO Programmes and co-sponsored programmes.

**The third area of standardization:** Various end-products generated on the basis of observations/measurements by all WIGOS constituent observing systems and exchanged through WIS should meet quality management framework requirements to ensure the best possible products are delivered to end users.

#### 4. RESPONSIBILITIES

In order to commence efforts towards achieving full WIGOS operations, the following entities are considered to have essential responsibilities:

- Sponsors and co-sponsors of WIGOS constituent systems, both current and future;
- EC WG on WIGOS-WIS;
- SG WIGOS;
- Inter-Commission Coordination Group on WIS (ICG WIS);
- Regional associations and technical commissions;
- WMO Secretariat.

## **5. OPERATIONAL FRAMEWORK**

### **5.1 Overall approach**

This Concept of Operations covers the full spectrum of management and integration for WIGOS. In order for WIGOS to effectively and efficiently respond to user data needs, WIGOS will use WIS as a data exchange, discovery, access and retrieval mechanism.

### **5.2 WIGOS components**

The WIGOS constituents are (noting that the following are not necessarily complete):

- (a) The surface-based component of the Global Observing System (GOS) of the World Weather Watch (WWW) Programme;
- (b) Space-based component of the GOS including the geostationary meteorological satellite constellation, the core polar-orbiting meteorological constellation and R&D earth observation satellites;
- (c) Aircraft Meteorological Data Relay (AMDAR) systems including expansions of aircraft measurement capabilities for atmospheric composition constituents;
- (d) Marine meteorological and relevant oceanographic observing networks;
- (e) The relevant components of atmospheric, oceanographic and terrestrial observing systems contributing to GCOS;
- (f) Related terrestrial network;
- (g) Regional, river basin and global hydrological networks;
- (h) The Global Atmosphere Watch (GAW) networks and systems for observation of atmospheric chemical composition and related environmental parameters;
- (i) The various radiation networks both observing solar and net radiation (e.g. the BSRN);
- (j) The observing component of the proposed Global Cryosphere Watch approved by the fifteenth WMO Congress;
- (k) Other possible components yet to be defined.

### **5.3 Integration, Standardization and Interoperability**

It is envisioned that the integration process will bring about architectural and governance structures as well as processes for WIGOS development, implementation and sustainability. Standardization and interoperability, including data compatibility, are primary factors enabling integration. WIGOS will:

- Improve the production, use and application of data and information from across all WMO and co-sponsored observing systems, in a seamless way, to satisfy user requirements;
- Be designed to accommodate the diversity among Member countries with respect to their capabilities and needs;
- Strengthen the ability of all Member countries to access and utilize observations and analysis products from all WMO and co-sponsored observing systems;
- Ensure compatibility, connectivity and interoperability including interface arrangements within and among all WMO and co-sponsored observing systems components and externally with other users;
- Allow for the continuous review of the requirements placed on the integrated system and have the capability to effectively adjust and respond to changing requirements;

- Ensure the continuing sense of ownership by the various groups that have initiated and developed the individual observing system components through directly involving these groups in the planning and implementation of the WIGOS;
- Promote the development, testing and comparison of new observing capabilities and provide mechanisms to easily integrate them into WMO and co-sponsored operational observing systems;
- Ensure the optimum integration of the various components of all observing programmes;
- Increase efficiency and effectiveness by reducing as far as possible redundancies and overlaps of systems and the management activities supporting them;
- Facilitate more rapid and efficient assimilation of technological advances and apply them as far as possible across all observing programmes;
- Foster co-location of observing sites of complementary systems as far as practical thereby reducing redundancies; and
- Ensure the involvement of the various scientific and user communities in the activities of setting requirements, and monitoring and assessing system performance.

#### **5.4 Relation with the co-sponsored observing systems**

5.4.1 Effective implementation and operation of WIGOS will require close ongoing collaboration with several of WMO's partner organizations (UNESCO and its IOC, UNEP, FAO, and ICSU) with whom it co-sponsors the Global Ocean Observing System (GOOS), the Global Terrestrial Observing System (GTOS) and the cross-domain Global Climate Observing System (GCOS). This will be necessary in order to ensure essential interoperability and mutual support while also respecting and reinforcing the individual identities and mandates of both the partners and their co-sponsored observing systems. It will also require a clear understanding, at both international and national levels, as to how WIGOS, GOOS, GTOS and GCOS fit together within the overall framework of GEOSS.

5.4.2 By virtue of WMO's co-sponsorship of the IOC-led GOOS and the FAO-led GTOS, those parts of these systems which contribute to, or support, WMO research and service programmes, are appropriately regarded as part of WIGOS. Every effort should be made, therefore, to achieve full interoperability and mutually supportive advisory and coordination arrangements with both GOOS and GTOS.

5.4.3 Similarly, the jointly-sponsored, cross-cutting GCOS, which is made up primarily of the climate-relevant components of WIGOS, GOOS and GTOS, will need to be implemented and operated on the basis of maximum possible complementarity and mutual support between GCOS and its component systems, including WIGOS.

5.4.4 Coordination will be needed at policy, technical and Secretariat levels. Policy and technical coordination will be facilitated through cross representation at sessions of the advisory/steering committees and implementation bodies of the various systems supported by joint working groups and the like. The principal mechanisms for inter-Secretariat coordination will be the WMO-UNESCO-UNEP-FAO-ICSU Interagency Coordination and Planning Committee for Earth Observations (ICPC) which was established to ensure a well-coordinated UN system contribution to GEOSS.

5.4.5 The policy, technical and Secretariat coordination mechanisms may also need to be supported by a higher-level reconciliation mechanism defined through the WMO-UNESCO-IOC-UNEP-FAO-ICSU Memoranda of Understanding (MOU) in order to resolve possible conflicts on data policy, product delivery and other governance issues.

5.4.6 These interagency and inter-observing system coordination mechanisms at the international level will need to be complemented and supported through similar cooperation and coordination arrangements between NMHSs and their counterpart national implementation mechanisms for GOOS, GTOS, GCOS and GEOSS.

## 6. DATA POLICY

6.1 WIGOS will respect the data policies of partner organizations and will adhere to the decisions of the Twelfth and Thirteenth World Meteorological Congresses (1995, 1999) that adopted 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", and Resolution 25 (Cg-XIII) "Exchange of Hydrological Data and Products", respectively.

6.2 WIGOS will strive to ensure that the conditions placed by the originator on the additional data and products are respected and made known to initial and subsequent recipients for the exchange of meteorological and related data and products including guidelines on relationships in commercial meteorological and hydrological activities.

## 7. BENEFITS

Across all WMO domains of activity, WMO Member countries and partner organizations will benefit from WIGOS through:

- Improved quality, traceability and consistency of observations for better products and services;
- Improved access to observations, whether real-time, or not;
- Optimization of observing network design and flexibility to incorporate new observing systems;
- Improved coordination, standardization and evaluation of national observing networks by National Meteorological and Hydrological Services (NMHSs);
- Improved data assimilation techniques to allow better exploitation of observations in Numerical Weather Predictions (NWP) in an integrated manner.

## 8. CHALLENGES

Challenges and needs associated with embarking upon integration of WMO and co-sponsored observing systems include but are not limited to:

- Active collaboration, close cooperation and coordination by, and firm long-term commitment of all concerned;
- Timely and effective implementation of integration concept by individual Members;
- Differences in levels of development of national and regional systems and services;
- Achieving the timeline as laid out by Cg-XV and, in particular, the need for an early start to additional Pilot Projects and Demonstration Projects;
- The need for a comprehensive and costed development and implementation strategy for WIGOS that, inter alia:
  - (a) Fully outlines the technical challenges to be addressed and the roles and responsibilities of all players,
  - (b) Elucidates the process for capturing the lessons-learned from the Pilot Projects and Demonstration Projects,
  - (c) Outlines a capacity building strategy to ensure the benefits of WIGOS will reach all Member countries, and
  - (d) Designates clear responsibilities across the WMO system for the further development of WIGOS;
- The need to complete the full functionality of WIS so that WIGOS can exploit new data access and retrieval facilities;

- The importance of engaging the hydrological community in WIGOS activities;
- The need to clarify and communicate the relationship and intersection of WIGOS with the co-sponsored observing systems, (GOOS, GTOS and GCOS) and with GEOSS;
- Finding ways to demonstrate the opportunities of WIGOS to all potential partners and users to build their ongoing support, trust and collaboration; and
- Finding a way to more effectively incorporate all WMO observing activities into WIGOS and address their different requirements and priorities, especially the need to ensure WIGOS effectively supports all WMO applications programmes;
- Elaboration of a comprehensive implementation strategy that takes WIGOS from concept to reality, and its implementation;
- Technical challenges including:
  - (a) Documenting and validating requirements for operational weather, climate, water and related environmental observations (Building on Rolling Requirements Review),
  - (b) Specifying relevant processes, procedures and relationships,
  - (c) Determining standards, procedures, practices and protocols,
  - (d) Step-by-step implementation of sets of standardization, interoperability and data compatibility arrangements into operational observing networks and systems, and
  - (e) Systematic and rigorous performance monitoring and evaluation (PM&E) of WIGOS capabilities;
- Adequately structured and resourced WMO Secretariat.

## **9. RISKS**

Associated risks are as follows:

- Resources will be a critical risk factor in achieving timely completion of WIGOS goals. Current low level allocation of resources, including the lack of a fully functioning WIGOS Project Office, is an impediment to progress;
- Effective and constructive cooperation, collaboration and coordination is not achieved;
- Long-term commitments by all players are not achieved;
- Timeframe for implementation of WIGOS is not understood and/or not achieved;
- Adequate resources and support are not available to players to achieve key elements of WIGOS implementation;
- Resource, coordination etc. requirements for ongoing operation of WIGOS are inadequately understood and/or provided for;
- Full implementation of agreed-upon standards, procedures and practices is not achieved across all WMO observation systems.

## **10. RESOURCES**

Implementation of WIGOS will require substantial resources and support at the national, regional and global levels as well as within the WMO Secretariat.

**LIST OF ACRONYMS**

AMDAR	Aircraft Meteorological Data Delay
BSRN	Basic Surface Radiation Network
CONOPS	Concept of Operations
EC WG	Executive Council Working Group
GAW	Global Atmospheric Watch
GCOS	Global Climate Observing System
GOOS	Global Ocean Observing System
GOS	Global Observing System
GTOS	Global Terrestrial Observing System
ICG WIS	Inter-Commission Coordination Group on WIS
QA	Quality Assurance
QC	Quality Control
QMF	Quality Management Framework
QMS	Quality Management System
R&D	Research and Development
WDIP	WIGOS Development and Implementation Plan
WHYCOS	World Hydrological Cycle Observing System
WIGOS	World Integrated Global Observing System
WIS	WMO Information System
WWW	World Weather Watch

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## WIGOS TEST OF CONCEPT DEVELOPMENT AND IMPLEMENTATION PLAN (WDIP)

*(Version 1.2 updated by EC-WG/WIGOS-WIS-2, May 2009)*

### I. Introduction

The following document is an update of the WIGOS Development and Implementation Plan as mandated by the Fifteenth WMO Congress (Cg-XV).

### II. Strategic Roadmap for Testing the WIGOS concept

2.1 Cg-XV agreed that planning and implementation of the WIGOS test of concept should proceed in phases defined by the annual sessions of the WMO Executive Council in order to assure oversight, review and direction. To that end, Cg-XV requested EC-LIX to appoint a Working Group to oversee WIGOS and WIS. The process foreseen was one where planning and implementation of WIGOS would be considered at Cg-XVI (2011), and the WIGOS Implementation Plan for the next intersessional period would be determined.

2.2 EC-LIX, by its Resolution 3 (EC-LIX), established the EC Working Group on the WMO Integrated Global Observing System and the WMO Information System (EC-WG/WIGOS-WIS) with terms of reference as follows:

- (1) Provide advice and guidance in the preparation of an overarching WIGOS Development and Implementation Plan;
- (2) Refine the WIS Development and Implementation Plan and ensure coordination between WIGOS and WIS Plans to allow for an integrated WMO end-to-end system of systems;
- (3) Monitor the development and implementation of WIGOS and WIS through a "rolling review" mechanism; and
- (4) Monitor the development and implementation of WIGOS-WIS "Pilot Projects", as suggested by the Fifteenth Congress, to test concepts, identify problem areas, and to help in elaborating the Development and Implementation Plan.

2.3 As authorized by EC-LIX, EC-WG/WIGOS-WIS established its Subgroup on WIGOS with following terms of reference:

- (1) To provide overall technical guidance, assistance and support for the implementation of the WIGOS concept based on strategic directive of the Fifteenth WMO Congress;
- (2) To elaborate in detail the three areas of integration of WIGOS including standard practices to be applied to the different areas of WIGOS integration; integration areas being as follows and further described in the WIGOS Concept of Operations:
  - Standardization of instruments and methods of observation (instruments and methods of observation levels),
  - Common information infrastructure (WIS data levels),
  - End-product quality assurance (QM/QA/QC product levels);
- (3) To work with each WIGOS component, propose new components and coordinate agreed interactions with other partners (e.g. co-sponsored systems, international initiatives' systems, etc.);
- (4) To refine the concept of WIGOS operations, including its basic definitions;
- (5) To address major issues identified by the EC Working Group on WIGOS and WIS;
- (6) To develop a mechanism for the inclusion of the regional aspects of WIGOS through involvement of the presidents of regional associations;
- (7) To coordinate the WIGOS planning phases (including the Pilot Projects) according to the over-

arching WIGOS Development and Implementation Plan;

- (8) To coordinate WIGOS implementation with the planning and implementation of the WMO Information System (WIS);
- (9) To advise the EC Working Group on WIGOS and WIS on aspects related to management, governance and interoperability;
- (10) To report to the EC Working Group on WIGOS and WIS.

2.4 The WIGOS Test of Concept Development and Implementation Plan (WDIP), should take into account the WIS Development and Implementation Plan, and will be updated annually during the four-year period 2008-2011. A draft Version 1.0 of this document was reviewed and updated at the first session of the EC-WG/WIGOS-WIS. Subsequent reviews and updates will benefit from experience gained from the various Pilot Projects, Demonstration Projects and inputs from the technical commissions, regional associations and the advisory/steering bodies of WMO co-sponsored programmes. Meetings of EC-WG/WIGOS-WIS will provide oversight and guidance regarding the evolution of the Plan, which subsequently would be considered at each session of EC. While further evolution of the Plan will occur, it is anticipated that it should include an assessment of all observational requirements of all WMO Programmes and co-sponsored programmes and identify those (including characteristics such as observational accuracy and resolution) that are needed to service all programmes or applications. It would also include implementation details for the various Pilot Projects, Demonstration Projects and their results, details of actions required to address revisions of the terms of reference (TOR) of the technical commissions, the WMO Programme structure, and WMO Secretariat budgetary, personnel and organizational implications. Many observing systems are outside of the remit of Member NMHSs; however their data provides a valuable contribution to WMO Programmes and Member NMHSs. Additionally, observational data from WMO Programmes and co-sponsored programmes is of value to organizations outside of WMO. The WDIP needs to address this from the aspect of improving data access across these boundaries. Data dissemination practices must be capable of respecting the data-sharing policies as designated by the owners of the observing systems including authorization of users.

2.5 The Roadmap or schedule below is broken into annual Phases timed according to sessions of EC. The items listed under each Phase required further elaboration since the dates of various events (e.g. Commission Meetings) are not yet confirmed, but they should be incorporated as the information becomes available. For historical purposes as well as further elaboration of the Plan, a description of the Preparatory Phase that occurred prior to Cg-XV is reproduced as well. The preparation of Version 1.0 of WDIP (WDIP V.1.0) that was endorsed by the EC in June 2008 was a crucial first step. WDIP V.1.1, and its subsequent revisions, will be important for informing the technical commissions, regional associations and the steering committees of GCOS, GOOS, GTOS and WCRP on WIGOS and WIS planning activities and to encourage their input into the process. Scheduling of as many regular sessions of technical commissions and regional associations as possible before 2010 would be most useful in obtaining their input in the planning process. EC-LXII (2010) marks the end of the active planning period since during its session the basic proposals to Cg-XVI will be prepared. Essential to taking this process forward will be the staffing of a WIGOS planning office in the WMO Secretariat as was proposed in III. (3) and IV. (3).

## **STATUS of the testing the WIGOS concept**

### **III. Preparatory Phase - December 2006 – Cg-XV (May 2007)**

- (1) Document prepared for the EC Task Team on the WMO Integrated Global Observing Systems (EC-TT/WIGOS), February 2007; (Status: Completed);
- (2) Report of EC-TT/WIGOS submitted to Cg-XV. This report to address the decision of EC-LVIII as contained in Resolution 13 (EC-LVIII); (Status: Completed);
- (3) Formation of an internal Interim WMO Secretariat WIGOS Team under the chairmanship of a Director with participation from all relevant WMO Programmes. The Interim Secretariat WIGOS Task Team to address follow-up actions as required according to proposals by the EC-TT/WIGOS in preparation for presentation to Cg-XV. (Status: Not completed.

### **IV. Test of Concept, Phase I. Cg-XV (May 2007) – EC-LX (June 2008)**

- (1) Establish and update as appropriate the WIGOS Concept of Operations (CONOPS); (Status: Completed);
- (2) Cg-XV through the EC-LIX establishes the EC-WG/WIGOS-WIS to oversee the development of WIGOS and WIS; (Status: Completed);
- (3) Full time WIGOS Planning Unit organized in the WMO Secretariat (June 2007); (Status: Partially done);
- (4) Coordinate with IOC regarding the WIGOS-WIS initiatives; (Status: Completed);
- (5) Initiate the preparation of the draft WDIP v.1.0 (completion by Dec. 2007). Present the draft WDIP v.1.0 to EC-WG/WIGOS-WIS; (Status: Completed);
- (6) Initiate first Pilot Projects:
  - (a) Joint GOS-GAW Pilot Project to accelerate implementation of WIGOS-WIS; (Status: Initiated);
  - (b) Initiation of Global Hydrological Network addressing a GCOS Requirement; (Status: Still in planning process);
  - (c) Integration of AMDAR into WIGOS; (Status: Initiated);
  - (d) Elaborating the underpinning/crosscutting role and responsibilities of the Instruments and Methods of Observation Programme; (Status: Initiated);
  - (e) Integration of marine meteorological and other appropriate oceanic observations into the WMO Global Observing System; (Status: Initiated);
- (7) Adjust draft WDIP and CONOPS v.1.0 as guided by EC-WG/WIGOS-WIS and present draft WDIP and draft CONOP v.1.1 to EC-LX; (Status: Completed);
- (8) The agendas of technical commissions and regional associations should include an item relating to the Integration of WMO Observing Systems and should seek their “consensus inputs” to the WDIP to which the EC-WG/WIGOS-WIS would provide an input; (Status: done);
- (9) At the Meeting of Presidents of Technical Commissions a major agenda item should be the WDIP to which the EC-WG/WIGOS-WIS would provide input. (Status: Partly completed);
- (10) Initiate planning for the eight Demonstration Projects (see paragraph IX.); (Status: Done in the case of six);

**V. Test of Concept, Phase II. EC-LX (June 2008) - EC-LXI (June 2009)**

- (1) EC-LX provides guidance for this phase; (Status: done);
- (2) Review and update as appropriate the WIGOS CONOPS and WDIP; (Status: done);
- (3) Initiate planning for the Pilot Projects concerning the integration of marine meteorological and oceanographic observations with WIGOS-WIS; (Status: done);
- (4) The Pilot Projects (PP) begun in Phase I evaluated by corresponding Project Teams and SG-WIGOS; adjustments to the WDIP may arise from the evaluations; (Status: ongoing with a good progress: PP-I: Implementation Plan is missing; PP-II: change of the project; PP-III: Ongoing; PP-IV: Ongoing; PP-V: Ongoing);
- (5) Coordinate with GTOS regarding terrestrial initiatives of relevance to WIGOS; (Status: pending, waiting for GCOS proposal on new PP);
- (6) Additional Pilot Projects may be identified; (Status: done: EC-WG: reviewed and agreed with new proposals for GRUAN and GSICS Pilot Project);
- (7) Demonstration Projects begun in Phase I evaluated by SG-WIGOS; adjustments to the WDIP may arise from the evaluations; (Status: Ongoing; project implementation plans to be submitted);
- (8) Schedule possible concurrent sessions of CAS and CBS with joint agenda items regarding the integration of GAW and GOS into WIGOS; (Status: not feasible; Coordination underway; issue to be addressed/presented at CAS by appropriate WIGOS representative);
- (9) Initiate work on the proposed revision to the WMO Technical Regulations; (Status: noted that some actions are required on Technical Regulations to be accomplished upon completion of Pilot and Demonstration Projects; initial discussion on the technical regulations is needed considering lessons learned);
- (10) Revise WDIP and CONOPS and submit to EC-LXI for review and guidance; (Status: done);
- (11) The agendas of technical commissions and regional associations should include an item relating to the Integration of WMO Observing Systems (including relevant components of co-sponsored observing systems) and should seek their "consensus inputs" to the WDIP to which the EC-WG/WIGOS-WIS would provide input; (Status: done at CHy-XIII, XIV-RA II, CBS TECO-WIGOS; XV-RA IV, CBS-XIV);
- (12) Coordinate a way that RA working bodies can be involved into WIGOS activities in the Region (Status: started: initiated for two RAs (II, IV) that met during the period);
- (13) Develop a reporting mechanism for Pilot and Demonstration projects; (Status: Ongoing);
- (14) Elaborate basic definitions of WIGOS operations; (Status: Ongoing);
- (15) Elaborate three areas of integration; (Status: done; significant revision achieved);
- (16) Elaborate guidance on Demonstration Projects; (Status: Ongoing);
- (17) Organize a workshop to facilitate the use of DCPCs in Pilot and Demonstration Projects; (Status: Pending);

**PLANNING of the testing the WIGOS concept**

**VI. Test of Concept, Phase III. EC-LXI (June 2009) - EC-LXII (June 2010)**

- (1) EC-LXI provides guidance for this phase (note this is the last period for active planning before specific proposals are prepared for submission to Cg-XVI);
- (2) Review and update as appropriate WIGOS CONOPS and WDIP;

- (3) Agreed activities of Pilot and Demonstration Projects begun in Phase I and II should be completed and evaluated for viability of the WIGOS concept. Experiences from Pilot and Demonstration Projects to be reflected in the draft Implementation Plan for WIGOS;
- (4) SG-WIGOS meets in 2009 to consider status of Demonstration and Pilot Projects, updates of CONOPS and WDIP and formulate recommendations for EC-WG/WIGOS-WIS;
- (5) EC-WG/WIGOS-WIS meets in 2010 to elaborate draft recommendations for EC-LXII;
- (6) The agendas of technical commissions and regional associations should include an item relating to the WIGOS and should seek their “consensus inputs” to the WDIP;
- (7) Finalize elaboration of areas of integration;
- (8) Elaborate standardized description of all observing networks contributing to WIGOS;
- (9) Develop WIS component (e.g. DCPC) for each Demonstration and Pilot Project when needed;
- (10) Develop Guidance for NMHSs why and how to optimize their observing network by integration of their observing systems;
- (11) Coordinate with GCW regarding cryospheric initiatives of relevance to WIGOS;
- (12) Further WIGOS implementation activities for the period May 2009 – March 2010 were considered by the second session of the Executive Council Working Group on the WMO Integrated Global Observing System and the WMO Information System (EC-WG/WIGOS-WIS-2), 6 - 8 May 2009, and were included in the Future Work Programme and Action Plan of EC WG (Reference: Final Report of EC-WG/WIGOS-WIS-2, [Appendix IV](#)).

#### **VII. Test of Concept, Phase IV. EC-LXII (June 2010) - Cg-XVI (May 2011)**

- (1) EC-LXII to agree on the content of the submission to Cg-XVI regarding the implementation of WIGOS. This will include the proposed changes to the Technical Regulations, the revised roles and Terms of References of the various technical commissions, the adjustments to the WMO Programme structure, and the impact on the Secretariat budgets and personnel, proposed actions of Cg-XVI how to implement WIGOS;
- (2) Subgroup WIGOS meets in 2010 to formulate advice and recommendations to EC-WG WIGOS-WIS;
- (3) EC-WG WIGOS-WIS considers matters relating to the revision of the Technical Regulations, the TORs of technical commissions, and proposals regarding WMO Programme structure and content, and the WMO Secretariat structure will be addressed in this Phase;
- (4) Coordinate a way that RA working bodies can be involved into WIGOS activities in the Region;
- (5) Pilot and Demonstration Projects will be evaluated for sustained legacy within WIGOS if appropriate. Experiences from Pilot and Demonstration Projects should be reflected in the draft Implementation Plan for WIGOS;
- (6) Test of concept WDIP and CONOPS are completed and draft WIGOS Implementation Plan is prepared;
- (7) EC-WG WIGOS-WIS submits its final report and recommendations to Cg-XVI.

#### **VIII. Pilot Projects**

Undertaking at the earliest possible stage several WIGOS Pilot Projects would be useful to address major issues on the integration process and would help in elaborating the WDIP. Pilot Projects will emphasize the role and contributions to be made by the Technical Commissions. In accordance with recommendations by Cg-XV, the following Pilot Projects were identified:

- *Pilot Project I:* Improvement of **Dissemination of Ozone** (total column, profiles and surface) and **Aerosol** observations through the WIS;
- *Pilot Project II:* **Hydrological Applications Runoff Network**;
- *Pilot Project III:* Integration of AMDAR into WIGOS;
- *Pilot Project IV:* Elaboration of the underpinning/crosscutting role and responsibilities of the Instruments and Methods of Observation Programme in the context of WIGOS;
- *Pilot Project V:* Integration of Marine Meteorological and other appropriate Oceanographic Observations into the WMO Integrated Global Observing System.

Additional projects can be initiated after approval of EC-WG/WIGOS-WIS.

## **IX. Demonstration Projects on the Development and Implementation of WIGOS at NMHSs**

9.1 Helping Members to more fully understand WIGOS and keeping them up-to-date on its practical development should be considered as an essential component in WIGOS implementation. This can be achieved through launching Demonstration Projects in selected NMHSs. These Demonstration Projects will be linked to demonstrating aspects of the WIGOS concept and, at this early stage of WIGOS development, the Demonstration Projects should aim to be focussed on specific aspects of WIGOS and not be overly ambitious. Feedback and lessons learnt from these NMHSs will be extremely beneficial in understanding expectations of the WIGOS concept at a national or regional level. These projects will also have a high profile impact since they may involve functions of other observing networks that provide the delivery of time critical data and products, as well as other information, underlying the basic operations of NMHS. The Secretariat working with appropriate working bodies of regional associations and technical commissions would ensure regular coordination and communication between Members involved in Demonstration Projects.

9.2 The following countries expressed their willingness and intention to launch Demonstration Project: Kenya, Namibia and Morocco (RA I), Republic of Korea (RA II), Brazil (RA III), United States of America (RA IV), Australia (RA V) and the Russian Federation (RA VI). Proposals for new Demonstration Projects will be considered when submitted.

## **X. WIGOS web page**

It is essential to have an effective website containing current information about WIGOS roles and tasks, related upcoming events and background information. The WMO Secretariat, in coordination with Members, relevant focal points for WIGOS in regional associations and technical commissions, will establish and update of a WIGOS web pages on the WMO Website by publishing information about WIGOS, including information on the current status of implementation of Pilot and Demonstration Projects, providing condensed information to various WIGOS user communities. (Status: Completed; See: [http://www.wmo.int/pages/prog/www/wigos/index\\_en.html](http://www.wmo.int/pages/prog/www/wigos/index_en.html)).

## **XI. Policy and Governance Aspects**

To accomplish the goals above regarding the development of a WMO Integrated Global Observing System, adjustments must be made in the WMO Technical Regulations, the WMO Programme structure, the working structure and functions of the technical commissions, and of the WMO Secretariat. The motivations for WIGOS are focused to the objective of instituting an integrated end-to-end system of systems - comprised principally of WIGOS and WIS. The development of an effective and efficient system of governance to guide and implement it, arrangements for effective scientific and technical advisory mechanisms to develop, monitor and evaluate it, and an appropriate WMO Programme and WMO Secretariat structures to support it, will all be important and essential

components of the systems integration.

## **XII. WMO Technical Regulations (TR)**

12.1 One of the principal strengths of WMO is the organizational and operational backbone provided by the *WMO Basic Document Series No. 2, Technical Regulations* (WMO-No. 49). The three volumes of the WMO Basic Document Series are supplemented by Annexes called Manuals, which have the same status as the Basic Documents and are aimed at facilitating cooperation between WMO Members, specifying their obligations and ensuring adequate uniformity and standardization in the practices and procedures employed. In addition to the Manuals, there is a class of WMO documentation, not part of the technical regulations, called *Guides* (e.g. the *Guide to the Global Observing System* (WMO-No. 488)). The purpose of the *Guides* is to provide practical information on the development, organization, implementation and operation of the system, subsystem(s) or service in order to enhance both the participation of individual WMO Members in the activity and the benefits they may obtain from it. The *Guides* supplement the regulatory material contained in the TR and their Annexes.

12.2 The present structure of the Technical Regulations, Volume I describes the WWW/GOS, GDPFS, and GTS with other components of the overall WMO Programmes or systems distributed within the GOS or simply added on as they evolved. In order to effectively approach the integration of WMO Global Observing System, and to incorporate WIS, a fundamental reorganization and approach to the WMO TR is required. Undertaking this task early in the WIGOS and WIS planning activity will provide structure and organization to the overall effort, and will help in organizing the work programme required to implement WIGOS and WIS.

12.4 The revised structure of the TR must document the structure of WIGOS. The revised TR will need to be comprehensive and reflect all of the component systems. It will allow addressing the wide ranging multi-discipline issues and requirements for observational resources from all domains (atmosphere, ocean, and terrestrial). It should also build on and amplify the integration across surface-based and space-based observations.

12.5 In undertaking such a revision, a clearer vision for the purpose, scope, content and structure for continuous review and updating of the various elements that make up the TR, including the Guides, should be developed.

12.6 There is also an opportunity to make the TR easier to access, update and use. The application of electronic access through the Internet or similar technology for technical regulatory information should be considered as part of the integration activity. The role of WIS as the vehicle for this function may be a viable option.

## **XIII. WMO Programmes and technical Commissions**

13.1 It may be considered that one single WMO Programme should be assigned the responsibility to lead the planning of WIGOS and WIS and with its ultimate implementation and operation, noting that EC-LX emphasized that CBS should take a lead role for WIGOS. Participation during the integration by the other Programmes which currently have responsibility for components of the WMO Global Observing System will be crucial in this transition. The feasibility of this idea, in particular for the operation of WIGOS, should be investigated during the test of concept phase and incorporated into the draft WIGOS Implementation Plan for consideration by Cg-XVI.

13.2 As recognized in Resolution 30 (Cg-XV), the process leading to WIGOS would have a wide impact on the structure and functions of WMO including the WMO Technical Regulations, data policy, roles, terms of reference, and working arrangements of the technical commissions, the WMO Programme structure and the WMO Secretariat.

## **XIV. Jointly Sponsored Observing Systems**

In progressing towards enhanced integration between WMO observing systems, it will be important that this be carried out in close coordination and cooperation with WMO's partner organizations that co-sponsor some of those systems. This will apply particularly to:

- The joint WMO-IOC-UNEP-ICSU Global Climate Observing System (GCOS);
- The WMO contribution to the joint IOC-UNEP-WMO-ICSU Global Ocean Observing System (GOOS);
- Those terrestrial/hydrological observing systems which serve as part of the FAO-UNEP-WMO-ICSU Global Terrestrial Observing System (GTOS);
- WCRP (WMO, IOC, ICSU) observing components.



**LIST OF ACRONYMS**

AMDAR	Aircraft Meteorological Data Delay
CBS	Commission for Basic Systems
CIMO	Commission for Instruments and Methods of Observation
CONOPS	Concept of Operations
DCPC	Data Collection or Production Centres
EC WG	Executive Council Working Group
FAO	Food and Agriculture Organization
GAW	Global Atmospheric Watch
GCW	Global Cryosphere Watch
GCOS	Global Climate Observing System
GDPFS	Global Data-Processing and Forecasting System
GOOS	Global Ocean Observing System
GOS	Global Observing System
GRUAN	Global Reference Upper-Air Network
GSICS	Global Space-based Inter-Calibration System
GTOS	Global Terrestrial Observing System
GTS	Global Telecommunication System
ICSU	International Council for Science
IOC	Intergovernmental Oceanographic Commission
QA	Quality Assurance
QC	Quality Control
QM	Quality Management
QMF	Quality Management Framework
QMS	Quality Management System
UNEP	United Nations Environment Programme
WCRP	World Climate Research Programme
WDIP	WIGOS Development and Implementation Plan
WIGOS	World Integrated Global Observing System
WIS	WMO Information System
WWW	World Weather Watch

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**Work Programme and Action Plan of EC WG  
WIGOS Implementation Activities  
(May 2009 – March 2010)**

<b>No</b>	<b>Activities</b>	<b>Responsibility</b>	<b>Target</b>	<b>Comments</b>
<b>1</b>	<b>Management of WIGOS</b>			
1.1	Review coordination mechanism with owners of co-sponsored observing systems and GEO	EC-WG	II. 2010	
1.2	Compile WIGOS data policy (including co-sponsored and non-WMO observing systems)	EC-WG	II. 2010	Cross Cg-XVI
1.3	Define broader governance framework that should include description of coordination, collaboration, partnership, and draft working arrangements of WIGOS with co-sponsored observing systems	EC-WG	II. 2010	
1.4	Coordination with WIS	SG-WIGOS ICG-WIS	-	Coordinated through WIGOS PO
<b>2</b>	<b>Requirements for WIGOS</b>			
2.1	Review strengths and weaknesses in the management of current observing systems (SWOT analysis)	SG-WIGOS	X. 2009	In collaboration with co-sponsored observing systems
2.2	Requirements and expectations for WIGOS Framework	CBS & CIMO	X. 2009	
2.3	Linking of WIGOS and WIS requirements	EC-WG ICG-WIS	-	Coordinated through WIGOS PO
2.4	Communicate expectations for WIGOS to Members, RAs, TCs and partners	WIGOS PO	XI. 2009	
<b>3</b>	<b>WIGOS Demonstration and Pilot Projects (WP)</b>			
3.1	Develop detailed WPs' implementation plans and project teams' work plans	Contact Points	VII. 2009	Coordinated through WIGOS PO
3.2	Facilitate and monitor progress of WPs	WIGOS PO	-	
3.3	Develop methods for providing lessons learned and feedback from WPs	SG-WIGOS	X. 2009	Coordinated through WIGOS PO
3.4	Formulate recommendations based on lessons learned	EC-WG	II. 2010	Cross Cg-XVI
3.5	Organize a workshop on the use of DCPC	WIS PO	XI. 2009	Depends on the WP development
<b>4</b>	<b>WIGOS standardization</b>			
4.1	Develop template for a description of all observing networks contributing to WIGOS	WIGOS PO	IX. 2009	
4.2	Identify implementation strategies for the three areas of standardization	SG-WIGOS	X. 2009	

<b>5</b>	<b>CONOPS and WDIP</b>			
5.1	Specify roles, responsibilities and mandates of stakeholders	SG-WIGOS and relevant stakeholders	X. 2009	
5.2	Specify the relationship, intersection and boundaries of WIGOS with the co-sponsored observing systems (GOOS, GTOS and GCOS) and with GEOSS	SG-WIGOS	X. 2009	Coordinated through WIGOS PO
5.3	Define the vision for an operational WIGOS (including CBS RRR process)	CBS	IX. 2009	
5.4	Complete final draft of CONOPS for EC-LXII	EC-WG	II. 2010	Coordinated through SG-WIGOS
5.5	Update WDIP for EC-LXII	EC-WG	II. 2010	
<b>6</b>	<b>WIGOS Implementation Strategy</b>			
6.1	Develop a strategy for mobilization of Regions in WIGOS Development and Implementation	WIGOS PO	IX. 2009	
6.2	Draft proposals for <b>Comprehensive, Costed Development and Implementation Strategy</b> , including possible impacts on WMO Members	WIGOS PO in coordination with SG-WIGOS	X. 2009	Seconded expert
6.3	Review proposals for Comprehensive, Costed Development and Implementation Strategy	EC-WG	II. 2010	
<b>7</b>	<b>Benefits of WIGOS</b>			
7.1	Describe in detail possible benefits of WIGOS and outline communication strategies	SG-WIGOS	X. 2009	
7.2	Outline a capacity building strategy to ensure the benefits of WIGOS will reach all Members	WIGOS PO in coordination with SG-WIGOS	XI. 2009	
7.3	Communicate benefits and opportunities to all WIGOS partners	WIGOS PO		
7.4	Prepare concise introduction to WIGOS	WIGOS PO	X. 2009	Need for seconded expert
<b>8</b>	<b>Preparations of report to EC-LXII (Cg-XVI)</b>	<b>EC-WG</b>	<b>II. 2010</b>	

## Notes:

- 1) EC-WG: EC WG on WIGOS and WIS
- 2) ICG-WIS: Inter-Commission Coordination Group on WIS
- 3) SG-WIGOS: Subgroup on WIGOS
- 4) WIGOS PO: WIGOS Planning Office
- 5) WIS PO: WIS Project Office

## **TECO-WIGOS CONFERENCE STATEMENT**

The Commission for Basic Systems (CBS) Technical Conference on the WMO Integrated Global Observing Systems (TECO-WIGOS) welcomed the progress that had been achieved towards further understanding and articulating the concept of a comprehensive, coordinated and sustainable system of observing systems based on the observational requirements of all WMO Programmes, pursuant to the request of Congress-XV (Cg-XV), bearing in mind the rapid development of systems and technologies and the risks of divergence. The development of WIGOS as a framework for integration of the component global observing systems across WMO and relevant co-sponsored systems, in collaboration with partner agencies, recognises the additional value that can be achieved through a more coordinated and collaborative approach. The benefits that will flow include reduced financial demands on Members, increased availability of required information, improved access, higher data quality standards, and archiving and technical innovations. However, the development of WIGOS also poses challenges at many levels that the various contributing players and partners must resolve together.

The TECO-WIGOS acknowledged and commended:

- The foundation role of the CBS systems, GOS and WIS, in the development of WIGOS and the need for a collaborative approach, involving all Technical Commissions and WMO Programmes, to build WIGOS so that it is greater than the sum of the individual component parts;
- The progress of the Pilot Projects, especially those focussing on AMDAR, ocean observations through JCOMM, atmospheric monitoring through CAS/GAW and the key cross-cutting role of CIMO, and the initial steps taken in addressing satellite intercalibration through the WMO Space Programme and the space community;
- The progress of the Demonstration Projects in all WMO Regions, especially integration of various observing systems, standardisation and quality control of observational data at the national level, with NMHSs playing the leading role and reaching out to a wide range of stakeholders;
- The active engagement in the development of a framework for WIGOS by agencies co-sponsoring component observing systems and programs, recognising the opportunities for cooperation and mutual support and the need to respect individual mandates and policies;
- The fundamental importance of constructing WIGOS together with the WMO Information System (WIS) so that a comprehensive and coordinated solution supporting WMO Members and other users is achieved;
- The commitment of Members and partners engaged on WIGOS activities;
- The increasing consideration of coordinated planning of space-based and surface-based component systems in the WIGOS context, noting the development of the proposed Vision for the GOS in 2025; and
- The breadth of understanding of the technical complexities and the growing engagement of a broad range of experts that provide an increasingly sound foundation for WIGOS to build on.

TECO-WIGOS highlighted the challenges that remain, including:

- Achieving the timeline as laid out by Cg-XV and, in particular, the need for an early start to additional Pilot Projects and Demonstration Projects;
- The need for a comprehensive and costed development and implementation strategy for WIGOS that, inter alia:
  - Fully outlines the technical challenges to be addressed and the roles and responsibilities of all players;

- Elucidates the process for capturing the lessons-learned from the Pilot Projects and Demonstration Projects;
- Outlines a capacity building strategy to ensure the benefits of WIGOS will reach all Members; and
- Designates clear responsibilities across the WMO system for the further development of WIGOS;
- The current lack of WMO resources allocated to addressing WIGOS, which is an impediment to progress, including the need for a fully functioning WIGOS project office;
- The need to complete the full functionality of WIS so that WIGOS can exploit new data access and retrieval facilities
- The importance of engaging the hydrological community in WIGOS activities;
- The need to clarify and communicate the relationship and intersection of WIGOS with the co-sponsored observing systems, (GOOS, GTOS and GCOS) and with GEOSS;
- Finding ways to demonstrate the opportunities of WIGOS to all potential partners and users to build their ongoing support, trust and collaboration; and
- Finding a way to more effectively incorporate all WMO observing activities into WIGOS and address their different requirements and priorities, especially the need to ensure WIGOS effectively supports all WMO applications programmes.

TECO-WIGOS encouraged CBS to focus on what it can contribute to the further development of the WIGOS concept, and in particular to construction of a comprehensive roadmap that takes WIGOS from concept to reality, and to the implementation of WIGOS, both through leadership and collaboration.

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