

WMO INTEGRATED GLOBAL OBSERVING SYSTEMS (WIGOS)

This working paper reports on the WMO Integrated Global Observing Systems (WIGOS) initiative, the WIGOS Development and Implementation Plan (WDIP), and its Concept of Operations (CONOPS). Information is also provided on current activities related to the implementation of the WIGOS concept, including the Pilot Projects and Demonstration Projects for the Development and Implementation of WIGOS within NMHSs.

The importance of the space-based component for WIGOS was stressed by the Implementation Coordination Team for Integrated Observing Systems (ICT-IOS). Guidance from CGMS is welcomed for the development of the space-based aspect of WIGOS and in particular with respect to the potential space related activities that should contribute to the WDIP. For example, the Pilot Project on Marine Meteorology may offer a particular scope for a significant contribution from space. GSICS might also be considered as a model case for global integration of space-based observations at data quality level.

CGMS is invited to:

- Comment on the possible role of space agencies for the development of the space-based aspect of WIGOS, and indicate potential space related activities that should contribute to the WDIP;
- Consider in particular possible support from satellite operators to the Pilot Project on Marine Meteorology for fostering integration of space-based ocean surface wind data with surface-based wind observation;
- Consider GSICS as a potential new Pilot Project demonstrating the benefit of integration at the data quality level.

WMO INTEGRATED GLOBAL OBSERVING SYSTEMS (WIGOS)

1 BACKGROUND

1.1 Decision of the WMO Fifteenth World Meteorological Congress

The Fifteenth World Meteorological Congress (Geneva, May 2007), by its Resolution 30 (Cg-XV) - *Towards Enhanced Integration between WMO Observing Systems*, has decided to initiate the WMO Integrated Global Observing Systems (WIGOS). It stressed that enhanced integration between the WMO observation systems was being pursued as a strategic objective of WMO and one of the eleven major Expected Results for the fifteenth financial period (2008-2011) as reflected in the WMO Strategic Plan and the Result-based Budget. Acting accordingly, EC-LIX (Geneva, June 2007) established through its Resolution 3 (see [Annex 1](#)) the WMO Executive Council Working Group on WIGOS and WIS (WMO Information System). The EC WG WIGOS-WIS held its first session in December 2007.

1.2 Guidance from CM-8

At the eighth session of the WMO Consultative Meetings on High-level Policy on Satellite Matters (CM-8, New Orleans, Louisiana, USA from 15 to 16 January 2008), the President of WMO, Dr A.I. Bedritsky, informed the session of new challenges for WMO in the next four-year cycle, including the new WIGOS and its partner the WIS.

CM-8 considered that the space-based Global Observing System (GOS) would evolve to become the space component of the WMO Integrated Global Observing Systems (WIGOS) as well as a major component of the GEOSS. The session further noted that the EC WG WIGOS-WIS developed a Concept of Operations (CONOPS) and an initial draft WIGOS Development and Implementation Plan (WDIP). The CONOPS contained an overview of WIGOS including assumptions, responsibilities, operational framework, data policy, benefits, challenges, and resources. The WDIP contained a description of:

- A strategic roadmap for integration
- A preparatory and four phases between now and the next WMO Congress
- Five Pilot Projects: (i.) joint GOS-GAW Pilot Project to accelerate implementation of WIGOS/WIS (ii.) initiation of global hydrological network addressing a GCOS requirement (iii.) integration of AMDAR into WIGOS (iv.) elaboration of the underpinning and crosscutting role and responsibilities of the instruments and methods of observation programme in the context of WIGOS and (v.) integration of marine meteorological and other appropriate oceanic observations into the WMO global observing systems)
- Demonstration Projects on the development and implementation of WIGOS at NMHSs in Kenya, Namibia (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)
- Policy and governance aspects
- WMO technical regulations (TR) WMO Programmes and Technical Commissions
- Jointly sponsored observing systems and
- Three integration levels within WIGOS.

CM-8 noted the important role to be played by the space-based components of the various observing systems that will constitute the space-based component of WIGOS. CM-8 noted initial activities in the establishment of WIGOS and was requested to provide guidance on CONOPS in particular as concerns the space-based aspects to consider the implications of the draft WDIP for the space-based component of the GOS and to indicate potential space related activities that could or should contribute to the WDIP.

CM-8 agreed WIGOS and WIS were major undertakings that would be of fundamental value to WMO Members for many years. The session stressed the importance of the space component of WIGOS. It agreed that since there was only one space component, it would serve as the common “integrator” across all other observing systems. With regard to hydrological networks, the session noted the potential role that satellite systems could play in enhancing information necessary to better measure and understand the hydrological cycle including river runoff. The session was pleased to see WIGOS was intended to ensure that broader governance frameworks and relationships with other international entities would be sustained and strengthened. The session also recalled that all WMO observing systems and information systems had already been declared by WMO Members to be contributions to the Global Earth Observing System of Systems (GEOSS). Furthermore, the session was pleased to note that the interoperable arrangements between WIGOS and WIS were fully consistent with the interoperable arrangements with GEOSS such that information would be able to flow both from and to GEOSS to the benefit of WMO Members and worldwide GEO communities. With entry points through WIS National Centres to both WMO and GEOSS information, national visibility and importance for NMHSs would be increased and enhanced.

The session agreed it was important for space agencies to have an active role in future EC WG WIGOS-WIS activities and that the WMO Space Programme should serve as the focal point for coordination. Thus, it requested the Chairman of the EC WG WIGOS -WIS to take into consideration the valuable role to be played by space agencies and include space agencies in its future activities.

1.3 Guidance from WMO EC-LX

EC-LX (Geneva, 18-27 June 2008) discussed the status of implementation of the WIGOS initiative and based on the proposals developed by the EC WG WIGOS-WIS made specific recommendations related to WIGOS development. It adopted the WIGOS Development and Implementation Plan (WDIP) V.1.1 draft (see [Annex 2](#)) and urged Members, WMO Regional Associations and Technical Commissions to collaborate actively in the implementation of WDIP. It also agreed with the WIGOS Concept of Operations (CONOPS) developed by the EC WG WIGOS-WIS which contains goals, objectives, major characteristics, operational framework, data policy and benefits of WIGOS. The EC decided to establish an EC WG WIGOS-WIS subgroup (SG-WIGOS). The CONOPS as well as all other WIGOS reference documents, such as the SG-WIGOS Terms of Reference and membership, are available on the WIGOS home page http://www.wmo.int/pages/prog/www/wigos/index_en.html. SG-WIGOS will hold its first session from 10 to 13 November 2008 in Geneva. Documentation for the SG-WIGOS session is posted at http://www.wmo.int/pages/prog/www/WIGOS-WIS/meetings/WIGOS-1_Geneva2008/DocPlan.html.

2 DISCUSSION

2.1 Scope

The purpose of WIGOS is to create an organizational, programmatic, procedural and governance structure that will significantly improve the availability of observational data and products, and which will provide 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. The integration process is intended to encompass four broad objectives as follows:

- (a) Improving WMO management and governance;
- (b) Increasing interoperability between systems with particular attention given to space-based and in situ components of the systems;

- (c) Addressing the needs of the atmospheric, hydrologic, oceanographic, cryospheric and terrestrial domains within the operational scope of a comprehensive integrated system; and
- (d) Ensuring the broader governance frameworks (for example interagency co-sponsorship of systems) and relationships with other interested entities are sustained and strengthened.

2.2 WIGOS Development and Implementation Plan

The implementation of the overarching WDIP closely coordinated with the WIS Project and Implementation Plan will be a critical ongoing activity for the Organization during the four-year period 2008-2011. As recommended by the EC, the WDIP will be a “living” document with subsequent reviews and updates that will be done at least annually as the planning proceeds and experience is gained from the various Pilot Projects and input from the Technical Commissions, Regional Associations and the advisory/steering bodies of WMO co-sponsored programmes contributing to WIGOS.

Accordingly, activities were initiated by relevant WMO bodies to contribute to the implementation of appropriate tasks identified as Phases and formulated in seven sections of WDIP. The current Implementation Phase II of the WDIP encompasses the period from EC-LX (June 2008) to EC-LXI (June 2009) and foresees the following:

- Review and update as appropriate the WIGOS Concepts of Operation;
- EC-LX reviews draft WDIP v.1.1 and provides guidance to issue the WDIP v1.1;
- The Pilot Projects begun in Phase I implemented and evaluated; adjustments to the WDIP may arise from the evaluations;
- Initiate planning for the Pilot Project concerning the integration of marine meteorological and oceanographic observations with WIGOS-WIS;
- Additional Pilot Projects may be identified;
- Schedule possible concurrent sessions of CAS and CBS with joint agenda items regarding WIGOS-WIS and the integration of GAW and GOS into WIGOS;
- Initiate work on the proposed revisions to the WMO Technical Regulations;
- Revise the WDIP v.1.1 as appropriate with guidance from EC WG WIGOS-WIS – issue WDIP v. 1.2 and submit to EC-LXI for review and guidance;

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 input.

Section XIV of WDIP specifically refers to WIGOS relations with jointly Sponsored Observing Systems. In particular, it is underlined that in progressing toward enhanced integration of, and interoperability amongst, WMO observing systems, it will be especially important that this be carried out in close consultation with WMO’s partner organizations that co-sponsor some of those subsystems. 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); and
- Those terrestrial/hydrological observing systems which serve as part of the FAO-UNEP-WMO-ICSU Global Terrestrial Observing System (GTOS).

2.3 WIGOS Pilot Projects

While the preparation of an over-arching WIDP was the crucial centrepiece of the planning and implementation of WIGOS, Cg-XV felt that undertaking at the earliest possible stage several

WIGOS Pilot Projects (PP) would be useful to address major issues in the integration process and would help in elaborating the WDIP. The purpose of Pilot Projects is to emphasize the role and contributions to be made by the Technical Commissions. Cg-XV had identified the following Pilot Projects in the context of WIGOS:

- Pilot Project I:* Joint GOS-GAW Pilot Project to accelerate implementation of WIGOS/WIS;
- Pilot Project II:* Initiation of Global Hydrological Network addressing a GCOS Requirement;
- 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 Oceanic Observations into the WMO Global Observing Systems.

Initial ad-hoc meetings related to the above PPs had been held where the planning and implementation aspects of PPs were discussed and working programmes were developed. The status of all PPs was discussed by the fourth session of the CBS OPAG IOS Expert Team on the Evolution of the GOS (ET-EGOS) in July 2008 (documentation is available at http://www.wmo.int/pages/prog/www/OSY/Meetings/ET-EGOS_Geneva2008/index_en.html).

2.4 WIGOS Demonstration Projects

Cg-XV emphasized that support and involvement of NMHSs and Regional Associations in the implementation of the WIGOS concept was a crucial factor for ensuring important benefits for all Members. Helping Members to more fully understand WIGOS and keeping them current on its practical development should be considered as an essential component in WIGOS implementation. This can be achieved through launching Demonstration Projects (DP) in selected NMHSs. These NMHSs will be at the operational end of the WIGOS implementation demonstrating to all concerned how to initiate and keep WIGOS together with WIS components running at the required levels of performance. Feedback and lessons learnt from these NMHSs will be extremely beneficial in understanding others' expectations of WIGOS/WIS concept implementation. These projects will also have a high profile impact since they would include all observing systems, i.e. in addition to WWW/GOS, the DPs would 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 NMHSs. The WMO Secretariat working with appropriate working bodies of Regional Associations and Technical Commissions would ensure regular coordination and communication between Members involved in Demonstration Projects. The Demonstration Projects would complement the already agreed-upon Pilot Projects. The Pilot Projects focus on Technical Commission involvement while the Demonstration Projects focus on NMHSs in Regional Associations. To date, four demonstration projects have been initiated, by Brazil, Korea, Morocco, and the United States respectively.

More detailed information related to the implementation of PPs and DPs can be found at: http://www.wmo.int/pages/prog/www/wigos/index_en.html.

2.5 Updates from the CBS Open Programme Area Group (OPAG) on the Integrated Observing System

It might be of interest for CGMS that the CBS Implementation Coordination Team on the Integrated Observing System (ICT-IOS) at its fifth session (September 2008) reviewed CONOPS and raised a number of questions and recommendations:

- (a) ICT-IOS sought clarity on the reporting mechanism, responsibilities and representation of different WMO bodies and was concerned with potential duplication of work;
- (b) ICT-IOS was also concerned with both the financial and expert resources needed to address WIGOS issues and the risk that it would drain resources currently available to CBS and ICT-IOS. This is further exacerbated by the fact that the WIGOS Planning Office (PO WIGOS) is yet to be fully staffed;
- (c) ICT-IOS supported a concept of WIGOS Pilot Projects (PP), however, it sought clarity on whether the PP should be comprehensive or should be limited in scope;
- (d) ICT-IOS had little information to understand the nature of WIGOS Demonstration Project (DP) as regards their substance and involvement of other Members from Regions. It noted the value of the Regional Rapporteurs on the GOS being involved in DP. The rapporteurs would then be able to keep OPAG-IOS informed of progress with the regional DP.
- (e) ICT-IOS recognized that the **WIGOS concept should foster more effective integration of satellite and *in-situ* observations, however, little involvement of satellite expert groups is seen so far. It proposed that satellite components be incorporated into relevant PPs.**
- (f) The ICT-IOS noted that the current Manual and Guide on the GOS already recognized many of the systems proposed to be part of WIGOS, but the challenge is effective integration of those data into WIGOS/WIS.

As regards WIGOS Pilot Projects, the ICT-IOS noted the progress in their implementation. It felt, however, that tight coordination and reporting procedures needed to be implemented so that PP activities would get reported back to appropriate expert teams, and not just back to the Executive Council. ICT-IOS looked forward to PP Teams being defined so that the ICT-IOS may establish appropriate linkages to those teams. **The ICT-IOS requested that the level of involvement of the Satellite Programme in the PP be increased. This involvement is particularly needed in the PPs for Hydrology and for Marine.** This should be reflected in the Future Plans of the relevant ETs. The ICT-IOS also felt that launching a GRUAN PP could make a significant contribution to the development of WIGOS, and suggested that a new PP might be appropriate.

2.6 CBS Technical Conference on WIGOS (TECO-WIGOS)

EC-XL endorsed the organization of a WMO Technical Conference on the WMO Integrated Global Observing Systems (TECO-WIGOS). The Conference will be held in Dubrovnik, Croatia from 23 to 24 March 2009, immediately preceding the fourteenth session of the Commission for Basic Systems (CBS) which is being convened from 25 March to 2 April 2009. The Conference will be both informative as well as a forum for exchanging experiences on the planned and ongoing activities of WIGOS being undertaken to ensure the interoperability between its constituent observing systems as identified by Cg-XV. It will also highlight coordination of WIGOS activities with current and envisaged arrangements for planning and implementation of the WMO Information System (WIS). Overall, TECO-WIGOS should clearly identify the CBS leadership role and visibility within the implementation of the WIGOS initiative. The TECO-WIGOS should reach NMHSs, WMO Regional Associations and Technical Commissions concerned through presentations of already initiated WIGOS Pilot Projects and Demonstration Projects. Representatives of the co-sponsored observing systems (GOOS, GTOS and GCOS) were also invited to participate in the Conference

together with relevant International Organizations, and users from various communities interested in weather, water, climate and other related environmental data and products.

To assess the status and trends in the WIGOS development, it is necessary to collect information on planned and/or ongoing WIGOS activities from NMHSs on a regular basis. In this connection the NMHSs will be invited to complete a special questionnaire by the end of October 2008. The results of this first WIGOS survey will be presented to the second session of the EC Working Group on WIGOS and WIS (16- 18 December 2008, documentation will be at <http://www.wmo.int/pages/prog/www/BAS/CBS-meetings.html>) and published on the WMO WIGOS Web site.

3 CONCLUSIONS

The CGMS Members are invited to consider and discuss the above information, noting in particular the comments from ICT-IOS that there should be greater involvement of satellite components in the Pilot Projects. CGMS is invited to comment on the role to be played by space agencies for the development of WIGOS.

CGMS is invited to consider, for example, particular support to the Pilot Project on Marine Meteorology, bearing in mind the importance of integrating SST and ocean surface wind vector measurement with surface data in this project.

As another matter of example, consideration could be given to the relevance of the Global Space-based Inter-calibration System (GSICS) as a potential new Pilot Project.

REFERENCES:

- Cg-XV, Abridged final report with resolutions (WMO-No. 1026)
- EC-LX, Abridged final report with resolutions (WMO-No.1032)
- Final report of the first session of the EC Working Group on the WMO Integrated Global Observing Systems (WIGOS) and the WMO Information System (WIS), Geneva, 4-7 December 2007
- Final report of the fifth session of the CBS OPAG on Integrated Observing Systems Implementation and Coordination Team (ICT-IOS), Geneva, 15-18 September 2008

ANNEXES:

1. Res. 3 (EC-LIX) — Executive Council Working Group on the WMO Integrated Global Observing System (WIGOS) AND the WMO Information System (WIS)
2. WIGOS Development and Implementation Plan (WDIP) V.1.1

ANNEX 1

Res. 3 (EC-LIX) — EXECUTIVE COUNCIL WORKING GROUP ON THE WMO INTEGRATED GLOBAL OBSERVING SYSTEM (WIGOS) AND THE WMO INFORMATION SYSTEM (WIS)

THE EXECUTIVE COUNCIL,

Noting:

- (1) Cg-XV Res. 30 – Towards Enhanced Integration Between WMO Observing Systems,

Considering:

The request expressed in Res. 30 (Cg-XV) for the Executive Council to:

- (a) Establish a mechanism to steer and monitor the activity and to achieve the broadest possible collaboration and cooperation;
- (b) Ensure the active participation and representation of the principal bodies concerned and also the participation, as appropriate, of technical experts and representatives of agencies undertaking co-sponsored observing initiatives;
- (c) Ensure that this mechanism is closely coordinated with the institutional arrangements for planning and overseeing WIS;
- (d) Submit a comprehensive report on the integration between the WMO observing systems to the Sixteenth WMO Congress;

Decides to establish an Executive Council Working Group on the WMO Integrated Global Observing System (WIGOS) and the WMO Information System (WIS) with terms of reference as follows:

Provide advice and guidance in the preparation of an over-arching WIGOS Development and Implementation Plan;

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;

Monitor the development and implementation of WIGOS and WIS through a “rolling review” mechanism;

Monitor WIGOS/WIS “Pilot Projects”, as identified by Cg-XV, to test concepts, identify problem areas, and to help in elaborating the Development and Implementation Plan;

Requests:

Regional associations and technical commissions to provide input into an over-arching Development and Implementation Plan and to include relevant activities in their strategic plans, work programmes, in particular those activities that require joint actions by regional associations and/or technical commissions for “Pilot Projects”;

The Working Group on WIGOS/WIS to report to subsequent sessions of the Council on the progress in the development and implementation of WIGOS/WIS;

Further requests the Intercommission Coordination Group on WIS (ICG-WIS) to report to the working group to ensure the coordination of the respective WIGOS and WIS development and Implementation Plan, especially as regards WIS meeting WIGOS data collection, exchange and access requirements;

Authorizes:

- (1) The working group to establish Sub Groups and Task Teams as and when required;
- (2) The working group to undertake intersessional activities that require urgent action while keeping the President immediately informed of such actions and in providing specific descriptions of such activities to the next EC session;

Decides further:

- (1) That a high-level representative from each regional association and technical commission, to be designated by its president, participate in relevant activities of the working group or its sub-groups;
- (2) That the WMO/IOC/UNEP/ICSU Steering Committee for the Global Climate Observing System (GCOS), the WMO/ICSU/IOC Joint Scientific Committee for the World Climate Research Programme (WCRP), the WMO/FAO Joint Scientific Committee for GTOS, and WMO/IOC/UNEP/ICSU Steering Committee for GOOS participate in the working group or its sub-groups;
- (3) That the chairperson may seek advice from, or invite experts, in particular from Satellite Operators, as necessary;

Requests the Secretary-General to provide the necessary assistance and Secretariat support for this working group, within the available budgetary resources.

ANNEX 2**WIGOS DEVELOPMENT AND IMPLEMENTATION PLAN***(Version 1.1)***I. Introduction**

The top-level and detailed descriptions for WMO Integrated Global Observing Systems (WIGOS) are foundational documents and identify the urgent need for WIGOS implementation. The following document describes an initial WIGOS Development and Implementation Plan as mandated by the Fifteenth WMO Congress (Cg-XV).

II. Strategic Roadmap for Integration

2.1 Cg-XV agreed that planning and implementation of the WIGOS integration process should proceed in phases defined by the annual meetings 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 and of WIS would culminate with Cg-XVI (2011) adopting improvements towards strengthening the WMO programme structure and the system of technical commissions, which would be positioned to extend the benefits of the integration into the service and application components of the overall WMO Programmes at both the national and international levels.

2.2 EC-LIX, in its Resolution 2/4 (EC-LIX), established the EC Working Group on WMO Integrated Global Observing Systems and WMO Information System (EC-WG WIGOS/WIS) with the following TOR:

Provide advice and guidance in the preparation of an over-arching WIGOS Development and Implementation Plan;

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;

Monitor the development and implementation of WIGOS and WIS through a "rolling review" mechanism; and

Monitor WIGOS/WIS "Pilot Projects", as identified by Cg-XV, to test concepts, identify problem areas, and to help in elaborating the Development and Implementation Plan.

2.3 Preparation of the overarching WIGOS Development and Implementation Plan (WDIP) closely coordinated with the WIS Development and Implementation Plan will be a critical ongoing activity during the four-year period 2008-2011. WDIP will be a "living" document. 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 be done at least annually as the planning proceeds and experience is gained from the various Pilot Projects and inputs from the Technical Commissions, Regional Associations and the advisory/steering bodies of WMO co-sponsored programmes are received. 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 for 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 and their results, details of actions required to address revisions of the TR of the Technical Commissions, the WMO Programme structure, and WMO Secretariat budgetary,

personnel and organizational implications. Many observation 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 WIGOS plan needs to address this from the aspect of improving data access across these boundaries. Data dissemination practices must be capable of respecting the data policies as designated by the “owners of the observation systems including authorization of users.

2.4 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 is provided of the Preparatory Phase that occurred prior to Cg-XV. The preparation of Version 1.0 of WDIP (WDIP V-1.0) that can be endorsed by the EC in June 2008 will be a crucial first step. WDIP V-1.0, and its subsequent revisions, will be important for informing the Technical Commissions, Regional Associations and the steering committees of GCOS, GOOS and WCRP of WIGOS and WIS planning activities and to encourage their input into the process. Scheduling of as many regular sessions as possible of Technical Commissions and Regional Associations 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.

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

Document prepared for the EC Task Team on the WMO Integrated Global Observing Systems (EC-TT/WIGOS) Feb. 2007;

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);

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.

IV. Implementation Phase I. Cg-XV (May 2007) – EC-LX (June 2008)

Establish and update as appropriate the WIGOS Concepts of Operations;

Cg-XV through the EC-LIX establishes the EC-WG/WIGOS-WIS to oversee the development of WIGOS and WIS;

Full time WIGOS Planning Unit organized in the WMO Secretariat (June 2007);

Coordinate with IOC regarding the WIGOS-WIS initiatives;

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;

Initiate first Pilot Projects (see paragraphs below):

Integration of WWW/GOS and GAW into WIGOS;

Initiation of Global Hydrological Network in context of WIGOS;

Integration of AMDAR into WIGOS;

Elaborating the underpinning/crosscutting role and responsibilities of the Instruments and Methods of Observation Programme in the context of WIGOS;

Integration of marine meteorological and other appropriate oceanic observations into WIGOS.

Adjust draft WDIP v.1.0 as guided by EC-WG/WIGOS-WIS and present draft WDIP v.1.1 to EC-LX;

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;

At meetings of Presidents of Technical Commissions a major agenda item should be the WDIP to which the EC WG WIGOS-WIS would provide input.

V. Implementation Phase II. EC-LX (June 2008) - EC-LXI (June 2009)

Review and update as appropriate the WIGOS Concepts of Operation;

EC-LX reviews draft WDIP v.1.1 and provides guidance to issue the WDIP v1.1;

The Pilot Projects begun in Phase I implemented and evaluated; adjustments to the WDIP may arise from the evaluations;

Initiate planning for Pilot Project concerning the integration of marine meteorological and oceanographic observations with WIGOS-WIS (see paragraph below);

Additional Pilot Projects may be identified;

Schedule possible concurrent sessions of CAS and CBS with joint agenda items regarding WIGOS-WIS and the integration of GAW and GOS into WIGOS (see paragraph below);

Initiate work on the proposed revisions to the WMO Technical Regulations;

Revise the WDIP v.1.1 as appropriate with guidance from EC-WG/WIGOS-WIS – issue WDIP v. 1.2 and submit to EC –LXI for review and guidance;

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 input.

VI. Implementation Phase III. EC-LXI (June 2009) - EC-LXII (June 2010)

- (1) Review and update as appropriate WIGOS Concepts of Operation;
- (2) EC-LXI provides guidance for this year (note this is the last period for active planning before specific proposals are prepared to submit to CG-XVI);
- (3) Pilot Projects begun in Phase I and II should be completed and evaluated. Results to be appropriately incorporated into the WDIP V.2.0;
- (4) EC-WG/WIGOS-WIS meets to review in detail the WDIP that is nearing completion at this stage;
- (5) The agendas of Technical Commissions and Regional Associations should include an item relating to the WIGOS-WIS and should seek their “consensus inputs” to the WDIP;
- (6) Matters relating to the revision of the Technical Regulations, the TORs of Technical Commissions, and proposals regarding WMO Programme structure and content and Secretariat structure will be addressed in this Phase;
- (7) The final preparations for the presentation of the overall WMO structure and function that reflects the WIGOS-WIS should be prepared for EC–LXII. The action of EC at this

time will consist of the details that will be presented to Cg-XVI to which the EC WG WIGOS-WIS would provide input.

VII. Implementation Phase IV. EC-LXII (June 2010) - Cg-XVI (May 2011)

Review and update as appropriate WIGOS Concepts of Operation;

WDIP (final version) is completed;

EC-LXII to agree on the content of the submission to Congress regarding the implementation of WIGOS-WIS. This will include the proposed changes to the Technical Regulations, the revised roles and TORs of the various Technical Commissions, the adjustments to the WMO Programme structure, and the impact on Secretariat budgets and personnel. Proposed actions of Cg-XVI to implement the programme;

EC-WG/WIGOS-WIS submits its final report and recommendations to Cg-XVI.

VIII. Pilot Projects

While the preparation of an over-arching WIDP will be the crucial centerpiece of the planning and implementation of WIGOS, Cg-XV felt that undertaking at the earliest possible stage several WIGOS Pilot Projects would be useful to address major issues in the integration process and would help in elaborating the WIDP. Pilot Projects will emphasize the role and contributions to be made by the Technical Commissions. In accordance with recommendations by Cg-XV, Technical Commissions had identified the following Pilot Projects in the context of WIGOS:

- Pilot Project I:* Joint GOS-GAW Pilot Project to accelerate implementation of WIGOS/WIS;
- Pilot Project II:* Initiation of Global Hydrological Network addressing a GCOS Requirement;
- 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 Oceanic Observations into the WMO Global Observing Systems.

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

9.1 Cg-XV emphasized that support and involvement of NMHSs and Regional Associations in the implementation of WIGOS concept was a crucial factor for ensuring important benefits for all Members. Helping Members to more fully understand WIGOS and keeping them current 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 NMHSs will be at the operational end of the WIGOS implementation demonstrating to all concerned how to initiate and keep WIGOS together with WIS components running at the required levels of performance. Feedback and lessons learnt from these NMHSs will be extremely beneficial in understanding others' expectations of WIGOS/WIS concept implementation. These projects will also have a high profile impact since they would include all observing systems, i.e. in addition to WWW/GOS, the Demonstration Projects would 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. The Demonstration Projects would complement the already agreed-upon Pilot Projects. The Pilot Projects focus on Technical Commission involvement while the Demonstration Projects focus on NMHSs in Regional Associations.

9.2 Candidates for "test-bed" Demonstration Projects include the following NMHSs: Kenya, Namibia (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).

X. Develop and maintain WIGOS web page

It would be 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 concerned, relevant focal points for WIGOS in RAs and Technical Commissions, should establish and update of a WIGOS web page on the WMO Web site by publishing information about WIGOS, including general information on the current status of implementation of Pilot and Demonstration Projects, providing a condensed information to various WIGOS user communities.

XI. Policy and Governance Aspects

To accomplish the goals above regarding the development of a truly integrated WMO global observing systems, adjustments must be made in the WMO Technical Regulations, the WMO Programme structure, the working structure and function of the Technical Commission, and of the WMO Secretariat. The motivations for WIGOS are focused; i.e. to the objective of instituting a truly integrated end-to-end system - comprised principally of the 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 structure to support it, will all be important and essential components of the systems into system 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, usually 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* often supplement the regulatory material contained in the *TR* and their *Annexes*.

12.2 The present structure of the Technical Regulations (TR) Volume I centers around 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 Systems (WIGOS), 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. In this regard, CBS-Ext(06) (Seoul, Republic of Korea, November 2006) has already noted that the implementation of the WIGOS and WIS will ultimately require a major revision of the TR.

12.3 Space based observing and communications systems are becoming more and more central to the over-all WMO system operations. In fact, many future applications will often rely on space-based sensors as the primary source of data, and require surface based or *in situ* observations for calibration or “ground truth” purposes, thus changing the operational requirements placed on the integrated system substantially. The present set of TR often treats the satellite systems as entities separate from the surface based networks and systems.

12.4 The revised structure of the TR should provide a foundation for WIGOS. It should document the structure of a system of systems based on interoperability and compatibility among all its elements and with the user community. The revised TR would need to be comprehensive and reflect all of the component systems. It would allow room to address, the wide ranging multi-discipline issues and requirements for observational resources from all domains (atmosphere, ocean, and terrestrial) facing WMO today (weather monitoring and prediction, atmospheric composition monitoring, climate monitoring and change, disaster risk reduction and mitigation, water resources etc.); it should also build on and amplify the integration across surface-based and space-based sources of observations.

12.5 In undertaking such a revision, a clearer vision for the purpose, scope, content and a process 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 One single WMO Programme should be assigned the responsibility to lead the planning of WIGOS and WIS and with its ultimate implementation and operation. Participation during the integration by the other Programmes which currently have responsibility for components of the total WMO observation system will be crucial in this transition.

13.2 Likewise WIGOS and WIS should fall under a revised Commission for Basic Systems. The revised CBS TOR would be designed to reinforce its 'basic systems' responsibilities while building in stronger mechanisms for assessing and meeting the needs of the different applications sectors and programmes. The revised CBS would be focused on operational systems issues including planning and implementation across the full spectrum of observing domains and disciplines. Scientific research, system requirements, service provision etc would be the prerogatives of other Commissions, WMO Programmes or the various Advisory/Steering bodies.

13.3 As recognized in Resolution 7.4/1 (Cg-XV), the process leading to WIGOS and WIS would have a wide ranging 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. Initially what is needed to effectively proceed is the decision to focus the WIGOS and WIS within a single Programme and associated Commission. Given that decision, proposals with regard to how to organize and adjust the rest of the WMO Programme structure and Technical Commission TOR can be developed as an early step in the planning and implementation process.

13.4 Cg-XV agreed further that the integration process would centre initially upon the preparation of an over-arching WIGOS Development and Implementation Plan (WDIP). The plan should be kept up-to-date through a “rolling review” mechanism. It should also serve as the source of information on the integration initiative for all WMO Members and in particular developing countries. Several “Pilot Projects”, as approved by Cg-XV, should be designed to test concepts, identify problem areas, and to help in elaborating WDIP. The possible candidate Pilot Projects approved by Cg-XV include those mentioned above under “Phase I. Cg-XV (May 2007) – EC-LX (June 2008)”.

XIV. Jointly Sponsored Observing Systems

In progressing toward enhanced integration of, and interoperability amongst, WMO observing systems, it will be especially important that this be carried out in close consultation 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); and

those terrestrial/hydrological observing systems which serve as part of the FAO-UNEP-WMO-ICSU Global Terrestrial Observing System (GTOS).

XV. Integration levels within WIGOS

15.1 As a system of observing systems, integration will be accomplished at three levels: observation standardization; a common information infrastructure\$ i.e. WIS; and end-product quality assurance.

Coordination of WIGOS development and implementation through standardization at the observation level

15.2 A sustained, optimized, end-to-end WMO Integrated Global Observing System should encompass homogeneity, interoperability, compatibility of observations from all WIGOS constituent observing systems. This should be achieved through implementation of guidance and studies on methods of observations by IMOP within WIGOS constituent networks including tests, calibration and comparisons. Schematically, it could be defined as an “instruments” level of integration.

Coordination of WIGOS development and implementation with WIS

15.3 Cg XV emphasised that the planning and implementation of WIGOS should proceed in parallel to the planning and implementation of WIS. It is therefore crucial that as from its early planning stages the WIGOS activities be coordinated with WIS. This will be accomplished through activities of the EC WG on WIGOS&WIS, with active participation of representatives of RAs and Technical Commissions concerned and coordination role of the Secretariat. 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 presentation in compliance with WIS information exchange requirements for all WMO Programmes. This may be considered as “WIS” integration.

Development of WMO Regulatory material related to WIGOS, including QMF aspects

15.4 To ensure integrated/coordinated data acquisition efforts among NMHSs and other operators to minimize duplication, reduce costs and maximize data and products availability and quality, the development of an integrated management system to secure sustained, timeliness data streams and adequate quality control, there is the need for appropriate regulatory documentation including organization and recommended practices and procedures so that Members can proceed adequately with WIGOS development and implementation taking into account QMF aspects. This will constitute an “end-products” integration.