

EXPECTED RESULT 4

AGENDA ITEM 4.4: ENHANCED CAPABILITIES OF MEMBERS TO ACCESS, DEVELOP, IMPLEMENT AND USE INTEGRATED AND INTEROPERABLE EARTH- AND SPACE-BASED OBSERVATION SYSTEMS FOR WEATHER, CLIMATE AND HYDROLOGICAL OBSERVATIONS, AS WELL AS RELATED ENVIRONMENTAL AND SPACE WEATHER OBSERVATIONS, BASED ON WORLD STANDARDS SET BY WMO

WMO INTEGRATED GLOBAL OBSERVING SYSTEM (WIGOS)

SUMMARY

DECISIONS/ACTIONS REQUIRED:

- (a) Adoption of the draft text for inclusion in the general summary;
- (b) Review and adopt the Regional WIGOS Implementation Plan;
- (c) Adoption of Resolution 4.4/1- Regional WIGOS Implementation Plan;
- (d) Adoption of a revised RBSN/RBCN as per draft Resolution 4.4/2 (RA II-15).

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APPENDIX A:
DRAFT TEXT SUPPORTING THE DECISIONS OF THE ASSOCIATION –
FOR INCLUSION IN THE GENERAL SUMMARY OF RA II-15

4.4 Enhanced capabilities of Members to access, develop, implement and use integrated and interoperable Earth- and space-based observation systems for weather, climate and hydrological observations, as well as related environmental and space weather observations, based on world standards set by WMO (agenda item 4.4)

WMO Integrated Global Observing System (WIGOS)

The WIGOS Framework Implementation

4.4.1 The Association considered the WIGOS implementation actions to be undertaken by its Members and subsidiary bodies. In this consideration, the Association took into account decisions of Cg-XVI, EC-64 and CBS-15 on the WIGOS implementation.

4.4.2 The Association recalled Resolution 50 (Cg-XVI) – Implementation of the WMO Integrated Global Observing Systems, by which the regional associations were requested: (1) to develop their regional WIGOS implementation plans; (2) to coordinate WIGOS implementation activities with the WMO Information System in their operating plans and work programmes; and (3) to promote capacity-building and outreach activities to assist Members in the implementation of WIGOS. The Association agreed that WIGOS would provide a framework for improved collaboration and coordination between NMHSs and relevant national, sub-regional/regional and international organizations.

4.4.3 The Association expressed its gratitude to the Republic of Korea and the Russian Federation in implementing their WIGOS Demonstration Projects¹ providing a number of lessons learned, experiences and perspectives received on the potential benefits, value and impact of the WIGOS implementation process at the national and regional levels. In this regard, the Association encouraged its Members to share relevant experiences and cooperate with one another in implementing WIGOS, including assistance to Members with specific WIGOS implementation needs.

4.4.4 The Association emphasized that strong support and close collaboration among Members were needed to advance scientific knowledge and technical infrastructure to meet the regional WIGOS requirements. Therefore, it will be desirable to strengthen cooperation and partnership through Region-wide organizations or subregional groupings overseeing the WIGOS observing components. It specifically referred to enhanced cooperation among meteorological, hydrological, marine/oceanographic and environmental institutions/services where they are separated at the national level.

4.4.5 The Association recalled Resolution 10 (EC-64) – WIGOS Framework Implementation Plan (WIP) developed by ICG-WIGOS and expressed its concern that the timely completion of WIGOS implementation in the Region would directly depend on the available resources (expertise and funds). The Association further underlined that WIGOS implementation at national and regional levels would require initial investment, specifically for improvement of coordination and technological infrastructure. This investment should be a significant component of WIGOS

¹ For details, see: www.wmo.int/pages/prog/www/wigos/projects.html

implementation plans of individual NMHSs. In this regard, the Association urged Members to provide resources to support the implementation of WIGOS in the Region.

4.4.6 The Association agreed that the recently established WIGOS Project Office is critical to the success of WIGOS implementation and should be fully resourced. It therefore urged its Members to continue to provide resources, through the WIGOS Trust Fund and seconded experts or Junior Professional Officers, to help support the implementation of WIGOS.

4.4.7 The Association noted that CBS-15 considered the new “Implementation Plan for the Evolution of Global Observing Systems” (EGOS-IP). In this regard, the Association thanked the Members of the Region for their contributions, reporting on progress and plans in their countries related to actions in the original EGOS-IP.

4.4.8 The Association further requested its Members to: (a) nominate national focal points tasked to monitor the implementation of the EGOS-IP nationally, report on implementation issues, and provide feedback to the CBS through the Secretariat; and (b) address the actions listed in the EGOS-IP in collaboration with partner organizations and agents identified in the EGOS-IP. It also encouraged Members to mobilize additional resources to drive these activities forward. It further requested the relevant RA II subsidiary bodies to address the EGOS-IP in their work programmes, and promote its effective implementation.

4.4.9 The Association noted with great appreciation that, in response to the request from the Sixteenth Congress, the development of a Regional WIGOS Implementation Plan for RA II (R-WIP-II) was initiated at the meeting of the Working Group on WMO Integrated Observing System and WMO Information System (WG-IOS/WIS) held in November/December 2011 in Seoul, Republic of Korea. The RA II Management Group at its fourth session (Doha, Qatar, February/March 2012) endorsed the proposal by the WG-IOS/WIS for the establishment of the Task Team on R-WIP (TT/R-WIP) and requested the TT/R-WIP to streamline the proposed projects within the draft R-WIP-II. Through a meeting of TT/R-WIP held in September 2012 in Jakarta, Indonesia during CBS-15, the Task Team further developed the draft R-WIP-II. The Association expressed its appreciation to WG-IOS/WIS, especially TT/R-WIP for the development of R-WIP-II, which includes seven draft RA II WIGOS Implementation Projects

4.4.10 The Association accordingly adopted Resolution 4.4/1 (RA II-15) – Regional WIGOS Implementation Plan for RA II and its Annex. The Association agreed that the implementation of R-WIP-II be supported by all the Members of the Region, and be guided, supervised and monitored by the Management Group of RA II, with periodic reports from appropriate subsidiary bodies in charge of WIGOS. The Association further agreed that R-WIP-II be further revised to accommodate new projects which would be submitted by Members and authorized the president to approve the revised R-WIP-II during the intersessional period in consultation with the Management Group.

4.4.11 The Association noted that some Members, including China, Republic of Korea and the Russian Federation, had already conducted projects to implement the WIGOS for the design of an integrated national observing system. The Association invited these Members to share with the other RA II Members their experiences and lessons learned from a national integration process to support the implementation of WIGOS.

4.4.12 The Association noted with appreciation the willingness of the Russian Federation to include a national tsunami monitoring system as a new regional WIGOS project. The Association agreed that the regional WIGOS projects should be expandable to include more sub-regional and national projects.

Regional Basic Synoptic Network (RBSN) and Regional Basic Climatological Network (RBCN)

4.4.13 The Association noted that owing to Members' efforts, the RBSN and RBCN have demonstrated sustainable performance. It also appreciated the work done by the Lead Centre for monitoring the data quality of land surface observations in Tokyo (JMA) to improve monitoring procedures and for the presentation and distribution of monitoring results on the availability and quality of land surface-based observational data.

4.4.14 By adopting Resolution 4.4/2 (RA II-15), the Association approved the new list of RBSN and RBCN stations as given in Annexes I and II to this resolution

GCOS Reference Upper-Air Network (GRUAN)

4.4.15 The Association noted that implementation of the GCOS Reference Upper-Air Network (GRUAN) has progressed steadily over the past years, with 15 highest-quality upper-air sounding sites currently contributing globally (of which two are located in RA II, in Xilinhot (China) and Tateno (Japan)). The fourth GRUAN Implementation-Coordination Meeting was hosted by JMA in March 2012. GRUAN data have been flowing since summer 2011 through NOAA's National Climatic Data Centre (NCDC) to data users. The Association noted that specific details of, and information on, GRUAN from the forthcoming GRUAN Reference Manual and Guide are planned to be included in the WIGOS regulatory material.

Marine and Oceanographic Observations

4.4.16 The Association requested its Members to contribute to the JCOMM Observations Programme Area Implementation Goals² and thereby increase the deployment of ocean observing platforms (buoys, floats, ships, sea level stations, Tsunameters) in data sparse areas. It noted the establishment of a WMO-IOC Regional Marine Instrumentation Centre (RMIC) in Tianjin, China per Resolution 9 (Cg-XVI) and IOC Resolution XXVI-9, and invited its Members to take advantage of the infrastructure in order to enhance traceability of ocean observations produced by the Region.

Cryospheric Observations and Global Cryosphere Watch (GCW)

4.4.17 The Association expressed its strong interest in the ongoing development of the Global Cryosphere Watch (GCW) as reported to EC-64, the recent availability of the GCW Implementation Plan and the engagement of experts from RA II in GCW activities. It strongly urged Members to consider expansion or implementation of measurements of solid precipitation and snow and ice parameters which would enhance monitoring of cryospheric changes nationally and regionally, and to consider establishment of GCW reference sites as part of GCW's CryoNet initiative. It further stressed that the measurement and exchange of cryospheric data at synoptic and climate stations, where appropriate, but particularly in mountain and high land regions, would be especially useful to meet the operational, research and service needs of weather, climate, hydrology and environmental science nationally, regionally and globally. The Association urged interested Members to nominate national focal points for GCW activities and to review and provide the EC Panel on Polar Observations, Research and Services (EC-PORS) with information on how GCW could help them.

Aircraft Observations

4.4.18 The Association noted that the Global AMDAR Programme is the core of the aircraft-based observing system and now comprises 33 airlines, over 2800 aircraft, and provides around 300,000 observations per day on the GTS supplemented by around 15,000 additional aircraft-based observations from ICAO sources. It recognized that the AMDAR Programme in Region II is well advanced with long-term operational programmes for China; Hong Kong, China; Japan; and

2 http://www.jcomm.info/index.php?option=com_oe&task=viewDocumentRecord&docID=8930

Republic of Korea. Between these programmes, the Region contributes around 25,000 AMDAR observations on the GTS per day from 7 airlines and around 270 aircraft. While this is a significant contribution to the global aircraft-based observations programme, there is still large potential for AMDAR programme growth and improved coverage over the Region and even greater potential through the addition of water vapour sensing as a component of the AMDAR observing system platform.

4.4.19 In line with the actions of the CBS Implementation Plan for Evolution of the GOS, the Association encouraged its Members to work with the CBS Expert Team on Aircraft-based Observations (ET-ABO) and determine strategies for ensuring wider and optimized implementation of AMDAR programmes towards an improved and more efficient upper-air observing system throughout the Region.

Surface-based remote sensing observations

4.4.20 The Association noted that, lead by the Turkish State Meteorological Service (TSMS), CBS has overseen the development and operational implementation of the WMO Weather Radar Database (WRD) (<http://www.dmi.gov.tr/Default.aspx?l=en>), which will be an important contributor to the WIGOS Information Resource and the WMO Information System as a source of radar metadata. The Association encouraged its Members to nominate WMO radar metadata focal points to ensure their weather radars are included and timely updated in the WRD.

4.4.21 Planning has commenced for a Workshop in early 2013 on the Regional and Global Exchange of Weather Radar Data. It is expected that the outcomes from this workshop would provide clear guidance to enable Members to meet the requirements for the international exchange of Doppler radial winds and reflectivity data, which was a clear recommendation from the fourth WMO Workshop on the impact of various observing systems on Numerical Weather Predictions. The Association agreed to support the representative of the Region to the Workshop and contribute to future activities associated with the international and regional exchange of weather radar data.

Atmospheric Chemical Composition and UV Measurements

4.4.22 The Association welcomed the establishment of the GAW global station Nepal Climate Observatory - Pyramid (5079 m asl) in Nepal and GAW regional station Tiksi (71.58°N) in the Russian Federation. The Association appreciated the uninterrupted operation of the global GAW station Minamitorishima in Japan after a severe earthquake and following a tsunami in March 2011. The Association recognized that further efforts are needed in filling the observational gaps in Eurasia and in the extension of the observational programme at existing stations. It reminded members to submit data in a timely fashion to the appropriate data centers. The Association requested its Members to update now and to continue updating regularly their station information on the GAW Station Information System (GAWSIS) at <http://gaw.empa.ch/gawsis/>.

Terrestrial observations - Water cycle

4.4.23 The Association noted with appreciation the successful implementation of the MEKONG-HYCOS project, involving Cambodia, Lao People's Democratic Republic, Thailand and Viet Nam. Implemented through the Mekong River Commission, the objective of the project had been to establish a hydrological information system in support of regional flood forecasting of the lower Mekong basin, complementary to flood forecasting services of Members. In this regard, the Association thanked the Government of France for funding the project.

4.4.24 The Association welcomed the substantive progress made in the implementation of the Hindu Kush Himalaya-HYCOS (HKH-HYCOS) project that aims to establish a regional flood information system. Bangladesh, Bhutan, Nepal and Pakistan cooperate actively in the project

while China and India are prepared to provide meteorological forecasts and prediction products. The project is implemented in cooperation with the International Centre for Integrated Mountain Development (ICIMOD) as a well-established intergovernmental regional organization. The Association thanked the government of Finland for funding the project.

4.4.25 The Association noted with concern that in over more than eight years the establishment of an ARAL-HYCOS project that had been promoted by the NMHSs of five Central Asian states had still not been successful in securing funding for this important project aiming to improve water management in the Aral Sea basin including the Amur Darya and Syr-Darya river basins. The Association encouraged Members, and requested the Secretary-General, to continue efforts to secure extrabudgetary funds to support the project.

Space-based Observations

4.4.26 The Association welcomed the substantial progress accomplished by Members' agencies participating in the Coordination Group for Meteorological Satellites (CGMS) in adopting a new baseline for their contribution to the space-based GOS. It agreed that this was an important step towards fully implementing the space-based component of the Vision for the GOS in 2025. CBS-15 decided to reflect this new baseline in the WMO regulatory material and adopted amendments to the Manual on the GOS.

4.4.27 The Association encouraged continuation of the RA II Pilot Project to Develop Support for NMHSs in Satellite Data, Products and Training, coordinated by JMA and KMA. This Pilot Project is to be evolved into a RA II WIGOS Project from 2013, as it is important for improving the dialogue between satellite providers and users in the Region. In this respect, the Association stressed the importance of identifying and regularly documenting Region-oriented requirements for satellite data access and exchange, following the guidance provided by the "Procedure for Documenting Regional Requirements for Satellite Data Access and Exchange" The Pilot Project conducted a questionnaire survey in 2012 to develop an initial set of such requirements.

4.4.28 The Association expressed its deep appreciation to CMA, JMA and KMA for hosting the first (2010), second (2011) and the third (2012) Asia/Oceania Meteorological Satellites Users' Conferences, respectively. The third Asia/Oceania Meteorological Satellites Users' Conference, preceded by a 3-day WMO-KMA RA II Pilot Project VLab Satellite Training Event attended by participants from 13 Members of the Region, brought together more than 160 scientists, users and satellite operators representatives and has become the prime forum for the satellite meteorology community in the Region. The Association strongly encouraged continuation of the Conference on an annual basis.

4.4.29 The Association looked forward to the planned introduction of several next generation geostationary satellite systems by RA II satellite operators in the 2013-2017 timeframe: INSAT-3D, FY-4A, Himawari-8/9 and GEO-KOMPSAT-2A. Emphasizing that optimal utilization of the new operational satellite systems should be assured and the risk of disruption for operational users be mitigated, the Association recognized the need for appropriate and timely preparation of satellite data users to these new systems, in line with the CBS-15 "Guideline for Ensuring User Readiness for New Generation Satellites" (http://www.wmo.int/pages/prog/sat/documents/SAT-GEN_CBS-15-GuidelineUserReadiness.pdf). The preparation should involve user training, guidance to upgrade processing software and hardware, information and tools.

Observing System Experiments (OSEs)

4.4.30 The Association noted the list of topics for NWP impact studies (Observing Systems Experiments and Observing Systems Simulation Experiments) relevant to the evolution of global observing systems proposed by CBS-15, and requested its Members to consider undertaking such

studies from a regional perspective, and report feedback through the CBS Rapporteur on Scientific Evaluation of Impact Studies (R-SEIS).

Instrument Standards and Best Practices

4.4.31 The Association recalled that Cg-XVI stressed that Regional Instrument Centres (RICs) and Regional Marine Instrument Centres (RMICs) should provide effective support to Members in ensuring the traceability of their standards and reaffirmed the need to regularly assess their capabilities making use of the evaluation scheme that was developed to this effect. The Association noted that Regional Radiation Centres should provide support to Members for the traceability of radiation measurements. The Association requested its Members hosting RICs, RMICs and RRCs to reconfirm their on-going willingness to provide these facilities and their compliance with the relevant Terms of Reference of these centres at the latest by December 2013 as they play a crucial role in ensuring traceability of measurement to the International System of Units (SI), and capacity building which is fundamental for the development of WIGOS.

4.4.32 The Association noted that the Pilot Project to Enhance the Availability and Quality Management Support for NMHSs in Surface, Climate and Upper-air Observations (PP-QM), in collaboration with WMO, held Workshop on Quality Management in Surface, Climate and Upper-air Observations in RA II (Asia) in Japan in July 2010. The workshop confirmed the importance of full utilization of RICs and promotion of capacity building for enhancement of data quality and availability in RA II. All materials from the workshop are available on the JMA website at: http://www.jma.go.jp/jma/en/Activities/qmws_2010/qmws_2010.html.

4.4.33 The Association noted that PP-QM conducted two questionnaire surveys to assess the current implementation status of relevant observations and quality management in July 2010, and to gather necessary information on the calibration capabilities of RA II Members and their need for RIC services in December 2011. The result is summarized as a WMO IMOP/IOM Report No. 111 on the WMO website at: <http://www.wmo.int/pages/prog/www/IMOP/publications-IOM-series.html>.

4.4.34 The Association welcomed that RIC-Tsukuba, in collaboration with WMO and RIC-Beijing, will hold a Training Workshop on Calibration and Maintenance of Meteorological Instruments in RA II (Asia) in Japan from 19 to 22 February 2013. The Association noted that the workshop will be a RIC Tsukuba's follow-up activity to the outcomes of the JMA/WMO Workshop in July 2010 and to the results of two questionnaire surveys in July 2010 and in December 2011, as part of the RIC's contribution to the implementation of WIGOS in RA II.

4.4.35 The Association noted the support expressed by Congress and the Executive Council to the further development of the siting classification for observing stations on land that was published in the *Guide to Instruments and Methods of Observations* (WMO-No. 8), as a common ISO-WMO standard. The Association recognized that its Members needed guidance material on the use and implementation of the siting classification, to implement their observing stations. The Association noted that CIMO/ET on standardization drafted questions and answers related to use and implementation of the siting classification as a working document. The Association urged its Members to implement this classification and to share experience and to represent their interests in the further development of the classification as a common WMO-ISO standard.

4.4.36 The Association noted that the eighth WMO Intercomparison of High Quality Radiosonde Systems held in China in July 2010 has produced a large data set on the performance of new operational radiosonde designs, backed up by measurements from Scientific Sounding Instrumentation. This allows recommendations as to the radiosonde designs that are potentially suitable for the GRUAN network operations and those which are suitable for routine operations, together with recommendations to improve systems without excessive development expenditure.

4.4.37 The Association recognized the need for a new Dobson calibration exercise in RA II, in view of the fact that the previous exercise took place in Tokyo in 2006.

Radio Frequency Coordination

4.4.38 The Association recalled Resolution 11 (EC-64) on radio frequencies for meteorological and related environmental activities. It noted that several RA II Members had contributed significantly to the WMO success at the International Telecommunication Union (ITU) World Radio Communication Conference 2012 (WRC-12) in protection spectrum employed by WMO systems and applications. However, there remains increasing pressure to share or reallocate frequencies used for meteorological purposes that could impact on Members' operations, in particular their observing systems. The Association supported the EC-64 request for all Members to participate actively in national, regional and international activities on radio frequency regulatory issues in order to defend radio frequency bands used for meteorological and environmental activities.

4.4.39 The Association further noted that RA II incorporates parts of several ITU regional organizations, in particular, the Regional Commonwealth in the field of Communications (RCC), the Asia-Pacific Telecommunity (APT) and the League of Arab States (LAS). It emphasized that it is essential that these groups be represented in WMO radio frequency coordination, and that meteorological requirements/interests are appropriately represented in the relevant ITU regional organizations.

Coordination of Observations for Climate

4.4.40 The Association noted with appreciation the consideration given by the CCI Management Group for supporting the WIGOS implementation and addressing the need in providing guidance on improving national climate networks and furthering the establishment of national reference climate networks. The Association urged its Management Group to keep this issue as a matter of high priority in the Regional WIGOS Implementation Plan.

4.4.41 The Association took note of the update of the 2006 GCOS report on *Systematic Observation Requirements for Satellite-based Products for Climate*, providing supplemental details to the satellite-based component of the 2010 update of the *Implementation Plan for the Global Observing System for Climate in Support of the UNFCCC*. The report recognizes in particular the importance of building data records and deriving products from the measurements made by satellites. It is intended primarily to assist those Members and their multi-national agencies that provide Earth observation from space in their response to the requirements of the Implementation Plan.

4.4.42 The Association noted that GCOS provides the international framework through which the various global observing systems and programmes operate under the auspices of WMO, IOC/UNESCO, UNEP and ICSU. The successful implementation of GCOS activities also depends on effective coordination at the national level of the contributions of Member countries to the WMO Integrated Global Observing Systems (WIGOS), the IOC-led and co-sponsored Global Ocean Observing System (GOOS), the FAO-led and co-sponsored Global Terrestrial Observing System (GTOS), and the many other in situ and space-based observing systems providing climate-related observation data.

APPENDIX B: DRAFT RESOLUTIONS

DRAFT RESOLUTION 4.4/1 (RA II-15) – REGIONAL WIGOS IMPLEMENTATION PLAN

THE REGIONAL ASSOCIATION II,

Noting:

- (1) Resolution 50 (Cg-XVI) – Implementation of the WMO Integrated Global Observing System (WIGOS),
- (2) Resolution 10 (EC-64) – WMO Integrated Global Observing System Framework Implementation Plan,

Noting further the final report of the first session of ICG-WIGOS and its recommendations on WIGOS implementation, including the development of regional WIGOS Implementation Plans (R-WIP),

Decides to adopt the Regional WIGOS Implementation Plan for RA II (Asia) (R-WIP-II) as presented in the annex to this resolution,

Requests the Management Group:

- (1) To keep the Implementation Plan under regular review and update; to guide, oversee and monitor the progress in the implementation of the Plan; and to submit amendments/updates to the Plan to the president of the Association for approval;
- (2) To coordinate with the Members the implementation of the Regional Plan and consult with the appropriate technical commissions on technical aspects of the implementation,

Requests the Members:

- (1) To develop their national WIGOS implementation plans;
- (2) To organize their activities so as to realize WIGOS goals and associated outcomes as described in the R-WIP-II;
- (3) To communicate and promote the concept of WIGOS and benefits of WIGOS to the Region and Members;
- (4) To continue to provide resources, including through the WIGOS Trust Fund and/or seconded experts, to help support the implementation of WIGOS;

Requests the Secretary-General to provide the necessary assistance and Secretariat support for the WIGOS implementation in RA II;

Invites the Partners to participate in relevant implementation activities as specified in the R-WIP-II.

Annex to draft Resolution 4.4/1 (RA II-15)

**REGIONAL WIGOS IMPLEMENTATION PLAN
FOR
REGIONAL ASSOCIATION II (ASIA)**

**(R-WIP-II)
Version 1.0**

Final Draft



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WIGOS REGIONAL IMPLEMENTATION PLAN FOR REGIONAL ASSOCIATION II (ASIA)

1. INTRODUCTION AND BACKGROUND

1.1 Purpose of WIGOS and scope of the Regional WIGOS Implementation Plan for RA II (R-WIP-II)

The WMO Integrated Global Observing System (WIGOS) provides a new framework for WMO observing systems and the contributions of WMO to co-sponsored observing systems. It is important to recognize that WIGOS is not replacing the existing observing systems, but is rather an over-arching framework for the evolution of these systems which will continue to be owned and operated by a diverse array of organizations and programmes. WIGOS will focus on the integration of governance and management functions, mechanisms and activities to be accomplished by contributing observing systems, according to the resources allocated on global, regional and national levels.

The WIGOS Framework Implementation Plan (WIP) addresses the necessary activities to establish an operational WIGOS by the end of the period 2012-2015, as per the direction of WMO Congress. Yet WIGOS will continue to evolve and improve beyond 2015 through the governance and management mechanisms established by the execution of this Plan.

The WIP also addresses a number of additional activities that would substantially improve the operational capabilities of WIGOS beyond the 2012-2015 implementation; however these activities are dependent on resources in addition to the regular budget. If these activities are not completed, WIGOS can still be considered operational. The resulting system will, however, be less effective in achieving its goals and benefits to Members will be reduced or delayed.

The WIP provides a basis for the development of the Regional WIGOS Framework Implementation Plans (R-WIP). The Members of a Region will adhere to the global WIP and to their regional framework (R-WIP) in the design, operation, maintenance and evolution of their national observing systems.

This plan is laid out in several chapters that identify and describe the various activity areas to be addressed within this Region. Specific regional/national activities for each area are included in Table 2 (see Section 4), which identifies deliverables, timelines, responsibilities, costs and risks, and whether the activity requires regional and/or national implementation. Similar activities are grouped under the title corresponding to the respective sub-section of Section 2.

1.2 WIGOS Vision and Congress Guidance for WIGOS Implementation

The Sixteenth World Meteorological Congress (Cg-XVI), held in 2011, decided that enhanced integration of the WMO observing systems should be pursued as a strategic objective of WMO and identified this as a major expected result of the WMO Strategic Plan¹.

The WIGOS vision calls for an integrated, coordinated and comprehensive observing system to satisfy, in a cost-effective and sustained manner, the evolving observing requirements of Members in delivering their weather, climate, water and related environmental services. WIGOS will enhance the coordination of WMO observing systems with those of partner organizations for the benefit of society. Furthermore, WIGOS will provide a framework for enabling the integration and optimized evolution of WMO observing systems, and of WMO's contribution to co-sponsored systems. Together with the WMO Information System (WIS), this will allow continuous and reliable access to

¹ see http://www.wmo.int/pages/about/documents/1069_en.pdf

an expanded set of environmental data and products, and associated metadata, resulting in increased knowledge and enhanced services across all WMO Programmes. The implementation of WIGOS should build upon and add value to the existing WMO observing systems with emphasis on integration of surface- and space-based observations in an evolutionary process to satisfy requirements of WMO and WMO co-sponsored Programmes.

In implementing WIGOS, it is imperative that the current management, governance and support activities be reviewed and aligned with WMO priorities. This alignment will promote cooperation and coordination at the technical, operational and administrative levels.

The integrated satellite systems are a unique source of observational data for monitoring of weather, climate and the environment. It is important to further advance instrument intercalibration, data exchange, data management standardization, and user information and training, in order to take full advantage of space-based capabilities in the context of WIGOS.

WIGOS will be essential for the Global Framework for Climate Services (GFCS), aviation meteorological services, disaster risk reduction (DRR), and capacity development, each of which is a WMO priority. It will also ensure a coordinated WMO contribution to the co-sponsored GCOS, GOOS, GTOS, and to the Global Earth Observation System of Systems (GEOSS).

2. KEY ACTIVITY AREAS FOR REGIONAL WIGOS IMPLEMENTATION

To migrate the existing global observing systems (the Global Observing System (GOS), the Global Atmosphere Watch (GAW), the World Hydrological Cycle Observing System (WHYCOS) and the Global Cryosphere Watch (GCW), including surface-based and space-based components and all WMO contributions to GFCS, GCOS, GOOS, GTOS and GEOSS), particularly their regional components, into a more integrated single system that is WIGOS, focused effort is required at the regional level in the following key areas, detailed in the sub-chapters to follow:

- (a) Management of WIGOS implementation;
- (b) Collaboration with WMO and co-sponsored observing systems;
- (c) Design, planning and optimized evolution;
- (d) Integrated Observing System operation and maintenance;
- (e) Integrated Quality Management;
- (f) Standardization, system interoperability and data compatibility;
- (g) The WIGOS Operational Information Resource;
- (h) Data and metadata management, delivery and archival;
- (i) Capacity development;
- (j) Communication and outreach.

2.1 Management of the Regional WIGOS Implementation in RA II

WIGOS implementation is an integrating activity for all regional components of the WMO and co-sponsored observing systems: it supports all WMO Programmes and activities.

Executive Council

The WMO Executive Council (EC) will continue to monitor, guide, evaluate and support the overall implementation of WIGOS. Following the guidance by Cg-XVI, the Executive Council at its sixty-third session established the Inter-Commission Coordination Group on WIGOS (ICG-WIGOS) with a view to providing technical guidance and assistance for the planning, implementation and further development of the WIGOS components. Progress on implementation of WIGOS will be reported

to subsequent sessions of EC. The Council designated the president of the Commission for Basic Systems (CBS) as chairperson of ICG-WIGOS.

Regional Association II (Asia)

The Regional Association II (RA II) will play the key role in WIGOS implementation in the Region. RA II, through its Expert Group on WIGOS (EG-WIGOS)², will coordinate planning and implementation of WIGOS on the regional level taking into account all WMO future priorities, such as GFCS and DRR. The Expert Group on WIGOS, under guidance from ICG-WIGOS and the Management Group of RA II, and with the support, where required, of the WIGOS Project Office and the Regional Office for Asia and the South-West Pacific in the WMO Secretariat, will be responsible for:

- (a) The development of the Regional WIGOS Framework Implementation Plan (R-WIP);
- (b) The integration of WIGOS regional network components; and
- (c) The evolution of their regional networks according to the implementation plan for the evolution of global observing systems (EGOS-IP)³.

R-WIP-II will also address regional aspects of requirements, standardization, observing system interoperability, data compatibility, data management, Quality Management System (QMS) procedures including performance monitoring and data quality monitoring, and proposed improvements in observing networks/systems. An important role of the RA II will be to assess and continuously monitor regional requirements, identify regional gaps and identify capacity development projects within the Region to address those gaps.

The Members of the Region

Members of the Region will plan, implement, operate and maintain national networks and observing programmes based on the standards and best practices stated in the WMO Technical Regulations, the WIGOS Manual and the respective Manuals of the WIGOS component observing systems (e.g., GOS, GAW, WHYCOS and GCW). They will be encouraged to adopt a composite network approach to their networks and to include the acquisition, and onward transmission, of data from external sources, including NMHSs and other government agencies, the commercial sector and members of the public. A particular area of focus for Members of the Region under WIGOS will be increased attention to site protection and radio frequency spectrum protection.

Plans should also be developed to strengthen cooperation through partnership with different owners overseeing the WIGOS observing components within their countries. Specifically, these activities aim to enhance cooperation amongst meteorological, hydrological, marine/oceanographic and academic/research institutions/services where they are separated at the national level.

2.2 Collaboration with WMO and co-sponsored observing systems

WIGOS will be an integrated, comprehensive, and coordinated system primarily comprising the surface-based and space-based observing components of the GOS, GAW, GCW, and WHYCOS, plus all WMO contributions to GCOS, GOOS and GTOS. It should be noted that in contrast to the primarily NMHS-owned observing systems upon which the WWW was built, the proposed WIGOS component observing systems are owned and operated by a diverse array of organizations, both research and operational. Therefore, the interaction between these various communities at the regional and national levels is important for the implementation of WIGOS within the Region. In particular, strengthening the interaction between research and operational observing communities

² RA II15 will make a decision on the working body responsible for implementation of WIGOS in RA II.

³ <http://www.wmo.int/pages/prog/www/OSY/gos-vision.html#egos-ip>.

is important for sustaining and evolving observing systems and practices, in line with new science and technology outcomes.

Partner Organizations

At the regional level, coordination and cooperation will be supported by a mechanism to be defined by the Regional Association and the respective regional bodies, such as PANGAEA⁴, in order to resolve possible problems in data policy, product delivery and other governance issues. This interagency and inter-observing system coordination mechanism will need to be complemented and supported through similar cooperation and coordination arrangements among NMHSs and through national implementation mechanisms for GFCS, GCOS, GOOS, GTOS, and GEOSS.

The Architecture for Climate Monitoring from Space has been defined as an end-to-end system, involving the different stakeholders including operational satellite operators and R&D space agencies, the Coordination Group for Meteorological Satellites (CGMS), the Committee on Earth Observation Satellites (CEOS), the Global Climate Observing System (GCOS), the World Climate Research Programme (WCRP) and the Group on Earth Observations (GEO). Within the Regional context, the Architecture shall be part of the space-based component of WIGOS. Therefore, particular emphasis will be placed on their coordinated contribution to WIGOS within the Region, building on existing coordination mechanisms stated above.

2.3 Design, Planning and Optimized Evolution of WIGOS component observing systems

WMO has agreed on the Vision for the Global Observing Systems in 2025⁵ which provides high-level goals to guide the evolution of the global observing systems during the coming decades. To complement and respond to this Vision, an Implementation Plan for the Evolution of Global Observing Systems (EGOS-IP) has been considered by CBS-15 (2012). This EGOS-IP focuses on the long-term evolution of WIGOS observing systems components, while the WIP focuses on the integration of these observing system components. Beyond 2015 these plans will provide Members of the Region with clear and focused guidelines, specifying actions that stimulate the cost-effective evolution of the observing systems to address in an integrated way the requirements of all WMO Programmes and relevant parts of co-sponsored programmes.

Concerning the surface-based sub-system of WIGOS, the current composition of mainly separate networks of observing stations comprises numerous different types of sites. With the implementation of WIGOS, these separate networks will continue to evolve but will also be given a more prominent collective identity as the WIGOS surface-based sub-system and for some purposes may be considered as a single composite system of observing (fixed or mobile) sites/platforms. The Regional Association will adopt a broader role in coordinating the implementation of relevant elements of the WIGOS surface-based sub-system, evolving from the previous concepts of mainly the regional synoptic and climatological networks into an integrated concept of a WIGOS regional network.

Similarly, the space-based sub-system of WIGOS is composed of many different platforms and types of satellites. There is already partial integration due to the existence of a globally coordinated plan, which is maintained by WMO and CGMS, and which takes into account the needs of a number of application areas. However, it should be further developed and expanded to better support certain application areas that, at present, are not benefiting from the full potential of space-based observations, for example, other components of GAW and WHYCOS and new

⁴ Another key Partners and stakeholders can be considered.

⁵ Available from the WMO Website at: <http://www.wmo.int/pages/prog/www/OSY/gos-vision.html>.

initiatives like GFCS and GCW. In addition, further integration shall be pursued in terms of inter-calibration, data and product harmonization, and composite product delivery. RA II will adopt an active role in compiling the views of Members and maintaining documented requirements and priorities for data and products to be available for the Region from the WIGOS space-based sub-system.

Rolling Review of Requirements (RRR)⁶

Coordinated strategic planning at all levels will be based on the RRR process, and will be supported by the WIGOS regulatory material. This activity will be carried out primarily at the global level under the guidance of the ICG-WIGOS.

The RRR process involves regularly reviewing the observational data requirements⁷ for each of the defined WMO Application Areas and all required variables (see Table 1). The RRR process also involves reviewing the capabilities of WMO observing systems and co-sponsored systems, and the details of the networks/platforms in existence⁸, for both space-based and surface-based systems, in delivering data on different variables. The comprehensive information collected for the globe on both requirements and capabilities is quantitatively recorded in a database accessible through the Observing Systems Capability Analysis and Review tool (OSCAR⁹) of the WIGOS Information Resource (WIR, see section 2.7 below). The information on surface-based networks and instrumentation details is currently recorded in the WMO Publication No. 9, Volume A, but will ultimately be available, with additional metadata through the OSCAR tool. Space-based capabilities are also recorded and made available through the OSCAR tool. OSCAR allows performing gap analyses to identify weaknesses in existing observing programmes.

The above steps represent the analysis phase of the RRR, which is as objective as possible. Next is the prioritization and planning phase of the RRR in which experts from the various application areas interpret the gaps identified, draw conclusions, identify key issues and priorities for action. This input is composed as Statements of Guidance (SoG) from each application area. The technical commissions respond to the SoG by formulating new global observing system requirements and the regulatory and guidance publications to assist Members in addressing the new requirements. Additionally, CBS and other technical commissions draw on the SoGs to develop a Vision and an Implementation Plan for further development of WIGOS.

⁶ Currently specified in the *Manual on the Global Observing System* (WMO-No. 544), elaborated in the *Guide to the Global Observing System* (WMO-No. 488), and described further on the WMO Website at <http://www.wmo.int/pages/prog/www/OSY/GOS-RRR.html>

⁷ The RRR describes data requirements, which are expressed in terms of space/time resolution, uncertainty, timeliness, etc., for each of the required observed variables, and are measures independent of observing technology.

⁸ Capabilities are derived from the individual platforms characteristics submitted by Members to WMO e.g. through WMO No. 9, Volume A, or its evolution

⁹ The following components are currently available via the WMO website: User Requirements: <http://www.wmo.int/pages/prog/www/OSY/RRR-DB.html>; and Space-based capabilities: http://www.wmo.int/pages/prog/sat/gos-dossier_en.php. The surface-based capabilities part is currently under development

Table 1: The 12 recognized WMO Application Areas

No.	Application Area	No.	Application Area
1	Global NWP	7	Ocean Applications
2	High Resolution NWP	8	Agricultural Meteorology
3	Nowcasting & Very Short-range Forecasting	9	Hydrology ¹⁰
4	Seasonal to Inter-annual Forecasts	10	Climate Monitoring
5	Aeronautical Meteorology	11	Climate Applications
6	Atmospheric Chemistry	12	Space Weather

At the Regional Level

Although the primary coordination of the RRR will lie with CBS for overall WIGOS planning, RA II, through its EG-WIGOS, will follow the technical guidance of the technical commissions as represented in the EGOS-IP and other observation system implementation plans in order to evolve and implement observing systems in the Region.

RA II will examine, and report back to CBS, its requirements for data, and any issues it identifies with the global WIGOS design, taking into account the particular requirements of the Region and international river basin authorities. This process will involve, in essence: (1) the use of the global data to prepare regional data requirements; (2) use of this for detailed planning of observing system components at the regional scale; and then (3) encouragement of Members of the Region to implement these components, subject to further review at the national or sub-regional level, where appropriate.

At the National or Sub-Regional Level

The Members of the Region will contribute to the collective regional effort to: (1) assess the regional data requirements and plan the regional observing system components; and (2) implement and evolve observing systems following this plan, the EGOS-IP and other observation system implementation plans.

The Members of the Region will also have the global and regional data requirements information available to use as guidance for the preparation of national requirements information which can then be used to assist with the detailed planning for evolution of national observing components of WIGOS.

In some cases, where countries are small and geographically close or already have established multilateral working relationships, there may be more merit in taking a sub-regional, as opposed to national, approach to WIGOS observing infrastructure planning. In this case, it will be necessary for the Members concerned to work in close cooperation to prepare sub-regional reviews of requirements to be used as a basis for detailed planning at that scale.

2.4 Integrated Observing System Operation and Maintenance

Observing system owners or custodians are responsible for operating and maintaining their systems and for complying with the regulations of the WMO and co-sponsored observing systems

¹⁰ Hydrological information only; water quality monitoring and information is currently excluded.

to which they contribute. System owners are generally NMHSs or other organizations within WMO Member countries but are sometimes other entities.

WIGOS on the regional level involves a process for sharing of operational experiences, practices and ideas, for sharing of expertise and for pooling resources for joint activities. The benefit is to realize synergies and greater efficiencies. These interactions may be between different teams within a single organization (such as an NMHS) or between regional organizations. These may benefit from technical guidance from relevant technical commissions and, while occurring primarily at a national level, there is a regional role to be played. Within RA II, the following WIGOS implementation projects will be important:

- RA II WIGOS Project to Enhance the Availability and Quality Management Support for NMHSs in Surface, Climate and Upper-air Observations;
- RA II WIGOS Project to Develop Support for NMHSs in Satellite Data, Products and Training;
- RA II WIGOS Project for Capacity Building in Radar Techniques in Southeast Asia.

2.5 Integrated Quality Management

The Region recognizes that meeting the quality requirements and expectations of users will be critical to the success of WIGOS. This will require an in-depth examination of current practices used by WMO observing programmes, specific mission-related requirements that are already in place, and available technological opportunities.

The WIGOS Quality Management approach is to apply the WMO QMF to the WIGOS observing components (see WMO *Technical Regulations*, Vol. IV (WMO-No. 49)). WIGOS quality management at the regional level will strive for compliance of all components of WIGOS with international standards, such as ISO 9001/9004 and the ISO 17025 standard where appropriate (i.e., with respect to instrument calibration and traceability of data). Compliance with international standards should be pursued in all quality assurance (QA) procedures applied by Members of the Region to all their national WIGOS observing components. In addition to the WMO QMF document, further guidance to Members will be provided by WMO via the standards and best practices described in the Regulatory Materials, such as the WIGOS Manual and Guide. Such guidance, for both mandatory and desirable practices, can be referred to for the application and implementation of quality management in national observing systems. In this context, the Region will give attention to:

- (a) The examination of current quality management practices being used in the Region;
- (b) The documentation of the quality of observations from the WIGOS regional networks at all stages of data processing; and
- (c) Ensuring, where possible, traceability of observations to the International System of Units (SI).

CGMS, in coordination and collaboration with WMO, supports the development of quality assurance standards and formats for satellite observations, multi-satellite and multi-sensor algorithms for estimating retrieved data and products, and advanced atmospheric sounding derivation packages for use by WMO Members. To assist this effort, RA II will ensure that surface-based sites that are needed for calibration/validation of satellite data are specified.

A key aspect of regional quality management that requires particular attention under WIGOS is the systematic and rigorous performance monitoring and evaluation (PM&E) of WIGOS capabilities, in terms of both: (a) the flow of observational data/products to models; and (b) provision of products/information for decision-support tools and services in accordance with requirements specified by

end users. Effective PM&E can improve the overall performance of WIGOS and its ability to effectively interact with its user community and to meet community needs and requirements.

Members of the RA II will be responsible for ensuring compliance with the WIGOS quality management principles (such as ISO 9001, 9004, 17025).

2.6 Standardization, System Interoperability¹¹ and Data Compatibility

WIS has an important role in regional WIGOS implementation, in relation to data exchange and discovery, and the provision of effective standards and practices for data management. Therefore, RA II will coordinate WIGOS and WIS implementation activities.

Taking into account the ongoing rapid progress in technology that will continue to provide a basis for further improvements in the capability, reliability, quality and cost-effectiveness of observations, the Members of the Region will ensure that WIGOS utilizes international standards and best practices set by WMO and partner organizations and described in the WMO Regulatory Materials in the following areas:

- (a) Instruments and methods of observation across all components including surface-based and space-based elements (observations and their metadata);
- (b) WIS information exchange, as well as discovery, access and retrieval (DAR) services; and
- (c) Data Management (Data Processing, Quality Control, Monitoring and Archival).

RA II will support all activities leading to the interoperability (including data compatibility) of WIGOS observing components through utilization and application of the same, internationally accepted standards and best practices (that is, standardization). Data compatibility will also be supported through the use of standardized data representation and formats.

Any regional deviations from the standard practices (documented in the WMO Technical Regulations through the WIGOS Manual and other relevant Manuals) will be reported to the WIGOS Project Office.

2.7 The WIGOS Operational Information Resource

The WIGOS Operational Information Resource (WIR), accessible via a centralized point (web portal), will provide all WIGOS related operational information, including observational user requirements, a description of the contributing observing networks (instrument/site/platform metadata), and their capabilities, list of standards used in the WIGOS framework, data policies applicable, and information on how to access data. It will also provide general information on WIGOS benefits, and impacts to Members. It will be a tool for conducting critical reviews as part of the Rolling Review of Requirements (RRR), and can assist Members and the Regional Association in conducting observing network design studies as appropriate. It will provide guidance on how to develop capacities in developing countries according to WIGOS requirements, and will provide Members of the Region with a toolbox to be used nationally if and when required. The information collected is intended in particular to identify the gaps in the observational networks, identify areas where existing observing systems could be used, or where their scope could be expanded at limited cost to address the requirements of more application areas. The information provided on standards will support the production of more homogeneous data-sets and make the observations traceable and of known quality.

¹¹ Interoperability is a property referring to the ability of diverse systems to work together (inter-operate)

The key support tools of WIGOS are: (a) a central web portal (WIGOS Portal); (b) The WIGOS Standardization of Observations Reference Tool (SORT); and (c) the Observing System Capabilities Analysis and Review tool (OSCAR) which includes information on observational user requirements and observing systems capabilities, and allow to perform the critical review by comparing the two.

Understanding that sources of the individual components of the WIGOS Operational Information Resource (WIR) rely on the inputs from its Members, RA II is committed to provide regular inputs to keep the information resource up-to-date.

2.8 Data Discovery, Delivery and Archival

Within the WIGOS framework, the WMO Information System (WIS¹²) provides exchange of data and interpretation of metadata¹³, and management of related discovery metadata¹⁴. These discovery metadata play an important role in the discovery, access and retrieval of WIGOS observations and products by the entire WMO community.

Submission, management and archival of the data themselves is generally the responsibility of observing system owners/data custodians. However, several World Data Centres and a number of regional or specialized data centres exist that collect, manage and archive basic observational data that are relevant to WMO Applications. Members of the Region are responsible for submitting their data to these regional or specialized data centres. RA II will encourage its Members to abide by this commitment.

Members of the Region will adopt WIGOS and WIS standards and make their data and metadata available through WIS for delivery or for discovery, access and retrieval services. In this regard, promotion and implementation of DCPCs (Data Collection and Production Centres) as well as National Centres will be supported and encouraged by RA II. Guidance will be developed and provided through the appropriate WIGOS regulatory and technical documents.

2.9 Capacity Development

A coordinated capacity-development effort at global, regional and national levels is of paramount importance to the developing countries in the implementation of WIGOS. This is especially the case for NMHSs of Least Developed Countries (LDCs) and Small Island Developing States (SIDS), to enable them to develop, improve and sustain national WIGOS observing components. This needs to be complemented by capacity development efforts outside of WIGOS but in closely related areas to improve access to and effective utilization of observations, data and products, and related technologies. The WIGOS capacity development activities at the regional level are focused on:

- (a) Providing assistance to Members of the Region to introduce or improve institutional mandates and policies that enable effective implementation, operation and management of observing systems;
- (b) Filling the existing gaps in the design, operation and maintenance of WIGOS observing systems, including both the infrastructure and human capacities development;
- (c) Technological innovation, technology transfer, technical assistance and decision-support tools.

¹² <http://www.wmo.int/wis>

¹³ Interpretation metadata is the information required to interpret the data.

¹⁴ Discovery metadata is the information describing the data-sets, generally using ISO-19115 standard, and WMO core profile in case of WIS.

Capacity development in satellite applications for developing countries, LDCs and SIDS are also addressed in the *Implementation Plan for the Evolution of the GOS* (see WMO/TD-No. 1267). The virtual laboratory (VL) will continue to grow and help all WMO Members realize the benefits of satellite data.

2.10 Communication and Outreach

The Region will establish its communication and outreach strategy through the efforts of WMO Members, Programmes, Regional Associations (RAs) and Technical Commissions (TCs), and co-sponsors. The strategy will provide details on WIGOS benefits, increased effectiveness, and efficiency, and impact on the activities of the Members of the Region, as well as on the socio-economical benefits of WIGOS data. It will take advantage of outreach programmes developed and effectively deployed so far by WMO and its partner organizations within the Region.

The WIGOS Portal will provide convenient access to relevant information on the regional communication, outreach and capacity development, aimed at complementing, not duplicating, others' efforts. A variety of outreach materials will be developed to educate the Members, funding agencies, policy-makers and the general public, on the importance of WIGOS to society. Materials will include posters and other educational material for elementary and high school classes, a WIGOS brochure, a semi-annual or annual newsletter, an online photo and video library, and information on the current state of the observing systems.

3. REGIONAL PROJECT MANAGEMENT

RA II will be responsible for the implementation of WIGOS in the Region through its EG-WIGOS with the support from the Regional Office for Asia and the South-West Pacific and the WMO Office for West Asia.

3.1 Monitoring, review and reporting mechanism

- (a) RA II, through its Management Group, will monitor, review, guide and support the overall implementation of WIGOS in the Region, and update the Implementation Plan if and when necessary;
- (b) RA II, through the Coordinator of EG-WIGOS, will report to the ICG-WIGOS and the WIGOS Project Office on the progress in implementation of WIGOS in the Region;
- (c) The president of RA II will report to the sessions of RA II on WIGOS implementation.

3.2 Evaluation

The evaluation methodology will be designed against WIGOS implementation activity tables, i.e. with respect to the activities, deliverables, timeline, responsibility and budget allocations. This will include a schedule of monitoring and evaluation activities and related responsibilities. Mid-term evaluation, interim progress reports and post-implementation reviews are planned as a means of providing early feedback on progress towards success, and as a means of meeting accountability and transparency requirements for the whole implementation phase. RA II and NMHSs will provide progress reports at the request of the WIGOS Project Office.

4. IMPLEMENTATION

4.1 Activities, Deliverables, Milestones, Costs and Risks

Table 2 given in Annex I to this Plan presents the key implementation activities that are required for the Regional WIGOS implementation within the timeframe from 2012 to 2015. The table is arranged to correspond to the activity areas presented in Section 2. In the table each implementation activity is presented along with its associated deliverables, timelines, responsibilities, costs and associated risk.

Most of the activities in Table 2 will be implemented through the RAI WIGOS projects under the initiative of key regional players given in Annex II. EG-WIGOS has responsibility for tracking execution of these activities and projects.

5. RESOURCES

The possible resources will be described here.

6. RISK ASSESSMENT/ MANAGEMENT

The Risk Management Plan (RMP) will be developed for each implementation activity/projects, including risk mitigation. The following risk areas have been identified:

- (a) Lack of resources (funds, expertise);
- (b) Lack of understanding of benefits that WIGOS can bring to the Region, sub-regions and Members;
- (c) Lack of cooperation and collaboration with key partners and stakeholders;
- (d) Low commitment of Members.

7. OUTLOOK

This document has described the key activities for the period 2012 to 2015. As determined by Cg-XVI, the goal is to have WIGOS operational by 2016. This is a challenging task. The experience gained during the WIGOS test of the concept phase clearly shows that it will be impossible to complete integration of all observing systems on global, regional and national levels in only four years. While WIGOS operations should start in 2016, there will still be a strong need to continue a significant number of implementation activities.

ANNEX I

Table 2 RA II WIGOS IMPLEMENTATION ACTIVITIES

Depending on the implementation scale, planned activities are specified as follows:

R = Regional activity; SR = Sub-regional activity and N = National activity.

No.	Activity	Deliverables	Timeline	Responsibility	Estimated Costs (2012-2015) K CHF			Potential Risks
					Total	ARB	Shortfall	
1. Management of WIGOS Implementation in RA II								
1.1 R	Develop and update R-WIP-II	Regional WIGOS Implementation Plan for RA II (R-WIP-II)	Develop in 2012 and update if necessary	Drafted by TT-R-WIP-II, to be adopted by RA II-15 (Dec. 2012) and updated by RA II EG-WIGOS/MG				Low (on-going)
1.2 R	Report progress of the RA II R-WIP-II Projects ¹⁸ to RA II MG	Progress reports	2013-2015 every year	Coordinators of Projects ¹⁹				Low
1.3 R N	Encourage RA II Members to appoint National Focal Points and submit national reports on progress of EGOS-IP	A list of RA II EGOS-IP National Focal Points	2013-2015 every year	RA II Members (Project No. I)				Mod
2. Collaboration with WMO and co-sponsored observing systems								
2.1 SR	Examine data policy and exchange of surface-based remote sensing datasets/ products for NWP use on an offline basis	Exchange of datasets	2013-2014	East Asia (China, Japan, Republic of Korea) (Project No. III.1)				High
2.2 SR	Examine data policies and exchange observational sand and dust data	Exchange of datasets	2013	SDS-WAS Asian Node WG (China, Japan, Republic of Korea) (Project No. V)				High
3. Design, planning and optimized evolution of WIGOS and its regional, sub-regional and national observing components								
3.1 R	Review the progress of EGOS-IP in RA II based on EGOS national reports submitted by RA II Members	Prioritized actions listed in the EGOS-IP	2015	China, Hong Kong, China (Project No. I)				Mod

¹⁸ See Annex II: RA II WIGOS implementation projects

¹⁹ See Annex II

No.	Activity	Deliverables	Timeline	Responsibility	Estimated Costs (2012-2015) K CHF			Potential Risks
					Total	ARB	Shortfall	
3.2 SR	Design feasible and optimal draft design of integration of surface-based remote sensing observations based on OSE; use the results to update the RRR user requirements database and to fine tune the EGOS-IP and observing system plans.	Draft design of integration of surface-based remote sensing observation based on OSE	2015	East Asia (Project No. III.1)				High
3.3 SR	Assess enhanced capacity in monitoring and forecasting of sand and dust storms by exchanged datasets; use the results to update the RRR user requirements database and to fine tune the EGOS-IP and observing system plans.	Identified benefits from exchange of sand and dust data on a near real-time basis	2015	SDS-WAS Asian Node WG (Project No. V)				High
3.4 SR	Develop strategic plan on development of the Southeast Asia radar network.	Draft strategic plan on development of the Southeast Asia radar network	2015	Southeast Asia (ASEAN—SCMG: Thailand, Malaysia) (Project No. III.2)				Mod
3.5 R	Identify the requirements of NMHSs of developing countries, regarding satellite imagery, data and products, use the results to update the RRR user requirements database and to fine tune the EGOS-IP	Reports on requirements of NMHSs of developing countries, regarding satellite imagery, data and products		Japan, Republic of Korea, other satellite operators (Project No. VI)				Mod
4. Integrated Observing System Operation and Maintenance								
4.1 R	Collect and share standard and best practices documents from RA II Members	Shared best practices on integration of observational systems	2013-2015	Republic of Korea (Project No. II)				Low
4.2 SR	Develop and share national reports toward operational rainfall estimation/forecasting based on radar data.	Identified technical issues and lessons learned on operation of radar systems among ASEAN countries	2015	Southeast Asia (ASEAN—SCMG: Thailand, Malaysia) (Project No. III.2)				Mod
5. Integrated Quality Management								
5.1 R	Survey and share the status on calibration instruments for surface-based observations in RA II	Reports on status on calibration instruments for surface-based observations in RA II	2012-13	China, India, Japan (Project No. IV)				Low (on-going)
5.2	Monitor data quality by utilizing NWP QC	Improved data quality of	2012-15	Japan				Low

No.	Activity	Deliverables	Timeline	Responsibility	Estimated Costs (2012-2015) K CHF			Potential Risks
					Total	ARB	Shortfall	
R	monitoring reports on surface observations	surface observations		(Project No. IV)				(on-going)
5.3 R	Organize intercomparison between regional standards of RICs	Traceability between RICs	2013-15	China, Japan (Project No. IV)				High
5.4 R	Obtain ISO/IEC 17025	Enhanced RIC's capacity	2013-15	China, Japan (Project No. IV)				Mod
5.5 R	Enhance support by RICs, and encourage Members to work with RICs to ensure traceability to SI	Improved data quality of surface observations	2013-15	China, Japan (Project No. IV)				Mod
6. Standardization, System Interoperability and Data Compatibility								
6.1 R	Survey and share the status on QC/QA procedures and site management for the network of RBCN and RBSN stations	Reports on status on QC/QA procedures and site management in RA II	2013-15	Japan (Project No. IV)				Mod
6.2 N	Encourage the collection of metadata on observing stations	Collection of metadata on observing stations	2013-15	RA II Members				High
7. The WIGOS Operational Information Resource								
7.1 R	Develop a portal to share EGOS national reports	Portal to share EGOS national reports	2013-15	China (Project No. I)				Low
7.2 R	Develop a standards and best practices Portal	Standards and best practices Portal	2013-15	Republic of Korea (Project No. II)				Low
7.3 R	Develop QA/QC Portal	QA/QC Portal	2013-15	Japan (Project No. IV)				Mod
8. Data discovery, delivery and archival								
8.1 R	Encourage RA II Members to be designated as NCs and DCPCs	RA II Members designated as NCs and DCPCs	2012-15	RA II EG on WIGOS				Mod
8.2 R	Encourage RA II Members to share data via WIS, including from organizations other than NMHSs	New sources of data are available through WIS	2012-15	RA II EG on WIGOS				Mod

No.	Activity	Deliverables	Timeline	Responsibility	Estimated Costs (2012-2015) K CHF			Potential Risks
					Total	ARB	Shortfall	
9. Capacity development ²⁰								
9.1 R	Technical Training on QA/QC procedures	Improved QA/QC at RBCN and RBSN stations	2013-15	China; India; Japan; Republic of Korea; Hong Kong, China; Kuwait; Russian Fedederation (Project No. IV)				High
9.2 R	Hold training workshops on maintenance and calibration of meteorological instruments	Improved capacity in maintenance and calibration of meteorological instruments	2013	Japan (Project No. IV)				Low (being planned)
9.3 R	Develop training materials on maintenance and calibration of meteorological instruments	Training materials on maintenance and calibration of meteorological instruments	2013-15	Japan (Project No. IV)				Low (being planned)
9.4 R	Coordinate training activities on utilization of satellite data/products	Improved capacity in utilization of satellite data/products	2012-15	Japan, Republic of Korea, other satellite operators (Project No. VI)				Low (on-going)
9.5 R	Establishing filed intercomparison campaign for observation techniques	Guidance to operate and maintain observation instruments	2013-15	Republic of Korea (Project No. II)				Low
10. Communication and outreach								
10.1 R	Interlink RA II WIGOS portals and related Websites	Better access to RA II WIGOS-related information and products	2013-15	China; Hong Kong, China; India; Japan; Republic of Korea				low
10.2 R	Develop RIC Websites	Improved access to information on RICs	2012-15	China, Japan (Project No. IV)				Low (on-going)

²⁰ Congress stressed that an effective capacity-building strategy is an essential component of the WIGOS implementation. Specialized education, training activities and improvement of necessary observing infrastructure should be reflected in the regional, sub-regional and national WIGOS implementation plans, especially for NMHSs of LDCs, LLDCs and SIDS. Hence, capacity building is not to be limited to scientific and technological concerns, but also to strategic and management consideration including human resources development, resource mobilization and communications and outreach activities.

No.	Activity	Deliverables	Timeline	Responsibility	Estimated Costs (2012-2015) K CHF			Potential Risks
					Total	ARB	Shortfall	
10.3 R	Publish newsletter regularly	Improved access to information on satellite data/products	2012-15	Japan, Republic of Korea, other satellite operators (Project No. VI)				Low (on- going)

ANNEX II
RA II WIGOS IMPLEMENTATION PROJECTS

List of RA II WIGOS Projects

No.	Project title	Key regional players
I	Monitor and review the Implementation of EGOS- IP in RA II	China; Hong Kong, China
II	Standard and best practise Portal, including technical documents with necessary details in English from all RA II Members	Republic of Korea
III.1	Observing systems integration for supporting disaster risk reduction - Integration of Surface-based Remote Sensing Data in the East Asia	China, Japan, Republic of Korea
III.2	Observing systems integration for supporting disaster risk reduction - Capacity Building in Radar Techniques in the Southeast Asia	ASEAN (Thailand, Malaysia)
IV	Enhance the Availability and Quality Management Support for NMHSs in Surface, Climate and Upper-air Observations	Japan
V	Developing a Sand and Dust Storm Warning Advisory and Assessment System (SDS-WAS) in Asia Node	China, Japan, Republic of Korea
VI	Develop Support for NMHSs in Satellite Data, Products and Training	Japan, Republic of Korea

Project No. I

Project Title	RA II WIGOS Project to Monitor and Review the Implementation of EGOS-IP in RA II
Type	Regional Implementation Project (RA II)
Status	Draft Design
Overview	<p>A vision for the Global Observing Systems in 2025 which provides high-level goals to guide the evolution of the global observing systems during the coming decades has been approved by EC-LXI in 2009. Accordingly, CBS-15 adopted a recommendation for the Implementation Plan for the Evolution of Global Observing Systems (EGOS-IP) to complement and respond to this Vision. The Implementation Plan outlined the key activities to be implemented during the period 2012 to 2025 aiming at maintaining and developing all WMO component observing systems. Thus, a project can be established to monitor the progress of RA II Members on the implementation of EGOS-IP, analyze gaps in the regional observing network, and therefore, prioritize actions listed in EGOS-IP. The concerned information should be shared by RA II Members and all users by establishing a portal. This project will:</p> <ul style="list-style-type: none"> ● Encourage RA II Members to appoint National Focal Points and submit EGOS National Reports annually, ● Identify gaps and prioritize actions listed in EGOS-IP through reviewing the progress of EGOS-IP in RA II, ● Develop a Portal to share the progress of EGOS-IP Implementation of RA II Members.
Aim(s)	<ul style="list-style-type: none"> ● To identify gaps and prioritize actions listed in the EGOS-IP through reviewing the progress of the Evolution of Global Observing Systems (EGOS), ● The progress and experiences are shared by RA II members when implementing the EGOS-IP.
Benefits	The Portal will provide Members and users with a platform for sharing updated progress of EGOS-IP implementation in RA II
Key Regional Players	China and Hong Kong, China
Capacity development requirements	<ul style="list-style-type: none"> ● Technical assistance by CBS, ● Workshop(s) on gaps analysis and actions prioritizing listed in EGOS-IP.
Partners/Participants	All RA II Members
Funding Source(s)	This project will rely on existing budget allocations at the national level. Additional funding will be needed to facilitate some elements such as the cost for developing the portal software.
Overall Costs	(TBD)
Timescale	2013–2016
Expected Key Deliverables/Key responsible body	<ul style="list-style-type: none"> ● A list of RA II EGOS National Focal Points, ● Prioritized actions listed in the EGOS-IP, ● Portal to share progress EGOS IP implementation in RA II.
Main risk(s)	Lack of resources (funds/expertise), lack of cooperation and missing or mistaken information from Members
Website	Not available
Summary	This project will develop a Portal that will provide updated progress on EGOS-IP in RA II, identify gaps and prioritize actions listed in EGOS-IP identify regional prioritized actions to be taken.
Date of the update	21 November 2012
Contact Person 1	<p>Ms GUO Jianxia Meteorological Observation Center, China Meteorological Administration (CMA) China Tel: +86 10 68407934 Fax: +86 10 68400936 E-mail: gjxaoc@cma.gov.cn</p>

Contact Person 2	Mr LEE Lap Shun Hong Kong Observatory Hong Kong, China Tel.: +852-2926-8416 Fax: +852-2311-9448 E-mail: lslee@hko.gov.hk
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Project No. II

Title	RA II WIGOS Project for Standard and Best Practice Portal, including Technical Documents with Necessary Details in English from all RA II Members
Type	Regional Implementation Project (RA II)
Status	Draft Design
Overview	This project will develop a Standard and Best Practise Portal including mechanism and procedures needed for a regular updating process.
Aim(s)	<ul style="list-style-type: none"> ● To develop a Standard and Best Practise Portal, ● To establish regional standard and best practices documentation (regional practices database) for enhanced observational data/products utilization, including data/metadata management, ● To specify mechanisms, procedures for regular monitoring and updating of the portal.
Benefits	The standard and best practices portal will enhance and improve quality and utilization of data/products.
Key Regional Player	Republic of Korea
Capacity development requirements	Technical assistance by CBS and CIMO
Partners/Participants	RA II Members
Relationship with existing project(s)	KMA WIGOS demonstration project
Funding Source(s)	This project will rely on existing budget allocations at the national level
Overall Costs	(TBD)
Timescale	2013–2016
Expected Key Deliverables / Key responsible body	Portal on standards and best practices with mechanisms and procedures for regular monitoring and keeping the portal up-to-dated.
Main risk(s)	Lack of resources (funds/expertise), lack of cooperation and missing or mistaken information from Members.
Website	Not available
Summary	This subproject will establish a RA II Portal of standards and best practices for enhanced observational data/products utilization.
Date of the update	21 November 2012
Contact Person 1	Dr WON Jaegwang Korea Meteorological Administration (KMA) Republic of Korea Tel.: +82-2-2181-0694 Fax: +82-2-2181-0709 E-mail: wonjg@kma.go.kr , ecotus37@korea.kr
Contact Person 2	Dr PARK Seongchan Korea Meteorological Administration (KMA) Republic of Korea Tel. +82-2-2181-0696 Fax: +82-2-2181-0709 E-mail: scpark@korea.com

Project No. III.1

Project Title	RA II WIGOS Project for Observing Systems Integration for Supporting Disaster Risk Reduction
Subproject Title	Integration of Surface-based Remote Sensing Data in the East Asia
Type	Regional Implementation Project (RA II)
Status	Draft Design
Overview	<p>In order to enhance observing capabilities in severe weather monitoring and forecasting, specifically in East Asia, surface-based remote sensing datasets/products, such as radar and GPS data, should be integrated for their better utilization.</p> <p>This project, as a first step, aims at developing a feasible and optimal draft design of integrated surface-based remote sensing observations toward future operational assimilation in meso-scale NWP system at the sub-regional level, as well as real-time quality-assured radar composite maps. The project will be Observing System Experiments (OSE) driven and proceed as follows:</p> <ol style="list-style-type: none"> 1. Offline Exchange of surface-based remote sensing datasets/products including radar echo intensity, Doppler velocity, AWS data, and, if available, GPS precipitable water vapour, together with supplementary information (e.g. data format, details on observations, and data quality) among participating organs. 2. Examination of impacts of assimilation of exchanged remote sensing observation on its NWP performance. Also, sub-regional radar composite maps meeting their own operational requirements will be developed. Results and identified technical issues (e.g. data format, data policies, telecommunication for real-time data exchange, and quality of data) will be shared with and worked out cooperatively by the participating organs. Thus, requirements of data exchange for operational phase will be specified. 3. A feasible and optimal draft design of integration of surface-based remote sensing observations will be developed based on the results of the project. <p>To proceed with this project, existing frameworks such as CMA-JMA-KMA NWP meeting will be expanded to include this project into its agenda.</p>
Aim(s)	The aim of this project is to develop a feasible and optimal draft design of integrated surface-based remote sensing observations toward operational assimilation of those data in meso-scale NWP model of the participating organs at the sub-regional level, as well as real-time quality-assured radar composite maps.
Benefits	<p>Members in East Asia will benefit from this project through enhancement of their capabilities in observations for better early monitoring/warning/nowcasting/very short-range forecasting.</p> <p>All the other RA II Members, particularly ones in Southeast Asia which might plan a similar project in the future, will benefit from shared outcomes of this project, namely: (1) solutions to identified issues for integration of surface-based remote sensing observations at sub-regional level; as well as (2) results of impact analysis on capacities in severe weather monitoring and forecasting.</p>
Key Regional Player	China, Japan and Republic of Korea
Capacity development requirements	Workshop(s) on better utilization (decision making & assimilation)
Partners/Participants	CMA, JMA, KMA
Relationship with existing project(s)	<ol style="list-style-type: none"> 1. WMO Workshop on the Impact of Various Observing Systems on Numerical Weather Prediction. 2. CMA-JMA-KMA joint workshop on NWP (The 1st CMA-JMA-KMA joint workshop on NWP was held in September 2011). 3. WMO/CIMO Radar Quality Control and Quantitative Precipitation Estimation Intercomparison (RQQL).
Funding Source(s)	This project will rely on existing budget allocations at the national level. The project will build on existing national observational networks and information management infrastructures. Additional funding might be needed to regularly hold technical meetings among CMA, JMA, and KMA to proceed with this

	project.
Overall Costs	(TBD)
Timescale	2013 – 2016
Expected Key Deliverables / Key responsible body	<ol style="list-style-type: none"> 1. Establishment of collaborative working mechanism toward integrated surface-based remote sensing observations in the East Asia for operational monitoring and forecasting severe weather. 2. Solutions to identify issues to be solved for integration of surface-based remote sensing observations at sub-regional level and their solutions. 3. Impacts on capacities of NMHSs in severe weather monitoring and forecasting through utilization of surface-based remote sensing observations.
Main risk(s)	<ol style="list-style-type: none"> 1. Limited exchange of observational data, for instance, due to data policies of providers. 2. Lack of sharing relevant technical documentation on exchanged data.
Website	Not to be established
Summary	This project will develop a feasible and optimal draft design of integrated surface-based remote sensing observations toward the sub-regional utilization in East Asia.
Date of the update	21 November 2012
Contact Person 1	<p>Mr Yuki HONDA Office of International Affairs Japan Meteorological Agency (JMA) Japan Tel.: +81-3-3211-4966 Fax: +81-3-3211-2032 E-mail: iao-jma@met.kishou.go.jp,</p>
Contact Person 2	<p>Dr Jaegwang WON Korea Meteorological Administration (KMA) Republic of Korea Tel.: +82-2-2181-0694 Fax: +82-2-2181-0709 E-mail: wonjg@kma.go.kr, ecotus37@korea.kr</p>
Contact Person 3	<p>Mr LI Feng Meteorological Observation Center China Meteorological Administration (CMA) China Tel.: +86 10 68409293 Fax: +86 10 68400936 E-mail: liflif04@cma.gov.cn</p>

Project No. III.2

Project Title	RA II WIGOS Project for Observing Systems Integration for Supporting Disaster Risk Reduction
Subproject Title	Capacity Building in Radar Techniques in the Southeast Asia
Type	Cross-regional Implementation Project (RAs II and V)
Status	Draft Design
Overview	<p>Developing countries in Southeast Asia share common challenges for severe weather monitoring and forecasting. In spite of many radars having been installed in the region, they are not fully utilized due to lack of their expertises in weather radar techniques. Thus, capacity building in weather radar techniques is crucial concern for the countries.</p> <p>Although their levels of operational usage of radar vary, they are often facing common technical challenges. In this regard, sharing their technical issues and lessons learnt among countries in the Region and developing the regional strategy on development of the radar network in the Region will enable them to tackle those challenges collaboratively with help from the WMO community in an effective and efficient manner.</p> <p>This project, initiated by Thailand and Malaysia, within the framework of the ASEAN Sub-Committee on Meteorology and Geophysics (SCMG), aims at establishing a collaborative mechanism within SCMG through the following steps:</p> <ol style="list-style-type: none"> 1) Thailand and Malaysia, as leaders of this project, will develop their national reports toward operational rainfall estimation/forecasting based on radar data. In order to share their experiences and lessons learnt among the participating organs, and to identify technical problems to be solved and necessary technical supports for, the reports should include the following items in a well-structured format: <ol style="list-style-type: none"> (a) overview of the current radar systems, (b) organization (department, division, staff, and budget), (c) specification of radar systems, (d) maintenance of equipment, (e) data processing (QC, calibration, and composite technique), (f) radar products, (g) details of current technical problems associated with (a) to (f), (h) lessons learnt from the past experiences, (i) recent progress, (j) future development plans. <p>The reports will be submitted to the 35th SCMG meeting (2013).</p> 2) The other ASEAN member countries will also develop their national reports in the same format as that of <u>Thailand and Malaysia</u>, and submit their reports to 36th SCMG meeting. Based on the submitted report, the meeting will develop a regional strategic plan on radar which identifies common technical issues and necessary actions to be taken. 3) During the period of the project, all the above Members will be requested to update their national reports and submit the latest version to a SCMG meeting every year. Thailand and Malaysia are requested to encourage the other Members to develop and keep their national reports up-to-date. The regional strategic plan is also to be updated at every SCMG meeting. <p>*Each Member will consult with the WMO or advanced RA II Members about appropriate technical missions focused on identified technical issues in the reports such as dispatch of radar experts to recipient countries, with the VCP or other funds. On completion of such a mission, the recipient Member is requested to update its national report by including details of the outcomes of the mission.</p> <p>*SCMG set up a new agenda item for discussion on the progress of this project.</p>
Aim(s)	This project aims to develop effective early warning systems building on radar data in Southeast Asia.
Benefits	Capacity in monitoring and forecasting of the severe weather using radar data will be enhanced by shared experiences and lessons among the participating organs and

	technical missions focused on technical issues identified in national reports and the regional strategic plan.
Key Regional Player	ASEAN-SCMG: Thailand, Malaysia
Partners/ Participants	All the ASEAN Member countries (Cambodia, Brunei Darussalam, Indonesia, Lao PDR, Malaysia, Myanmar, Philippines, Singapore, Thailand, Vietnam)
Relationship with existing project(s)	<ul style="list-style-type: none"> - Radar composite map in Southeast Asia, one of the on-going projects under the Meteorological Working Group of the WMO/ESCAP Typhoon Committee, - Severe Weather Forecasting Demonstration Project (SWFDP) for Southeast Asia, - ASEAN Sub-Committee on Meteorology and Geophysics(SCMG).
Funding Source(s)	This project will rely on existing budget allocations at the national level. The project will build on existing national observational networks and information management infrastructures. Additional funding will be needed for technical cooperation for those countries by dispatching appropriate experts and/or providing training workshops.
Overall Costs	(TBD)
Timescale	2013–2016
Expected Key Deliverables / Key responsible body	<ul style="list-style-type: none"> - National reports in the Southeast Asia toward operational rainfall estimation/forecasting based on radar data, - Regional strategic plan on development of the radar network.
Main risk(s)	<ol style="list-style-type: none"> 1) Failure of development of national reports by participating organs. 2) Lack of available experts. 3) Lack of funds available.
Website	Not to be established
Date of the update	21 November 2012
Contact Person 1	Dr.Somchai Baimoung Deputy Director-General/Acting Director-General Thai Meteorological Department Thailand Tel.: +66 81 989 9025 Email: somchaib@tmd.go.th
Contact Person 2	Mr A. Kamiluddin Hj Ibrahim Director, Radar Meteorology Division Malaysian Meteorological Department Malaysia Tel.: +603 7967 8154 Fax: +603 7955 0964 E-mail: kamiluddin@met.gov.my

Project No. IV

Project Title	RA II WIGOS Project to Enhance the Availability and Quality Management Support for NMHSs in Surface, Climate and Upper-air Observations
Type	Regional Implementation Project (RA II)
Status	Draft Design
Overview	<p>The Japan Meteorological Agency (JMA)/World Meteorological Organization (WMO) Workshop on Quality Management in Surface, Climate and Upper-air Observations, held at Tokyo in July 2010 as part of activities of the Pilot Project to Enhance the Availability and Quality Management Support for NMHSs in Surface, Climate and Upper-air Observations (hereafter, Pilot Project), found out that primary factors adversely affecting data quality in RA II are calibration and maintenance of instruments mainly due to lack of traceability of measurements to international standards and calibration facilities. This project will build on outcomes of the workshop.</p> <p>It consists of the following two activities: (i) improvements of data quality of RBCN/RBSN stations; and (ii) enhancement of capabilities of RIC-Tsukuba and RIC-Beijing. All the outcomes of this project will be shared at a Portal to be established by the Coordinator.</p> <p>1. Improvements of data quality at RBCN/RBSN stations</p> <p>(a) Monitoring Data Quality</p> <p>The Coordinator checks data quality of RA II stations and identifies and requests RA II Members to identify technical issues, based on the following results:</p> <ul style="list-style-type: none"> • Questionnaire on the Surface, Climate, and Upper-air Observations and Quality Management in Regional Association II (Asia) (conducted in July 2010), • Questionnaire on meteorological instruments, calibration and training in Regional Association II (Asia) (conducted in January 2012), • 6-monthly monitoring reports by the Lead Centre for monitoring the quality of land surface observations in Region II. <p>(b) Survey on status on QA/QC procedures and site managements for the network of RBCN/RBSN stations, and report the results.</p> <p>Based on requests from the Coordinator, the following Members will consider the possibility of technical support if funds are available, and share the summary of the technical missions with RA II Members:</p> <ul style="list-style-type: none"> - CMA, HKO, JMA, and KMA for Southeast Asia, - IMD for South Asia, - Roshydromet for Central Asia, - Kuwait for Middle East. <p>2. Enhancement of RIC's Services</p> <p>RICs plan to implement the following action items for further enhancement of their services in capacity building and calibration during the project:</p> <ul style="list-style-type: none"> (a) Organization of a training workshop to improve understanding of calibration and maintenance of meteorological instruments according to needs of RA II Members to be identified by the "Questionnaire on Meteorological Instruments, Calibration and Training in Regional Association II (Asia)", (b) Development of training materials on calibration and maintenance of instruments (to be prepared for publication as an Instruments and Methods of Observation Programme (IMOP) technical document), (c) Obtaining the International Standard ISO/IEC 17025 – General requirements for the competence of testing and calibration laboratories – certification for air pressure, temperature, and humidity, (d) Development of RIC's Websites, (e) Intercomparison between RIC-Tsukuba and RIC-Beijing, (f) Reports on status on calibration instruments for surface-based observations in RA II (to be prepared for publication as an Instruments and Methods of Observation Programme (IMOP) technical document).
Aim(s)	This project aims at improvement of data quality at RBCN/RBSN stations and enhancement of services of RA II RICs.

Benefits	RA II Members, especially those with technical issues on data quality of observations, will potentially benefit from this project.
Role/Involvement of WMO Regional Centres in RA II	Regional Instrument Centres (RICs) Lead Centre for monitoring the quality of land surface observations
Key Regional Player	JMA (Coordinator), and Members of Coordination Group Technical Mission: <ul style="list-style-type: none"> - CMA, HKO, JMA, and KMA for Southeast Asia, - IMD for South Asia, - Roshydromet for Central Asia, - Kuwait for Middle East.
Capacity development requirements	1. Workshop on maintenance, field inspection, etc. (basic level), 2. Workshop on traceability, measurement uncertainty, etc. (advanced level).
Partners/Participants	RA II Members
Funding Source(s)	This project will rely on existing budget allocations at the national level. Additional funding will be needed to dispatch experts to NMHSs in developing countries and/or invite their observational staff to RICs for trainings and calibrations of national standards.
Overall Costs	(TBD)
Timescale	2013–2016
Expected Key Deliverables / Key responsible body	<ol style="list-style-type: none"> 1. Provision of technical support for instrument maintenance and calibration by experts from RICs. 2. Holding a RIC's training workshop for RA II Members. 3. Development of training materials (to be prepared for publication as an IMOP technical document). 4. Obtaining ISO/IEC 17025 certification. 5. Portal Website to share outcomes of this project. 6. Report on status on QC/QA procedures and site management in RA II. 7. Reports on status on meteorological instruments, calibration and training in Regional Association II.
Main risk(s)	<ul style="list-style-type: none"> • Lack of funding for technical missions by RICs, • Insufficient communication between the Coordinator, RICs, and RA II Members on their status on maintenance and calibration of instruments to specify needs of technical supports, • Lack of responses from RA II Members.
Website	RIC's Website/Portal on QC/QA
Summary	Improvement of data quality of RA II Members through enhancement of RIC's services and capacity
Date of the update	21 November 2012
Contact Person 1	Mr Yoshihisa KIMATA Senior Coordinator for Observation Networks Administration Division, Observations Department Japan Meteorological Agency (JMA) Japan Tel.: +81 3 3211 6018 Fax: +81 3 3211 7084 Email: kimata@met.kishou.go.jp
Contact Person 2	Mr He Xiaolei Meteorological Observation Center China Meteorological Administration (CMA) China Tel: +86 10 68409767 Fax: +86 10 68400936 E-mail: hxlaoc@cma.gov.cn

Project No. V

Project Title	RA II WIGOS Project to Develop a Sand and Dust Storm Warning Advisory and Assessment System (SDS-WAS) in Asia Node
Type	Regional Implementation Project (RA II)
Status	Draft Design
Overview	<p>SDS-WAS was established in 2007 to achieve comprehensive, coordinated and sustained observations and modelling capabilities of sand and dust storms in order to improve the monitoring of sand and dust storms to increase the understanding of the dust processes and to enhance dust prediction capabilities for mitigation of risks in many affected area (aviation, health impacts, etc.).</p> <p>The WMO SDS-WAS Region for Asia third meeting of Regional Steering Group (RSG) was held at Tsukuba, Japan in March 2012. At the meeting, it was confirmed that observation data exchange schemes should be implemented promptly in order to enhance systematic near-real-time (NRT) monitoring of sand and dust events in each country, and the following near-term implementation plan was agreed within the SDS-WAS Asia Node activity:</p> <ul style="list-style-type: none"> • Each country will confirm their data policy on observation data delivery, to reach an agreement on the provision of observation data to be shared within the Node in NRT, • Regional Centre (RC: China) will provide a portal website with a function for sharing the observation data and announce it to the Node members, • At the beginning, experimental observation data sharing will be conducted in off-line basis (not NRT) for the sand/dust storms (SDS) seasons, • For the data exchange, the ad-hoc working group will propose appropriate data format and parameters, • In SDS season in the spring (from February to June) 2013, the NRT (with a goal of approximately 1-day delay) data exchange will be conducted regularly, • NRT data will be used for intercomparison of sand and dust storm forecast model to improve forecast accuracy as well as for monitoring of sand and dust storms.
Aim(s)	This project aims at mitigation of risks in many affected areas in the Asia Node countries through enhancement of systematic NRT monitoring of sand and dust storm.
Benefits	The systematic NRT monitoring of sand and dust storm will provide the Asia Node countries with useful information for sand and dust storm risk mitigation.
Role/Involvement of WMO Regional Centres in RA II	Regional Specialized Meteorological Centre with activity specialization on Atmospheric Sand and Dust Forecast (RSMC-ASDF) (TBD)
Key Regional Player	China, Japan, Republic of Korea
Partners/Participants	Countries in SDS-WAS Asia Node (China, Japan, Kazakhstan, Republic of Korea and Mongolia)
Funding Source(s)	This project will rely on existing budget allocations at the national level.
Overall Costs	(TBD)
Timescale	2013–2015
Expected Key Deliverables / Key responsible body	The systematic NRT monitoring of sand and dust storm in SDS-WAS Asia Node
Main risk(s)	Lack of resources (funds/expertise)

Website	SDS-WAS Asia Node portal
Summary	Improvement of sand and dust storms monitoring in the SDS-WAS Asia Node
Date of the update	12 November 2012
Contact Person 1	Prof. ZHANG Xiaoye Chinese Academy of Meteorological Sciences China Meteorological Administration (CMA) China Tel.: +86 10 68406601 Fax: +86 10 62175931 E-mail: xiaoye@cma.gov.cn
Contact Person 1	Mr Hiroshi Koide Senior Coordinator for Global Atmosphere Watch Atmospheric Environment Division Global Environment and Marine Department Japan Meteorological Agency (JMA) Japan Tel.: +81-3-3287-3439 Fax: +81-3-3211-4640 E-mail: hkoide@met.kishou.go.jp
Contact Person 1	Dr Youngsin Chin Korea Meteorological Administration (KMA) Republic of Korea Tel.: +82 70 7850 6752 Fax: +82 2 831 4930 E-mail: hwangsa@korea.kr

Project No. VI

Project Title	RA II WIGOS Project to Develop Support for NMHSs in Satellite Data, Products and Training
Type	Regional Implementation Project (RA II)
Status	Draft Design
Overview	<p>At its fourteenth session (December 2008), Regional Association II adopted a resolution to establish a pilot project for the development of support for National Meteorological and Hydrological Services (NMHSs) in the areas of satellite data, products and training. The Coordinating Group of the Pilot Project is composed of Japan (Co-coordinator); Republic of Korea (Co-coordinator); Bahrain; China; Hong Kong, China; India; Kyrgyzstan; Maldives; Oman; Pakistan; Russian Federation; Uzbekistan; Viet Nam and EUMETSAT (observer).</p> <p>The object of this project is to encourage NMHSs in RA II to make a kind of self-help effort to improve the flow of satellite-derived information by:</p> <ul style="list-style-type: none"> ● Identifying the requirements of NMHSs of developing countries, regarding satellite imagery, data and products, use the results to update the RRR user requirements database and to fine tune the EGOS-IP, ● Facilitating the timely provision of satellite-related information by satellite operators themselves to users via the project web page, newsletters, etc., and ● Aligning with VLab activities to optimize assistance to NMHSs in RA II and coordinating training activities on use of satellite data/products).
Aim(s)	<ul style="list-style-type: none"> ● To encourage NMHSs in RA II to make a kind of self-help effort to improve the flow of satellite-derived information, ● To improve the knowledge and techniques to use satellite data and products.
Benefits	NMHSs in RA II have benefited from this project to find means to access satellite data, products and training they want, and to improve the usage of satellite-derived information. This is expected to improve NMHSs' activities from nowcasting to climate and environment monitoring.
Key Regional Player	Japan, Republic of Korea and other satellite operators in RA II
Capacity development requirements	<ul style="list-style-type: none"> ● Assistance (or support) of WMO VLab activities and other regional training activities, ● Assistance of satellite operators, ● Liaison with EGOS-IP.
Partners/Participants	<p>Members of the Coordination Group members: Japan (Co-coordinator); Republic of Korea (Co-coordinator); Bahrain; China; Hong Kong, China; India; Kyrgyzstan; Maldives; Oman; Pakistan; Russian Federation; Uzbekistan; Viet Nam, RA V (observer) and EUMETSAT (observer)</p> <p>All other RA II Members can be nominated as the Group members.</p>
Relationship with existing project(s)	(TBD)
Funding Source(s)	Regular activities of this project rely on existing budget allocations at the national level. Additional funding will be needed to hold the Coordination Group meetings and training events regularly.
Overall Costs	(TBD)
Timescale	2012–2016
Expected Key Deliverables / Key responsible body	<ul style="list-style-type: none"> ● Reports on requirements of NMHSs regarding satellite imagery, data and products, ● Improvement on access to information on satellite data/products, ● Improvement on capacity in use of satellite data/products and facilitation of training datasets and toolboxes.
Main risk(s)	Lack of resources (funds/expertise) and lack of cooperation from Members

Website	The portal site of the project is operated on the WMO web server. http://www.wmo.int/pages/prog/sat/ra2pilotproject-intro_en.php
Summary	The project will encourage NMHSs in RA II to make a kind of self-help effort to improve the flow of satellite-related information.
Date of the update	12 November 2012
Contact Person 1	Mr Hironobu Yokota Senior Coordinator for Meteorological Satellite Systems Satellite Program Division, Observations Department Japan Meteorological Agency (JMA) Japan Tel: +81-3201-8677 Fax: +81-3217-1036 E-mail: hyokota@met.kishou.go.jp
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APPENDIX

LIST OF ABBREVIATIONS AND ACRONYMS

CEOS	Committee on Earth Observation Satellites
CGMS	Coordination Group for Meteorological Satellites
CONOPS	Concept of Operations
DAR	Discovery, Access and Retrieval
DB	Database
DCPC	Data Collection or Production Centre (of WIS)
DRR	Disaster Risk Reduction
ET	Expert Team (of WMO Technical Commission)
FAO	Food and Agriculture Organization of the United Nations
GAW	Global Atmosphere Watch
GCOS	Global Climate Observing System
GCW	Global Cryosphere Watch
GEO	Group on Earth Observations
GEOSS	Global Earth Observation System of Systems
GISC	Global Information System Centre(of WIS)
GFCS	Global Framework for Climate Services
GOOS	Global Ocean Observing System
GTOS	Global Terrestrial Observing System
ICG-WIGOS	Inter-Commission Coordination Group on WIGOS
ICPC	Interagency Coordination and Planning Committee for Earth Observations
ICSU	International Council for Science
IOC	Intergovernmental Oceanographic Commission (of UNESCO)
ISO	International Organization for Standardization
ITU	International Telecommunication Union
LDC	Least Developed Country
MOU	Memorandum of Understanding
NMHS	National Meteorological and Hydrological Service
NOS	National Observing System
OSes	Observing Systems Experiments
OSCAR	WIGOS Observing Systems Capabilities Analysis and Review tool
OSSEs	Observing System Simulation Experiments
QA	Quality Assurance

QC	Quality Control
QMF	Quality Management Framework
QMS	Quality Management System
PANGEA	Partnership for new GEOSS Application
RA	Regional Association
RCC	Regional Climate Centre
RIC	Regional Instrument Centre
RMIC	Regional Marine Instrument Centre
RRR	Rolling Review of Requirements
SIDS	Small Island Developing State
SoG	Statement of Guidance
SORT	Standardization of Observations Reference Tool (of WIGOS)
SLA	Service Level Agreement
TC	Technical Commission
TOR	Terms of Reference
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
WCRP	World Climate Research Programme
WIGOS	WMO Integrated Global Observing System
WIP	WIGOS framework Implementation Plan
WIR	WIGOS Operational Information Resource
WIS	WMO Information System
WHYCOS	World Hydrological Cycle Observation System
WWW	World Weather Watch

**DRAFT RESOLUTION 4.4/2 (RA II-15) –
REGIONAL BASIC SYNOPTIC NETWORK AND REGIONAL BASIC CLIMATOLOGICAL
NETWORK IN REGION II**

THE REGIONAL ASSOCIATION II,

Noting:

- (1) Resolution 2 (XIV-RA II) – Regional Basic Synoptic Network (RBSN),
- (2) Resolution 3 (XIV-RA II) – Regional Basic Climatological Network (RBCN),
- (3) The *Manual on the Global Observing System* (WMO-No. 544), Volume I, Part III, Regulations 2.1.3.1-2.1.3.5, and the definition of the Regional Basic Synoptic and Climatological Networks,
- (4) The *Manual on Codes* (WMO-No. 306),
- (5) The *Manual on the Global Telecommunication System* (WMO-No. 386),

Considering:

- (1) That the establishment and maintenance of an RBSN of surface and upper-air synoptic stations, adequate to meet the requirements of Members and of the World Weather Watch, constitute one of the most important obligations of Members under Article 2 of the WMO Convention,
- (2) That the Fourteenth World Meteorological Congress welcomed the establishment of RBCNs in all WMO Regions and urged Members to ensure that their operational observing stations compiled and transmitted the CLIMAT messages according to existing regulations,

Decides:

- (1) That the stations and the observational programmes listed in Annex I to this resolution constitute the RBSN in Region II;
- (2) That the stations listed in Annex II to this resolution constitute the RBCN in Region II;

Urges Members:

- (1) To secure, at the earliest date possible, full implementation of the network of RBSN and RBCN stations and observational programmes set forth in Annexes I and II to this resolution;
- (2) To comply fully with the standard times of observation, the global and regional coding procedures and data collection standards as laid down in the *WMO Technical Regulations* (WMO-No. 49) and the *Manuals on the GOS* (WMO-No. 544), *on Codes* (WMO-No. 306) and *on the GTS* (WMO-No. 386);

Authorizes the president of the Association to approve, at the request of the Members concerned and in consultation with the Secretary-General, amendments to the list of RBSN and RBCN stations in accordance with the procedures laid down in the *Manual on the Global Observing System* (WMO-No. 544), Volume II – Regional Aspects, Region II (Asia), and to monitor the Members' implementation and to address non-compliance in consultation with the Member concerned and the Secretary General.

Annexes: 2

Note: This resolution replaces Resolutions 2 (XIV-RA II) and 3 (XIV-RA II), which are no longer in force.

Annex I to draft Resolution 4.4/2 (RA II-15)

LIST OF STATIONS COMPRISING THE RBSN IN REGION II

See: RA II-15/INF. 4.4(1)

and/or

<http://www.wmo.int/pages/prog/www/ois/rbsn-rbcn/rbsn-rbcn-home.htm>

Annex II to draft Resolution 4.4/2 (RA II-15)

LIST OF STATIONS COMPRISING THE RBCN IN REGION II

See: RA II-15/INF. 4.4(2)

and/or

<http://www.wmo.int/pages/prog/www/ois/rbsn-rbcn/rbsn-rbcn-home.htm>

**APPENDIX C:
PROGRESS REPORT FOR INFORMATION –
NOT TO BE INCLUDED IN THE GENERAL SUMMARY**

WMO INTEGRATED GLOBAL OBSERVING SYSTEM (WIGOS)

References:

1. Resolution 50 (Cg-XVI) - Implementation of the WMO Integrated Global Observing System (WIGOS)
2. The first session of the Inter-Commission Coordination Group on WIGOS (ICG-WIGOS), Geneva, 26-30 September 2011
3. The first session of the ICG WIGOS Task Team on WIGOS Implementation Plan (TT-WIP), Geneva, 27-30 March 2012
4. Resolution 10 (EC-64) - WIGOS Framework Implementation Plan (WIP)
5. Recommendation 4.2/5 (CBS-15) - Implementation Plan for the Evolution of Global Observing Systems (EGOS-IP)
6. RA II-15/BM 4.4(1) - WIGOS Framework Implementation Plan (WIP)
7. RA II-15/BM 4.4(2) - Implementation Plan for the Evolution of Global Observing Systems (EGOS-IP)
8. RA II-15/Doc. 4.4(1), Annex to draft Resolution 4.4/1 (RA II-15) – Regional WIGOS Implementation Plan (R-WIP-II)
9. RA II-15/INF. 4.4(1) - Proposed List of Stations Comprising the Regional Basic Synoptic Network (RBSN) in Region II
10. RA II-15/INF. 4.4(2) - Proposed List of Stations Comprising the Regional Basic Synoptic Network (RBCN) in Region II
11. Report of the meeting of the Management Group of the Commission for Climatology, Denver, USA, 26-29 October 2011

Implementation of the WMO Integrated Global Observing System (WIGOS)

1. Adopting Resolution 50, Cg-XVI decided to implement the WMO Integrated Global Observing System (WIGOS) during the sixteenth financial period as one of the major efforts of the Organization with the goal that WIGOS should become operational from 2016 onwards [Reference 1].
2. ICG-WIGOS-1 formulated recommendations on WIGOS implementation [Reference 2]. TT-WIP-1 developed the WIGOS Framework Implementation Plan (WIP) submitted to EC-64 for approval [Reference 3].
3. EC-64 endorsed the WIGOS Framework Implementation Plan (WIP) [Reference 4]; for more details, see Reference 6.
4. CBS-15, through its Recommendation 4.2/5 (CBS-15), adopted EGOS-IP [Reference 7].

5. RA II Task Team on R-WIP (TT/R-WIP)²¹ drafted the Regional WIGOS Implementation Plan (R-WIP-II) [Reference 8].

Regional Basic Synoptic Network (RBSN) and Regional Basic Climatological Network (RBCN)

6. The Annual Global Monitoring (AGM) and the special MTN Monitoring (SMM) of the WWW are carried out respectively, in October and on a quarterly basis each year, and provide information on the performance of the observing systems. Overall, during the intersessional period, the implementation of the RBSN surface and upper-air observational programme in the Region shows 88% of surface stations performing the complete observational programme and 83% of upper-air stations carrying out observations at the two main standard times.

7. The status and monitoring trends in the last four years are presented in the table below. For full details on AGM and Special MTN monitoring results, see:
http://www.wmo.int/pages/prog/www/ois/monitor/index_en.html.

**Availability of SYNOP, TEMP and Climatological data at MTN centres from RA II
AGM-IWM-SMM: October (2008–2011)**

Year	Surface (SYNOP)		Upper-air (TEMP)		CLIMAT	
	Number of stations	Reports received (%)	Number of stations	Reports received (%)	Number of stations	Reports received (%)
2008	1309	91%	279	80%	659	85%
2009	1355	90%	275	81%	669	88%
2010	1355	93%	275	81%	669	86%
2011	1365	92%	274	83%	666	87%

Note: Results based on the RBSN/RBCN in RA II

Aircraft Observations

8. Steps have been initiated to develop the WMO standard AMDAR software specification of requirements that will ensure a more uniform approach to AMDAR software development, functionality and resulting data quality.

9. A study has been undertaken to analyse the current AMDAR Programme data coverage, carry out a survey of airlines and their operations with respect to the identified data-sparse areas and then propose a set of recommendations for future targeted AMDAR programme development in order to strategically improve AMDAR data coverage.

10. Following the Workshop on Aircraft Observing System Data Management (Geneva, 5-8 June 2012) the Quality Management System and data and metadata management framework for aircraft-based observations will be further improved.

11. Considerable progress has been made in the validation of the WVSS-II water vapour sensor through intercomparison with standard instrumentation on research aircraft, for which the results have been extremely promising and adding to evidence that the sensor meets

²¹ Final Report, RA II Working Group on WMO Integrated Observing System and WMO Information System (WG-IOS/WIS); Final Report, Fifth session of the RA II Management Group

requirements for full operational implementation. Installations of the latest version of the sensor are well advanced already in the USA, Europe and Australia.

Global Cryosphere Watch (GCW)

12. The development and implementation of GCW is currently coordinated by the Executive Council Panel on Polar Observations, Research and Services (EC-PORS) on behalf of the Council. The first GCW implementation meeting brought together the GCW Task Team from among the EC-PORS members, GCW national focal points (including some from RA II) and WMO Programmes and as well as partners from the outside agencies, organizations and scientific associations which are major contributors to GCW. The meeting (see http://www.wmo.int/pages/prog/www/polar/index_en.html) identified activities for implementation and the GCW Implementation Plan v.1.0 is now available at: http://www.wmo.int/pages/prog/www/OSY/Meetings/GCW-CN1/INF5_GCW-IP.pdf. A proposed governance structure has been endorsed by EC-PORS.

13. One of the initial priorities of the Global Cryosphere Watch (GCW) is the initiation of CryoNet - the surface-based network of reference sites and supersites. The definition of the types of surface sites, e.g., supersites, reference sites, and/or tiered sites in cold climate regions, on land or sea, operating a sustained, standardized programme for observing and monitoring as many cryospheric variables as possible are being defined. Discussion has been initiated on the development of formal procedures for establishing the GCW network, evaluation of potential supersites, discussion of the measurement standards and determination of data availability and exchange. RA II is a critical region for cryospheric observing and Members are encouraged to contribute actively to the development of CryoNet and enhanced cryospheric observing in the Region. It is noted that many of the cryospheric networks are external to WMO, so partnering will be essential. A GCW web portal will ensure access to real-time, near real-time and historical cryospheric data and products through WIS.

14. The GCW Implementation Plan identifies the need for a "Project Office". This could be in the WMO Secretariat or hosted by a Member or Members, or a combination. Currently funds do not exist for a full-time permanent staff member in WMO to support GCW. Lack of a Project Office or Secretariat staff will seriously limit GCW Implementation.

Atmospheric Chemical Composition and UV measurements

15. The RA II measurement network for atmospheric composition parameters consists of 92 fully operational stations according to the registrations in the GAW Station Information System (GAWSIS) (website: <http://gaw.empa.ch/gawsis/>). Seventy of those stations are regional GAW stations with about 20 stations in the Russian Federation running only filter ozone instruments. There are three Global GAW stations operating in the Region, namely Mt. Waliguan (China), Minamitorishima (Japan) and the Nepal Climate Observatory – Pyramid (Nepal). The main problems with the existing regional stations are the limited, non-comprehensive measurement programmes and delayed or missing data submission.

Coordination of observations for climate

16. The CCI Management Group (MG) considered CCI involvement in WIGOS based on Cg-XVI decisions requesting technical commissions to guide the WIGOS Implementation Plan and develop guidance on the design and evolution of the observing systems.

17. The CCI MG agreed on the need for CCI to be involved at the appropriate level of representation to provide input to the WIGOS Implementation Plan whereby some of the CCI technical publications would be useful in guiding the WIGOS Implementation Plan.

18. CCI recalled the urgent need in providing guidance on improving national climate networks and furthering the establishment of national reference climate networks. This would complement the role of GCOS in providing guidance on the requirements and principles for global climate monitoring. In many cases these networks are operated by collaborative agencies or by individuals with low level or lack of standardization, continuity and sustainability. CCI consideration of this issue was further supported by EC-64.
