

World Meteorological Organization

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**REGIONAL ASSOCIATION V
(SOUTH-WEST PACIFIC)**

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EXPECTED RESULT 4

AGENDA ITEM 4.4: WMO INTEGRATED GLOBAL OBSERVING SYSTEM (WIGOS) AND WMO INFORMATION SYSTEM (WIS)

WMO INTEGRATED GLOBAL OBSERVING SYSTEM (WIGOS)

SUMMARY

DECISIONS/ACTIONS REQUIRED:

- (a) To adopt the draft text for inclusion in the general summary;
- (b) To adopt draft Resolution 4.4/1(RA V-16) - Regional WIGOS Implementation Plan;
- (c) To adopt draft Resolution 4.4/2 (RA V-16) – Regional Basic Synoptic Network (RBSN) and Regional Basic Climatological Network (RBCN) in Region V.

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APPENDIX A: DRAFT TEXT FOR INCLUSION IN THE GENERAL SUMMARY

4.4 WMO Integrated Global Observing System (WIGOS) and WMO Information System (WIS) (agenda item 4.4)

WMO Integrated Global Observing System (WIGOS)

The WIGOS Framework Implementation

4.4(1).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, CBS-15, and EC-65 on the WIGOS implementation.

4.4(1).2 The Association recalled Resolution 50 (Cg-XVI) – Implementation of the WMO Integrated Global Observing Systems, by which the regional associations were requested: (a) to develop their regional WIGOS implementation plans; (b) to coordinate WIGOS implementation activities with the WMO Information System in their operating plans and work programmes; and (c) 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 across WMO programmes, across WMO observing systems, and between NMHSs and relevant national, sub-regional/regional and international organizations who contribute to or partner with WMO programmes and observing systems.

4.4(1).3 The Association expressed its gratitude to Australia in implementing the WIGOS Demonstration Project¹ “*Implementing a Composite Observing System*” 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(1).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 would be desirable to strengthen cooperation and partnership through Region-wide organizations or subregional groupings overseeing the WIGOS component observing systems. 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(1).5 The Association recalled Resolution 10 (EC-64) – WIGOS Framework Implementation Plan (WIP) developed by the Inter-Commission Coordination Group on WIGOS (ICG-WIGOS) and noted its significance in establishing a clear understanding of the ten Key Activity Areas that must be tackled in order to implement the WIGOS framework. The Association 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 implementation plans of individual NMHSs. In this regard, the

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

Association urged Members to provide resources to support the implementation of WIGOS in the Region.

4.4(1).6 The Association also urged its Members to continue providing resources, through the WIGOS Trust Fund and seconded experts or Junior Professional Officers, to help support the implementation of WIGOS.

4.4(1).7 The Association noted that CBS-15 considered the new "Implementation Plan for the Evolution of Global Observing Systems" (EGOS-IP) that was subsequently approved by EC-65. In this regard, the Association 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 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 V subsidiary bodies to address the EGOS-IP in their work programmes, and promote its effective implementation. The Association noted that the EGOS-IP builds on the analysis and guidance of the WMO Rolling Review of Requirements (RRR) process, and provides a substantial contribution to the third WIGOS key activity area on design, planning and optimized evolution of WIGOS component observing systems.

4.4(1).8 The Association noted with great appreciation that, in response to the request from the Sixteenth Congress, the development of the Regional WIGOS Implementation Plan for RA V (R-WIP-V) was accomplished by the RA V Working Group on Infrastructure (WG-INFR). The Association expressed its appreciation to WG-INFR for the development of R-WIP-V.

4.4(1).9 The Association accordingly adopted Resolution 4.4/1 (RA V-16) – Regional WIGOS Implementation Plan for RA V. The Association agreed that the implementation of R-WIP-V be supported by all the Members of the Region, and be guided, supervised and monitored by the Management Group of RA V, with periodic reports from appropriate subsidiary bodies in charge of WIGOS. In this regard, the Association emphasized that commitment by Members to WIGOS is essential and urged their Members to support implementation of WIGOS in their Region, including providing sufficient resources. In particular, the Association urged Members to make experts available to contribute to relevant regional Working Groups.

4.4(1).10 The Association further agreed that R-WIP-V be further revised to accommodate new projects which would be submitted by Members and authorized the president to approve any revisions of R-WIP-V during the intersessional period in consultation with the Management Group. In this regard, 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(1).11 The Association noted that owing to Members' efforts, the RBSN and RBCN have demonstrated sustainable performance. However, the Association recognized that further efforts should be made by Members to improve the data sustainability and availability performance to a satisfactory level to meet service requirements. It also recognized that in order to increase the availability of CLIMAT messages, greater efforts by Members should be made in ensuring that their operational observing stations compile and transmit the climate-related messages according to existing WMO regulations. The Association also appreciated the work done in the beginning of the intersessional period by the Lead Centre for monitoring the data quality of land surface observations in Melbourne to improve monitoring procedures and for the presentation and distribution of monitoring results on the availability and quality of land surface-based observational data. However, it noted that this monitoring was interrupted and no reports were received in the last two years. It also recalled that quality management is a key activity area of the WIGOS

framework Implementation Plan and noted that improved monitoring is a significant element of this activity.

4.4(1).12 By adopting Resolution 4.4/2 (RA V-16), the Association approved the new list of RBSN and RBCN stations as given in Annexes I and II to this resolution. The Association noted that the concepts behind the RBSN and RBCN are becoming outdated as Members implement a wider range of observing systems in integrated composite networks serving multiple purposes. The Association noted further that an aim of WIGOS is to develop the definition of an integrated Regional Basic Observing Network (RBON) together with a new database of station information which will more completely describe the WMO observing capabilities achieved collectively by Members. It requested the CBS and relevant Technical Commissions, the Inter-Commission Coordination Group on WIGOS (ICG-WIGOS), with the support of WIGOS Project Office, to give priority to making progress on these matters and to keep WMO Members and this Regional Association well informed and guided of developments in this regard.

GCOS Reference Upper-Air Network (GRUAN)

4.4(1).13 The Association noted that the issues are addressed in RA V-16/Doc. 4.4(3).

Marine and Oceanographic Observations

4.4(1).14 The Association noted that implementation of marine observing network in the Region has continued to expand thanks to the prominent role of Members in the Region. In particular, 26 of the planned 32 targeted deep ocean moorings of the Research Moored Array for African-Asian-Australian Monsoon Analysis and Prediction (RAMA) have been deployed and are maintained. However, the Association expressed concerns that data availability for both the moored buoy arrays in the Tropical Pacific (TAO, now complete with 67 units) and Indian oceans is not at its optimum (reduced to 50% only) due to vandalism on the data buoys, and difficulties to assure maintenance due to the cost of ship time, and piracy. The Association urged its Members to contribute to the JCOMM Observations Programme Area Implementation Goals² and thereby invest additional resources in the further development of ocean observing systems in order to address the increasing needs for climate applications and services. The Association recommended that its Members work closely with the Data Buoy Cooperation Panel (DBCP), the Global Drifter Programme, and the Argo programme for providing opportunities for the deployment of drifting buoys and profiling floats in the Region. The Association urged its Members to install barometers on all drifters they are planning to deploy in the Region.

4.4(1).15 The Association invited its Members to investigate providing the infrastructure for establishing WMO-IOC Regional Marine Instrument Centres (RMIC) in the Region in order to assure traceability of the marine observations, improve data quality, permit bias correction, and facilitate adherence of observational data, metadata, and processed observational products to higher-level standards.

Aircraft Observations

4.4(1).16 The Association was advised that a new programmatic structure for the development and maintenance of aircraft-based observations and the WMO AMDAR observing system had now been established within the WMO Technical Commissions, CBS and CIMO.

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

4.4(1).17 The CBS Expert Team on Aircraft-based Observing Systems, in line with the global actions on Aircraft Meteorological Stations within the Implementation Plan for Evolution of the Global Observing System (WIGOS Technical Report No. 2013-4) has offered to collaborate with each WMO Regional Association towards the development, maintenance and application of regional aircraft-based observations implementation plans.

4.4(1).18 The Association agreed that an appropriate subsidiary body of the Association should be responsible for planning and coordination of regional activities on aircraft-based observations improvement over the South-West Pacific as an action for the regional WIGOS implementation, and decided to consider it further under the item of the subsidiary body of the Association.

Cryospheric Observations and Global Cryosphere Watch (GCW)

4.4(1).19 The Association expressed its interest in the ongoing development of the Global Cryosphere Watch (GCW) as reported to EC-65, the recent availability of the GCW Implementation Plan and a need for the engagement of experts from RA V in GCW activities. Members were urged to provide comments on the GCW Implementation Plan and to indicate those activities in which they would like to be engaged. It urged those Members that routinely measure solid precipitation and snow and ice parameters to consider the establishment of GCW reference sites as part of GCW's CryoNet initiative. The Association urged interested Members to nominate national focal points for GCW activities and to review and provide the EC Panel of Experts on Polar Observations, Research and Services (EC-PORS) with information on how GCW could help them.

WMO Polar Activities

4.4(1).20 The Association acknowledged the importance of WMO polar initiatives and the need for ongoing coordination of activities with the regional associations and technical commissions. It urged its Members to review and comment on the International Polar Partner Initiative (IPPI) Concept for follow-on activities in the Polar Regions and to provide their guidance on what the role of WMO could be in IPPI.

Atmospheric Chemical Composition and UV Measurements of the GAW Programme

4.4(1).21 The Association noted the issues addressed in agenda item 4.5(3).

Terrestrial observations – Water cycle

4.4(1).22 The Association noted the importance of information exchange standards such as WaterML 2.0 and supported the potential adoption of WaterML 2.0 as a WMO standard for information exchange managed by WMO (supported by the WMO/OGC MOU), subject to the successful implementation of the testing programme proposed.

4.4(1).23 The Association encouraged further work by WMO in the evaluation of the usefulness and suitability of the HY_Features model to WMO applications.

4.4(1).24 The Association noted further that CHy-14 had invited Members that had developed good practices in the use of radar data for nowcasting in operational hydrology to support the AWG member responsible for Data Operations and Management (Tony Boston (Australia)) in providing guidance, advice and training in this regard.

4.4(1).25 The Association was informed that, to date, efforts to implement a second phase of the Pacific HYCOS had not been successful, despite strong support for the initiative amongst the Member countries and that the proposed South East Asia HYCOS (SEA HYCOS) was still in its early planning stages.

Space-based Observations

4.4(1).26 The Association noted the issues addressed in Agenda subitem 4.4(2).

Observing System Experiments (OSEs)

4.4(1).27 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(1).28 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 (RRCs) 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 2014 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(1).29 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 urged its Members to implement this classification and to share experience.

4.4(1).30 The Association noted that CIMO proposed to carry out an extensive revision and update of the International Cloud Atlas – *Manual on the Observation of Clouds* (WMO-No. 407, Volume I and II), parts of which constitute Annexes to *WMO Technical Regulations* (WMO-No. 49). This would make it the undisputable web-based global reference standard for the classification and

reporting of clouds and meteors. The Association noted that funding had to be identified for this activity as the document had not been updated since 1975 (Volume I) and 1987 (Volume II) and no technical commission was in charge of this document since then. In view of the importance of this document to Members, in particular from developing countries which still make extensive use of human observers, the Association strongly supported this CIMO proposal and recommended that the Executive Council and/or Congress identify funding possibilities to urgently develop this new edition.

4.4(1).31 The Association expressed its appreciation for the ongoing Solid Precipitation Intercomparison Experiment (SPICE) activity under the lead of CIMO, within which substantial progress is expected in the understanding and calibration of solid precipitation measuring equipment. 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 noted that two RA V sites (Guthega Dam – Australia and Mueller Hut - New Zealand) were taking part in the WMO SPICE, which encompasses overall 20 sites in 15 Members with instruments of 30 different types in various set-ups. The main measurement phase will last two winters, until 2014/15. The Association welcomed the plan to complete the data analysis and publish the final report of the intercomparison by 2016 in spite of the complexity of the experiment and noted this could only be achieved if external resources could be identified. The Association encouraged its Members to support this initiative either by secondment of experts for the data analysis or through financial contribution to the CIMO Trust Fund.

National Climate Networks

4.4(1).32 The Association took note of a CCI-led initiative, following a request of EC-65, to work – in close collaboration with GCOS and CIMO - for establishing a minimum set of objective assessment criteria for the recognition of centennial observing stations. The work will lead to a draft document containing these criteria; and propose through WIGOS a WMO mechanism for verifying compliance of candidate stations. Centennial observation data – carefully treated in terms of quality assurance and archiving - are of utmost importance for documenting and studying climate variability and change on decadal to centennial time scales, thereby providing basic input to relevant climate research and services. By raising the profile of centennial observing stations the initiative is intended to assist Members in their efforts to maintain such stations under the most preferable conditions.

4.4(1).33 The Association noted with appreciation the consideration given by CCI for supporting the WIGOS implementation in the area of national climate networks; in particular on the urgent need in providing guidance for improving these networks. These networks are becoming increasingly useful for climate services at local level. However in many cases these networks are operated by collaborative agencies or by individuals with a low level or lack of standardization, continuity and sustainability.

4.4(1).34 The Association urged its Management Group to consider these issues as a matter of high consideration in the Regional WIGOS Implementation Plan in close collaboration with CCI.

Radio Frequency Coordination

4.4(1).35 The Association recalled Resolution 11 (EC-64) on radio frequencies for meteorological and related environmental activities. It noted that its Members, both individually and through the participation in the CBS Steering Group on Radio Frequency Coordination (SG-RFC), had contributed significantly to the WMO success at the International Telecommunication Union (ITU) World Radiocommunication Conference 2012 (WRC-12) in protection of the existing and providing additional radio-frequency spectrum employed by meteorological and Earth observation systems

and applications. However, there remains increasing pressure to share (also allocate) radio-frequency bands used for meteorological purposes that could impact on Members' operations, in particular their observing systems.

4.4(1).36 The Association noted Resolution 9 (EC-65) relating to the ITU World Radiocommunication Conference 2015 (WRC-15) to be held in November 2015. It further noted that according to the WMO Preliminary Position Paper on WRC-15 Agenda,³ there are many WRC-15 Agenda items that may affect the operation of systems/applications of NMHSs. As most countries in RA V are members of the Asia Pacific Telecommunity (APT), which is one (out of six) of the regional telecommunication organizations participating in the ITU preparation to WRC-15, the Association emphasized the necessity of appropriate representation of meteorological requirements/interests in the relevant national and APT activities. It further noted that Permanent Representatives in RA V should endeavour to ensure that the WMO position on radio-frequency matters is made known to their national and APT representatives.

4.4(1).37 The Association noted the pressure to share frequencies presently allocated to radiolocation, meteorological-satellite and Earth observation radiocommunication services and used by systems/applications for meteorological and related environmental observations with International Mobile Telecommunications (IMT) and RLAN⁴ systems. Of special concern to RA V Members were the initiatives from countries in RA IV and VI to allocate to the mobile service and identify to RLAN C-Band frequency range 5 350-5 470 MHz. This frequency range is allocated to the Earth exploration-satellite (active) and radiolocation services, and used, in particular, by the Synthetic Aperture Radars (SAR) for remote sensing from satellites (e.g. Sentinel and Radarsat) as well as ground-based weather radars. Studies to date show that the use of RLAN systems in this frequency range could have significant negative impact on above-mentioned systems/applications. This in turn relates to RA V's current and future use of these remote sensing systems for improved environment monitoring, disaster prediction and warning systems, especially in remote or isolated areas.

4.4(1).38 The Association agreed that, in order to protect present and future services provided by NMHSs for timely warning of impending natural and environmental disasters, accurate climate prediction and detailed understanding of the status of global water resources, it is essential that the Association emphasized the necessity of appropriate representation of meteorological requirements/interests in the relevant national and APT activities. It further noted that Permanent Representatives in RA V should endeavour to ensure that the WMO position on radio-frequency matters is made known to their national and APT representatives. and related environmental activities with other radiocommunications systems and especially that IMT/RLAN systems are made available to the wider radio-frequency management community.

4.4(1).39 The Association supported the need for all Members to participate actively in national, regional and international activities on radio-frequency spectrum regulatory and use issues in order to defend radio-frequency bands used for meteorological and environmental activities. Noting the draft "WMO Strategy on Radio-Frequency Protection for Meteorology" developed by the SG-RFC and provided to EC-65 as an information document⁵, the Association requested CBS to provide as

³ "WMO PRELIMINARY POSITION ON WRC-15 AGENDA" Information Documents EC-65-inf04-4(1)-RFC_en.doc available at <http://ec-65.wmo.int/information-papers-e-f>

⁴ RLANs – radio local area networks widely used for fixed, semi-fixed (transportable) and portable computer equipment for a variety of broadband applications. They are also used for fixed, nomadic and mobile wireless access applications.

⁵ "DRAFT WMO STRATEGY ON RADIO-FREQUENCY PROTECTION FOR METEOROLOGY" Information Documents EC-65-inf04-4(2)-Draft-Strategy-RFP_en.doc available at <http://ec-65.wmo.int/information-papers-e-f>

a matter of priority guidance material for NMHSs on radio-frequency coordination and on how to effectively participate in this important activity.

APPENDIX B: DRAFT RESOLUTIONS

Draft Resolution 4.4/1 (RA V-16)

RA V WIGOS Implementation Plan

REGIONAL ASSOCIATION V (SOUTH-WEST PACIFIC)

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 reports of the first, second and third sessions of ICG-WIGOS and the recommendations on WIGOS implementation, including the development of Regional WIGOS Implementation Plans (R-WIP),

Decides to adopt the Regional WIGOS Implementation Plan for RA V (South-West Pacific) (R-WIP-V) 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, prioritise elements of, 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-V;
- (3) To communicate and promote the concept of WIGOS and benefits of WIGOS to the Region and Members;
- (4) To continue providing resources, including through the WIGOS Trust Fund and/or seconded experts, in-kind contributions, etc. to support the implementation of WIGOS;

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

Invites the partners to participate in relevant implementation activities as specified in the R-WIP-V.

Annex: 1

Annex to draft Resolution 4.4/1 (RA V-16)

WORLD METEOROLOGICAL ORGANIZATION

WMO INTEGRATED GLOBAL OBSERVING SYSTEM (WIGOS)

REGIONAL WIGOS IMPLEMENTATION PLAN FOR REGIONAL ASSOCIATION V (SOUTH-WEST PACIFIC)

**(R-WIP-V)
Version 1.0
(05/05/2014)**



VERSION CONTROL

Version	By	Date	Changes
			Initial template provided by WIGOS-PO
0.3	WIGOS-PO	09/01/2013	Table of WIGOS implementation activities prepared by the RA V WIGOS Workshop, then added to the template R-WIP-V
0.4	WG-INFR	27/04/2013 and 12/05/2013	Gaps in text completed, table of implementation activities reviewed. Feedback from WG-INFR members incorporated.
0.9	Chair, WG-INFR	30/08/2013	Final version 0.9 after review by PRs of Member countries in RA V, then finally the WIGOS Project Office, ready for approval by president RA V.

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WIGOS IMPLEMENTATION PLAN

1. INTRODUCTION AND BACKGROUND

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

The WMO Integrated Global Observing System (WIGOS) provides a new framework for WMO observing systems, including 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 a global, regional and national level.

The WIGOS Framework Implementation Plan (WIP) addresses the necessary activities to establish an operational WIGOS Framework by the end of the period 2012-2015, as per the directive of the WMO Congress. Yet WIGOS implementation will continue 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 Framework 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 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 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 Plan⁶.

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, including of WMO's contribution to co-sponsored systems. Together with the WMO Information System (WIS), this will allow continuous and reliable access to

⁶ 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 an important and 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, 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

The component observing systems of WIGOS comprise the Global Observing System (GOS), the observing component of the Global Atmosphere Watch (GAW), the WMO Hydrological Observing System (including the World Hydrological Cycle Observing System (WHYCOS)) and the observing component of the Global Cryosphere Watch (GCW), including their surface-based and space-based components. The above component systems include all WMO contributions to the co-sponsored systems, i.e., GCOS, GOOS, GTOS, as well as the WMO contributions to GFCS and GEOSS.

To migrate the existing observing systems into a more integrated single system that is WIGOS, focused effort is required in the following ten key areas, detailed in the sub-chapters to follow:

- (a) Management of WIGOS implementation in RA V;
- (b) Collaboration with the WMO co-sponsored observing systems and international partner organizations and programmes;
- (c) Design, planning and optimized evolution of WIGOS component observing systems at regional, sub-regional and national levels;
- (d) Observing System operation and maintenance;
- (e) Quality Management;
- (f) Standardization, system interoperability and data compatibility;
- (g) The WIGOS Operational Information Resource;
- (h) Data discovery, delivery and archival;
- (i) Capacity development;
- (j) Communication and outreach.

2.1 Management of WIGOS Implementation in RA V

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 will continue to monitor, guide, evaluate and support the overall implementation of WIGOS. Following the guidance by Cg-XVI, EC-LXIII 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 component observing systems. Progress on implementation of WIGOS will be reported to subsequent sessions of EC.

Regional Association

The regional association will play the key role in WIGOS implementation in the Region. The regional association, through its Working Group on Infrastructure, in particular the Task Team on WIGOS, will coordinate planning and implementation of WIGOS on the regional level taking into account all WMO future priorities, such as GFCS and DRR. The Working Group on Infrastructure, in particular the Task Team on WIGOS, under guidance from ICG-WIGOS, and with the support of the WMO Secretariat including the WIGOS Project Office, will be responsible for:

- (a) The development of the Regional WIGOS 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)⁷.

R-WIP will also address regional aspects of requirements, standardization, observing system interoperability, data compatibility, data management, Quality Management procedures including performance monitoring and data quality monitoring, and proposed improvements in observing networks/systems. An important role of the regional association 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 will plan, implement, operate and maintain national networks and observing programmes based on the standards, recommendations 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, WHOS 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 component observing systems 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.

⁷ <http://www.wmo.int/pages/prog/www/OSY/gos-vision.html#egos-ip>.

Concerning Radio Frequency Spectrum Protection, Members should maintain close coordination with their national telecommunication authorities to register their frequencies for adequate protection, and to defend the availability of frequencies for Meteorology, Climatology and Earth observations, influencing positively the national delegations to the World Radiocommunication Conferences (WRC).

Countries in Region V which are not Members of WMO

There are countries in RA V which are not Members of WMO but nevertheless participate in WMO arrangements for data exchange and utilize WMO standards and recommended practices and procedures. These countries will be encouraged to adopt WIGOS standards and recommended practices and procedures.

2.2 Collaboration with the WMO co-sponsored observing systems and international partner organizations and programmes

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 WMO Hydrological Observing System (WHOS) (including WHYCOS), including 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 is important for sustaining and evolving observing systems and practices, in line with new science and technology outcomes. WIGOS is a major observing component of GFCS and also provides indispensable contributions to GEOSS.

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 SOPAC⁸, SPREP⁹, its PMC¹⁰, and ASEAN¹¹ 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.

⁸ Applied Geoscience and Technology Division of the SPC (Secretariat of the Pacific Community)

⁹ Secretariat of the Pacific Regional Environment Programme

¹⁰ Pacific Meteorological Council

¹¹ Association of Southeast Asian Nations

2.3 Design, Planning and Optimized Evolution of WIGOS component observing systems at regional, sub-regional and national levels

The WMO has agreed on the Vision for the Global Observing Systems in 2025¹² 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) was approved by CBS-15 (September 2012). This EGOS-IP focuses on the long-term evolution of WIGOS component observing systems, while the WIP focuses on the integration of these component observing systems. 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 WHOS and new 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. The regional association 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)¹³

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-WIOS.

The RRR process involves regularly reviewing the observational data requirements¹⁴ 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 existence¹⁵, for both space-based and surface-based systems, in delivering data on different variables. The comprehensive information collected for the

¹² Available from the WMO Website at: <http://www.wmo.int/pages/prog/www/OSY/gos-vision.html>

¹³ 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>

¹⁴ 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.

¹⁵ Capabilities are derived from the individual platforms characteristics submitted by Members to WMO e.g. through WMO-No. 9, Volume A, or its evolution

globe on both requirements and capabilities is quantitatively recorded in a database accessible through the Observing Systems Capability Analysis and Review tool (OSCAR¹⁶ of the WIGOS Operational 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 OSCAR. Space-based capabilities are also recorded and made available through OSCAR. OSCAR allows the performance of 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 developments of WIGOS.

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 ¹⁷
4	Seasonal to Inter-annual	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, the regional association, through its Working Group on Infrastructure, 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.

The regional association 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.

¹⁶ 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

¹⁷ Hydrological information only; water quality monitoring and information is currently excluded.

In Region V, a Strategic Operating Plan 2012-2015 was composed to respond to the WMO Strategic Plan and document the regional key priorities. Drawing in part on that document, the Pacific region countries prepared a Pacific Islands Meteorological Strategy 2012-2021 (PIMS).

It is already recognized that there are requirements for improved coordination and collection of observations related to lightning, marine coverage, upper-air systems including sustainable balloon programmes and AMDAR and affordable and reliable access to satellite data and products.

Region V includes many small island countries separated by vast ocean areas. Surface-based observing networks are consequently relatively sparse. Hence there is a unique level of requirement for satellite products and reliable communications.

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 available 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.

In Region V, many Pacific countries collaborate through the Pacific Meteorological Council (PMC) and several countries collaborate through the ASEAN Sub-Committee on Meteorology and Geophysics.

2.4 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 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.

Efforts also need to be made to identify opportunities to benefit from sharing (of experiences, practices and ideas, expertise and joint activities) across Regions (particularly with RA II as well as with other RAs).

Within Regional Association V, the following regional activities provide examples:

- CBS Lead Centre for GCOS;
- SOPAC Sea Level monitoring programme

2.5 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 component observing systems (see *WMO Technical Regulations*, WMO-No. 49, Vol. IV). WIGOS quality management at the regional level will strive for compliance of all components of WIGOS with international standards, such as ISO 9001 and ISO 17025. Compliance with international standards and recommendations should be pursued in all quality assurance (QA) procedures applied by Members of the Region to all their national WIGOS component observing systems. In addition to the WMO QMF document, further guidance to Members will be provided by WMO via the standards, recommendations 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, recommendations 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, the Region will ensure that surface-based sites that are needed for calibration/validation of satellite data are specified.

A key aspect of regional WIGOS quality management that requires particular attention 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 Region will be responsible for ensuring compliance with the WIGOS quality management principles (such as ISO 9001, 17025).

2.6 Standardization, System Interoperability¹⁸ and Data Compatibility

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

¹⁸ Interoperability is a property referring to the ability of diverse systems to work together (inter-operate)

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, recommendations 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).

The Region will support all activities leading to the interoperability (including data compatibility) of WIGOS component observing systems through utilization and application of the same, internationally accepted standards, recommendations 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 Secretary-General (under Article 9 of the Convention of the World Meteorological Organization).

2.7 The WIGOS Operational Information Resource

The WIGOS Operational Information Resource (WIR), accessible via a centralized point (web portal), will provide seamless access to 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 standard and recommended practices and procedures 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, 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 standard and recommended practices and procedures will support the production of more homogeneous data-sets and make the observations traceable and of known quality.

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. *[For more information on each of these support tools, please refer to the WIP.]*

Understanding that sources of the individual components of the WIGOS Operational Information Resource rely on the inputs from its Members, the Region 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 (WIS¹⁹) provides exchange of data and interpretation metadata²⁰, and management of related discovery metadata²¹. 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. The regional association will encourage its Members to abide by this commitment.

Members of the Region will adopt WIGOS and WIS standard and recommended practices and procedures 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 the Regional Association. 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 component observing systems. 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 component observing systems, including both the infrastructure and human capacities development;
- (c) Technological innovation, technology transfer, technical assistance and decision-support tools.

In RA V, it is important to promote the training needs identified in collaboration with Member countries with respect to WIGOS.

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 lab (VL) will continue to grow and help all WMO Members realize the benefits of satellite data.

¹⁹ <http://www.wmo.int/wis>

²⁰ Interpretation metadata is the information required to interpret the data

²¹ Discovery metadata is the information describing the data-sets, generally using ISO-19115 standard, and WMO core profile in case of WIS

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

The regional association will be responsible for the Project through its Working Group on Infrastructure, in particular the Task Team on WIGOS, with support from the Regional Office for Asia and the South-West Pacific, and the WMO Office for the South-West Pacific.

3.1 Monitoring, review and reporting mechanism

- (a) The regional association, 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) The regional association, through the chair of the Working Group on Infrastructure, will report to the ICG-WIGOS and the WIGOS Project Office on the progress in implementation of WIGOS in the Region;
- (c) The president will report at the RA's sessions 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. RAs 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 presents the key implementation activities that are required for the regional WIGOS implementation within the timeframe 2012-2015. 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.

For each activity in Table 2, a detailed activity plan will be developed by the responsible entity or entities, with the support of the Working Group on Infrastructure. The Working Group on Infrastructure has the responsibility for tracking execution of these activities and this plan itself.

Table 2 WIGOS Implementation Activities (Region V)

Activities in bold are considered the most critical for WIGOS to gain operational acceptance by 2015.

Depending on the implementation scale, planned activities are specified as follows: **R** = Regional activity and **N** = National activity.

Key to activity numbers: **a.b.c**, where **a** is number of respective sub-section of section 2, **b** is for a regional (2) or national (3) activity, and **c** is a sequential number to distinguish activities from one another. ARB = Available Regular Budget. RB = Regular Budget.

No.	Activity	Deliverables	Timeline	Responsibility	Estimated Costs (2012-2015) K CHF		Potential Risks ¹
							Low/Mod/High
1. Management of WIGOS Implementation in Region V							
1.2.1 R	Develop the Regional WIGOS Implementation Plan for Region V (R-WIP-V).	Regional WIGOS Implementation Plan for Region V (R-WIP-V).	2012-13	Drafting by WG-Infrastructure (TT-WIGOS), adoption by president RA V			Low
1.2.2 R	Compile information from Member countries, other relevant partners and WMO sources as input to a "stock-take" of existing WMO observing systems in RA V.	A report detailing all the current WMO observing systems in Region V, including the composition of networks, data outputs and who the owners/operators are.	2013	WG-Infrastructure (TT-WIGOS) assisted by Secretariat			High
1.2.3 R	Assess the EGOS-IP and other WMO observing system implementation plans to identify actions relevant to RA V and Member countries; assign priorities to these actions.	Prioritized list of actions for RA V and for Members arising from the EGOS-IP and other IPs.	2012-13	Drafting by WG-Infrastructure (TT-WIGOS), adoption by president RA V			Low
1.2.4 R	Provide an effective RA V focal point to liaise with CBS about the implementation of EGOS-IP in RA V.	An effective RA V focal point for EGOS-IP, who is actively corresponding with CBS.	2012-15	RA V MG, focal point for EGOS-IP			Mod

¹ A simple rating of "risk" is registered in this plan for each activity, using the scale Low/Medium/High to represent the combined assessment of the likelihood of not fully completing the activity and deliverable() as intended, plus the consequential impact of such non-completion. More detailed risk assessment, including mitigation where warranted, is needed when more detailed planning is undertaken for each activity.

2. Collaboration with WMO and co-sponsored observing systems						
2.2.1 R	Identify and engage further potential partners for collaboration in the collection of observations on a regional scale. Clarify the target area(s) for collaboration and the mechanism for resolving governance issues.	A report on existing partnerships on a regional level, to provide a baseline and reference.	2012-15	WG-Infrastructure (TT-WIGOS).		Mod
2.3.1 N	Encourage Member countries to identify and engage further potential partners in the collection of observations for WMO Programmes. Clarify the target area(s) for collaboration and the mechanism for resolving governance issues.	Increased number of collaborating partners at a national level and increased collection of observations.	2012-15	Encouragement by MG, action by all Member countries in RA V.		Mod
2.2.2 2.3.2 R, N	Collaborate with CIMO to develop a <i>reliable feedback mechanism</i> on the performance of instruments and systems in Region V. Provide feedback regularly.	A status report is provided to RA V and CIMO on progress of meteorological observing systems against WMO regulations (standards and recommendations).	2013	WG-Infrastructure (TT-Traceability) develop mechanism, Member countries in RA V provide feedback.		Mod
3. Design, planning and optimized evolution of WIGOS component observing systems at regional, sub-regional and national levels						
3.2.1 R	Design and plan observing systems in the Region, taking into account: (i) the technical guidance of the technical commissions as represented in the EGOS-IP and other observation system implementation plans; (ii) the regional priorities adopted by the president of RA V (see action item 1.2.3); (iii) relevant actions identified in the Technical Plan of the Tropical Cyclone Committee for the South Pacific and South-East Indian Ocean; (iv) the need for “gap filling” and restoration of silent stations; and (v) cross-regional coordination opportunities.	Improved WMO observing system design in Region V.	2012-15	Coordination by WG-Infrastructure (TT-WIGOS).		High

3.3.1 N	Evolve and implement national observing systems, taking into account: (i) the technical guidance of the technical commissions as represented in the EGOS-IP and other observation system implementation plans; (ii) the regional priorities adopted by the president of RA V (see action item 1.2.3); (iii) relevant actions identified in the Technical Plan of the Tropical Cyclone Committee for the South Pacific and South-East Indian Ocean; (iv) the need for “gap filling” and restoration of silent stations.	Improved WMO observing systems in Region V.	2012-15	Member countries in Region V.		High
3.2.2 R	Define and describe the Regional WIGOS Network (building on action item 1.2.2) as the collective identity for all WMO observing systems in Region V.	A report to convey the definition and description of the Regional WIGOS Network.	2014	WG-Infrastructure (TT-WIGOS).		High
3.2.3 R	Validate the user requirements documented by the global RRR process against regional user requirements; use the results to update the RRR user requirements database and to fine tune the EGOS-IP and observing system plans.	WMO observing systems are responsive to regional user requirements.	2013-15	WG-Infrastructure (TT-WIGOS).		Mod
3.3.2 N	Validate the user requirements documented by the global RRR process against national user requirements for WMO systems; use the results to update the RRR user requirements database and to fine tune the EGOS-IP and observing system plans.	WMO observing systems are responsive to national user requirements for WMO systems.	2013-15	Member countries in Region V.		Mod

4. Integrated Observing System Operation and Maintenance						
4.2.1 R	<p>Compile, from Member contributions, a set of examples of integrated operation and maintenance between observing system owners/operators, covering the sharing of experiences, practices and ideas, the sharing of expertise and the pooling of resources for joint activities; noting specifically that:</p> <ol style="list-style-type: none"> (1) training is an effective way to share knowledge and skills; (2) funding for capacity development is often the trigger which enables increasingly integrated approaches. <p>Promote this report amongst Member countries as a stimulus for thinking broadly about opportunities to benefit from integration.</p>	A report providing examples of integrated approaches to operation and maintenance.	2013	WG-Infrastructure (TT-WIGOS).		low
4.2.2 R	Capacity development in data communication techniques related to observations collection and reporting	Reference material, case studies and training, leading to enhanced capacities	2013-15	WG-Infrastructure (TT-PSC)		
4.2.3 R	<p>Capacity Building in Radar Techniques in South-East Asia, supported by appropriate technical missions to countries, through:</p> <ul style="list-style-type: none"> • All the ASEAN developing countries will prepare a national report on their arrangements for the operational use of weather radar data; and • A sub/cross-region (for the ASEAN developing countries) strategic plan for addressing technical issues and necessary actions identified in the national reports. 	Enhanced capacity in monitoring and forecasting of severe weather using radar data.	2013-15	Those Member countries involved in the sub-regional/cross-regional (with RA II) ASEAN Sub-Committee on Meteorology and Geophysics		Mod

5. Integrated Quality Management						
5.2.1 R	Progressively achieve traceability to SI standards of measurements made throughout RA V, focusing initially on surface pressure, temperature, precipitation, humidity, also sea level.	Traceable observations from progressively more components of the Regional WIGOS Network.	2012-15	WG-Infrastructure (TT-Traceability), in collaboration with the RICs and Members.		Mod
5.2.2 5.3.1 R, N	Develop a self-assessment tool to enable Members to follow CIMO guidelines for observations	Self-assessment tool.	2014	WG-Infrastructure (TT-Traceability), with input from Members.		High
5.2.3 R	Actively review and respond to the findings of CBS' periodic data flow monitoring exercises.	An active review process.	2012-15	WG-Infrastructure (TT-WIGOS).		Low
5.2.4 R	Find new means of continuous monitoring of observations data quality in Region V with the support of Centres of the GDPFS (Global Data Processing and Forecasting System).	Request is made (for the systemic errors in observations from the analysis scheme) and collaboration is established with Chair OPAG-GDPFS on this topic.	201x	WG-Infrastructure (TT-WIGOS), in collaboration with Centres of the GDPFS.		Mod
6. Standardization, System Interoperability and Data Compatibility						
6.2.1 R	Achieve the migration to Table Driven Code Forms throughout Region V as specified by CBS.	Completed migration to Table Driven Code Forms throughout Region V.	2014	WG-Infrastructure (TT-TDCF).		Mod
6.2.2 R	Develop a process to monitor and report on what Members currently do in relation to compliance with WIGOS standards and recommendations.	A process is developed to monitor and report on what Members currently do in relation to compliance with WIGOS standards and recommendations.	20xx	WG-Infrastructure (TT-WIGOS).		Mod

6.2.3 R	Review and suggest requirements for new WIGOS standards, recommendations and/or regional best practices.	Proposals for new WIGOS standards, recommendations and/or regional best practices.	20xx	WG-Infrastructure (TT-WIGOS).		Mod
6.2.4 6.3.1 R,N	Implement the WMO Siting Classification Scheme in RA V, through: <ul style="list-style-type: none"> Provision of information and training to Member countries, and Adoption of new procedures by Member countries. 	WMO Siting Classification Scheme is implemented in RA V.	201xxx	WG-Infrastructure		high
6.2.5 R	Determine capacity of WMO Members in RA V to maintain and submit to WMO interpretation metadata (as currently required for Vol. A)	Report on the capacity of WMO Members in RA V to maintain and submit to WMO interpretation metadata (as currently required for Vol. A).	2014	WG-Infrastructure (TT-WIGOS).		Mod
7. The WIGOS Operational Information Resource (WIR)						
7.2.1 R	Request, support and encourage Members to provide up-to-date metadata to the WIR and ensure its ongoing maintenance.	Up-to-date metadata maintained at WMO.	201x- (dependent on completion of database)	WG-Infrastructure (TT-WIGOS).		Mod
8. Data discovery, delivery and archival						
8.2.1 R	Foster increased exchange of observations data and discovery metadata using WIS in the Region, through awareness raising and provision of guidance for the adoption of WIS standards and recommendations, including implementation of Data Collection and Production Centres (DCPC) and National Centres (NC), in collaboration with GISC Melbourne.	Increased provision of "discovery metadata" hence accessibility of data through the WIS.	2012-15	WG-Infrastructure (TT-WIS).		Mod

8.2.2 R	Encourage Member countries to share data via the WIS, including from organizations other than NMHSs.	New sources of data are available through the WIS.	2012-15	WG-Infrastructure (TT-WIS).		Mod
9. Capacity development¹						
9.2.1 R	Assist Member countries to introduce or improve institutional mandates and policies relating to observing systems.	Improved institutional mandates and policies in Member countries relating to observing systems.	2012-15	Management Group, supported by TT-WIGOS.		Mod
9.2.2 9.3.1 R, N	Assist Members to fill gaps (infrastructure & human capacities) in their WIGOS component observing systems, in particular: assist Fiji to fully implement and sustain their calibration facilities (end of 2013).	Gaps (both infrastructure and human capacities) in the WIGOS component obs systems of Member countries identified/filled.	2012-15	WG-Infrastructure (TT-WIGOS, TT-TO), in collaboration with regional partners and Members.		Mod
10. Communication and outreach						
10.2.1 R	Contribute to WIGOS communication and outreach across Region V by: (i) responding to the role defined in the ICG-WIGOS communication strategy; (ii) utilizing material provided by WIGOS-PO to raise awareness and commitment to WIGOS in Region V.	Effective communication and outreach for WIGOS across Region V.	2012-15	WG-Infrastructure (TT-WIGOS) and Management Group.		Low
10.3.1 N	Contribute to WIGOS communication and outreach within Member countries by: (i) responding to the role defined in the ICG-WIGOS communication strategy; (ii) utilizing material provided by WIGOS-PO to raise awareness and commitment to WIGOS in Region V.	Effective communication and outreach for WIGOS within Member countries.	2012-15	WMO Member countries in Region V.		Low

¹ 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.

5. RESOURCES

The activities for implementation of the WIGOS framework will be completed through resources of:

- The experts conducting the work of WG-INFR and its Task Teams;
- Member countries and their efforts to implement WIGOS;
- Partner bodies;
- Capacity development initiatives.

Specific resources required for each activity will be identified when specific detailed planning is undertaken for each activity.

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) Awareness

The communication and outreach strategy for WIGOS in the Regions and Member countries is not very clear and does not appear to have progressed greatly yet. Increased resources in the WIGOS Project Office might help to address this. Part of this effort is development of materials, including materials suitable for RA V.

The WIGOS framework Checklist for Members might contribute as an awareness-raising device in addition to a self-assessment tool.

(b) Coordination and Commitment

There is a need for alignment and coordination between the R-WIP-V and other plans. That applies to other WMO plans as well as plans of other agencies for meteorological development in the Region (for example the Pacific Islands Meteorological Strategy). The commitment to any activities and the attention of donor agencies will be strengthened if alignment & coordination is achieved.

(c) Resources

Ultimately it is Member countries that must find the resources to implement and operate systems identified by some of the WIGOS framework activities. This is a significant challenge which calls for attention to WIGOS capacity development activities and constraint in the demands placed on Member countries.

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.

LIST OF ACRONYMS

ASEAN	Association of South-East Asian Nations
CBS	Commission for Basic Systems
CEOS	Committee on Earth Observation Satellites
CGMS	Coordination Group for Meteorological Satellites
CIMO	Commission for Instruments and Methods of Observation
CONOPS	Concept of Operations
DAR	Discovery, Access and Retrieval
DB	Database
DCPC	Data Collection or Production Centre (of WIS)
DRR	Disaster Risk Reduction
EGOS-IP	Implementation Plan for the Evolution of Global Observing Systems
ET	Expert Team (of WMO Technical Commission)
FAO	Food and Agriculture Organization of 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
GOS	Global 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
ISO	International Organization of Standardization
ITU	International Telecommunication Union
LDCs	Least Developed Countries
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
PIMS	Pacific Islands Meteorological Strategy 2012-2021
PM&E	Performance Monitoring and Evaluation
PMC	Pacific Meteorological Council (of SPREP)
QA	Quality Assurance
QC	Quality Control
QMF	Quality Management Framework
QMS	Quality Management System
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 States
SoG	Statement of Guidance
SOPAC	Applied Geoscience and Technology Division of the SPC (Secretariat of the Pacific Community)
SORT	“Standardization of Observations” Reference Tool (of WIGOS)
SPREP	Secretariat of the Pacific Regional Environment Programme
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
WHOS	WMO Hydrological Observation System
WWW	World Weather Watch

Draft Resolution 4.4/2 (RA V-16)

REGIONAL BASIC SYNOPTIC NETWORK (RBSN) AND REGIONAL BASIC CLIMATOLOGICAL NETWORK (RBCN) IN REGION V

REGIONAL ASSOCIATION V (SOUTH-WEST PACIFIC),

Noting:

- (1) Resolution 3 (XV-RA V) – Regional Basic Synoptic Network and Regional Basic Climatological Network in Region V,
- (2) 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,
- (3) The *Manual on Codes* (WMO-No. 306),
- (4) 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 compile and transmit 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 V;
- (2) That the stations listed in Annex II to this resolution constitute the RBCN in Region V;

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 V (South-West Pacific), 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 Resolution 3 (XV-RA V) which is no longer in force.

Annex I to draft Resolution 4.4/2 (RA V-16)

LIST OF STATIONS COMPRISING THE RBSN IN REGION V

See: RA V-16/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 V-16)

LIST OF STATIONS COMPRISING THE RBCN IN REGION V

See: RA V-16/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 second session of the Inter-Commission Coordination Group on WIGOS (ICG-WIGOS), Geneva, 18-22 March 2013
4. The third session of the Inter-Commission Coordination Group on WIGOS (ICG-WIGOS), Geneva, 10-14 February 2013
5. Resolution 10 (EC-64) - WIGOS Framework Implementation Plan (WIP), version 1.0
6. RA V-16/INF. 4.4(3) - WIGOS Framework Implementation Plan (WIP), version 2.0, adopted by EC-65
7. RA V-16/INF. 4.4(4) - Implementation Plan for the Evolution of Global Observing Systems (EGOS-IP), adopted by EC-65
8. RA V-16/Doc. 4.4(1), Annex to draft Resolution 4.4/1 (RA V-16) – Regional WIGOS Implementation Plan (R-WIP-V)
9. RA V-16/INF. 4.4(1) - Proposed List of Stations Comprising the Regional Basic Synoptic Network (RBSN) in Region V
10. RA V-16/INF. 4.4(2) - Proposed List of Stations Comprising the Regional Basic Climatological Network (RBCN) in Region V
11. Final Report, GCW CryoNet Team Meeting, First Session, Reykjavik, Iceland, 22–23 January 2014
12. Final Report, GCW Steering Group Meeting, First Session, Reykjavik, Iceland, 23–24 January 2014
13. The fifth session of EC Panel of Experts on Polar Observations, Research and Services, Wellington, New Zealand, 25-28 February 2014
14. Draft concept of a potential long-term international cooperative initiative in the Polar Regions ('International Polar Initiative', IPI)
15. The fifteenth session of the Commission for Basic Systems (CBS-15), Jakarta, 10-15 September 2012

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]. A set of recommendations on WIGOS implementation were formulated by ICG-WIGOS-1, ICG-WIGOS-2 and ICG-WIGOS-3 [References 2-4].
2. The first version of the WIGOS Framework Implementation Plan (WIP) was adopted by EC-64 [Reference 5] and the second (updated) version was adopted by EC-65 [Reference 6]. In

response to WIGOS, the new Implementation Plan for the evolution of global observing systems (EGOS-IP) was considered by CBS-15 and subsequently adopted by EC-65 [Reference 7].

3. The RA V Working Group on Infrastructure (WG-INFR) drafted the Regional WIGOS Implementation Plan (R-WIP-V) [Reference 8].

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

4. The existing RBSN and RBCN are based essentially on a design representing the late 1990s status of the observing networks. Also, the majority of stations in the RBSN and RBCN are multipurpose, serving both synoptic and climatological purposes. Therefore, the need to integrate the two networks into one Regional Basic Observing Network (RBON) is recognized under the WIGOS implementation. It is expected that the new re-designed RBON would also take into consideration the inclusion of new ground-based observing systems, such as weather radars, wind profiler systems, existing buoys, ships and aircraft that make meteorological, climatological and marine observations. The network re-design would also be coordinated with satellite observations. The existing scheme of two separate networks (RBSN and RBCN) is expected to be continued until such time a new RBON or other is designed.

5. Overall, during the intersessional period, the implementation of the RBSN surface and upper-air observational programme in the Region shows 76% of surface stations performing the full observational programme (8 observations per day) and 38% of upper-air stations carrying out observations at the two main standard times²⁴. Overall, 68% of upper-air stations carry out at least one observation at a main standard time per day. Implementation of stations reporting CLIMAT is around 92% during this same period.

6. The integrated WWW Monitoring (IWM) and the **Annual Global Monitoring** (AGM) of the operation of the WWW carried out on a quarterly basis and in October each year, respectively, provide information on the performance of the observing systems. The status and monitoring trends in the last 4 years are presented in the table below. For full details on IWM and AGM monitoring results, see: http://www.wmo.int/pages/prog/www/ois/monitor/index_en.html.

Average Availability of SYNOP, TEMP and CLIMAT data at MTN centres from RA V AGM: 1 to 15 October (2010–2013)

Year	Surface (SYNOP)		Upper-air (TEMP)		CLIMAT	
	Number of stations	Reports received (%)	Number of stations	Reports received (%)	Number of stations	Reports received (%)
2010	400	75%	92	67%	253	82%
2011	400	79%	92	71%	251	80%
2012	399	74%	89	66%	248	81%
2013	393	77%	89	66%	246	75%

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

Marine Observations

7. JCOMM-4 (Yeosu, Republic of Korea, May 2012) updated the Implementation Goals²⁵ of the JCOMM Observations Programme Area (OPA). These are aligned with the ocean chapter of the GCOS Implementation Plan for the Global Observing System for Climate in support of the

²⁴ Upper-air: 00, 12 UTC.

²⁵ http://www.jcomm.info/index.php?option=com_oe&task=viewDocumentRecord&docID=8930

UNFCCC (GCOS-138 in its 2010 update). They provide specific implementation targets for building and sustaining an initial global ocean observing system representing the climate component of the Global Ocean Observing System (GOOS) and the ocean component of the Global Climate Observing System (GCOS). Although the baseline system proposed under the Implementation Goals was designed to meet climate requirements, non-climate applications, such as NWP, prediction of hurricanes (especially those providing upper ocean thermal profiles, sea surface temperature, and sea level pressure), global and coastal ocean prediction, and marine services in general, will be improved by implementation of the systematic global observations of Essential Climate Variables (ECVs) called for by the GCOS-138 plan. JCOMM is also mindful of the emerging requirements for new technologies and observations, especially of biogeochemical variables, that have been outlined during the OceanObs'09 conference (Venice, Italy, September 2009). Coordination of this is being developed through the GOOS Framework for Ocean Observations.

8. JCOMM-4 also endorsed the future priority activities for the next intersessional period for the Observations Programme Area (OPA). Of particular relevance to RA V are: (i) JCOMM regional contribution to WIGOS implementation; (ii) the Association's role in assessing and documenting regional ocean observational requirements; (iii) the contribution of the Members to the regional implementation of the JCOMM OPA implementation goals; (iv) enhanced cooperation with the industry, in particular for seeking the sharing of marine meteorological observations made by them; (v) development of synergies between the different ocean observing systems to exploit the potential of joint deployment opportunities, and to foster a common approach to sensor development and best practices; (vi) the promotion of pilot activities and new technologies; (vii) capacity development in the Region on the basis of the Partnership for New GEOSS Applications (PANGEA²⁶) concept; (viii) enhanced traceability of ocean observations; and (ix) collecting and sharing instrument/platform metadata concerning marine meteorological and oceanographic observations to advance consistent, climate-quality, seamless data delivery both in near real-time and delayed mode.

9. While dramatic progress has been made since the beginning of the century in the implementation of the ocean observing networks in RA V thanks to prominent role of the regional association Members, no substantial progress has been noted in the last four years, except for the Research Moored Array for African-Asian-Australian Monsoon Analysis and Prediction (RAMA) in the Equatorial Indian Ocean as 26 units (81%) of the 46 targeted network have been deployed. RAMA is a multi-national, multi-platform network designed to support climate forecasting and research as part of the Indian Ocean Observing System (IndOOS). Of particular interest in the Region are also: (i) the Argo profiling float programme (sustained at a level of 3000 units globally); (ii) the Tropical Moored buoy array in the Western Equatorial Pacific (TAO now complete with 67 units) and Eastern Equatorial India Oceans (RAMA); (iii) the global surface drifter network (1250 units globally, half of them with barometers); and (iv) Ship observations, and in particular the Voluntary Observing Ship (VOS) scheme (124 vessels recruited by 3 Members of the Association and operating in the Region), and the Ship of Opportunity Programme (SOOP), which is providing valuable upper ocean thermal data in real-time for climate monitoring, ocean forecasting, and tropical cyclone prediction. The number of Automatic Weather Stations installed onboard ships and providing hourly observations has increased leading to a continued increase in the total number of SHIP reports available on the GTS despite the reduced number of recruited vessels. Vandalism on data buoys, acts of piracy on ships in the Western part of the tropical Indian Ocean, and the cost of ship time have prevented assuring appropriate maintenance of the tropical moored buoy arrays, and are impacting the level of data availability in both the Indian and Pacific oceans (reduced to about 50% in 2013).

²⁶ <http://www.jcomm.info/pangea-concept>

Aircraft Observations

10. The Aircraft Meteorological Data Relay (AMDAR) observing system for collection of meteorological observations by commercial aircraft has now been fully integrated into the WMO World Weather Watch Programme as a component of the Global Observing System (GOS).

11. The growth and success of the AMDAR observing system²⁷ arises chiefly from the fact that the system provides high-quality upper-air temperature and wind data, utilizing existing commercial aircraft sensors and avionics systems, therefore requiring a software deployment only to implement. The resulting vertical profile data is derived at only a fraction of the cost of comparative radiosonde data.

12. Following the cessation of the activities of the WMO AMDAR Panel at its 15th session in November 2012, the AMDAR programme is now under the joint responsibility of the Commission for Basic Systems (CBS) through its Expert Team on Aircraft-Based Observing Systems (ET-ABO) and the Commission for Instruments and Methods for Observation (CIMO) through its Task Team on Aircraft-Based Observations (TT-AO). Together these two teams will continue to coordinate and assist Members in activities to ensure the maintenance, expansion and further enhancement of AMDAR and other aircraft-based observing systems under the new Aircraft-Based Observations programme (ABOP).

13. In response to the rapid growth²⁸ and demonstrated significant positive impact of AMDAR observations, the recently approved CBS Implementation Plan for the Evolution of Global Observing Systems (EGOS-IP), published as WIGOS Technical Report No. 2013-4, contains 6 global actions urging all Members to contribute to the further expansion and enhancement of AMDAR and aircraft-based observations. To assist Members in this development, the ABOP Strategy and Implementation Plan²⁹ has been developed to form the basis for more detailed planning, expected to be developed and coordinated regionally as part of the Regional WIGOS Implementation Plan. This strategy and plan has been based to some extent upon the results of a recent WMO study coordinated by the ABOP, AMDAR Coverage & Targeting for Future Airline Recruitment (Feb 2013)³⁰ and from which a list of high priority airlines for recruitment to the AMDAR programme have been identified.

14. From within ET-ABO, an expert from each WMO Region has been designated to initiate and coordinate the development of an ABOP Regional Implementation Plan (A-RIP) in consultation with the respective RA. The RAs will be invited to consider and review these plans and, if appropriate and approved by Members, also consider how best to integrate these plans into the infrastructure planning documents and processes of the RA. Dr Douglas Body of Australia has undertaken the role of ET-ABO Lead on RA V and has led the initial work on the draft A-RIP for Region V.

Global Cryosphere Watch (GCW)

15. The development and implementation of GCW is coordinated by the Executive Council Panel of Experts on Polar Observations, Research and Services (EC-PORS) on behalf of the Executive Council. The first GCW Steering Group meeting, Reykjavik, Iceland, 23-25 January 2014, finalized the GCW Implementation Plan³¹, agreed on the establishment of the core GCW network called CryoNet³², finalized the GCW working structure, suggested ways of collaboration with partners from the outside agencies, organizations and scientific associations and

²⁷ See: http://www.wmo.int/pages/prog/www/GOS/ABO/AMDAR/AMDAR_System.html

²⁸ See: http://www.wmo.int/pages/prog/www/GOS/ABO/data/ABO_Data_Statistics.html#hist_gts

²⁹ See: http://www.wmo.int/pages/prog/www/GOS/ABO/documents/ABOP_Strategy_Implementation_Plan_V2013.1A.pdf

³⁰ See: http://www.wmo.int/pages/prog/www/GOS/ABO/AMDAR/resources/AMDAR_Coverage_Recruitment_Study.html

³¹ http://www.wmo.int/pages/prog/www/polar/GCW/GCW_IP.pdf

³² <http://globalcryospherewatch.org/cryonet/stations.php>

made suggestions on the GCW Portal³³ and GCW website³⁴. Deliberations of GCW Steering Group meeting were considered by the fifth session of EC-PORS, Wellington, New Zealand, 24-28 February 2014.

16. GCW also held its first workshop on the surface-based observation network, called “CryoNet”, November 2012, Vienna, Austria followed by the GCW CryoNet Asia Workshop³⁵, Beijing, China, 3-5 December 2013 and the first session of the GCW CryoNet Task Team³⁶, Reykjavik, Iceland, 20-23 January 2014. CryoNet is one of the four observing components of WIGOS and will initially be comprised of existing stations/sites, rather than creating new sites. CryoNet stations will agree to provide prescribed sets of measurements taken according to GCW standards, guidelines and best practices, thus ensuring high quality data for scientific research and operational use. Over 100 sites were proposed for consideration to be included in the Baseline, Reference and Integrated sites of CryoNet. The CryoNet Task Team is developing a draft Primer to CryoNet (Guide) based on available guidelines and inputs from contributors and through extensive discussion with partners. The Primer to CryoNet will become a resource for the WIGOS Regulatory Material. Members of the Region 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.

17. Thanks to the increased support of Norway, the development of the GCW portal (operated by met.no) has further progressed. The portal will ensure access to real-time, near real-time and historical cryospheric data and products through WIS. Thanks to USA, the GCW website offers complete information on the development and implementation of GCW, including several GCW monitoring products as “the Watch” component of GCW.

18. 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 and Members are encouraged to discuss the feasibility of hosting a Project Office in RA V.

19. The limited funds available in the Regular Budget for GCW have been invaluable in supporting GCW tasks/activities only. The Trust Fund resources have funded a part-time staff person to support PORS and GCW activities. GCW will need additional resources to move forward as planned. Contributions to the EC-PORS Trust Fund would help immensely to continue these activities.

WMO Polar Activities

20. The EC Panel of Experts on Polar Observations, Research and Services (EC-PORS) was established by EC to assist in its oversight of WMO Polar Activities. The aim is to bring observations, research and services together allowing WMO to maximize the value of its and its partners’ investments in Polar Regions. The fifth session of EC-PORS was held in Wellington, New Zealand, 13-15 March 2013. The emphasis for this meeting was to review its activities and to develop guidance to EC-66 and Cg-17 on WMO Polar activities, especially the Antarctic Observing Network (AntOn), the Global Integrated Polar Prediction Systems (GIPPS), the International Polar Initiative (IPI) and the WMO Global Cryosphere Watch (GCW).

21. The Steering Group for a Long-term Corporate Polar Initiative has proposed the concept of the International Polar Initiative (IPI). IPI is proposed as a cooperation framework to address the

³³ <http://gcw.met.no/metamod/search>

³⁴ <http://globalcryospherewatch.org/>

³⁵ http://www.wmo.int/pages/prog/www/polar/index_en.html

³⁶ http://www.wmo.int/pages/prog/www/polar/index_en.html

fast and dramatic transformations of the Polar Regions that impact their environment, economy, the life of local residents and lead to significant global implications. The framework envisages preparation of a common IPI Implementation Plan for the development of observing systems, research, services, related education and outreach, and practical applications of scientific knowledge in the Polar Regions. One of the motivations for IPI is to optimize the use of existing resources and, at the same time, identify areas where new investments in polar activities are necessary for environmental protection, sustainable development of the regions, and addressing existing and emerging societal needs. Existing polar programmes and infrastructure, including the legacy of the recently concluded International Polar Year 2007-2008, will provide initial building blocks for IPI. Given the many commonalities between the polar and alpine regions, involvement of the alpine research community in IPI is considered.

Terrestrial observations – Water cycle

22. Cooperation between WMO and the Open Geospatial Consortium (OGC) within the framework of the Hydrology Domain Working Group (DWG) has resulted in WaterML 2.0 (an encoding standard for the representation of in-situ hydrological and hydrogeological observations data in a variety of exchange scenarios) being adopted as an OGC Standard (<http://www.opengeospatial.org/standards/waterml>). Such standards are important to improve service delivery of key CHy programmes including WHYCOS and the WMO Flood Forecasting Initiative. CHy, by its Resolution 3 (CHy-14) has decided to commence a process, including testing, that could see the potential adoption of WaterML 2.0 as a WMO standard for information exchange managed by WMO (supported by the WMO/OGC MOU) and to register this standard as a joint WMO/ISO standard.

23. The Global Runoff Data Centre (GRDC) has been tasked by CHy (Resolution 6 (CHy-XIII)) with the development of the metadata profile, under the overall guidance of WIS/WIGOS to form part of the WMO Core Profile of the International Organization for Standardization (ISO) Metadata Standard. CHy-14 subsequently stressed that such a profile is a working document and would evolve with time.

24. At the WMO/OGC Hydrology DWG workshop (Quebec City, Canada, 17-21 June 2013), the HY_Features model was widely accepted as the overarching reference model for referencing the types of hydrologic features that may have persistent identity across multiple data systems and the definitions captured in the model are based on semantics defined within WMO standards and official literature. The Association encouraged further work by WMO in the evaluation of the usefulness and suitability of the HY_Features model to WMO applications.

25. During its Sixth Panel Session (Koblenz, Germany 12-14 June 2013), two new network member organizations were included in the “network of networks” of global data centres, namely the International Soil Moisture Network (ISMN) as the custodian of global terrestrial data on soil moisture and the French Space Agency (CNES/LEGOS) as provider of radar altimeter information on the stage of lakes and rivers.

26. The areas of areal precipitation; altimetric observations of water levels in large rivers, lakes and reservoirs; soil moisture; and snow cover characteristics (snow cover boundaries and snow water equivalent) were identified by CHy-14 as the four top requirements from the water sector regarding satellite data. EUMETSAT is investing in the development of new satellite products targeted for operational usage in hydrology in the framework of the Satellite Application Facilities (SAF) programme, namely EUMETSAT Hydrology SAF (EUMETSAT H-SAF). These will require further development and assist in the promotion of satellite-based applications in hydrology and water resources.
