PROGRESS REPORT FOR INFORMATION PRESENTED AT THE 16TH SESSION OF THE COMMISSION FOR INSTRUMENTS AND METHODS OF OBSERVATIONS (CIMO-16)

(unedited)

FOR INFORMATION –
NOT TO BE INCLUDED IN THE GENERAL SUMMARY

TENTATIVE WORK PLAN

1. The tentative work plan, as provided herewith, has been prepared by the Secretariat in consultation with the president of the Commission on the assumption that the work of session would be carried out in plenary meetings, as suggested in the provisional annotated agenda (CIMO-16/Doc. 2.2).

2. The tentative work plan provides the proposed allocation of items. The Coordination Committee, which the Commission may wish to set up in accordance with General Regulation 29, would have the task of reviewing the work plan as the session proceeds with its work.

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Appendix: 1

APPENDIX

TENTATIVE WORKING PLAN

for

CIMO-16 conjointly held with TECO-2014 / METEOREX-2014

(St Petersburg, Russian Federation, 7 to 16 July 2014)

All items will be discussed in plenary meetings	Monday 7 July	Tuesday 8 July	Wednesday 9 July	Thursday 10 July		Friday 11 July		Saturday 12 July		Sunday 13 July		Monday 14 July		Tuesday 15 July		Wednesday 16 July	
				am	pm	am	pm	am	pm	am	pm	am	pm	am	pm	am	pm
PLENARY	TECO 2014			1 2 3 10	4	5	6	11 9	7	NO SESSION	NO SESSION	8 10	AD + TB/ LC	AD	AD	AD	AD 12 13
	METEOREX 2014																

Explanatory notes:

Figures indicate the agenda items
AD – consideration of available drafts
TB/LC: Presentations by Testbeds and Lead Centres

Working hours:

Morning session:	09:00 – 12:00
Afternoon session:	14:00 – 17:00
Lunch break:	12:00 – 14:00

No sessions are planned on Sunday, 13 July

Dates and times of side meetings will be provided at the session

TECO-2014 Technical Conference on Meteorological and Environmental Instruments and Methods of Observation (7 July to 9 July).

METEOREX-2014 Exhibition of Meteorological Instruments, Equipment and Services (7 July to 9 July)

PROGRESS REPORT FOR INFORMATION – NOT TO BE INCLUDED IN THE GENERAL SUMMARY

REPORT BY THE PRESIDENT OF THE COMMISSION

Introduction

1. The president thanked the Russian Federation for its kind invitation to host the sixteenth session of the Commission for Instruments and Methods of Observation (CIMO-16) in St. Petersburg from 10 to 16 July 2014, and the WMO Technical Conference on Meteorological and Environmental Instruments and Methods of Observation (TECO-2014), which preceded CIMO-16, during the three days from 7 to 9 July 2014. TECO-2014 was held conjointly with an Exhibition of Meteorological Instruments, related Equipment and Services (METEOREX-2014), organized by Roshydromet, and the National Meteorological Congress of the Russian Federation.

CIMO TECO 2012 and TECO 2014

2. The president recalled that the 2012 CIMO Technical Conference (TECO-2012) was organized together with the Meteorological Technology World Expo 2012. Altogether, 270 people attended TECO-2012 over the three days duration of the conference. After the conference, a survey of the conference participants was organized by the WMO Secretariat. The results of the survey were very positive and helped in understanding what worked well and what could be improved. In view of CIMO's continuous search for improvement, the president recommended that representatives of CIMO Members who attended TECO-2014 complete the 2014 survey that has been distributed to them.

WMO Secretariat

3. Prof. Calpini expressed his grateful appreciation for the work achieved by the WMO Secretariat during his first four years as CIMO president. The president pointed out the very efficient day-to-day working mechanism adopted by the WMO Secretariat for decision-making processes related to CIMO, and where a review process was required. The informal and non-bureaucratic work method adopted allowed him to act in the most efficient manner as CIMO president and in quasi-real-time, notwithstanding a significant workload from his other duties in MeteoSwiss and from his teaching activities.

CIMO and WIGOS

4. The president underlined the changes that have taken place over this last intersessional period with the WMO Observing and Information Systems Department in the context of WIGOS and under the guidance of its Director, Dr Wenjian Zhang. Dr Zhang has at all times shown great appreciation for, and strong support for, CIMO and its president, and has on many occasions stressed the key role played by CIMO in the development of WIGOS. The president extended his thanks to Dr Zhang for this very encouraging support for CIMO.

WIGOS progress

5. The president underlined the importance of the new WIGOS framework in the context of CIMO's activities. He recently participated in the third Inter-Commission Coordination Group on the WMO Integrated Global Observing System (ICG-WIGOS-3, 10-14 February 2014, Geneva) as co-chair in support of Dr Sue Barrell. The president of CIMO expressed his great appreciation to

the work performed by Dr Barrell from the Bureau of Meteorology, Australia in her strong engagement and leadership in ICG-WIGOS.

CIMO achievements in WIGOS

6. Prof. Calpini noted that CIMO has been a major contributor to the development of WIGOS, in particular since the ICG-WIGOS meeting in 2013, through the work performed by its Inter-Commission Task Teams addressing:

(a) WIGOS regulatory material issues (Task Team-WRM). CIMO has contributed a key role to the development of TT-WRM through the Chair of the CIMO Guide Editorial Board, Dr Volker Kurz, who is a member of this Task Team. Notably, the CIMO Guide has been closely examined and several candidate requirements have been considered for elevation to regulatory status (for example, the capability and functional requirements of RICs, RRCs and RMICs) by their inclusion in the WIGOS regulatory material;

(b) WIGOS Metadata (Task Team-WMD). The CIMO Expert Team on Standardization is concerned with Metadata Standards. The Chair of the ET-Standardization, Dr Brian Howe, has also been chairing this WIGOS Task Team in its preparation of a WIGOS Core Metadata Standard. This clear linkage between each team was recognized by the president as a major contributor in ensuring a consistent and complementary approach is taken by each team.

CIMO Guide and new edition

7. The president underlined the specific contributions of CIMO to WIGOS embodied in reviewing the CIMO Guide to separate guidance from mandatory material, and in collaborating with other technical commissions in preparing the new edition of the CIMO guide, for example by developing contributions on atmospheric chemistry in collaboration with the Commission for Atmospheric Sciences (CAS), Marine Observations with the Joint Technical Commission for Oceanography and Marine Meteorology (JCOMM), a new Part on Space-based Observations with the Commission of Basic Systems (CBS) and its satellite experts, and Soil moisture with the Global Climate Observing System (GCOS) experts. He noted the important progress made by the CIMO Guide Editorial Board and with the cooperation of numerous experts from within and beyond the Commission in producing the Preliminary 2014 Edition of the CIMO Guide. This includes a number of updates and/or fully revised chapters that have been developed and/or reviewed by CIMO Expert Teams.

CIMO and other Technical Commissions and the Regional Associations

8. Also in the context of WIGOS, the president indicated his pleasure at the good cooperation that has been taking place between CIMO and both the regional associations (RA) and other WMO technical commissions in recent years. This cooperation with the other technical commissions has been key to the update of the CIMO Guide, as previously noted, and also for the development of common WMO-ISO standards and, for example, for the WMO Solid Precipitation Intercomparison Experiment (SPICE). Prof. Calpini also noted that all regional associations had put a strong focus on the Regional Instrument Centres (RICs) and their related activities in the WIGOS RA Implementation Plans. The president stressed the need to look for synergies to avoid duplication of work and ensure CIMO’s outputs meet user requirements.

CIMO and GFCS

9. The president expressed his concern to seek synergies with the current working structures in WMO and CIMO when considering the future development of the Global Framework

for Climate Services (GFCS) to enable society to better manage the risks and opportunities arising from climate variability and change, in particular its pillar related to observations and their related quality assessment. He noted that the GFCS framework is seeking improved coordination of ongoing activities (cross-cutting activities) relevant to GFCS within and among the technical commissions. In this context, the CIMO Management Group has also recognized the need to better inform meteorological data users on the whole observational process associated with the production of data, so that they better understand the data quality issues.

CIMO and the new edition of the International Cloud Atlas

10. During the Meetings of Presidents of Technical Commissions (PTCs) and Presidents of Technical Commissions and Regional Associations (PTCs/PRAs) in January 2014, and at the ICG-WIGOS-3 meeting in February 2014, the president of CIMO informed the meetings of the willingness of CIMO to develop the new edition of the International Cloud Atlas (ICA) as the world‘s authoritative, primary source of cloud classification. He advised that the new ICA would be web-based, and fully comprehensive with the most up-to-date information. This project has attracted a lot of attention and support from all parties in WMO. Prof. Calpini noted that, because revision of the ICA was not listed initially in the CIMO work plans for 2011-2014, nor in the WMO Regular Budget, it would require supplementary resources and a specific endorsement during the CIMO-16 session. The Final Report and Recommendations of the CIMO Task Team on Review of the International Clouds Atlas (TT-ICA) were supported by the CIMO Management Group in January 2014 and the proposal was presented to the WMO Publications Board in March 2014. The Board emphasized the need to retain the integrity of the ICA as the WMO global international standard and part of the WMO Technical Regulations, and agreed that a public-private partnership (PPP) might provide a path forward for financing the new ICA.

CIMO and HMEI

11. The president underlined very efficient collaboration with instrument manufacturers through the Association for Hydro-Meteorological Equipment Industry (HMEI), and in particular close cooperation with the HMEI president, especially during TECO 2012. The president thanked many HMEI experts who positively contributed to CIMO ET meetings, training workshops and instrument intercomparisons.

CIMO and ISO

12. The president was pleased with an increased collaboration between WMO and the International Standardization Organization (ISO) on the development of common ISO/WMO technical standards which resulted in an approved Draft International Standard (DIS) of the Siting Classification for Surface Observing Station on Land, and supported the activities in finalizing this process. He also noted the recent progress made on the development of the common ISO/WMO standard on wind lidars and encouraged the future work of experts contributing to the major revision of a number of standards managed by ISO TC 180/SC1 “Solar Energy”.

CIMO outreach and visibility

13. The president underlined that, while numerous activities of significant benefit to the WMO community are generally underway by CIMO, there is often little visibility of these activities. To address this, CIMO will need to pay more attention to outreach during the coming intersessional period.

Intercomparisons

SPICE

14. The president congratulated all those involved in the WMO Solid Precipitation Intercomparison Experiment (SPICE) project for the important work carried out to date under SPICE. He saw this work as one of the major milestones achieved during the intersessional period and noted that it would not have occurred without the willing cooperation of all the team members and the participating manufacturers. The president congratulated Rodica Nitu from Canada for her capable leadership as SPICE programme manager. He noted the further challenge to deliver and publish on schedule the results of SPICE during the next intersessional period. The president was pleased to invite the CIMO delegates to identify, in the light of the discussion session during TECO-2014, the priorities of Members for future intercomparisons and to clearly identify the aims of those intercomparisons, for which feasibility studies should be carried out within CIMO.

IPC-XI

15. The president emphasized that intercomparison of instruments for measuring infrared radiation was held in conjunction with the International Pyrheliometer Intercomparison (IPC) in Davos, in 2010, and has demonstrated the significant improvement achieved on the uncertainty and the traceability of radiation measurements. The president welcomed the recommendation that international intercomparison of sensors measuring infrared radiation be formally recognized by CIMO and organized regularly in conjunction with IPC. The president expressed his sincere appreciation to all PMOD/WRC Davos staff for their outstanding efforts in conducting the IPC-XI and reporting the final outcomes.

Yangjiang

16. The president stressed an essential contribution of the WMO Intercomparison of Radiosonde Systems conducted in Yangjiang, China, in 2010, to the WMO Integrated Global Observing Systems (WIGOS) to improve services to society by increasing the data quality and consequently availability to improve outputs from models and provide information and products to support decision-making at all levels. He expressed his sincere appreciation to all the major players involved in the intercomparison, and particularly Dr John Nash for his outstanding work in finalizing the outcomes of this experiment into the regulatory material and the CIMO Guide.

CIMO structure

17. The president recalled that the CIMO Structure and the CIMO Terms of Reference had been significantly modified at CIMO-XV to reflect the evolving priorities of Members and the expected contribution from CIMO to WIGOS: the new structure had worked well and only minor adjustments were submitted to the attention of CIMO-16 to clarify some ambiguities, fill some gaps and improve efficiencies.

Task Team on Radiation Measurements

18. One of the required modifications underlined by the president was related to the radiation measurement expertise in CIMO. He invited CIMO-16 to consider the creation of one specific Task Team on radiation measurements with the specific tasks to address changes of solar and terrestrial radiation references with regard to the difference between the World Radiometric Reference (WRR) and the International System of Units (SI), assess developments of reference instruments of solar and terrestrial radiation, and determine how to proceed to ensure continuity of radiation records in the future.

CIMO and AMDAR observations

19. The president was pleased to underline another important evolution in the structure and role of CIMO related to AMDAR observations. The Task Team on Aircraft-based Observations was established following CIMO MG-10 (2012), to continue, in collaboration with the CBS Expert Team on Aircraft Observations (ET-ABO), the activities that used to be carried out by the AMDAR Panel. Given the ongoing nature of the work of the team, the president proposed that the Task Team should be replaced by an Expert Team on Aircraft-based Observations (ET-AO) for the next CIMO intersessional period, with a similar ongoing functionality as a component of the Aircraft-based Observations Programme (ABOP), in cooperation with CBS ET-ABO.

CIMO focused on targeted actions

20. The president recalled the absolute need for targeted activities to be expected of CIMO's expert team members, with clear result-oriented deliverables. CIMO shall concentrate on defining and supporting important milestones, in close alignment with the on-going WIGOS and WIS objectives, and by prioritizing the work with a view to gaining efficiencies in the final CIMO and IMOP Programme activities.

CIMO experts' involvement

21. Prof. Calpini noted that in view of the high expectations of WMO Members and programmes for CIMO and the large number of requests for collaboration, participation and support, the management of the Commission requires significant work to ensure it meets those expectations and provides significant contributions to the WMO community. In this context, he stressed that in the future he would expect all CIMO MG members to take an even more active role in supporting and promoting the Commission activities, both within and outside the Commission. He also encouraged all ETs to have regular teleconferences, preferably at least twice per year, to support information exchange among the ET members, to achieve expected results and to spread the work load over the 4 year period. In order to increase CIMO efficiency the president and CIMO Management Group recommended that additional help be provided by the Secretariat to the respective ETs, if feasible, and allowed the Secretariat to be much more prescriptive in scheduling regular teleconferences of all ETs, even without such request from the ETs, to support the MG in monitoring their progress.

CIMO trust fund

22. The president noted that funds required to address new CIMO challenges (regular update and further translation of the CIMO Guide, future intercomparisons, new edition of the Cloud Atlas, a specific request for an additional data analyst in SPICE, Regional Instrument Centres, etc.) should come principally from the CIMO Trust Fund, in view of the limited funds available in the WMO regular budget to support CIMO. He therefore requested all CIMO members to consider potential contributions to the CIMO Trust Fund.

Closing Remarks

23. Finally, the president expressed his sincere appreciation and acknowledgement to all the CIMO experts who have contributed to the great variety of activities that have been performed in the intersessional period to ensure the ongoing improvement of the observing systems in use by Members and the overall quality of the observations.

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DECISIONS AND FUTURE PRIORITIES RELATED TO CAPACITY DEVELOPMENT

References:

1. Final report of the Meeting of the CIMO Expert Team on Regional Instrument Centres, Calibration and Traceability (First Session), Nairobi, Kenya, 23-26 September 2013: http://www.wmo.int/pages/prog/www/IMOP/reports/2013/Report_ET-RIC-1_Nairobi_Final.pdf

2. Final report of the Meeting of the CIMO Guide Editorial Board (Second Session), Geneva, Switzerland, 13-15 November 2013: http://www.wmo.int/pages/prog/www/IMOP/reports/2013/CIMO-EdBd-2_FinalRep.pdf

3. Final report of the Meeting of the CIMO Guide Editorial Board (First Session), Geneva, Switzerland, 2-4 May 2012: http://www.wmo.int/pages/prog/www/IMOP/reports/2012/CIMO-EdBd-1_FinalRep.pdf

4. Instruments and Observing Methods Report No. 109: Papers and Posters presented at the WMO Technical Conference on Instruments and Methods of Observation, Brussels, Belgium, 16-18 October 2012: http://www.wmo.int/pages/prog/www/IMOP/publications/IOM-109_TECO-2012/Programme_TECO-2012.html

Strengthening the RICs

1. All WMO Regional Associations have developed their own Regional WIGOS Implementation Plans (R-WIPs). They all put strong emphasis on the need to strengthen Regional Instrument Centres (RICs) to ensure their full functionality and to enhance the support they provide to Members. RICs indeed provide a major component of the integrated quality management key area of WIGOS since RICs contribute to ensuring the traceability of observations to international standards. Financial resources constrain the activities of RICs, as well as the ability of Members to bring/send their standards for calibration at RICs. The Expert Team on Regional Instrument Centres, Calibration and Traceability (ET-RIC) stressed that if the traceability of the observations is not achieved, then the full potential of WIGOS can not be utilized. Therefore, strengthening the RICs and developing an appropriate traceability strategy for those Members who do not have calibration laboratories should be considered within WIGOS.

2. The Sixteenth WMO Congress stressed that Regional Instrument Centres 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. Eight out of sixteen RICs provided their evaluation so far. Two groups of responses could be identified: those which are ISO/IEC 17025 already accredited and those which are not. The performance of the RICs which are accredited can be compared (in particular the uncertainties they can achieve in performing calibrations), while it is much more difficult in the case of the other group. At present, the RICs of Japan, Slovakia and Slovenia have reported that they are accredited, though it is known that some other RICs are also accredited. ET-RIC recommended that the WMO Secretariat requests clarification on the plans of all Members hosting RICs which had not yet provided their evaluation on their on-going willingness to provide their facilities to Members according to the agreed responsibilities of RICs. RICs are playing a crucial role in

ensuring traceability of measurement to the International System of Units (SI), and capacity development which is fundamental for the development of WIGOS.

3. RICs will play an important role in WIGOS by ensuring the quality of observations and data compatibility. Unfortunately, a number of NMHSs are not aware of the services that RICs can provide. ET-RIC agreed on a template for RICs web pages to be hosted on the WMO/IMOP website thus facilitating outreach and information exchange between RICs and Members of the region. This template is based on the information provided in the RIC Evaluation Scheme which is to be reported periodically to the WMO Secretariat. The web pages of six RICs were completed and are hosted on the WMO/IMOP website (http://www.wmo.int/pages/prog/www/IMOP/instrument-reg-centres.html).

4. Interlaboratory comparisons of RICs are aimed at demonstrating their capabilities in achieving the calibration and measurement capabilities (CMCs) they are declaring. Participation in interlaboratory comparisons is a criterion for accreditation, but is also an important assessment of reliability, operational certitude, staff confidence and measurement accuracy. It represents a vertical assessment of overall performance in a calibration laboratory. ET-RIC reiterated the importance of organizing RIC interlaboratory comparisons and had proposed to develop a plan to organize RIC intercomparisons.

5. ET-RIC has already developed proposals to promote and to carry out interlaboratory comparisons in RA I, RA II, RA V, and RA VI taking into account existing RICs' capabilities. These intercomparisons were planned to be held during the course of 2014. However, since there are several RICs in the accreditation process, these plans have been delayed.

6. A number of RICs from developing countries have made significant efforts to modernize their infrastructure including the calibration standards. Additional efforts will be needed for them to implement procedures to ensure the traceability of their instruments and to comply with the principles stated in the ISO/IEC 17025 standard "General requirements for the competence of testing and calibration laboratories". ET-RIC noted that the amount of work needed to establish the procedures required to become accredited according to ISO/IEC 17025 had generally been underestimated when RICs were established. Nonetheless, going through the process of preparing the documentation required to achieve compliance, in itself had helped Members to improve the capabilities of their laboratories, as well as to achieve recognition of their work within their services and beyond.

7. In response to the request of Congress for CIMO to support further strengthening of RICs and NMHSs calibration laboratories, particularly with respect to the technical calibration procedure estimating the uncertainties of the calibrations performed, ET-RIC has developed an Instruments and Methods of Observation (IOM) report providing guidance on the computation of calibration uncertainties, which is in the course of finalization. It provides a number of examples concerning the typical types of equipment used in RICs and NMHS laboratories for temperature, pressure and humidity calibrations and puts emphasis on how to evaluate the different uncertainty components. This document is aimed at personnel who already have basic knowledge about measurement uncertainty and the Guide to the Expression of Uncertainty in Measurement (GUM), but need further advice.

Improving the traceability of observations

8. The lack of traceability of measurements to international standards was recognized as a major concern by the Commission at its fifteenth session (CIMO-XV). In addressing this issue, CIMO recognized the need to sensitize NMHSs to the necessity of regular instrument calibration and to develop relevant training and capacity development material. It also recalled that preventive maintenance, in particular periodical instrument checks, is essential to ensure the required quality of measurements. In this regards, ET-RIC has developed a strategy, which is being finalized, that

would help ensuring that the traceability of measurements to SI standards is implemented by WMO Members.

9. Though the principles of traceability are clearly laid down in the CIMO Guide, many Members do not have a calibration laboratory and are also facing challenges in calibration of their network instruments and cannot assure traceability of measurements they perform. These Members are only carrying out field inspection checks to identify instruments which are out of the calibration tolerances and replace them, as appropriate with the calibrated ones. It has to be stressed that a field inspection is not equivalent to a calibration.

10. The aim of the traceability strategy is to ensure the traceability of measurements to SI through an uninterrupted calibration chain of the instruments to world standards. The following options could be chosen to achieve this goal, listed in order of preference:

(a) Field instrument calibrated in an accredited laboratory;

(b) Field instrument calibrated in the laboratory with a transfer standard, which was itself calibrated in an accredited laboratory;

(c) In the absence of a laboratory, make use of a field inspection kit that is traceable to a RIC or an accredited laboratory for the inspection of all the field instruments and ensure those which are out of the specified tolerance range are calibrated in a laboratory as described in options (a) and (b) above.

Minamata Convention on Mercury

11. The UNEP Minamata Convention on Mercury (http://www.unep.org/hazardoussubstances/MinamataConvention/tabid/106191/Default.aspx) that is planned to enter into force in 2020 will have significant consequences for Members that are still using mercury-based instruments in their networks. From that date, the manufacture, import and export of products containing mercury (including meteorological instruments, such as barometers and thermometers) shall not be allowed anymore, except for reference standards. A European Union regulation that totally bans sales of mercury containing instruments within Europe entered into force in April 2014 (http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2012:253:0001:0004:EN:PDF).

Survey on Dangerous and Obsolete Instruments

12. A survey on Alternatives for dangerous and obsolete instruments (published as IOM Report, see: http://www.wmo.int/pages/prog/www/IMOP/publications-IOM-series.html) was carried out in 2013 by ET-RIC. It revealed that mercury-based instruments are still widely used, while some Members have already phased out instruments using mercury. The survey also revealed that some Members are not aware of the hazardous effects of mercury, and that a large proportion of Members do not have appropriate calibration facilities to handle these instruments. Modern alternatives are generally available to replace mercury type of instruments. An IOM report providing a detailed analysis and evaluation of the survey and outlining main recommendations on alternatives to these types of instruments is about to be published. The Report also presents some examples of modern alternatives that have been successfully experienced in some developing countries and the real benefits gained in terms of quality of observation and costs.

13. ET-RIC recognized that alternatives for dangerous and obsolete instruments were available and can provide cost-effective solutions for replacement of these obsolete instruments. A large variety of instruments and providers are available, however, they vary in their performances and prices. ET-RIC recommended that Members investigate the metrological properties of these instruments and share these results so that these experiences could be compiled for further guidance to Members. ET-RIC stressed that the replacement of dangerous and obsolete

instruments should be considered by Members in their strategy to improve the quality of data from their observing networks. It also cautioned that the transition from the conventional to modern instruments require rethinking of the whole concept of the observing network, including the traceability chain.

14. ET-RIC questioned the continuous need for the Regional Standard Barometers list published in the CIMO Guide (Part I, Chapter 3, Annex 3B) and recommended that this issue will be addressed by the ET-RIC in the next intersessional period. In doing this, ET-RIC will assess the need for these regional standards, their status (whether they are still existing and calibrated) and the implications and possible solutions to be implemented to be compliant with the Minamata Convention.

15. ET-RIC recognized that autographic instruments cannot be considered obsolete in all cases. Well-maintained and calibrated autographic instruments may be of value for specific applications. ET-RIC recommended, however, that in cases where these instruments can not be practicably calibrated to a reference/national standard, then their replacement with instruments traceable to SI is considered. In these cases, a policy for ensuring periodic calibration of the new instrumentation needs first to be developed.

Competencies

16. In the context of WIGOS and of the WMO Quality Management Framework (QMF), there is a need to ensure that personnel performing tasks such as making meteorological observations, and calibrating or maintaining equipment have the appropriate skills, knowledge and behaviours to do the tasks to the level outlined in the CIMO Guide. ET-RIC has taken steps in developing a document on competencies required for performing calibrations based on experience of RICs that were already accredited.

Guide to Meteorological Instruments and Methods of Observation

17. The WMO *Guide to Meteorological Instruments and Methods of Observation* (WMO-No. 8) (CIMO Guide) was recognized by the Sixteenth Congress as the main source of information for Members in standardizing instrument performances and guaranteeing the quality of observations. CIMO, as requested by Congress, has been putting priority on the development of standards under the WIGOS framework and on the regular update of the CIMO Guide.

18. Following approval by CIMO-XV of the Final Draft of the First Supplement to the Seventh Edition (2008) of the CIMO Guide, the English version of the 2008 Edition, updated in 2010, was published in 2012 and is available from the WMO/IMOP website (http://www.wmo.int/pages/prog/www/IMOP/IMOP-home.html). The translation of this version of the CIMO Guide in Chinese, French, Russian and Spanish was completed in 2013. China, France, the Russian Federation and Spain kindly agreed to do the editing and layout of these translations. It is expected that they will be published in the course of 2014.

19. In a view of ensuring consistency in the way that the different observing technologies are presented in the CIMO Guide, the CIMO Guide Editorial Board (EdBd) updated the guidelines for drafting updates/new editions of CIMO Guide chapters and the procedures for updating the CIMO Guide. The guidelines and procedures were adopted by the CIMO Management Group (MG) and posted on the WMO/IMOP website:
http://www.wmo.int/pages/prog/www/IMOP/publications/CIMO-Guide/Procedure/Guidelines_2012.pdf,
http://www.wmo.int/pages/prog/www/IMOP/publications/CIMO-Guide/Procedure/Procedures_2012.pdf.

20. The Preliminary 2014 Edition of the CIMO Guide was made ready for Members' review and posted on the WMO/IMOP website in March 2014,
http://www.wmo.int/pages/prog/www/IMOP/publications/CIMO-Guide/CIMO-Guide_Prelim-2014Ed.html. It includes a number of updated and/or fully revised chapters that were developed and reviewed by

CIMO Expert Teams and EdBd. Significant contributions to this effort were also provided by experts from the Commission for Basic Systems (CBS), the Commission for Atmospheric Science (CAS), and the Joint Technical Commission for Oceanography and Marine Meteorology (JCOMM), and other experts. Members were invited to review the proposed changes. Comments received were reviewed and incorporated, as far as possible, in the provisional 2014 edition submitted to the session for approval. The session will be informed of any significant changes made in this process.

21. The Preliminary 2014 Edition of the CIMO Guide contains revisions to:

(a) Part I, Chapters 1, 2, 3, 4, 5, 6, 7, 8, 9, 11, 12, 13, 14, and 15;
(b) Part II, Chapters 3, 4, 5, 7, 9, and 10;
(c) Part III, Chapter 4.

In Part I, the two chapters on measurement of ozone (Chapter 16) and atmospheric composition (Chapter 17) have been extensively revised and combined into one new Chapter 16. In Part II, Chapter 6 has been removed due to the fact that rocket observations are rarely used for meteorological observations today, the information provided in the chapter was obsolete so may have been misleading, and no new information is available to replace it. Part II, Chapter 8 was extensively updated and expanded, and reintroduced as a new Part III on Space-based Observations. The current Part III therefore will become a new Part IV.

22. Accounting for the implications of the Minamata Convention on Mercury, information on dangerous chemicals and the impact of the Convention was included in Part I, Chapter 1 of the CIMO Guide and referred to it from all chapters mentioning the possible use of mercury.

23. Former versions of the CIMO Guide are available on request from the WMO library and the information from chapters that were deleted remain accessible in that way.

24. Further work on the CIMO Guide will be needed in the coming years, including in reorganizing the content of some chapters to present preferred technologies first, followed by those which are less recommended. This work will include matters that could not be completed in the preparation of the 2014 Edition as well as the latest developments related to the use of new technologies.

25. Discrepancies exist between the practices used in the CIMO Guide and some other WMO publications, concerning the use of quantities, units and symbols, as well as editorial practices. CIMO MG therefore recommended to propose to the WMO Executive Council that general principles concerning the use of quantities, units and symbols, throughout all WMO publications, should be in accordance with the International System of Units (SI), published and regularly updated by the International Bureau of Weights and Measures (BIPM, 2006), the Quantities and Units, defined by the International Organization for Standardization (ISO, 2009) and the Symbols, Units, Nomenclature and Fundamental Constants in Physics, described by the International Union of Pure and Applied Physics (IUPAP, 1987). Variables not defined as an international symbol by the above mentioned documents, but commonly used in meteorology should be used as stated in the International Meteorological Tables, published by World Meteorological Organization (WMO, 1966).

26. CIMO MG also agreed that all international reference systems, like SI, time (UTC), location (WGS84), altitude (MSL to be referenced to the geoid EGM96) should be endorsed by Congress (if not done already) and published in the starting chapters of the WMO Technical Regulations. Such coordination should be done through ICG-WIGOS and checked by CIMO MG during the review of the WIGOS regulatory material.

27. CIMO had considered developing a Manual on Instruments and Methods of Observations (Manual on IMO) in the context of the development of the WIGOS regulatory material. In this regard, CIMO MG agreed not to develop a separate Manual on IMO, but to contribute relevant standard practices elevated from the CIMO Guide directly to the Manual on WIGOS, or to the WMO Technical Regulations. A method to identify the correspondence between the WIGOS regulatory material and the CIMO Guide to ensure that cross-references are properly updated whenever a document is being revised, should be developed.

28. CIMO was tasked by the Sixteenth Congress to contribute to the development of a user-friendly direct access and on-line search tool for the CIMO Guide and other related WMO regulatory material that would help Members in accessing the information needed to improve and standardize their networks according to WIGOS requirements. Thorough investigations led to the conclusion that it could not be easily done in the present WMO IT environment. Currently, WMO is looking for an overall IT solution rather than individual ones addressing specific requirements of the technical commissions. This will be done through the Standardization of Observation Reference Tool (SORT) that is developed in the context of the development of the WIGOS Information Resource (WIR).

29. Based on a recommendation from the EdBd, CIMO MG reconsidered the possible development of a webportal providing links to numerous document sources in support of capacity development, as a follow-up and extension of the former “AWS portal” (http://www.wmo.int/pages/prog/www/IMOP/WebPortal-AWS/Index.html). It was proposed that the WMO Secretariat develops a webpage that could host links to relevant documents proposed by all CIMO ETs within their area of responsibility.

Training and Capacity Development Activities

30. The WMO RTC – Turkey organized four training courses where more than forty participants were trained on basics of calibration, weather radars and upper air observing systems.
List of training programmes conducted by RTC - Turkey:

(a) Training Course on Basics of Calibration, Ankara, Turkey, 12-14 September 2011 (8 participants from 7 countries);

(b) The sixth International Training Course on Weather Radars, Marmaris/Muğla, Turkey, 8-12 October 2012 (22 participants from 14 countries);

(c) The third International Training Course on Upper Air Observing Systems, Istanbul, Turkey, 15-19 October 2012 (10 participants from 10 countries);

(d) Training Course on Basics of Calibration, Ankara, Turkey, 30 September to 4 October 2013.

31. A WMO training workshop on Metrology for the Southwest Pacific RA V English-speaking countries was held from 21 to 25 November 2011, in Melbourne, Australia.

32. A course on Instruments Maintenance and Calibration was organized from 16 September to 11 October 2013, by the Institute for Meteorological Training and Research / World Meteorological Organization / Regional Training Centre (IMTR/WMO-RTC), Nairobi, Kenya, for 23 participants. The trainees were exposed to a hands-on environment where they carried out practical calibration and maintenance of various meteorological instruments.

33. The Japan Meteorological Agency, in collaboration with WMO, conducted a Training Workshop on Calibration and Maintenance of Meteorological Instruments for RA II (Asia) countries,

from 19 to 22 February 2013, in RIC Tsukuba, Japan. Altogether, 38 participants from 13 different NMHSs and one from RIC Beijing participated in the workshop. Both lectures and practical exercises were provided.

34. An International Training Course on Weather Radar Operation and Data Utilization organized by Korea Meteorological Organization, was held from 2 to 15 March 2014, in Seoul, Republic of Korea for 20 participants from RAs I, II and V.

35. The WMO Regional Training Centre Nanjing (China) conducted altogether seven training programmes related to radar meteorology, satellite meteorology, meteorological instruments and meteorological observations. Two of the programmes were held in Mozambique and Cape Verde, respectively. More than 120 people took part in these events. The list of training programmes conducted at RTC-Nanjing included:

(a) International Training Course on Satellite Meteorology, 18-29 April 2011 (15 participants);

(b) Training Course on Doppler Weather Radar Application, 12 September to 11 October 2011 (6 participants);

(c) International Training Course on Radar Meteorology, 11-22 June 2012 (22 participants);

(d) Advanced Course for Civil Aviation Observers (in Mozambique), 19-21 September 2012 (25 participants);

(e) Advanced Course for Civil Aviation Observers (in Cape Verde), 10-21 December 2012 (17 participants);

(f) Training Course on Radar Meteorology for Developing Countries, 17 May to 6 June 2013 (14 participants);

(g) International Training Course on Use of Meteorological Instruments, 12-25 September 2013 (22 participants).

36. The National Meteorological Service of Argentina, RIC Buenos Aires, has implemented Moodle platform for e-learning and organized the first Surface Meteorological Observer (SMO) Course in 2013 for 54 participants/students from Argentina.

37. Two interactive virtual training courses (courseware-s) were developed by the RTC Beijing, China. One of the training courses is focused on the maintenance of the new generation weather radar CINRAD/SA, while the other one, incorporating 3D interactive technology, provides a real simulation of working principle, installation, maintenance, and monitoring process operation of the automated observing systems.

38. Following the conclusion of the JMA/WMO Workshop on Quality Management in Surface, Climate and Upper-air Observations in RA II (Asia) in 2010 (see http://www.wmo.int/pages/prog/www/IMOP/publications/IOM-111_Survey_RA-II/IOM-111_Survey_RA-II.pdf) and the recommendations of CIMO-XV, a survey on meteorological instruments, calibration and training was conducted in RA II. The major outcome of the survey was that calibration and maintenance of meteorological instruments represented major issues to be tackled by Members and supported by RICs and RRCs. The survey also showed that conventional instruments such as mercury barometers and liquid-in-glass thermometers were still widely used.

39. A survey on Traceability and Calibration in Regional Association V (South-West Pacific) was organized in 2013 with the aim to assess the status of traceability for measured

meteorological parameters within Members of RA V. The results of the survey are under evaluation.

40. A number of documents, in Chinese language, providing training material on the use, maintenance and calibration of instruments were identified. It was recommended that the Regional Instrument Centre of Beijing, China, would include links to those documents on its website, which would in turn be linked to the WMO/IMOP website. This should ensure that these documents are accessible and would be maintained by staff having the appropriate language knowledge. CIMO MG recommended that a similar approach be followed for material in other WMO languages.

41. Team Leaders on Training Material and Training Activities (TLs-TM&TA) noted the problems and difficulties of collecting information on training activities organized in the regional associations and not reported by Members. TLs-TA&TM suggested that more efficient interaction with the RAs should be established in order to make the training materials and the scheduled training activities known to all their Members.

Radiosonde Performance Monitoring

42. The Theme Leader on Radiosonde Performance Monitoring (TL-RPM) paid particular attention to compiling global statistics of TEMP and PILOT messages and $s_r r_a r_a s_a s_a$ code figures arriving along with section 7 of TEMP messages. The statistics have allowed identifying outdated entries in the Common code table C-2 and re-allocating them for new radiosonde/system types in liaison with the CBS Inter-Programme Expert Team on Data Representation Maintenance and Monitoring (IPET-DRMM), HMEI and manufacturers of upper-air instrumentation. Updating the full-featured Catalogue of Radiosondes was prevented by lack of details, that could be obtained from Members and as a result only a “limited edition” of the Catalogue is available at the moment at: http://www.wmo.int/pages/prog/www/ois/volume-a/vola-home.htm.

43. Despite all intrinsic drawbacks the Common code table C-2 is evolved in a due manner. Due to de-allocation of outdated entries its capacity so far allows to cope with existing needs to allocate (or re-allocate) new types of radiosonde/systems. TL-RPM has implemented a basic web page http://cao-ntcr.mipt.ru/all_doc/c4 that allows one to monitor their progress in preparation of required deliverables.

44. Potentially the migration to TDCF may significantly facilitate compiling of the Catalogue of Radiosondes and even make it rather a routine task under condition of proper reporting practice. In fact, many instrumentation-related metadata descriptors had been inherited from traditional alpha-numeric codes with all their existing drawbacks and shortcomings while many novel descriptors and respective BUFR/CREX code/flag tables were introduced answering the particular specific requests of some Members and reflecting national practices rather than generic approaches. The amount of observation and instrumentation metadata descriptors grows very fast and it would be appropriate to develop a consistent approach to introduction of new instrumentation descriptors and maintaining respective code/flag tables based on scientifically proven classifications developed by CIMO experts in liaison with CBS and HMEI.

45. The lack of necessary descriptions for numerous existing instrumentation-related code/flag tables both in TAC and TDCF was identified, in particular for entries which are not in use anymore, like entries related to the code table 3849 s_r “Solar and infrared radiation correction”. To overcome these difficulties creation of a kind of “knowledge base” about meanings of respective entries, including historical ones, should be appropriate.

46. As the duration of parallel exchange TAC and TDCF has not been limited yet, an attention should still be paid to existing ways and means of reporting instrumentation metadata using traditional FM-32 and FM-35 codes. Due to the limited capacity of the Common code table C-2, it

would be necessary to look for a way of managing reporting required metadata on radiosonde instrumentation, after completed migration to TDCF.

47. There are still some inconsistencies between Vol. A and Vol. C1 of WMO No. 9 in respect to upper-air observations. As upper-air stations may share the same index number with stations of other types but reside in different location, such inconsistencies may potentially affect adequate interpretation of upper-air data. Recent discussions within IPET-DRMM revealed mistakes either in encoding or reporting coordinates with TDCF, thus Vol. A will preserve at least in medium term its significance as source of information about the upper-air station locations.

48. The following recommendations are submitted by TL-RPM to CIMO-16:

(a) Encourage NMHSs to apply for allocating code figures for their new radiosonde types;

(b) Enhance cooperation between CBS, CIMO and HMEI in introduction and maintaining instrumentation metadata BUFR/CREX descriptors;

(c) Draw attention of CBS on the necessity of harmonization of Vol. A and Vol. C1 of WMO-No. 9.

Surface-based instrument performance monitoring

49. Instrument performance monitoring is essential to ensure the sustained quality of observations and a number of Members are developing independent concepts to address this issue. Sharing expertise of Members who have already implemented such systems would be most beneficial to all. The Theme Leader on Surface-based Instrument Performance Monitoring collaborated with representatives from three NMHSs proposed by CIMO MG members in developing a draft report on surface-based instrument performance monitoring.

AWS Workshop

50. Automatic observations, i.e. without interventions of any observer, have been a major topic within the IMOP Programme for some time already. Guidance was provided to Members through the CIMO Guide, IOM reports and the Automatic Weather Station (AWS) portal. Feedback from Members indicates unsatisfactory performance of some automatic observing systems and their limited sustainability and CIMO should continue addressing AWS systems.

51. CIMO MG recognized that technologies are constantly changing, new equipment becomes available, integration from more sensors on the same instrumental platforms becomes common practice, so that there is a potential for organizing conferences addressing those matters. The "International Conferences on Experiences with Automatic Weather Stations in Operational Use within National Weather Services" (ICEAWS), which were organized regularly to exchange experiences with AWS systems and performance of AWS networks, were providing an appropriate forum for knowledge transfer between Members, but the last one was organized in 2006. CIMO MG recommended that such conferences be revived and agreed that CIMO should take an active role in stimulating their organization, helping to find NMHSs willing to host them, but with limited support from CIMO.

Scoping Workshop on Improved Standardization

52. Global improvements in the quality and traceability of observational data from basic observational instrumentation have resulted from the implementation of standardized calibration, maintenance and operational procedures, thanks to the establishment of the WMO Regional Instrument Centres and Regional Radiation Centres. WMO Members are increasingly transitioning from manual to automated observations for more than the basic measurements, yet similar

success in ensuring global data quality has not yet been accomplished for the more complex associated observing equipment (such as ceilometers, visimeters, weather radars, radar wind profilers, lidars, etc.). CIMO is committed to address this issue in the coming intersessional period.

TECO and METEOREX

53. The WMO Technical Conference on Meteorological Instruments and Methods of Observation (TECO 2012) was held at the Expo Centre in Brussels, Belgium, from 16 to 18 October 2012. The conference was held in parallel with the Meteorological Technology World Expo 2012. In total, there were 270 different participants over the three days, with between 200 and 240 in attendance each day. 105 papers and posters were presented and published in the IOM Report No. 109. In addition to the paper presentations, the programme included an open forum discussion session on the Siting Classification for Surface-based Observing Stations on Land, which was well-received. A survey was organized to assess the satisfaction of participants. They were generally pleased with the programme as well as with the duration of TECO.

54. At the kind invitation of Roshydromet, TECO-2014 was held in St. Petersburg, Russian Federation, from 7 to 9 July 2014 in conjunction with the Exhibition of Meteorological Instruments, Related Equipment and Services (METEOREX-2014). The Seventh Russian National Meteorological Congress also took place at the same location and time. 136 papers were proposed for oral and poster presentation at TECO-2014 which were published as an IOM Report.

Instruments and Methods of Observation Reports

55. A number of IOM reports were prepared by CIMO experts covering a wide field of activity. Ten IOM reports were published since CIMO-XV and it is expected that additional IOM reports will be published before the CIMO-16. All recent IOM reports are available on: http://www.wmo.int/pages/prog/www/IMOP/publications-IOM-series.html. The table below provides the list of the latest reports published and of those expected to be published by the time of the session:

IOM	Title	Authors
IOM 114	AMDAR Onboard Software Functional Requirements Specification Version 1.0, 16 July 2013	
IOM 113	Third WMO Regional Pyrheliometer Comparison of RA II Tokyo, 23 January to 3 February 2012	N. Ohkawara, H. Tatsumi, O. Ijima, H. Koide, S. Yamada (Japan)
IOM 112	Baltic Region Pyrheliometer Comparison 2012 21 May-1 June 2012, Norrköping, Sweden	T. Carlund (Sweden)
IOM 111	RA II - Survey on the Surface, Climate, Upper-air Observations, and Quality Management	Japan Meteorological Agency
IOM 110	Experiences of the Japan Meteorological Agency (JMA) with the Operation of Wind Profilers (2011)	Japan Meteorological Agency
IOM 109	Papers and Posters presented at the WMO Technical Conference on Instruments and Methods of Observation, Brussels, Belgium, 16-18 October 2012	
IOM 108	The International Pyrheliometer Comparison - Final Report Davos, Switzerland, 27 September to 15 October 2010	W. Finsterle (Switzerland)
IOM 107 *(TD 1580)*	WMO Intercomparison of High Quality Radiosonde Systems	J. Nash, T. Oakley (all United Kingdom), H. Vömel

	Yangjiang, China, 12 July-3 August 2010 (20 MB)	(Germany), LI Wei (China)
IOM 106 *(TD 1579)*	WMO Field Intercomparison of Thermometer Screens/Shields and Humidity Measuring Instruments Ghardaïa, Algeria, November 2008 - October 2009	M. Lacombe (France), D. Bousri (Algeria), M. Leroy (France), M. Mezred (Algeria)
IOM 105 (TD 1557)	Report on the WMO-BIPM workshop on "Measurement Challenges for Global Observing Systems for Climate Change Monitoring - Traceability, Stability and Uncertainty" Geneva, Switzerland, 30 March–1 April 2010	
	UNDER FINALIZATION	
	COST 727 Action Measuring and forecasting atmospheric icing on structures	COST
	Evaluation of CIMO Weather Radar Survey and Web-based Radar Database	Oguzhan Sireci (Turkey)
	Measurement of upper-air pressure, temperature and humidity	John Nash (United Kingdom)
	EG-CLIMET: Overview of the achievements of the action	COST
	Pyrgeometer Calibration Procedure at the PMOD/WRC-IRS	Julian Gröbner and Stefan Wacker (Switzerland)
	Report of the first International Pyrgeometer Intercomparison from 27 September to 15 October 2010 at PMOD/WRC	Julian Gröbner and Stefan Wacker (Switzerland)
	Survey on meteorological instruments, calibration and training in Regional Association II (Asia)	Japan Meteorological Agency
	Survey on alternatives for dangerous and obsolete instruments Evaluation of the questionnaire and recommendations on alternatives	A. Bakthavathsalu (India) and R. Merrouchi (Morocco)
	Guidance on the computation of calibration uncertainties	J. Duvernoy (France)
	Papers and Posters presented at the WMO Technical Conference on Instruments and Methods of Observation (TECO-2014), St. Petersburg, 7-9 July 2014	

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WMO INTEGRATED GLOBAL OBSERVING SYSTEM (WIGOS)

References:

1. Resolution 50 (Cg-XVI) - Implementation of the WMO Integrated Global Observing System (WIGOS)
2. Resolution 10 (EC-64) - WIGOS Framework Implementation Plan (WIP), version 1.0
3. The first session of the Inter-Commission Coordination Group on WIGOS (ICG-WIGOS), Geneva, 26-30 September 2011
4. The second session of the Inter-Commission Coordination Group on WIGOS (ICG-WIGOS), Geneva, 18-22 March 2013
5. The third session of the Inter-Commission Coordination Group on WIGOS (ICG-WIGOS), Geneva, 10-14 February 2014
6. WIGOS Framework Implementation Plan (WIP), version 3.0, adopted by EC-66

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 [see reference 1].

2. The implementation of the WIGOS Framework was undertaken according to the recommendations and guidance by the Executive Council and ICG-WIGOS [see references 2-5].

3. The WIGOS Framework Implementation Plan (WIP) [see reference 6] 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.

4. 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.

5. The CIMO expert teams reviewed the WIP and their workplans to verify whether their activities were in-line with the WIP and to identify possible other activities that they should engage in. It appeared that almost all CIMO expert team activities were directly contributing to the WIP tasks.

6. Based on the progress achieved in the WIP Key Activity Areas—those that are the most critical activities to be implemented by 2015—ICG-WIGOS-3 agreed that the implementation of the WIGOS Framework had reached a point of maturity where WIGOS is now enabling the development and deployment of its components. With the key initial building blocks of the WIGOS Framework, i.e.: (1) updated WMO Technical Regulations (WMO-No. 48), Vol. I, Part I, including the new Manual on WIGOS; (2) WIGOS Core metadata standard practices and procedures with initial access to WIGOS metadata provided by WIR; and (3) operational WIGOS Information Resource (WIR) in place by Cg-17, the prerequisites are available for a Preoperational Phase of WIGOS from 2016 to 2019.

7. During the Preoperational Phase of WIGOS (2016 to 2019), all activities specified by the WIP should be completed, CIMO should especially focus on the following areas:

(a) Global improvement in the quality and traceability of observations through development and implementation of WIGOS-related standard and recommended practices and procedures, in close collaboration with other technical commissions;

(b) Provision of the technical guidance and assistance to Members and regional associations helping them to achieve compliance with WIGOS Technical Regulations;

(c) Update, harmonization and development of WIGOS relevant regulatory and guidance material, including a new Guide to WIGOS;

(d) Strengthening Regional Instrument Centres (RICs), Regional Radiation Centres (RRCs), and Regional Marine Instrument Centres (RMICs).

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PROGRESS REPORT FOR INFORMATION – NOT TO BE INCLUDED IN THE GENERAL SUMMARY

GLOBAL FRAMORK FOR CLIMATE SERVICES (GFCS)

References:

1. Abridged Final Report with Resolutions of the First Session of the Intergovernmental Board on Climate Services: https://drive.google.com/file/d/0BwdvoC9AeWjUdHdYVlRNVm1JSzg/edit?usp=sharing
2. Abridged Final Report with Resolutions of EC-65 (Geneva, 15-23 May 2013), WMO-No. 1118: ftp://ftp.wmo.int/Documents/PublicWeb/mainweb/meetings/cbodies/governance/executive_council_reports/english/pdf/1118_en.pdf
3. Abridged Final Report with Resolutions of the Extraordinary Session of the World Meteorological Congress, Part I (Geneva, 29–31 October 2012), WMO-No. 1102, Resolution 1 (Implementation Plan of the Global Framework for Climate Services, and Resolution 2 (Establishment of the Intergovernmental Board on Climate Services): ftp://ftp.wmo.int/Documents/PublicWeb/mainweb/meetings/cbodies/governance/congress_reports/english/pdf/1102_Part1_en.pdf
4. Abridged Final Report with Resolutions of Sixteenth World Meteorological Congress (Geneva, 16 May–3 June 2011), WMO-No. 1077: ftp://ftp.wmo.int/Documents/PublicWeb/mainweb/meetings/cbodies/governance/congress_reports/english/pdf/1077_en.pdf
5. Report of the High-level Taskforce for the Global Framework for Climate Services: http://www.wmo.int/hlt-gfcs/downloads/HLT_book_full.pdf
6. Global Framework for Climate Services website: http://gfcs.wmo.int/

Outcomes of the Extraordinary Session of the World Meteorological Congress

1. The Commission recalled that the vision of the Global Framework for Climate Services (GFCS) is to enable society to manage better the risks and opportunities arising from climate variability and change, especially for those who are most vulnerable to climate-related hazards. Effective climate services will facilitate climate-smart decisions that will reduce the impact of climate-related disasters, improve food security and health outcomes, and enhance water resource management, among other societal benefits. All countries will benefit, but in the initial stages priority shall go to building the capacity of developing countries vulnerable to the impacts of climate variability and change. The GFCS aims to bridge the gap between those that need to know the climate and those that have such knowledge, thus empowering, in particular, the vulnerable.

2. To ensure that the entire value chain for the production and application of climate services is effectively addressed, the GFCS consists of five components or pillars, namely:

(a) *The User Interface Platform* — to provide ways for climate services users and providers to interact to identify needs and capacities and improve the effectiveness of the Framework and its climate services;

(b) *The Climate Services Information System* — to produce and distribute climate data, products and information according to the needs of users and to agreed standards;

(c) *Observations and Monitoring* – to generate the necessary data for climate services according to agreed standards;

(d) *Research, Modelling and Prediction* — to harness science capabilities and results and develop appropriate tools to meet the needs of climate services;

(e) *Capacity Development* — to support the systematic development of the institutions, infrastructure and human resources needed for effective climate services.

3. Implementation of these components would allow the development of the required capacities to respond to the needs for tailored climate services in the initial four priority areas of the GFCS, namely: agriculture and food security, water, health and disaster risk reduction.

4. The Extraordinary Session of the World Meteorological Congress, held for the first time in the history of WMO in October 2012, in Geneva, adopted three resolutions (see report at http://library.wmo.int/pmb_ged/wmo_1102_en-p1.pdf) pertaining to:

(a) The Implementation Plan of the GFCS for the subsequent consideration by the Intergovernmental Board on Climate Services;

(b) The establishment of the Intergovernmental Board on Climate Services as an additional body accountable to Congress under Article 8(h) of the Convention of the WMO;

(c) Financing of the Intergovernmental Board on Climate Services, Secretariat and Implementation Plan of the GFCS.

5. As part of the Extraordinary Session of the World Meteorological Congress, a Dialogue for Climate Services Users and Providers was organized 27–29 October 2012. The Dialogue provided a platform for sharing experiences, lessons and good practices on the production and application of climate services worldwide. A publication, “Climate ExChange” containing case studies on experiences from around the world on the development and application of climate services in various socio-economic sectors was launched at the Dialogue (the publication is available at: http://www.wmo.int/pages/tudor-rose/index.html). An Atlas of Health and Climate, a product of collaboration between the World Meteorological Organization and the World Health Organization was also launched (see http://gfcs.wmo.int/atlas-health-climate). The Atlas provides sound scientific information on the connections between weather and climate and major health challenges.

First session of the Intergovernmental Board on Climate Services (IBCS-1)

6. The first session of the Intergovernmental Board on Climate Services was held in Geneva 1-5 July 2013. As part of the session, a one-day workshop on “Operational Climate Services: a dialogue on practical action” was held on 1 July 2013 (see details at: http://gfcs.wmo.int/content/operational-climate-services-dialogue-practical-action). The workshop demonstrated the value of an organized and coordinated system to maximize synergies in addressing the entire value chain for the production and application of climate services and provided examples of concrete activities from the global to the national levels.

7. The major outcomes of IBCS-1 were the following (http://library.wmo.int/opac/index.php?lvl=notice_display&id=15878):

(a) Approval of the Implementation Plan of the GFCS and a Compendium of initial GFCS projects for immediate implementation;

(b) Establishment of a stakeholder engagement mechanism;

(c) Election of Dr Anton Eliassen (Norway) as the Chair, Dr Linda Makuleni (South Africa) and Dr Laxman Singh Rathore (India) as the Co-Vice-Chairs of the IBCS. It also selected the Members forming the Management Committee as follows:

- RA I (Africa): Cameroon, Cote d'Ivoire, Egypt, Guinea Bissau, South Africa (Co-Vice-Chair), United Republic of Tanzania;
- RA II (Asia): China, India (Co-Vice-Chair), Islamic Republic of Iran, Japan, Republic of Korea;
- RA III (South America) : Argentina, Brazil, Peru;
- RA IV (North America, Central America and the Caribbean): British Caribbean Territories, Canada, Costa Rica, United States of America;
- RA V (South-West Pacific): Australia, Fiji, Indonesia, Philippines;
- RA VI (Europe): Germany, Italy, Norway (Chair), Russian Federation, Switzerland, Turkey.

8. The Management Committee was entrusted with the following responsibilities:

(a) Draft recommendations to be submitted by the IBCS to the Seventeenth Congress on appropriate interaction mechanisms between the IBCS and WMO constituent bodies, including the technical commissions as well as constituent bodies of partner institutions;

(b) Review and update the "Principles and Criteria" for funding projects and activities from the GFCS Trust Fund;

(c) Design a monitoring and evaluation criteria and process for the implementation of the GFCS;

(d) Review the composition and criteria for membership of IBCS;

(e) Establish a process to capture the various contributions made by Members at the global, regional and national levels, which support the implementation of the GFCS.

Implementation of the GFCS

9. With the approval of the Implementation Plan and its governance structure the GFCS has entered into an implementation phase. In this regard, to ensure effective engagement mechanism with stakeholders in the implementation of the GFCS, partners have been invited to integrate the Partners Advisory Committee (PAC) established by IBCS. Partners have started sending in their applications.

10. In addition, the WMO Secretary-General established a Project Oversight Board (POB) for the GFCS involving partner UN and international agencies. The POB is comprised of the International Federation of Red Cross/Red Crescent Societies (IFRC), the Food and Agriculture Organization of the United Nations (FAO), the World Food Programme (WFP), United Nations Educational, Scientific and Cultural Organization (UNESCO), United Nations Development Programme (UNDP), United Nations International Strategy for Disaster Reduction (UNISDR), the World Bank (WB), the World Health Organization (WHO) and WMO. This coordination mechanism provides a platform for planning, coordination among partners and sharing of information related to implementation of GFCS related activities.

11. Furthermore, the Secretary-General also established an Interagency Coordination Group (ICG) on the GFCS to contribute to the development of effective forms of cooperation between organizations of the United Nations system engaged in the planning and implementation of the GFCS across UN partner organizations. The ICG will broaden the base of the GFCS so that all UN

partner organizations can better fulfil their functions according to their respective mandates within the UN system. The ICG is a high level coordination structure involving the heads of the following agencies: FAO, WFP, UNESCO, UNDP, UNISDR, WB, WHO and WMO.

12. A number of countries are conducting their national consultations intended to identify gaps and needs and to establish the internal coordination mechanisms needed to ensure effective implementation of the Framework (see http://gfcs.wmo.int/events). Additional national consultations are planned for Dominica (dates to be decided), while regional consultation are planned for Latin America in Costa Rica (28 July-1 August 2014), South Eastern Europe (dates to be decided) and Middle East (dates to be decided). These consultations allow the identification of key gaps in the various components of the GFCS that need to be addressed to support the development and application of climate services in the four priority areas. They also facilitate the identification of critical elements required for the development of guidelines for the establishment of frameworks for climate services at national level.

13. The Executive Council Task Tem on WMO Policy for International Exchange of Climate Data and Products to Support the Implementation of the GFCS met in Geneva 12-14 November 2013. The Task Team developed a draft resolution for the consideration by the sixty-sixth session of the Executive Council prior to submission to the WMO Seventeenth Congress in 2015. The resolution reiterates and complements Resolution 40 (Cg-XII) – WMO policy and practice for the exchange of meteorological and related data and products including guidelines on the relationships in commercial meteorological activities and Resolution 25 (Cg-XIII) – Exchange of hydrological data and products. It proposes the application of the policy and practices from these resolutions and in an Annex identifies a set of data and products that should be exchanged in a free and unrestricted manner.

14. Early efforts to showcase partnerships in the development and application of climate services are taking place through specific activities. With funding from Norway (10 million USD), the GFCS Adaptation Programme in Africa was launched in October 2013. This programme aims at co-designing and generating information and knowledge to support decision-making in food security and nutrition, health and disaster risk reduction with Malawi and Tanzania as the two focus countries. The project is hinged on multi-agency collaboration involving the following agencies:

(a) CGIAR Research Programme on Climate Change, Agriculture and Food Security (CCAFS);

(b) Centre for International Climate and Environmental Research – Oslo;

(c) Chr. Michelsen Institute

(d) International Federation of Red Cross and Red Crescent Societies (IFRC) including Norwegian Red Cross and Red Cross/Red Crescent Climate Centre;

(e) World Food Programme;

(f) World Health Organization;

(g) World Meteorological Organization.

15. With the support from Canada (6.2 million USD) a programme for implementing the GFCS at regional and national scales is under formulation. The programme will support Pacific Island countries, countries in the Caribbean and South Asia, including Arctic and Polar Regions. Other programmes supported by various donors such as Australia, China, Ireland, Korea, Indonesia are being designed.

16. A pilot on national climate outlook forum for Mozambique was kick-started with a meeting 3 –6 March 2014 in Maputo. The meeting provided assistance in appropriate use and interpretation of climate information to identify decision options through a participatory process, while enabling mutual feedback so that ways of improving services can be identified on an on-going basis; linked climate information being generated by National Meteorological Service with larger and newer stakeholder institutions; assessed generation and use of climate information in a national context to identify capacity gaps and help create a platform to bring together users and generators of climate information. The pilot will lead to lessons that could be shared and practices that will be replicated.

17. Early implementation will also be effected through the implementation of the activities contained in the Implementation Plan (including its Annexes and Exemplars) and the compendium of initial GFCS projects approved by IBCS-1. These activities will require the support of technical commissions, particularly as they relate to the various aspects of production and application of climate services. To address this, a meeting involving technical commissions, regional associations, WMO Programmes and partner agencies is planned. The meeting will identify tangible actions to be taken by technical commissions, WMO Programmes and partners agencies in relation to the implementation of the GFCS to meet the 2-, 6-, and 10-year targets identified in the Implementation Plan.

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DISASTER RISK REDUCTION

References:

1. *Abridged Final Report with Resolutions of the Sixty-fifth Session of the WMO Executive Council* (WMO-No. 1118) item 4.2 in the general summary, (Geneva, 15-23 May 2013).

2. *Abridged Final Report with Resolutions of the Sixty-fourth Session of the WMO Executive Council* (WMO-No. 1092) item 4.2 in the general summary with Resolution 8 (EC-64) and its Annex, (Geneva, 25 June-3 July 2012).

3. *Abridged Final Report with Resolutions of the Sixteenth World Meteorological Congress* (WMO-No. 1077), general summary, ref: paras 11.5.1 to 11.5.21, (Geneva, 16 May-3 June 2011), and Resolution 52 (Cg-16) – Disaster Risk Reduction Programme.

4. Final report of the 2014 Meeting of Presidents of Technical Commissions (PTC-2014), Geneva, Switzerland (pages 11-13): https://docs.google.com/a/wmo.int/file/d/0B1MKEzYs7u_-b1c4dUdYbW82U1E/edit?pli=1

5. Final report of the First (2013) Meeting of the DRR Focal Points of Technical Commissions and Technical Programmes, Geneva, Switzerland, 14-16 October 2013: http://www.wmo.int/pages/prog/drr/projects/Thematic/HazardRisk/2013-10-TC-Prog-FP-Meeting/index_en.html

INTRODUCTION

Progress with the Implementation of the WMO Disaster Risk Reduction Work Plan (2012-2015): Institutional mechanisms to facilitate implementation and the deliverables

1. Disaster Risk Reduction (DRR) is one of the priority areas of the WMO Strategic Plan because protection of lives, property and livelihoods are at the core of the priorities of the WMO Members and the National Meteorological and Hydrological Services (NMHSs). The WMO Disaster Risk Reduction Work Plan (2012-2015) (hereafter referred to as the DRR Work Plan) is underpinned by a service delivery framework, driven by user requirements to support risk-informed decision-making in DRR in thematic areas including: (i) sectoral disaster risk analysis to underpin DRR policy, strategic, financial and operational decisions; (ii) Multi-Hazard Early Warning Systems (MHEWS) and Emergency Preparedness; (iii) Sectoral planning such as land zoning, infrastructure and urban development; and (iv) disaster risk financing and risk transfer (e.g., insurance) (see Figure 1). Key elements include:

(a) **Changing governance and institutional frameworks for DRR at national level:** The implementation of the **international agreements** under the Hyogo Framework for Action (HFA) 2005-2015 by national governments has led (and continues to lead) to changes in **national policies, legislative and institutional frameworks**, with implications on the **role, responsibilities and new working arrangements** for the NMHSs;

(b) **Evolving and varied national DRR stakeholders and decision support systems:** Furthermore, the HFA brought about a paradigm shift from post-disaster response to a more holistic approach that also includes disaster preparedness and prevention, which has led to a much wider range of DRR-related decision-making processes at national to local levels (e.g., DRR policy development, risk analysis, development and financing of early warning systems, risk financing and operational mechanisms for managing preparedness, response and early recovery after an event, sectoral disaster risk management such as in

infrastructure development and land zoning, financial risk transfer and insurance, protection of critical infrastructure, etc.) in all nations, but increasingly in the developing and least developed nations, which experience highest impacts. This has led to a much larger and more diverse group of DRR stakeholders (e.g., government authorities and agencies in the public sector, private sector, non-governmental organizations (NGOs), general public and the media, etc.), that would require meteorological, hydrological, climate and environmental hazard information as one of the inputs to risk-based decision-making;

(c) **Producing development and service delivery models relevant to different DRR decision-support systems and target users:** With consideration for the different users, different DRR decision-making processes, and growing regulatory and safety requirements, the development and delivery of meteorological, hydrological, climate, and environmental **products** and services should consider: (i) **defining clearly the target user groups** (e.g., identification, segmentation and prioritization of target user groups); (ii) **defining clearly user requirements** as they vary for different DRR applications and across different DRR user groups; (iii) **defining types of products** that may range from the basic over-the-counter services to tailored services corresponding to those requirements; (iv) **developing working arrangements** with the target users for **delivery** and obtaining **feedback** from the target user on the products and services; and, (v) determining **categories of services** and proper **service delivery models**;

(d) **Development of NMHS core capacities and expertise** to support DRR products and service development and delivery;

(e) Development **of partnerships and working arrangements with other technical agencies** within their respective countries and with the WMO Global Producing Centres (GPCs), Regional Specialized Meteorological Centres (RSMCs), and Regional Climate Centres (RCCs) to support NMHS product and service development and delivery;

(f) Need **to engage in regional and global cooperation** for development of risk information for large scale and transboundary hazards, through strengthened regional and global cooperation and **driven** by regional DRR strategies developed through consultation mechanisms of regional socio-economic groupings derived from the international DRR framework agreements and regional DRR issues.

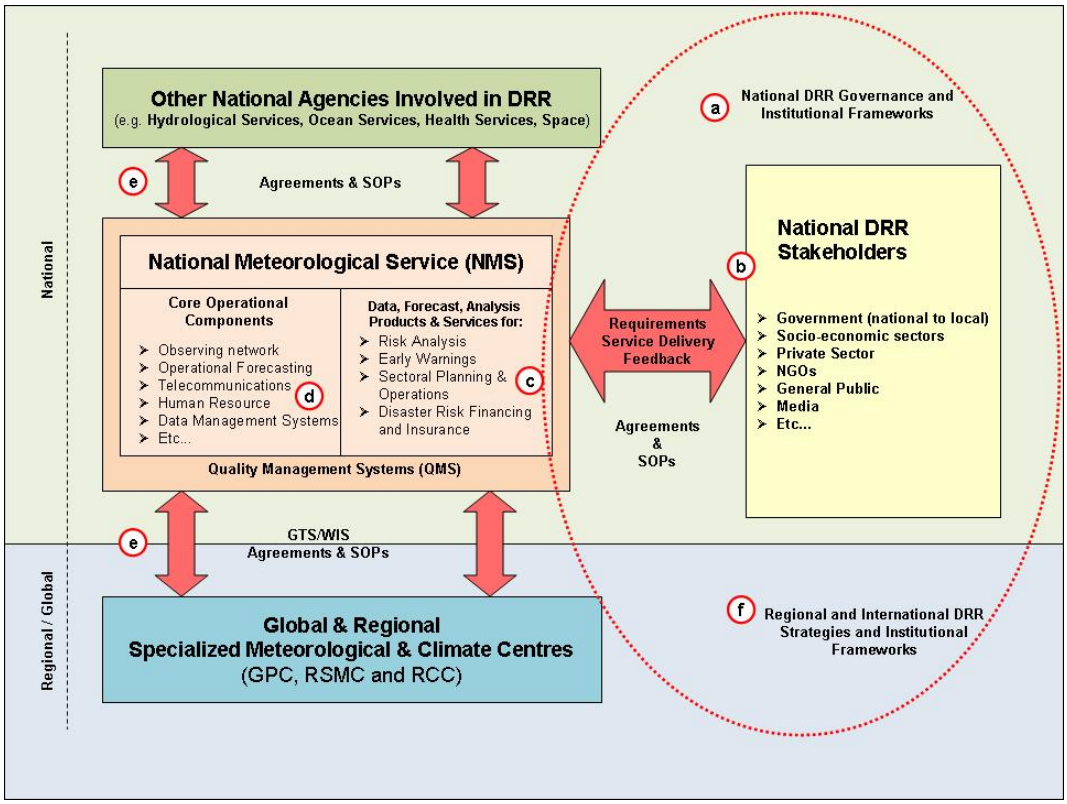

Figure 1: Overarching User-Driven Framework of the WMO DRR Programme for Development and Delivery of Products and Services to support DRR decision-making and related partnerships

2. The DRR Work Plan and its deliverables aim to assist NMHSs with the implementation of this user-driven framework, by providing: (i) **knowledge products in form of guidelines, recommended practices and standards on requirements** of targeted DRR applications and users; (ii) implementation of **integrated holistic DRR demonstration projects with national capacity development as well as regional cooperation** framework engaging target users; and, (iii) **DRR training related to service delivery aspects** targeted at the NMHSs and their stakeholders. The DRR Work Plan provides clear WMO priorities and deliverables approved by WMO governing bodies, as the basis to align and leverage the activities of WMO Technical Programmes (TPs), Regional Programme, Education and Training Programme (ETR), Technical Commissions (TCs), Regional Associations (RAs), globally coordinated system of WIGOS, WIS and GDPFS, and strategic partners towards implementation of these priorities and deliverables.

Progress with the Implementation of DRR Work Plan Guidelines on the Requirements of the DRR User Community

3. A critical goal of the DRR Work Plan is to provide guidelines on user requirements in different DRR applications not only to benefit the NMHSs but also to underpin TCs and TPs activities for updating and/or developing new WMO technical guidelines, recommended practices and technical regulations for meteorological, hydrological and climate services for different areas of DRR underpinned by DRR user requirements.

4. Progress has been achieved through the engagement of the four DRR User-Interface Expert Advisory Groups (DRR UI-EAGs) and mechanisms for development of user requirements in the respective DRR areas (see Table 1).

Table 1: Status of the implementation of knowledge products of the DRR Work Plan during the 2012-2015 Intersessional period

User-Driven DRR User-Interface Expert Advisory Group (DRR UI-EAG) or Coordination Mechanism and Participating Experts from WMO Network	Thematic Topic and Deliverable (Timeline)
Expert Advisory Group on Hazard/Risk Analysis: UNISDR, UNDP, CRED, Munich Re, Swiss Re, World Bank, UNFCCC, OECD, CIMA Foundation, EC Joint Research Centre (JRC), Willis Research Network (WRN) and IRDR **NMHSs**: Germany, Switzerland, United Kingdom, United States of America, Russian Federation, Japan, China, Netherlands and Australia **DRR Focal Points of WMO Technical Commissions and Technical Programmes (DRR FP TC-TP):** CBS, CCl, CHy, JCOMM, CAgM, CIMO, CAS, WCRP, TCP and WIGOS – *Chaired by:* Michel Jean: DRR FP of CBS	**Thematic Topic:** Hazard/Risk Analysis **Deliverables:** 1. "First WMO Technical Workshop on Standards for Hazard Monitoring, Databases, Metadata and Analysis Techniques to Support Risk Assessment", WMO headquarters, Geneva, Switzerland, 10-14 June 2013 http://www.wmo.int/pages/prog/drr/projects/Thematic/HazardRisk/2013-04-TechWks/index_en.html 2. WMO/CRED Atlas of Mortality and Economic Losses from Weather, Climate, and Water Extremes (1970-2012) (**Completed and being published**) 3. "Workshop on User Requirements for Meteorological, Hydrological and Climate Hazard information for Loss and Damage Data Collection and Risk Analysis", Understanding Risk Forum, London, United Kingdom, 3-4 July 2014 (**as input for development of WMO Guidelines under item 4**) 4. WMO hazard definition, classification and hazard data/metadata and modelling requirements to support loss and damage data collection and risk analysis (2014-2015)
Expert Advisory Group on Multi-Hazard Early Warning Systems (MHEWS): WHO, UNOCHA, WFP, FAO, UNHCR, UNDP, IFRC, UNESCO-IOC, World Bank, ITU, UNEP, UN-ISDR, UNICEF and Disaster Risk Management Agencies **NMHSs:** France, Germany, China, Bangladesh, Cuba, Japan and United States of America **DRR Focal Points of WMO Technical Commissions and Technical Programmes (DRR FP TC-TP):** CBS, CCl, CHy, JCOMM, CAgM, CIMO, CAS, WCRP, TCP, WIGOS – *Chaired by:* Michel Jean: DRR FP of CBS	**Thematic Topic:** Multi-Hazard EWS **Deliverables:** 1. Book: "Institutional Partnerships in Multi-Hazard Early Warning Systems: A Compilation of Seven National Good Practices and Guiding Principles" Springer Verlag, pp 243 (April 2012) (**Completed**) http://www.wmo.int/pages/prog/drr/projects/Thematic/MHEWS/MHEWS_en.html 2. "WMO Guidelines for National Meteorological and Hydrological Services on Institutional Partnerships in Multi-Hazard Early Warning Systems and Supporting Emergency Preparedness, Response, Rescue and Early Recovery Operations" (under development with publishing date in 2015)

Table 1: Status of the implementation of knowledge products of the DRR Work Plan during the 2012-2015 Intersessional period	
User-Driven DRR User-Interface Expert Advisory Group (DRR UI-EAG) or Coordination Mechanism and Participating Experts from WMO Network	**Thematic Topic and Deliverable (Timeline)**
Expert Advisory Group on Disaster Risk Financing and Insurance: UNEP-FI, WFP, Willis Research Network, CIMH, CSIRO, UNISDR, Munich Re, UNFCCC, World Bank, IFAD, Swiss Re, OASIS, University of Kentucky and Geneva Association (Insurance) **NMHSs:** Malawi, China, Russian Federation, Ethiopia, Australia, United Kingdom and United States of America **WMO Technical Commissions and Technical Programmes:** CAgM, WWRP and WCRP	**Thematic Topic:** Disaster Risk Financing and Insurance **Deliverables:** 1. Report: Meteorological and Climate Services for Disaster Risk Financing and Insurance: Documentation of Good Practices and Lessons Learned (Forthcoming, Q3, 2014) 2. "WMO Guidelines on Requirements for Meteorological and Climate Cervices for Disaster Risk Financing and Insurance" (2015)
DRR Task Team on Improved Humanitarian Planning and Response: UN-OCHA, IFRC, WFP, UNITAR-UNOSAT, JRC and EC-ECHO **CBS Task Team on the Provision of Operational Meteorological Assistance to Humanitarian Agencies** *Chair*: Mr Michel Jean (Canada).	**Thematic Topic:** Humanitarian Planning and Preparedness **Deliverables:** 1. Documentation of requirements of Humanitarian Community Requirements for Meteorological and Climate Services (**Completed**) http://www.wmo.int/pages/prog/drr/projects/Thematic/Humanitarian/humanitarian_en.html 2. Operational demonstration pilots linked to holistic DRR and adaptation national capacity development projects with regional cooperation (2013-2015) **a. Pilot with WIS/GTS will be demonstrated at CBS in September 2014** 3. Evaluation and scaling-up (2015)

5. Specifically in regards to the development of guidelines on "WMO hazard definition, classification and hazard data/metadata and modelling requirements to support loss and damage data collection and risk analysis (2014-2015)", this area is of critical importance as one of the priorities for the development of national loss and damage databases, which would require geo-referencing with hazard information. The following events have been or are in the processes to be completed to explore the implications of loss and damage data collection and risk analysis for meteorological, hydrological and climate services:

(a) "First WMO Technical Workshop on Standards for Hazard Monitoring, Databases, Metadata and Analysis Techniques to Support Risk Assessment", WMO Headquarters, Geneva, Switzerland, 10-14 June 2013: http://www.wmo.int/pages/prog/drr/projects/Thematic/HazardRisk/2013-04-TechWks/index_en.html;

(b) WMO review and participation in the Integrated Research For Disaster Risk Reduction (IRDR) Data Working Group, which is addressing the development of Peril Classifications and hazard definitions for loss and damage data collection, to ensure that this work is in

alignment with WMO guidelines, definitions and standards, engaging experts from the WMO TC and TP networks;

(c) "Workshop on User Requirements for Meteorological, Hydrological and Climate Hazard Information for Loss and Damage Data Collection and Risk Analysis", Understanding Risk Forum, London, United Kingdom, 3-4 July 2014;

(d) DRR Focal Points of Technical Commissions and Technical Programmes have been engaged to facilitate the engagements of their respective TCs and TPs with the development of these guidelines.

Progress with the Implementation of the Holistic Integrated DRR National Capacity Development Projects with Regional Cooperation Framework and Lessons Learned

6. The holistic integrated DRR national capacity development projects with regional cooperation framework are currently being implemented in **Southeast Europe, Central America, and the Caribbean**; although these are at different stages of development. Table 2 provides a summary of details and status of these projects. The development of these projects have been based on the following considerations:

(a) **Governments have demonstrated interest in investing in DRR capacity development**, therefore, these projects considered close alignment with national DRR and development priorities. The governments' interest were also confirmed through partners including UNDP, UNISDR and the World Bank that work with high levels of the government for development of DRR capacities;

(b) **The project design and implementation** included a group of countries in a (sub)region and considered **alignment** with national DRR policies and development priorities;

Table 2: Status of holistic integrated DRR national capacity development projects with regional cooperation framework

Region	Beneficiary countries and national agencies engaged	WMO, Regional and International Partners and Centres	Project status
South East Europe	**Eight IPA beneficiaries:** - Albania, Bosnia and Herzegovina, Croatia, FYR Macedonia, Montenegro, Serbia, Kosovo (as defined by UNSCR 1244/99), Turkey **National agencies engaged:** - Meteorological Hydrological Services - DRM Agency - Ministry of Agriculture - Ministry of Water	**WMO Programmes engaged:** Regional Office for Europe, DRR, AgM, HWR, WCP, GDPFS and WIGOS **WMO Regional and European Meteorological Network:** RA VI, EUMETNET, EUMETSAT, ECMWF, Climate Centre (Serbia) and Regional Drought Centre (Slovenia) **Regional Socio Economic Grouping, DRM agencies and other platforms:** RCC, DPPI and Sava River Commission **UN and International Partners:** World Bank, UNDP and UNISDR **Donor:** European Commission	✓ Assessment Phase: Holistic national and regional assessments completed (SEEDRMAP, 2008) (2007-2008) ✓ Phase 1: Completed (2009-2012) ✓ Phase 2: Underway to be completed in Q4 2014 (2012-2014) For details see an outcomes of all the phases: http://www.wmo.int/pages/prog/drr/projects/SEE/SEE_en.html

Table 2: Status of holistic integrated DRR national capacity development projects with regional cooperation framework

Region	Beneficiary countries and national agencies engaged	WMO, Regional and International Partners and Centres	Project status
Central America	**Country:** - Costa Rica Warning System for Hydrometeorological Hazards for the Sarapiqui Basin **National and local agencies engaged:** - Ministry of Planning and Finance - National DRM Agency - National Meteorological Service - National Hydrological Service - Red Cross Society - Local Governments and local DRM Agencies	**WMO Programmes:** WMO Regional Office for RA IV based in Costa Rica, DRR and HWR **WMO Regional Network:** RA IV and its DRR Task Team **Regional DRM agency:** CEPREDENAC **UN and international partners:** World Bank, UNDP, IFRC **Donor:** World Bank (GFDRR)	✓ Completed (2012-2013) http://www.wmo.int/pages/prog/drr/projects/CostaRica/CostaRica_en.html ✓ Showcased at the plenary of the Global Platform for DRR 2013 as a good practice http://www.wmo.int/pages/prog/drr/events/GPDRR-IV/index_en.html ✓ Following the successful implementation of this Project, a regional workshop were held under the auspices of RA IV "Workshop on Multi-Hazard Early Warning Systems for Urban Areas: ***San José, Costa Rica (10-12 December 2013)"*** http://www.wmo.int/pages/prog/drr/events/MHEWSCITIEScentralamerica/index_en.html ✓ This Project will be expanded to Nicaragua, Costa Rica, Honduras and Guatemala with a regional capacity development component. ✓ Presented to the Management Group of RA IV at its meeting in February 2014 in Atlanta ✓ Currently MoUs are being signed between WMO and CEPREDENAC. National assessment missions engaging WMO, CEPREDENAC and the World Bank will be underway in 2014
Caribbean	**Countries:** - All Caribbean island countries and territories **National Agencies engaged:** - Meteorological Hydrological Services - DRM Agency - Ministry of Planning	**WMO Programmes:** Regional Office for RA IV, DRR, GDPFS, MMOP, TCP, PWS, WIGOS, WIS, HWR, AgM, WCP **WMO Regional Network:** RA IV and its DRR Task Team, RA IV Hurricane Committee and RSMC-Miami, CMO and its CIMH **Regional Socio-Economic Grouping, DRM agencies and other platforms:** CARICOM and CEDEMA **UN and international partners:** UNDP, World Bank, UNISDR, IFRC, WFP **Donor agencies:** CDB, IADB, World Bank (GFDRR), CIDA, USAID-OFDA	✓ National and regional assessments of capacities and requirements in EWS and risk analysis completed and published (Completed) http://www.wmo.int/pages/prog/drr/transfer/1082-WMOCaribbeanReport-en.pdf ✓ As highlighted by the Representatives from the region at EC-65 the assessment process facilitated greater cooperation among NMHS and DRM agencies at both management and technical levels in the region and led to project development directly engaging WMO Members, partners and donors
South East Asia	**Countries:** - Lao PDR, Cambodia, Thailand and Viet Nam, (possibly Indonesia, and the Philippines)	**WMO Technical Commissions (TCs) and Technical Programmes (TPs):** TCs include CBS, CIMO, HWR, JCOMM, CAgM, CAS, and possibly CCl; Inter-Commission: WIS and WIGOS; (TPs): Tropical Cyclone Programme, GDPFS, MMOP, PWS, HWR, WCP and AgMP **WMO and Regional Meteorological**	✓ A preliminary assessment was carried out with World Bank and UNISDR (2012) ✓ Project proposal to be developed engaging Members, WMO TCs and TPs, and partners

Table 2: Status of holistic integrated DRR national capacity development projects with regional cooperation framework			
Region	**Beneficiary countries and national agencies engaged**	**WMO, Regional and International Partners and Centres**	**Project status**
		and Climate Network: WMO-UNESCAP Typhoon Committee, RSMC-Tokyo, WMO-UN ESCAP Panel on Tropical Cyclones, RSMC-New Delhi, RCC Tokyo, RCC China, other relevant RSMCs and GPCs and SWFDP Regional Centre – Hanoi **Regional Socio Economic Grouping, DRM agencies and other platforms** ASEAN (Committee on Science and Technology and Sub-Committee on Meteorology and Geophysics (SCMG) and Agreement on Disaster Management and Emergency Response (ADMEER)), UN-ESCAP, ADPC and Mekong River Commission **UN and International Partners:** World Bank, UNDP and UNISDR Donor: TBD	

(c) **National DRR stakeholders** (e.g., users of NMHSs) were **identified and engaged** with the NMHS from the early stage (at both executive management and technical levels) and multi-stakeholder, multi-sector DRR national project teams were established;

(d) **Regional and international strategic DRR partners**, specifically the UN International Office for Disaster Reduction (UNISDR), UN Development Programme (UNDP) and the World Bank have been the strategic partners. In addition, region's socio-economic groupings, regional intergovernmental DRM organizations and donors were identified and engaged from the early stage to leverage their capacities, networks, expertise and resources from early stage;

(e) **WMO RAs and its subsidiaries**, the **WMO Operational Network and relevant WMO TPs** (through working with WMO Secretariat staff) were engaged in a more coordinated manner from an early stage and efforts were made to identify WMO technical assistance projects (implemented by WMO TCs and TPs) that could be linked;

(f) **Assessment Phase** includes: (i) assessing policies, and institutional capacities and decision-support mechanisms in DRR (carried out by UNDP, UNISDR and the World Bank); (ii) identification of DRR users and analysis of their needs and requirements for NMHSs products and services (carried out by WMO);and (iii) assessment of NMHS capacities, gaps and capacity development needs to deliver those requirements and cooperation with regional centres;

(g) **Project design and proposal development** with clear activities, timelines, deliverables underpinned by the outcomes of the national and regional assessments;

(h) Project **management and oversight** of each phase of the project involved the following mechanisms with clear roles and responsibilities outlined in the proposal:

(i) **National Project Team:** Comprised of representatives from the NMHSs and the DRR user-community including DRM Agency, Ministry of Agriculture, etc., designated by the Director-General of the agencies;

(ii) **Project Steering Committee:** Comprised of Directors of the NMHSs and "DRR User" agencies of all the countries included in the project, the donor agency and representatives of strategic partners supporting the project serviced by the WMO Project Manager(s);

(iii) **Project Advisory Group:** Comprised of representatives from the WMO regional and global network, Regional Association DRR Task Team and other regional agencies supporting the project;

(iv) **Secretariat Project Implementation Team:** Comprised of the Regional Office representatives, DRR Division and WMO Secretariat Staff from TPs supporting/implementing the project (chaired by the WMO Project Manager);

(v) **WMO Project Manager:** The projects to date have been co-managed by two managers from the Regional Office and DRR programme, who were also responsible for the development of reports, management of the budget, preparing reports to the donors.

7. Significant lessons have been learned to date pertaining to the governance, development, implementation and overall management of these multi-stakeholder DRR projects for better leveraging of WMO contributions through its TCs, TPs, RAs, Members and strategic partners. In summary:

(a) Among the benefits are:

(i) Benefits to the NMHSs, particularly facilitating their engagement in the national DRR policy dialogues and institutional mechanisms, partnerships and working arrangements with their DRR target users, better understanding of the users needs and requirements;

(ii) Sustainability of NMHS capacities being developed through the user-driven framework; and,

(iii) The projects have provided enabling environments for more integrated planning, and a more coordinated approach to assist Members, leveraging the WMO Programmes with the RAs, Members and other partners;

(b) Some challenges include:

(i) More complex project management and oversight owing to the multi-sector, multi-stakeholder aspects;

(ii) Systematic engagement of TCs and their relevant technical assistance projects in these holistic and integrated DRR projects, remains to be addressed.

Initiatives related to Systematic and More Coordinated Engagement of the WMO Technical Commission (TCs) and Technical Programmes (TPs)

8. **Establishment of the DRR Focal Points of TCs and TPs (DRR FP TC-TP):** A network of DRR Focal Points of the TCs and TPs has been designated through sessions of TCs or nominations by the presidents of TCs (PTC, from the TCs' Management Group) as well as relevant coordinating mechanisms of other TPs and inter-commission activities. This network includes DRR

focal points of CBS, CIMO, CCl, CHy, JCOMM, CAS, CAgM, Tropical Cyclone Programme (TCP), WIGOS and WCRP.

9. **Recommendations of the 2013 Meeting of DRR FP TC-TP:** In 2013, following the EC-65, the DRR FP TC-TP carried out an extensive review of activities, mechanisms and technical projects of each respective TC and TP, identified opportunities to leverage TC and TP activities for the implementation of the DRR Work Plan for enhanced benefits to the Members. During its first meeting in October 2013, the DRR FP TC-TP developed recommendations for consideration of the 2014 meeting of the PTC, noting that significant opportunities to support the Members in DRR may be achieved through a more integrated approach in developing multi-hazard observation and forecasting platforms for development of relevant and seamless products and services to support MHEWS and risk analysis to be demonstrated in Southeast Asia, also nothing that this was a demonstration region for DRR as per Cg-XVI decision and that most TCs and TPs had activities and technical assistance projects in Southeast Asia that were done in isolation and could be leveraged through the holistic, integrated approach of the DRR Work Plan service delivery framework, engaging expertise from a number of TC and TP mechanisms.

For more details on the recommendations of DRR FP TC-TP see pages 5-6 of the report of the First Meeting of the DRR FP TC-TP (Geneva, Switzerland, 14-16 October 2013): http://www.wmo.int/pages/prog/drr/projects/Thematic/HazardRisk/2013-10-TC-Prog-FP-Meeting/index_en.html .

10. **Recommendations of PTC-2014:** PTC-2014 considered the recommendations of DRR FP TC-TP and with regard to the proposed DRR project in Southeast Asia, agreed that in principle such an integrated project would be an important undertaking but as the next step it needs to be scoped further by DRR FP TC-TP with clear outcomes and deliverables and provided further guidance to the DRR FP TC-TP for further development of the projects in alignment with the DRR projects approach. For more details on the recommendations of the PTC-2014, see the final report of PTC-2014 (pages 11-13): https://docs.google.com/a/wmo.int/file/d/0B1MKEzYs7u_-b1c4dUdYbW82U1E/edit?pli=1

11. A critical issue for systematic engagement of the TCs and TPs with the implementation of the DRR projects would be the establishment of an appropriate inter-commission and inter-programme mechanism that would provide technical advice for the design and support of the implementation and management of technical aspects of the project in working with the other project management and oversight mechanisms of such DRR projects as outlined in paragraph 6 and related Table 2 of this information paper. The PTC-2014 noted the need for evaluation of existing mechanisms such as the WIGOS inter-commission Task Team, which was established through the EC, as possible models.

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PROGRESS REPORT FOR INFORMATION – NOT TO BE INCLUDED IN THE GENERAL SUMMARY

AERONAUTICAL METEOROLOGY PROGRAMME

Volcanic ash related activities

1. The engagement of a research network, that was briefly operated in quasi-operational mode during the 2010 Eyjafjallajoekull volcanic eruption, had demonstrated the potential of a more permanent, “on-call” quasi/operational system for future volcanic crises. In these cases, in particular Raman LIDARs, supported by sun-photometers could be able to provide a first estimate of ash contamination levels in lower atmospheric layers where space-based systems were operating at the limit of detectability.

2. A survey of LIDAR instruments and ceilometers worldwide was initiated by WMO in 2011 within the framework of the Global Atmosphere Watch (GAW) Aerosol LIDAR Observation Network (GALION) project. Up to December 2013, a data base of about 2120 instruments had been created and an interactive web page hosted by the Deutscher Wetterdienst (DWD) had been set up, showing the global distribution of instruments and offering links to quick look data and station information pages (http://www.dwd.de/ceilomap). Networks with potential to contribute observational data on volcanic ash have been considered such as: the DWD ceilometer network, the European Aerosol Research Lidar Network (EARLINET), the EUMETNET E-PROFILE project, the Irish automatic LIDAR network (recently established for VA monitoring), and the French operational Vaisala CL31 ceilometers network. Significant investment had been made by Iceland and others into eruptive source plume observations, utilizing fixed C-band and mobile X-band radar and here too there was a need to coordinate the exchange of international best practice of the technologies and techniques used.

3. With regard the satellite-based observations, under the Sustained, Co-Ordinated Processing of Environmental Satellite Data for Nowcasting (SCOPE-Nowcasting), a volcanic ash focused pilot project on "Globally Consistent Volcanic Ash Products" will incorporate a satellite retrieval inter-comparison activity.

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EDUCATION AND TRAINING

Introduction

This document provides further background to the discussion in the draft general summary on education and training.

Competence standards

The Sixteenth World Meteorological Congress recommended that all technical commissions make definition of competency standards a high priority to ensure standardization and efficiency in service delivery and capacity development efforts. Congress recognized that well defined competencies help to maximize the benefits of limited training resources.

An increasing number of WMO technical commissions (http://www.wmo.int/pages/prog/dra/etrp/competencies.php) have proceeded to develop competence frameworks resulting in the evolving practices in the development and communication of competencies. Many of the development efforts have included participation, for at least part of the effort, by a representative of the ETR Office or EC Panel of Experts on Education and Training. Guidance by these representatives can help to establish better understanding of the utility of competencies and what makes a well written competence framework, and to ensure a more consistent approach, which will lead to a more cohesive collection of competency standards in the WMO Technical Regulations. Additionally, the structural framework for WMO competencies has evolved in subtle but important ways. The recommended approach is reflected best in the competencies developed for operating and using the WMO Information System and in those developed for training providers. These can be accessed from http://www.wmo.int/pages/prog/dra/etrp/competencies.php, and should be used to guide CIMO efforts. The EC Panel of Experts on ETR is currently planning to develop more formal guidelines for the development of competencies.

Training workshops during the intersessional period

Many of the NMHSs in least developed and developing countries have trouble to provide initial training and continuous professional development for staff in maintenance and calibration of meteorological instruments. Poorly maintained and calibrated equipment are of grave concern because they seriously threaten the quality of service being delivered, thus there is a dire need to address the lack of knowledge, skills and behaviours of the staff involved in procuring, maintaining and calibrating equipment. Ensuring that competencies of experts meet international standard will ultimately culminate in raising the standard of products and services delivered by NMHSs.

Given the limit of the available resources to tackle the situation, a multipronged solution by a consortium of partners is highly desirable. From this perspective, the process of targeted intervention by DRA/ETR commenced in 2013 through the support of Norway. In this regard WMO, in collaboration with the Institute for Meteorological Training and Research (IMTR) Kenya, organized a group fellowship training from 16 September to 11 October 2013 on instrument maintenance and calibration for 24 experts from the following RA I (Africa) countries: Burundi, Congo, Core D'Ivoire, Burkina Faso, Djibouti, the Gambia, Ghana, Guinea, Kenya, Liberia, Mali, Mauritius, Mozambique, Namibia, Rwanda, Senegal, Seychelles, Sierra Leone, South Sudan, Swaziland, Tanzania and Zimbabwe.

Considering the key role of the subject matter in ensuring quality service delivery, the course was tailored towards enhancing the knowledge and skills of trainees in the following areas: the science of measurement, siting and meteorological instruments, care and maintenance of basic and automatic meteorological instruments, calibration, trouble shooting and drawing of specifications

for weather instruments and measurement systems. It is expected that beyond technical workshops, short-term group fellowships like this would give opportunities to address competencies on, and periodically keep apace with, contemporary issues and technology on instruments maintenance and calibration to a higher degree of satisfaction, while also creating opportunities for the participants to expand their individual networks with professionals, particularly those in the similar areas of operation. Host institutions are also given the opportunity to enhance their training facility. DRA/ETR has been working closely with WMO/OBS in the delivery of these activities. For instance, on the Kenya training of 2013, they made useful suggestions on the orientation of the course, and how to improve on it. Also, the president of CIMO, Professor Bertrand Calpini, addressed participants by video link.

Taking into consideration the experience gained from the first course held in Kenya, especially further to an evaluation of the outcome, plans are under way to repeat the course in the last quarter of 2014 for the benefit of others who did not have the chance to take part in the course last year. The 2014 phase is designed for wider geographic coverage in Kenya (for English-speaking countries of Africa), Barbados (Caribbean), India (South Asia) and Morocco (Francophone Africa). In addition to those from the WMO regular budget, resources to meet the expenses of these courses are mainly from the Norway and Canadian Trust Funds.

In addition to the workshops held and planned using financial support from the Norway and Canada Trust Funds, similar courses have also been provided by the RTC in Turkey (Ankara, 2013) and RTC China (NUIST, Nanjing, September 2013 and June 2014). The nominations received indicate that there is a high demand for instrument courses. Each course has included more than 20 students. WMO ETR is able to provide financial support for flights for less than a third of those requesting financial assistance. Those applying express interest in learning about all aspects of instruments, including how they function, their use, and particularly maintenance and calibration. This is similar to the expectations of those attending the 4 to 5 week courses funded under the Norway and Canada Trust Funds.

PROGRESS REPORT FOR INFORMATION – TO BE INCLUDED IN THE GENERAL SUMMARY

WMO POLAR OBSERVATIONS

References:

1. WMO Polar Observations, Research and Services: http://www.wmo.int/pages/prog/www/polar/index_en.html

2. GCW Measurement Standards and Best Practices: http://globalcryospherewatch.org/cryonet/methods.html

3. GCW Implementation Plan: http://globalcryospherewatch.org/reference/documents/

WMO Polar Observations

1. It is recognized that the Polar Regions are extremely important in terms of their global impacts on weather and climate, and the functioning of the Earth system. There is a continuing need for weather, climate, water and related environmental data from the Polar Regions, including enhancement and development of instruments and methods of observation suited to these areas, for the full implementation of the World Weather Watch (WWW) and to support services provision by the Members.

2. The WMO Executive Council Panel of Experts on Polar Observations, Research and Services (EC-PORS) is coordinating the WMO Polar activities on behalf of EC. EC-PORS promote and coordinate relevant programmes that are carried out in the Antarctic and Arctic regions by nations and by groups of nations. It interfaces with all WMO Programmes, including the Instruments and Methods of Observation Programme (IMOP) of WWW, and other related programmes throughout the world, meeting global needs and requirements for meteorological observations, research and services in the Polar Regions. (See reference 1 for further information.)

Antarctic Observations

3. In the Antarctica, the EC-PORS is pursuing, on behalf of EC, the similar activities as the regional associations do in the area of facilitating establishment of observing networks and monitoring of the meteorological, climatological and related environmental variables. In this regard, EC-PORS is maintaining the Antarctic Observing Network (AntON), an integrated network of all available surface-based stations (synoptic, climatological), including the upper-air stations. Performing manual and/or automatic observations in this harsh environment requires adoption of practices that deviates from those described in the *Guide to Meteorological Instruments and Methods of Observations*, WMO-No. 8 (CIMO Guide). AntON is composed to a large extent of stations operated by the research and academic communities applying their own practices in the absence of the WMO agreed practices. There is also a need for CIMO to work with manufacturers to improve the performance of instruments in the cold environment. One specific aspect of this relate to performance of radiosonde balloons and their survivability in the very low temperatures of the polar stratosphere.

Arctic Observations

4. In the Arctic, it is the responsibility of RAs II, IV and VI to coordinate activities of their Members regarding observations, including maintenance of their Regional Basic Synoptic Networks (RBSN/RBCN). Similar to the Antarctic, there is a lack of CIMO guidance on how to perform observations in the harsh environment thus opening the door to Members in applying their own practices. This affects the compatibility of data and the interoperability of observing systems.

Global Cryosphere Watch Observing Network (CryoNet)

5. The WMO Global Cryosphere Watch (GCW) is an international mechanism for supporting all key cryospheric in-situ and remote sensing observations. To meet the needs of WMO Members and partners in delivering services to users, the media, public, decision and policymakers, GCW should provide authoritative, clear, and useable data, information, and analyses on the past, current and future state of the cryosphere. One of the immediate priorities in GCW development and implementation is to establish the core network of GCW surface measurement sites – CryoNet. CryoNet is one part of the whole GCW observing system, which is, in turn, a component observing system of the WMO Integrated Global Observing System (WIGOS).

6. The GCW Implementation Plan (GCW-IP) will drive the future development and implementation of GCW. The current version, endorsed by EC-PORS at its fifth session in Wellington, New Zealand, February 2014, is available for review by technical commissions, before it is submitted to the Congress for approval.

7. Under the general guidance of the GCW Steering Group (GSG), the CryoNet Team and the Infrastructure and Practices Team conduct an inventory of measurement methods and infrastructure at sites that measure components of the cryosphere, which includes solid precipitation, snow cover, sea ice, lake and river ice, glaciers, ice caps, ice sheets, permafrost, and seasonally frozen ground. An initial inventory of existing documents describing measurement practices is given in the GCW website (see reference 2).

8. GCW gives priority on establishing best practices, guidelines and standards for cryospheric measurements. This will include consideration of data homogeneity, interoperability, and compatibility of observations from all GCW constituent observing and monitoring systems and derived cryospheric products. While best practices will be offered across the GCW observing networks, those sites included in the CryoNet will have to be committed to apply GCW agreed practices. The GCW Infrastructure and Practices Team will collaborate with CIMO in the development of these best practices.

9. The GCW Infrastructure and Practices Team, in coordination with CIMO, should conduct formal instrument intercomparisons to determine and intercompare performance characteristics of instruments used for cryospheric measurements under field or laboratory conditions and link readings of different instruments, addressing data compatibility and homogeneity. GCW Reference sites could be well suited also as intercomparison sites. The current intercomparison of relevance and importance for GCW and CryoNet is the Solid Precipitation Intercomparison Experiment (SPICE).

10. At its fifteenth session, CIMO agreed to contribute to the compilation of cryospheric guidelines and to be involved in the identification of reference sites and their instrumentation and observations. CIMO agreed that the CIMO Guide should include a chapter related to measurements and observations in Polar Regions, including measurements from automatic weather stations (AWS).

11. There has been a significant effort over the past nine months to begin the creation of an official GCW Glossary. GCW has compiled a database of cryosphere terms from a variety of sources, resulting in approximately 2100 entries from all sources; over 1000 are unique. The GCW glossary terms will ultimately be included in METEOTERM the WMO's terminology database. This compilation is available on the GCW website. It will be formally vetted by cryospheric experts; however, collaboration with CIMO is needed avoid multiple, confusing definitions.

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CIMO'S ROLE IN WMO PRIORITY ACTIVITIES AND ITS COLLABORATION WITH OTHER WMO TECHNICAL COMMISSIONS AND PROGRAMMES

WMO RECOGNITION OF CENTENNIAL OBSERVING STATIONS

Reference:

Abridged Final Report with Resolutions from the Sixty-fifth session of the Executive Council (WMO-No. 1118).

WMO Recognition of Centennial Observing Stations

1. ICG-WIGOS noted the increased interest among Members in gaining official WMO recognition for centennial observing stations, which have been operating for one hundred years or more. It highly appreciated Members' efforts to maintain observational programmes at selected sites for decades or even centuries, and emphasized the outstanding importance of historically uninterrupted long and homogeneous time series of data as reference for long-term analyses of climate variability and change.

2. The Executive Council, at its sixty-fifth session, noted the support of ICG-WIGOS for centennial observations at specific sites and urged Members to sustain relevant observation programmes as an invaluable scientific heritage for future generations. While fully acknowledging Members' sole responsibilities for national observations, the Council requested the Commission for Climatology (CCl), jointly with the Global Climate Observing System (GCOS) programme and CIMO, to investigate existing site certification mechanisms, network criteria and monitoring principles and to set-up an appropriate WMO mechanism for the recognition of centennial observing stations, based on a minimum set of objective assessment criteria.

3. As noted by the CCl Management Group, a WMO initiative in this regard is intended to provide a global framework for identifying, assessing and designating centennial climate stations, whose data time series are valuable for research and services and which follow WMO standards where applicable. By raising the profile of centennial climate stations, the initiative would contribute to Members' efforts to maintain such stations under the most preferable conditions. Specifically, it is hoped to strengthen NMHSs' role in cases where centennial climate stations are at risk due to resource constraints and/or conflicting societal interests at national or local levels including intended unfavourable changes in the station environment etc. The CCl Management Group acknowledged, however, that such a purpose requires an objective and rigorous recognition mechanism.

4. Two experts, one from climate and one from observation domains representing CIMO, have developed "Draft criteria for a potential WMO designation of centennials observing stations". Such criteria include aspects of homogeneity, data gaps and station relocation, metadata and documentation, application of CIMO site classification, data rescue etc.

5. A WMO scoping meeting on a potential WMO recognition mechanism for centennial observing stations was organized from 11 to 13 June 2014. That meeting was expected to:

(a) Review the Draft criteria for a potential WMO designation of centennial observing stations as proposed by the above mentioned experts; and

(b) Discuss and outline an appropriate WMO mechanism for recognizing centennial observing stations.

6. The sixteenth session of the Commission for Climatology (CCl-16, Heidelberg, Germany, 3-8 July 2014) will review the outcomes of the scoping meeting and advise on the way forward. A discussion session on this topic will be organized during TECO-2014 (7-9 July, St. Petersburg, Russian Federation). CIMO-16 will be informed in-session on the outcome of the CCl-16 deliberations and of the TECO-2014 discussion session.

7. It is expected that the recognition mechanism and criteria for centennial observing stations will be submitted to Cg-17 (2015) for approval.

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PROGRESS REPORT FOR INFORMATION – NOT TO BE INCLUDED IN THE GENERAL SUMMARY

GLOBAL ATMOSPHERE WATCH PROGRAMME

1. The Global Atmosphere Watch (GAW) quality assurance (QA) system impacts all aspects of atmospheric chemistry observations, including training of station personnel; assessment of infrastructures, operations and the quality of observations at the sites; documentation of data submitted to the World Data Centres (WDCs); and improvement of the quality and documentation of legacy data at the WDCs. The GAW Central Facilities (http://www.wmo.int/pages/prog/arep/gaw/gaw_cent_facil.html) assist Members to respond to requirements to quality of observations. GAW Central Facilities include Central Calibration Laboratories (CCLs), World and Regional Calibration Centres (WCCs and RCCs), Quality Assurance Science Activities Centres (QA/SACs) and World Data Centres (WDCs) with their terms of reference formulated in the GAW Strategic Plan: 2008-2015 (GAW Report No. 172).

2. A number of Central Facilities have been established during intersessional period. Developments in the gas standards preparation allowed achieving stable standards for a number of volatile organic compounds (VOCs). Two CCLs hosting primary standards for two groups of VOCs, namely CCL for non-methane hydrocarbons (National Physical Laboratory, UK, http://www.npl.co.uk/science-technology/chemical-metrology/vocs) and CCL for monoterpenes (National Institute of Standards and Technology, USA, http://www.nist.gov/mml/csd/gas/wmogaw.cfm) were established in close collaboration with the International Bureau of Weights and Measures (BIPM).

3. Station audits performed by WCC for surface ozone, carbon monoxide, methane and carbon dioxide at Empa, Switzerland (http://www.empa.ch/plugin/template/empa/*/7571) and WCC for aerosol physical properties at the Institute for Tropospheric Research, Leipzig, Germany (http://www.wmo-gaw-wcc-aerosol-physics.org/audits.html) are useful for evaluation of the performance of observational stations.

4. Substantial developments of the Quality Assurance methods for nitrogen oxide measurements have taken place with the support of the European project ACTRIS (Aerosols, Clouds, and Trace gases Research InfraStructure Network). The World Calibration Centre for nitrogen oxide (NO and NO_2) was established in the Institute for Energy and Climate Research: Troposphere (IEK-8) at the Research Centre Juelich, Germany. A group of greenhouse gases was complimented by the new World Calibration Centre for SF_6, supported by the Republic of Korea.

5. The development of the harmonized methods of observations is an essential element in the network harmonization. GAW Scientific Advisory Groups, in collaboration with internationally recognized experts outside of the WMO community and other relevant organizations, are responsible for development of GAW Measurement Guidelines and standard operating procedures (SOPs), which are available as GAW Reports. New Standard Operating Procedures (SOPs) for ozonesonde observations and data reporting were published as GAW Report No. 201, and the “Guidelines for Reporting Total Ozone Data in Near Real-Time” are summarized in the GAW Report No. 193. Total ozone data submitted in NRT are used for preparation of Ozone Bulletins.

6. WMO/GAW and the International Ozone Commission under the International Association of Meteorology and Atmospheric Sciences (IAMAS) established in 2009 an ad hoc expert team to standardize the use of absorption cross sections in global ozone observations. The need for such a group was due to the historical differences between the total ozone reference instruments used by the European Calibration Centers (RBCC-E, RDCC-E). The application of the new developed Bremen cross sections to the CEOS Calibration campaign data of reference instruments eliminates the bias and reduces the seasonal differences if the temperature dependence of the algorithm is

taken into account. The ad hoc expert team has held four workshops between 2009 and 2013, and, to ensure compatibility, it has been agreed to adopt the new ozone absorption cross sections published by the University of Bremen for the Dobson and Brewer measurements.

7. The GAW Scientific Advisory Group for UV Radiation (SAG-UV) and its subgroup on instruments have finalized the series of reports on Instruments to Measure Solar Ultraviolet Radiation (four Parts). In collaboration with the International Commission on Illumination SAG-UV it published a technical report "Rationalizing Nomenclature for UV Doses and Effects on Humans".

8. The group of reactive gases prepared several measurement guidelines, including the Measurement of Atmospheric Carbon Monoxide (GAW Report No. 192), Standard Operating Procedures (SOPs) for Air Sampling in Stainless Steel Canisters for Non-Methane Hydrocarbons Analysis (GAW Report No.204) and Guidelines for Continuous Measurements of Ozone in the Troposphere (GAW Report No. 209). GAW will undertake further efforts on analysis of ozone trends especially in connection with the analysis of the variability of its precursors utilizing both observations and model simulations. The results will be used to establish a reactive gases bulletin.

9. The GAW Scientific Advisory Group prepared WMO/GAW Standard Operating Procedures for In-situ Measurements of Aerosol Mass Concentration, Light Scattering and Light Absorption (GAW Report No. 200) and several papers on aerosol trend and Black Carbon measurements interpretation. The last document was published in Atmos. Chem. Phys in 2013.

10. The National Oceanic and Atmospheric Administration, Earth System Research Laboratory (NOAA/ESRL) is the WMO/GAW Central Calibration Laboratory for CO_2, CH_4, N_2O, SF_6, and CO. NOAA/ESRL serves as a World Calibration Centre for CO_2. The WCC carried out the 5th greenhouse gas round robin campaign in 2009-2012. In total 39 labs participated in this exercise. The WCC started the 6th greenhouse gas round robin campaign in 2014. In total 43 labs plan to participate in this exercise.

11. The Japan Meteorological Agency (JMA) serves as the World Calibration Centre and Quality Assurance/Science Activity Centre for methane in Asia and the southwest Pacific. The Asian comparison campaign took place in the June 2011–March 2012 and included JMA, Korea Meteorological Administration (KMA), and China Meteorological Administration (CMA). The Japan comparison campaign took place in October 2012–February 2013. The fourth South-West Pacific comparison campaign is on-going. Results of the comparison are summarized at http://ds.data.jma.go.jp/gmd/wcc/.

12. The Seventh Intercomparison Campaign of the Regional Brewer Calibration Centre Europe (RBCC-E) was held from 16-27 July 2012 at the Arosa Observatory, Switzerland. This seventh intercomparison campaign was a joint exercise of the Regional Dobson Calibration Centre for Europe (RDCC-E) and RBCC-E in collaboration with the Arosa Observatory of MeteoSwiss. Nine Brewer instruments managed by eleven experts from five countries participated in the campaign. The 8th Intercomparison Campaign of the Regional Brewer Calibration Centre-Europe (RBCC-E) was held in El Arenosillo Atmospheric Sounding Station, Huelva, Spain from 10–20 June 2013. Seventeen instruments from ten countries participated. The European Space Agency calibration and validation (ESA-CALVAL) campaign was organized in Izaña, Tenerife, from 20 October to 20 November 2013, aiming at studies of the stray-light in single monochromator Brewer spectrophotometers. Five Brewer instruments operating in the Nordic countries have participated.

13. Quality Assurance/Science Activity Centre (America) that operates in support of precipitation chemistry group and is sponsored by the NOAA Air Resources Laboratory performed six laboratory comparisons since 2010. In total 78 laboratories reported measurements for the last comparison. The 50th Laboratory Intercomparison Study started in April 2014.

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COMMISSION FOR HYDROLOGY (CHY) – HYDROLOGY AND WATER RESOURCES PROGRAMME (HWRP)

1. Issues related to the topic of instruments and methods of observation are addressed through three Commission for Hydrology (CHy) thematic areas, namely the Quality Management Framework – Hydrology, Data Operations and Management and Water Resources Assessment (in particular, the World Hydrological Cycle Observing System (WHYCOS)).

2. Under the CHy project to assess the performance of flow measurement instruments and techniques, four teleconferences and one face-to-face meeting (Geneva, 2-5 December 2013) of the Management Committee (MC) have been held. A workplan has been developed and has been finalized and is ready for consideration by the Project Steering Committee (the CHy Advisory Working Group (AWG)). The workplan, which is a living document, is available at: http://www.wmo.int/pages/prog/hwrp/Flow/flow_tech/workplan.php. A community of practice has been launched for the MC to facilitate sharing of documents and communications amongst participants, noting that this is a password protected site.

3. Meetings have been held between WMO Secretariat staff and staff from the International Standards Organization (ISO) to discuss the process of how National Hydrological Services (NHSs) might be able to access ISO publications and use them in the development of Standard Operating Procedures (SOPs) of various NHSs. A meeting held on 17 April 2014 with ISO staff provided guidance on how WMO, as a liaison agency to an ISO Technical Committee, can submit a document for consideration under the various categories of ISO publications (i.e., technical document, technical specification, standard). As well, the review process for each approach was discussed. It became apparent that very few documents produced by the HWRP would likely be submitted through the joint WMO/ISO standard process, while more might be considered through the WMO liaison role. This process is being examined for the Manual on Streamflow Gauging.

4. A prototype for application of WaterML 2.0 has been developed in Italy by the Italian National Institute for Environmental Protection and Research (ISPRA), which has built a national hydrologic information system federating hydrologic data services from observation sites across Italy managed separately in 21 administrative regions. There is a HydroCatalog in Rome that brings together the data from HydroServers in each of the 21 regions. This technology is a modified form of the Consortium of Universities for the Advancement of Hydrologic Science, Inc. (CUAHSI) Hydrologic Information System developed in the United States, whose HydroCatalog brings together hydrologic data services from more than 100 hydrologic data services, including those of the United States Geological Survey (USGS) and the Environmental Protection Agency (EPA).

5. The tenth session of the WHYCOS International Advisory Group (WIAG-10) was held in Geneva from 10 to 11 October 2013. The meeting discussed the follow-up to the 2011 WHYCOS Review and noted that the WMO Secretariat was taking action on the recommendations and was studying the best operational arrangements in the Secretariat to provide maximum support to the implementation of the programme and its components. Some of the recommendations are also being addressed in the ongoing review of the WHYCOS Guidelines. The revised version of the Guidelines puts more emphasis on the goal of collecting quality data, publishing accurate products/information and promoting the application of standards in hydrological practices. It also puts more emphasis on the choice of most appropriate data collection equipment and practices (including observers), transmission modes and technologies. In addition to activities and outputs, it will also recommend putting more emphasis on project design and implementation and on

outcomes and societal impacts. Recommended administrative procedures and institutional settings are also simplified to make them more adaptable to varying local constraints.

6. Progress is being made in the implementation of a number of the WHYCOS Components, including IGAD-HYCOS, Niger-HYCOS, Volta-HYCOS, Congo-HYCOS, Senegal-HYCOS, HKH-HYCOS, Arctic-HYCOS and Mekong-HYCOS. The Council was also pleased to note that a number of other WHYCOS Components are in various stages of development or review, including SADC-HYCOS (Phase 3), Lake Chad-HYCOS, Aral Sea-HYCOS, Carib-HYCOS (Phase 2), Pacific-HYCOS (Phase 2), Oyapoque-HYCOS and SEA-HYCOS. Detailed information is available in the Annexes to the report of the tenth session of WIAG: http://www.whycos.org/whycos/documents-and-technical-material

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PROGRESS REPORT FOR INFORMATION – NOT TO BE INCLUDED IN THE GENERAL SUMMARY

AGRICULTURAL METEOROLOGY PROGRAME

Reference:

Resolution 3 (EC-LXIII) – Establishment of a Joint CCl/CAgM/CHy Expert Group on Climate, Food, and Water;

Introduction

There were several agricultural meteorological activities that were undertaken in the past several years. Also, there were new recommendations approved by the sixteenth session of CAgM.

1. The sixteenth session of the Commission of Agricultural Meteorology (CAgM) was held in Antalya, Turkey from 10 to 15 April 2014. The revised working structure of CAgM consists of four Open Panels of Agricultural Meteorology Experts (OPCAMEs) with the following focus areas: Operational Agricultural Meteorology, Science and Technology in Agricultural Meteorology, Natural Hazards and Climate Variability/Change in Agriculture, and Capacity Development in Agricultural Meteorology (http://cagm-16.wmo.int). The experts from OPCAME 2 specifically will provide expertise and guidance to the various WIGOS and WIS groups on matters related to agricultural meteorology.

2. The meeting of the Joint CCl/CAgM/CHy Expert Group on Climate, Food and Water (JEG-CFW) was held in Jeju, Republic of Korea on 5 November 2013 (reference 1). The meeting discussed how to achieve the objectives of the JEG-CFW by possibly developing a pilot project emphasizing climate, food and water sectors. There were presentations from representatives from the three Commissions.

3. Based on the request from the Conference of Directors of National Meteorological and Hydrological Services of West Africa in Las Palmas, Spain in October 2007, the METAGRI project started in 2008 with the aim to extend the experiences from Mali in Roving Seminars to other countries in Western Africa. The project covered the following countries: Cape Verde, Mauritania, Senegal, Gambia, Guinea-Bissau, Guinea, Liberia, Mali, Burkina Faso, Niger, Chad, Côte d'Ivoire, Ghana, Togo, Benin, Nigeria and Sierra Leone. This first phase of the project was funded by the State Agency for Meteorology of Spain. A Final Evaluation Meeting on the METAGRI project was held in Bamako, Mali from 26-30 September 2011 from which the new METAGRI OPERATIONAL project was developed with funding from the Government of Norway and incorporated new components on training, development of communications skills, feedback and evaluation tools and institutional strengthening.

4. The African Soil Moisture Project is funded by the Government of Norway and is currently focused on South Africa. A Stakeholder Meeting on Agromet and Soil Moisture Applications for South Africa was held in Pretoria, South Africa from 29-30 May 2012 and a follow-up meeting was held in Pretoria, South Africa from 10-11 March 2014.

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Global Climate Observing System (GCOS)

GCOS Expert Panels for Land, Atmosphere and Oceans

The GCOS/GTOS/WCRP Terrestrial Observation Panel for Climate (TOPC) held its sixteenth session from 10 to 11 March 2014, at JRC, in Ispra, Italy. TOPC reviews the climate-observing components of terrestrial global observing systems and is managed by the GCOS Secretariat. This year's meeting focused on discussing the status of terrestrial ECVs in light of the next GCOS assessment cycle, as well as in regard to the adequacy of the global observing system on climate in the next two years to come. TOPC-XVI focused on discussing the status of terrestrial ECVs in light of the next GCOS assessment cycle, as well as in regard to the adequacy of the global observing system on climate.

The GCOS/WCRP Atmospheric Observation Panel for Climate (AOPC), met for its 19th session from 9 to 11 April 2014, at JRC, in Ispra, Italy. WMO Members have commended the Panel's work as an efficient platform for discussions on the climate components of existing research and operational atmospheric observing systems and the related programmes, including important cross-cutting links to the World Climate Research Programme (WCRP) as well as to the Global Atmosphere Watch (GAW) Programme. The Members appreciated in particular the Panel's work on the GCOS Surface Network (GSN), the GCOS Upper-Air Network (GUAN) and the GCOS Reference Upper-Air Network (GRUAN) and have been requested in its future sessions to continue to advise explicitly on climate-observing elements of the WMO Integrated Global Observing System (WIGOS), and to ensure that there is full cooperation between GCOS, WIGOS and WIS as they develop. AOPC was preceded by an expert meeting from 7 to 8 April 2014 which discussed the principal design and quality criteria of the GCOS surface and upper-air networks.

Following the approval of the Framework for Ocean Observations, the panels of the Global Ocean Observing System (GOOS) have been reorganized. GOOS will now be overseen by a steering committee and three panels for Ocean Physics (OOPC), Biogeochemistry (the International Ocean Carbon Coordination Project will expand to include nutrients and oxygen) and a new Biology Panel. At the sixteenth session of the OOPC, a workplan for the coming five years was developed. Key tasks included coordinating an evaluation of the Tropical Pacific Observing System, reducing uncertainty in air-sea flux estimates and identifying requirements for observations of western boundary currents. The panel is also expected to expand its focus to the coastal oceans and shelf seas. The Evaluation of the Tropical Pacific Observing System was the first priority of the panel: in particular, due to the challenges in sustaining the TAO/TRITON mooring array across the Tropical Pacific: the backbone of the El Niño-Southern Oscillation (ENSO) monitoring system. A Tropical Pacific Observing System (TPOS) 2020 workshop was held at Scripps Institution of Oceanography, San Diego, 27-30 January 2014, involving both scientists and agency representatives with an interest in the Tropical Pacific region. The seventeenth session of the OOPC will be held in Barcelona, 22-24 July 2014.

GCOS Cooperation Mechanism

Recent initiatives to revitalize the GCOS upper-air and surface networks and to improve the overall performance of these important baseline networks in the last years include direct renovation projects, the activities of the CBS Lead Centers for GCOS, and various training workshops. Of particular relevance for CIMO is, that:

(a) The supply of radiosondes and balloons to Gan, Maldives; Khartoum, Sudan; Rarotonga, Cook Islands; and Yerevan, Armenia was made possible through funding from Japan, Switzerland and the United Kingdom;

(b) It is increasingly more evident that technical issues, failures in hydrogen generators and re-supply of consumables are resulting in significant downtimes for many of the GUAN stations. These issues are primarily due to lack of finance and often the long lead-times needed to get spend approval even for relatively small amounts of money. This is of particular relevance to a number of the Pacific Islands stations. GCOS is supporting where it can both with GCM funding and working with industry for a speedy resolution but immediate contact with the GCOS Secretariat when the issue is identified could help to lessen the downtime of the system. It is important that Members formally report to WMO and GCOS at the earliest opportunity on station closures or changes in practices which have an impact on the GSN and GUAN;

(c) The bi-annual CBS Lead Centre meeting for GCOS took place in Santiago, Chile from 8-10 October 2013, kindly hosted by the Dirección Meteorológica de Chile. This meeting focused on the Quality Management service provided by these Lead Centres, in terms of monitoring the network, diagnosing any issues and their methods of communication;

(d) In 2010 GCOS updated the minimum requirements for a GUAN station, to report temperature and wind to 30hPa and humidity to the tropopause, on at least 25 days each month. Members should note that the balloon size and how it is handled, has a significant impact on the burst heights achieved and thus every effort should be made to ensure the minimum requirement is reached for all GUAN stations;

(e) Whilst the majority of WMO Members are providing the monthly CLIMAT message, there are still a few that are not. It is important to remind Members on their commitment in providing the monthly CLIMAT message both for their GSN and RBCN stations. In support of this, a recommendation from the Lead Centre meeting in Chile was to organize a CLIMAT workshop in the Region and the Australian Lead Center was requested to investigate the feasibility of this.

GCOS Reference Upper-Air Network (GRUAN)

The GCOS Reference Upper-Air Network (GRUAN) is intended to provide long-term high-quality climate records of upper-air temperature, water vapour, and other key essential climate variables, particularly in the troposphere and in the lower stratosphere, by a combination of balloon borne and remote sensing state-of-the-art instrumentation, and will constrain and calibrate data from more spatially-comprehensive global observing systems, including satellites and current radiosonde networks (e.g., the GCOS Upper-Air Network (GUAN)). Its over-arching aim is to create an unimpeachable record of vertically resolved changes in atmospheric ECVs on multi-decadal timescales to support climate monitoring and climate change attribution activities and climate dataset development.

In 2009, the GRUAN Implementation Plan 2009-2013 was published and parts thereof were designated as a Pilot Project for the WMO Integrated Observing System (WIGOS). The strategy to implement GRUAN is described therein, complemented by the short- and medium-term GRUAN workplans which are updated on an annual basis. Recently, an update of the GRUAN Implementation Plan spanning the period 2013-2017 has been published.

Criteria for site assessment and certification, and the process for implementation, have been developed. The first official versions of the GRUAN Manual and Guide have been finalized. It

is expected that specific details of, and information on, GRUAN from the forthcoming GRUAN Manual and Guide will be included in WMO regulatory material (currently for GOS and CIMO, and ultimately for WIGOS).

The role of WMO in GRUAN governance has been clarified following a meeting held under the auspices of WIGOS (January 2012, Geneva). Representatives of the WMO Technical Commissions (CBS, CIMO, CAS and CCl) are now officially represented at the Working Group on GRUAN, formerly called Working Group on Atmospheric Reference Observations.

GRUAN is envisaged to eventually consist of 30-40 sites, covering major climatic zones worldwide. To guide expansion from the current 16 sites, a dedicated expert meeting was held (June 2012, Fürstenwalde, Germany), which brought together experts from the main user communities of GRUAN data to develop the network design and expansion criteria.

The 6th Implementation and Coordination Meeting (ICM-6) was held from 10-14 March 2014, Washington, D.C., USA. It focused on bringing additional data streams online within GRUAN.

The GCOS Atmospheric Observations Panel for Climate (AOPC) intends to conduct a scientific review of GRUAN's performance during its 2015 session.

GCOS Terrestrial Observation Panel for Climate (TOPC) experts contributed to the newest edition of the CIMO Guide, especially Prof. Wagner and his colleagues from the Vienna University of Technology, Austria, who revised and updated the chapter for soil moisture.

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PROGRESS REPORT FOR INFORMATION – NOT TO BE INCLUDED IN THE GENERAL SUMMARY

WMO QUALITY MANAGEMENT FRAMEWORK

WMO Quality Management Framework – CAeM Perspective

1. The establishment of a Quality Management Systems (QMS) is a mandatory ICAO and WMO standard requirement for all aeronautical meteorological service providers and it is strongly recommended that each implemented QMS should be compliant with the ISO 9001 standard. Therefore, the Task Team on Quality Management Systems (TT-QMS) of the Commission for Aeronautical Meteorology (CAeM) delivered a set of highly useful resources and tools to help Members to reduce the costs of establishment of QMS. As a result, the majority of Members have established their QMS for aviation during the intersessional period and a large number of providers have been ISO 9001 certified. The highest rate of ISO 9001 certification has been achieved in RA VI, where 90% of all Members have already certified their QMS. It was further noted that other WMO Programmes have sought the support of the TT-QMS, and have taken on board many of the resources developed for aviation.

2. The *Guide to the Implementation of a Quality Management System for National Meteorological and Hydrological Services* (WMO-No. 1100), developed by the TT-QMS, was deliberately kept simple and pragmatic, including a basic, but effective risk analysis of organizational risks for service providers and countries.

3. It was recalled that the WMO Strategy for Service Delivery referred to the QMS as a vital approach to all service areas. Steps have been undertaken to promote QMS in the provision of services having important safety implications, such as marine, hydrology, DRR, etc. Consequently, EC-66 agreed that quality management was becoming a requisite function and managerial practice to be promoted through different service delivery areas. This would require further guidance and capacity development by a suitable multi-disciplinary body, supported by adequate resources within the WMO Secretariat. The president of CAeM was requested by EC-66 to ensure that the TT-QMS would continue working until the end of the current financial period and support the transition to a new QMF structure, to be decided by Cg-17.

4. The new structure will need to take account of a new ISO 9001 standard, expected in 2015, which will involve some fundamental changes, including a focus on leadership and risk management.

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PROGRESS REPORT FOR INFORMATION – NOT TO BE INCLUDED IN THE GENERAL SUMMARY

COLLABORATION WITH RELEVANT INTERNATIONAL ORGANIZATIONS

International Organization for Standardization (ISO)

1. Following the support expressed by the sixteenth session of the WMO Congress for developing the siting classification for observing stations on land into a common WMO-ISO standard, the WMO Secretary-General contacted ISO in September 2012 proposing to collaborate on two standards. The standards considered in this process were:

(a) The Siting Classification for Surface Observing Station on Land that was approved by CIMO-XV and is published in the *Guide on Meteorological Instruments and Methods of Observation* (WMO-No. 8, CIMO Guide), Part I, Chapter 1, Annex 1B, http://www.wmo.int/pages/prog/www/IMOP/CIMO-Guide.html). ISO Technical Committee 146 “Air Quality” / Sub-Committee 5 “Meteorology” (ISO TC146/SC5) is the relevant ISO Technical Committee for this collaboration, but the work has been led by CIMO;

(b) The draft ISO standard “Ground-based remote sensing by Doppler wind lidar” that is presently being developed by ISO TC146/SC5 with the contribution from CIMO experts, and possibly other WMO Technical Commissions.

2. ISO has responded positively to both of these requests. Presidents of all WMO Technical Commissions were invited to nominate focal points for these two topics to represent the interests of their Commissions in these developments.

3. The Siting Classification for Surface Observing Stations on Land was subsequently submitted for voting to ISO Members as **Draft International Standard (DIS)** following the ISO fast-track procedure (Stage 4 of the ISO Standard approval procedure). The vote was completed in December 2013. The DIS was approved. However, one vote was negative and comments proposing modifications were submitted.

4. CIMO ET-Standardization reviewed and addressed all the comments collected through the ISO DIS voting process and prepared the **Final Draft International Standard (FDIS)** that was submitted to ISO in April 2014. The FDIS is then to be submitted for approval within ISO as well as within WMO as it is slightly different from the present version that was approved by CIMO-XV (2010). The voting process within ISO will last 2 months. Additional information on the approval of this standard within WMO is provided in CIMO-16/Doc. 4.

5. The Ground-based remote sensing by Doppler wind lidar standard is still in the preparatory stage (Stage 2 of the ISO Standard approval procedure). Four CIMO experts have been nominated by the WMO Secretary-General to represent WMO in the development of this standard, which is being led by ISO. The ISO TC146/SC5 Working Group which is developing this standard decided to hold a meeting in St. Petersburg, in conjunction with CIMO TECO-2014 at which a new version of the draft standard would be considered.

6. ISO TC180 “Solar Energy” is maintaining a number of standards relevant to CIMO. Some of them are in the process of being revised (ISO 9060:1990, *Solar energy - specification and classification of instruments for measuring hemispherical solar and direct solar radiation* and ISO 9845-1, *Solar energy - Reference solar spectral irradiance at the ground at different receiving conditions - Part 1: Direct normal and hemispherical solar irradiance for air mass 1,5)*. The CIMO Management Group proposed that the role of CIMO experts in this review should be in providing

specific information/feedback addressing mainly the metrological aspects of those standards based on requests from the Chair of the ISO TC 180/SC1 committee.

International Committee for Weight and Measures (CIPM) and International Bureau of Weights and Measures (BIPM)

7. The traceability of the World Radiometric Reference (WRR) to the international system of units (SI) has been obtained through several comparisons to the primary standard of radiant power held at National Metrology Institutes giving consistent results to within the stated WRR uncertainties. However, preliminary measurements from a new SI-traceable Cryogenic Solar Absolute Radiometer (CSAR) have suggested a possible difference between WRR and SI. Further measurements will be needed to confirm it. The extensive expertise of BIPM on how to move from one reference to another and on the conditions to be fulfilled to ensure a safe change of reference, would be most relevant in the eventuality of the need for a change of reference for solar radiation measurements.

8. New infrared radiometers have been developed that provide longwave radiation measurements that are traceable to SI. Preliminary intercomparison of those instruments showed that they agree with each other within their respective uncertainties. Corroborative evidence from follow-up intercomparisons will enable the means to calibrate the World Infrared Standard Group (WISG) relative to these reference instruments.

Association of Hydro-Meteorological Equipment Industry (HMEI)

9. Members of the Association of Hydro-Meteorological Equipment Industry (HMEI) participated actively in CIMO activities. HMEI had representative(s) in almost all CIMO expert teams. Some of them took part in the meetings and teleconference of the expert teams. Their contributions were most appreciated and beneficial to both parties.

10. HMEI is strongly involved in the WMO/CIMO Solid Precipitation Intercomparison Experiment (SPICE). The HMEI Chairman, Mr Brian Day, took part in the preparatory phase of SPICE, collaborating with the International Organizing Committee (IOC) and Project Team towards finalizing the experimental design phase of SPICE, to represent HMEI's interests. Around 20 manufacturers have provided instruments for SPICE. The SPICE IOC encouraged site managers and instrument manufacturers to collaborate in validating the installation and the operation of their instruments on the respective SPICE sites, as early as possible in the experiment, to minimize the risk of collecting data which could be seen as not representative for the operation of the provided instruments.

11. At the occasion of the sixty-sixth session of the WMO Executive Council, HMEI proposed to strengthen collaboration between WMO and HMEI to implement a Joint HMEI/WMO Project on Capacity Development. The proposed joint project would comprise two phases: Development of Tender Documentation and Specialized Training in Support of WIGOS Implementation in WMO Regions. HMEI stressed that the implementation of the project would support capacity development efforts to assist NMSs/NMHSs from developing and least developed countries with modernization of their observational networks and improving national service quality and service delivery. The Council was encouraged by this initiative and recommended that HMEI collaborate with relevant existing WMO bodies.

European Union Cooperation on Science and Technology (COST)

12. CIMO experts were involved in actions of the European Union Cooperation on Science and Technology (COST), in particular COST Action ES1303 "Towards operational ground based profiling with ceilometers, doppler lidars and microwave radiometers for improving weather

forecasts” (TOPROF, 22 October 2013-21 October 2017) and COST Action ES0702 “European Ground-Based Observations of Essential Variables for Climate and Operational Meteorology” (EG-CLIMET, 14 May 2008-13 November 2012). The chairs of some COST actions have expressed the desire to publish the final reports of their actions as WMO Instruments and Observing Method (IOM) Reports. WMO is in the process of clarifying copyright issues with COST required for such publications. Some CIMO experts were also asked to be the reviewers of COST actions final reports.

European Metrology Research Programme (EMRP)

13. The European Metrology Research Programme (EMRP) is presently conducting some projects of particular relevance to CIMO activities: ENV03 Joint Research Project "Traceability for surface spectral solar ultraviolet radiation", and ENV07 Joint Research Project “Metrology for Meteorology - Metrology for pressure, temperature, humidity and airspeed in the atmosphere”. A follow-up project ENV58 “MeteoMet2 - Metrology for Essential Climate Variables” will start in October 2014.

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PROGRESS REPORT FOR INFORMATION – NOT TO BE INCLUDED IN THE GENERAL SUMMARY

FUTURE WORK AND WORKING STRUCTURE OF THE COMMISSION

References:

1. Abridged Final Report with Resolutions of the Sixteenth World Meteorological Congress (WMO-No. 1077), Resolution 8 (Cg-XVI) and Resolution 43 (Cg-XVI)

2. Abridged Final Report with Resolutions and Recommendations of the Fifteenth Session of the Commission for Instruments and Methods of Observation (WMO-No. 1064)

3. Final Report of the Meeting of the CIMO Management Group (Eleventh Session), Payerne, Switzerland, 10-14 March 2014

4. Final Report of the Meeting of the CIMO Management Group (Ninth Session), Geneva, Switzerland, 5-8 April 2011

CIMO Working Structure

1. The Sixteenth World Meteorological Congress approved the revised terms of reference of the Commission for Instruments and Methods of Observation, as they had been proposed by CIMO-XV, and the WMO General Regulations were amended accordingly.

2. At its fifteenth session, CIMO recognized the need to adapt its working structure to the evolving priorities of WMO, putting more emphasis on the areas for which guidance was critically needed, and to have a flexible structure as WIGOS and GFCS would require adaptation from the Commission as they become better formulated. The Management Group recognized that the new structure had worked quite well and therefore decided to make only minor adjustments to it, to clarify some ambiguities to enable the Commission to be more efficient. It also decided not to propose modifications of the Terms of Reference of the Commission.

3. The Management Group recognized that the concept of Theme Leaders had in most cases not been very successful and decided to move the tasks expected from a number of Theme Leaders to Expert Teams in order for the relevant experts to work in a more stimulating environment. It decided to keep two theme leaders (Radio-Frequency Protection and Radiosonde Performance Monitoring) because of the interactions they have with other stakeholders outside of the Commission, but to endeavor inviting them to attend the meeting of at least one CIMO Expert Team (ET) to strengthen their internal linkages with the rest of the Commission and to provide them with a more motivating work environment.

4. The Management Group proposed to assign the relevant functions and tasks of the Theme Leader on Training Material and Training Activities to the OPAG Capacity Development and Operational Metrology Co-chairpersons.

5. Based on the above information and to remove possible ambiguities, the Management Group recommended making small modifications to the structure of CIMO, to adapt the Terms of Reference of the CIMO OPAGs, CIMO MG and CIMO ET&TLs and agreed on the preliminary future structure to be submitted for approval to CIMO-16.

Focal Points

6. The Management Group agreed that the functions of Focal Points (FP) nominated to liaise between the Commission and other Commissions or programmes (such as DRR focal point, FP on Climate observations, EC-PORS FP) should preferably be assigned to CIMO MG members.

CIMO Testbeds and Lead Centres

7. In order to ensure a good connection between the Testbeds (TBs) and Lead Centres (LCs) and the rest of the CIMO structure, the Management Group proposed that each TB and LC representative should be assigned to a specific ET by the CIMO MG as ex-officio member and should routinely provide the TB's reports to that expert team. TB and LC representatives should be invited to attend meetings of the relevant ET. However, the overall performance of TBs and LCs should remain under the responsibility of the CIMO MG.

8. Members were invited to provide new submissions for CIMO Testbeds and Lead Centres. In the eventuality that some proposals should be received by the time of CIMO-16, the president would establish a Task Team to review the proposals during the session in accordance with the designation process. All TBs and LCs were contacted to determine whether they would still be able to continue providing the service expected from TBs and LCs.

CIMO Working Mechanisms

9. The use of teleconferences has proven to be very useful in many instances, helping in achieving results, being cost-effective and saving travel costs and time. Most of the work of the ETs seems to be done shortly prior to, during and after a physical meeting of an expert team, as well as around planned teleconferences. The MG therefore recommended that in the future all ETs should have regular teleconferences, preferably at least twice per year, to support information exchange among the ET members, to help in achieving expected results and to spread the work load over the 4 year period.

10. In spite of the proposal from CIMO-XV that each ET should hold a teleconference with the responsible MG member, in the six months following CIMO-XV, and of the offers from the WMO Secretariat to organize such teleconferences, some ETs had their first meeting significantly later, which hampered the progress of one ET in completing its assigned activities. The CIMO MG felt that the efficiency of CIMO could be further improved and recommended if additional help was provided by the WMO Secretariat, and proposed to allow the WMO Secretariat to be much more prescriptive in scheduling regular teleconferences of all ETs, even without such a request from a particular ET, to support the MG in monitoring their progress.

11. The interaction mechanism between the ETs and the CIMO Guide Editorial Board functioned well in general. The same is true for the liaison between the ETs and the ET Instrument Intercomparisons, another team with a coordinating role. The experience with the Task Team on the International Cloud Atlas, which was established for a short duration with a clear mandate, was very positive.

12. Additional efficiency could also be gained by reducing the time between the CIMO session and the approval of the ET workplans by the Management Group. The MG therefore agreed to develop draft workplans for all CIMO ETs prior to the call for experts. The draft workplans would not be submitted for approval to CIMO-16, but provided for information. ETs should finalize the workplans, allocating tasks among themselves by mid-September 2014 and consideration and approval of these plans by the CIMO MG should take place before the end of September 2014, either by correspondence or by teleconference.

Gender Mainstreaming

13. EC-65 supported the proposal of its Panel of Experts on Gender Mainstreaming to convene in 2014 a Third WMO Gender Conference on the theme: "Gender Dimension of Weather and Climate Services: The Benefits of Working Together", eleven years after the Second Conference on Women in Meteorology and Hydrology took place.

14. EC-65 urged technical commissions and regional associations to compile appropriate statistics on the participation of men and women in their work and also urged Members to nominate female candidates to working structures of the WMO constituent bodies.

15. The list below provides the statistics on the participation of men and women in CIMO teams since CIMO-XV.

(1) Proportion of Women/Men in Management Groups

Commission	Women	Men	Total
CIMO	0	9	9

(2) Proportion of Women and Men in TC Working Groups, Task Teams, etc.

TC	WG/TT	Women	Men	Chair-Female	Chair-Male
CIMO	A1	2	8	0	2
	A2	1	8	0	2
	A3	1	6	0	2
	A4	0	2		
	A5	0	7		
	B1	0	8	0	2
	B2	0	10	0	2
	B3	1	1		
	B4	0	1		
	C1	1	7	0	2
	C2	0	3	0	2
	C3	0	2		
	C4	0	1		
	C5	1	0		
	IOC-SPICE	1	8	1	0
	IOC-RQQI	0	11	0	1
-	TT-ICA	3	5	0	1

PROGRESS REPORT FOR INFORMATION – NOT TO BE INCLUDED IN THE GENERAL SUMMARY

STRATEGIC AND OPERATIONAL PLANNING

Decisions of Congress and the Executive Council

WMO Strategic Plan and Operating Plan 2012-2015

1. Cg-XVI appreciated the active involvement of regional associations, technical commissions and the Secretariat, including Secretariats of WMO joint programmes, in the development of the WMO Strategic Plan 2012–2015, which ensured that the document reflected the collective view of all WMO constituent bodies. Cg-XVI indicated that the SP 2012-2015 should determine collective and coordinated activities of regional associations, technical commissions and the Secretariat through well defined programmes, projects and initiatives, as well as guide and motivate activities of Members and their National Meteorological and Hydrological Services (NMHSs).

WMO Strategic Plan and Operating Plan 2016-2019

2. The decisions of the Sixteenth World Meteorological Congress (Cg-XVI, May/June 2011)[1] on the preparation of WMO Strategic Plan 2016-2019 are presented in paragraphs 8.5.1-8.5.5 of the Abridged Final Report with Resolutions and Resolution 38 (Cg-XVI) – Preparation of the Strategic Plan for 2016–2019.

3. Cg-XVI agreed that:

(a) The Global Societal Needs (GSNs) that formed the basis for the Strategic Plan for the period 2012–2015 and the Strategic Thrusts (STs) together with the Expected Results (ERs) should form the basis for the WMO Strategic Plan for the period 2016–2019;

(b) The strategic and operational planning for the period 2016–2019 should follow the structure of the Strategic Plan 2012–2015 (GSNs, STs and ERs) and the overall planning process, taking into account the evolution of the societal and economic needs of the Members, relevant international initiatives, and the challenges of climate variability and change; build on experiences gained from the two phases (2008-2011 and 2012-2015); further enhance linkages between SP, OP and RBB to facilitate the implementation of RBM and to improve Key Performance Indicators.

4. The decisions of the sixty-first session of the WMO Executive Council (EC-LXI, June 2009[2]) that guided the preparation of the WMO SP 2012-2015 are presented in paragraphs 7.2.6-7.2.8 of the Abridged Final Report with Resolutions. They include:

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1 ftp://ftp.wmo.int/Documents/PublicWeb/mainweb/meetings/cbodies/governance/congress_reports/english/pdf/1077_en.pdf

2 ftp://ftp.wmo.int/Documents/PublicWeb/mainweb/meetings/cbodies/governance/executive_council_reports/english/pdf/61_session_wmo_1042_part1_en.pdf

(a) To develop a plan that is concise and that can easily be understood by different audiences including decision-makers;

(b) To base the strategic direction of the Organization on identified global societal needs;

(c) To use the results chain Strategic Thrusts (STs) ► Expected Results (ERs) ►Key Outcomes (KO) ► Deliverables ►Activities as the structure of the strategic planning process. The STs and ERs are to be the backbone of the SP, and ERs further detailed by KOs, performance metrics, and deliverables to form the substance for the OP;

(d) To involve regional associations and technical commissions;

(e) To include the major achievement of WMO.

5. To implement the request of Cg-XVI to the Secretary-General to submit the first outline with possible scenarios to the sixty-fourth session of the Executive Council, the EC Working Group on WMO Strategic and Operational Planning (WG/SOP) held its first session in Geneva, from 2 to 4 April 2012. The EC WG/SOP considered the proposals provided by the Secretariat, which included the processes and timelines for preparing the SP and OP; the structure and outline of the next SP and OP, and scenarios for the next SP.

6. The sixty-fourth session of the Executive Council (EC-64, June/July 2012) considered the recommendations of its working group and decided to endorse the following parameters for the development of the next Strategic and Operating Plans:

(a) The SP and OP should be articulated as plans for the entire Organization;

(b) The structure of the SP should be simplified to reduce the layers that are currently GSNs-STs-ERs-KOs;

(c) The ERs should be proposed by the RAs in consultation with the TCs and the Programmes;

(d) Five priorities were adequate but should be better integrated into the SP at an earlier stage, and their clarity should be improved;

(e) The SP should be shorter, more concise and simple. A short summary for the SP should be developed;

(f) Risks should be included in each section of the SP, rather than in a separate chapter;

(g) The Organization should have a single Operating Plan that includes the activities of RAs and TCs;

(h) The strategic planning process should be driven by the needs/priorities set by the Members (through RAs);

(i) KPIs should be measurable where possible, and clear milestones and responsibilities (Members, Secretariat, task forces and/or technical commissions) should be defined;

(j) The GSNs should represent global needs to which WMO activities can contribute to provide solutions;

(k) The current WMO SP is adequate for the next planning cycle. However, key priorities that would guide the investments in the next financial period should be identified;

(l) The EC and WG/SOP should focus on developing a “single” operating plan for the next financial period.

7. The Council also agreed with the development of the next Strategic and Operating Plans based on the outlines of the SP and OP, and the proposed process and timeliness as given below in Tables 1, 2 and 3, respectively.

Table 1
The outline of the WMO Strategic Plan 2016–2019

FOREWORD
INTRODUCTION
• Societal benefits of weather, climate and water services • Purpose and context of the WMO Strategic Plan • Structure of the WMO Strategic Plan 2016–2019 • Global Framework for Climate Services
STRATEGIC THRUSTS LINKING TO EXPECTED RESULTS, KEY OUTCOMES AND KEY PERFORMANCE INDICATORS
• Strategic Thrust 1: Improving service quality and service delivery • Strategic Thrust 2: Advancing scientific research and application, as well as development and implementation of technology • Strategic Thrust 3: Strengthening capacity-building • Strategic Thrust 4: Building and enhancing partnerships and cooperation • Strategic Thrust 5: Strengthening good governance Expected results, strategic priorities and potential risks shall be presented within each strategic thrust. Strategic thrusts are broad indications of strategic directions to address the global societal needs (GSNs) to achieve expected results. The ERs represent long-term objectives that WMO seeks to achieve in pursuing its mission. The key outcomes represent the expected effects of the achieved results on Members. The RAs will be requested to propose strategic priorities and activities focusing on their unique needs and those for the Organization. The priorities and activities of TCs should aim at addressing the needs of the RAs along with advancing global scientific research and applications.
WMO OPERATING PLAN
WMO RESULTS-BASED BUDGET
MONITORING AND EVALUATION
CONCLUSION
REFERENCES

Table 2
The proposed outline for WMO Operating Plan 2016-2019

I. Introduction The proposed structure of the OP puts all activities under the associated ER and KO for ease of monitoring and to make it easy to recognize commonality in the proposed activities. It is expected that the activities of the TCs will be aimed at addressing the shared and unique needs of RAs.	
II. **WMO Programme activities planned for implementation in 2016-2019**	
II.1	Expected Result 1
II.1.1	KO1 for ER1
Funded programme activities, and In-kind activities of RAs and TCs	
II.1.2	KO2 for ER1
Funded programme activities, and In-kind activities of RAs and TCs	
II.2	Expected Result 2
II.2.1	KO1 for ER2
Funded programme activities, and In-kind activities of RAs and TCs	
II.2.2	KO2 for ER2
Funded programme activities, and In-kind activities of RAs and TCs	
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II.8	Expected Result 8
II.8.1	KO1 for ER8
Funded programme activities, and In-kind activities of RAs and TCs	
II.8.2	KO2 for ER8
Funded programme activities, and In-kind activities of RAs and TCs	
Annex on programmatic focuses in the implementation of Expected Results	
List of Acronyms and Abbreviations	

SCHEMATIC REPRESENTATION OF OP

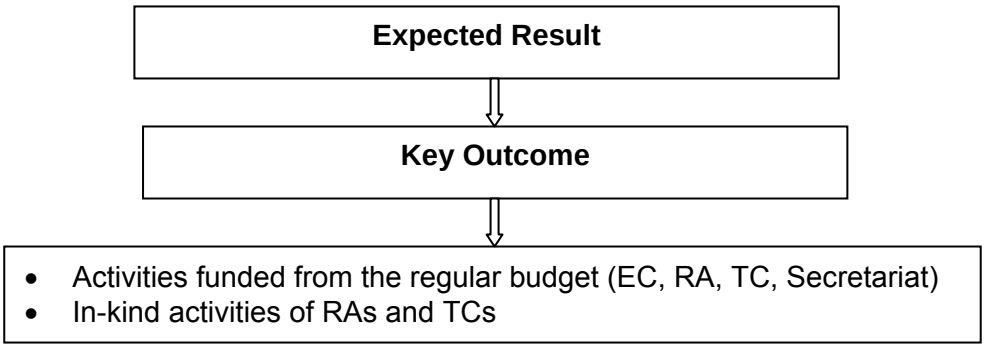

Table 3
Proposed process and timelines for preparing the WMO Strategic and Operating Plans 2016-2019

1. Input to EC-64 (2012)
a) EC WG/SOP considers the proposed structure, outline, scenarios and planning process **(April 2012)-Done** b) Secretariat prepares input to EC-64 based on the recommendations of WG/SOP **(April 2012)-Done** c) EC provides further guidance on GSNs, ST, ERs, Scenarios, and on the structures and outlines of SP and OP 2016-2019 **(June/July 2012)** d) Secretariat requests presidents of regional associations and technical commissions to submit strategic priorities focusing on their unique needs and those for the Organization. Proposals for Organization-wide priorities should take into consideration the strategic priorities for 2012-2015. The PRAs and PTCs will also be requested to provide activities relevant for addressing the proposed priorities. The MGs of RAs and TCs would assist the PRAs and PTCs to make submission without waiting for the sessions of the constituent bodies **(September 2012)**
2. **Input to EC-65 (2013)**
a) Secretariat concludes the preparation of the draft SP and OP using the information from RAs and TCs **(January 2013)** b) PRAs/PTCs are requested to review the draft SP and OP and provide further input **(January 2013)** c) EC WG/SOP meeting to consider the draft SP and OP **(April 2013)** d) EC considers the draft WMO SP and OP, and provides guidance for further development **(June 2013)** e) Members are requested to review the revised draft SP and make input for further improvement **(July 2013)**
3. Input to EC-66 (2014)
a) EC considers the revised draft SP and OP and makes appropriate recommendations to Cg-17 **(June 2014**) b) The Secretary-General submits to EC-66 the draft RBB proposal 2016-2019, that is based on the WMO SP and OP 2016-2019, for consideration **(June 2014)**
4. **Input to Cg-17 (2015)**
a) The revised SP and OP are finalized for presentation to Cg-17 **(October 2014)** b) The revised RBB proposal 2016-2019 is finalized for presentation to Cg-17 **(October 2014)**

8. The PRAs were requested to provide input for the preparation of the Strategic Plan on 28 September 2012 (ref.: P.RA-1744 of 1 August 2012) and the Operating Plan on 30 December 2013 (ref.: P.RA-1752 OF 27 November 2013).

Monitoring and Evaluation

9. EC-65 recalled the decisions of Sixteenth Congress (paragraphs 8.4.1-8.4.4) and EC-64 (paragraphs 4.8.16-4.8.17) with respect to further development and implementation of the WMO Monitoring and Evaluation (M&E) System. The Council noted with appreciation the report of its Working Group on WMO Strategic and Operational Planning (WG-SOP) and agreed with its assessment that the M&E process was maturing and moving in the right direction. The Council

noted that the Key Outcomes (KOs) and Key Performance Indicators (KPIs) were reviewed and the baselines and targets established for each KPI to facilitate the monitoring of progress to achieve results. It noted further the improvement in the level of response to the Survey on Impacts of Achieved Results on Members following its reopening as requested by EC-64. The Council observed that only a small fraction of NMHSs who responded to the questionnaire rated the level of utilization of WMO publications, and the quality of national and regional products as high to very high. The Council encouraged Members to continue with efforts to enhance the quality of products and make use of the various WMO publications to improve their services. The Council also continued to encourage Members to respond to the surveys to provide information that may help the Organization to focus its priorities on actions to address the needs of Members.

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APPENDIX B:
PROGRESS REPORT FOR INFORMATION:
NOT TO BE INCLUDED IN THE GENERAL SUMMARY

BACKGROUND INFORMATION TO REPORTING OF WIND AT SEA

1. Wind reports from ships and oil rigs are crucial in filling up the meteorological data void over the oceans and are particularly critical in estimating the intensity of tropical cyclones. Increasingly such reports are made by automatic unattended systems. As discussed in WMO-No. 8 – G*uide to Meteorological Instruments and Methods of Observation*, this task presents special problems since the standard exposure height of 10 m specified for land stations cannot always be achieved in a marine environment. To minimize the effect of platform structure on the wind measurement, the wind sensor on-board ship and oil rig has a typical height of 40m and 100m respectively. As discussed in WMO-No. 8, if wind speed is measured at a height significantly greater than 10m, a reduction to the 10m level should be performed.

2. WMO-No. 8 provided further guidance on correction of wind measurement for height. For the correction to be made by the users, it is necessary to obtain the height of the anemometer as the metadata for wind measurements on ships and oil rigs. However, such metadata are not readily available to users, particularly after the implementation of the VOS ship's identification masking scheme.

3. An alternative, and probably simpler, solution is for the station owner to provide the corrected wind speed data. While reduced wind at 10m was once reported in ship reports, the Commission will recall that JCOMM-2 in 2005, however, concluded that the original wind data should always be reported, out of the consideration that whether a particular vessel reports the uncorrected wind or reduced wind value cannot be detected in the current code format. With regard to oil rigs, it is noted that some oil rigs, in particular those in Europe, do correct the wind before dissemination. However, it is not clear whether this is a global practice.

4. Considering the importance of the ship and oil rig wind data particularly in estimating the intensity of tropical cyclones; and the height of the measurement and as such the reduction factor could be quite significant, the Commission may wish to request its MG to work with other technical commissions, as appropriate, to provide further guidance on the exchange of raw and corrected wind data and to update the CIMO Guide and/or other relevant WMO regulatory material as necessary.

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GAW World Calibration Centres. It noted that round-robin exercises organized for the group of greenhouse gases is an efficient way to ensure the compatibility of measurements by the different laboratories. The Commission appreciated the instrument comparisons organized for total ozone, the group of reactive gases, aerosols and Ultraviolet (UV) Radiation. The Commission stressed that comparison campaigns are essential for harmonization of quality of observations within the network and recommended that such exercises are carried out more frequently. The Commission encouraged the Members to take part in comparison exercises and to utilize GAW Central Facilities to ensure quality of the atmospheric composition observations. The Commission further noted that station audits performed by WCC for surface ozone, carbon monoxide, methane and carbon dioxide at Empa, Switzerland (http://www.empa.ch/plugin/template/empa/*/7571) and WCC for aerosol physical properties at the Institute for Tropospheric Research, Leipzig, Germany (http://www.wmo-gaw-wcc-aerosol-physics.org/audits.html) are useful for evaluation of the performance of observational stations.

7(9).6 The Commission noted that GAW quality assurance system includes a limited number of the regional calibration facilities. Only total ozone observations are supported by GAW RCC. The Commission noted that regional instrumental centres can be considered as a possible way for extension of the atmospheric composition calibration services in the regions where access to World Calibration Centres is difficult. The Commission requested the Members operating regional instrumental centres to consider the possibility of extending the scope of their calibration facilities to include atmospheric composition and related physical parameters.

7(9).7 The Commission appreciated the update of several GAW Measurement Guidelines. The Commission requested the Members to use the most recent measurement guidelines when performing atmospheric composition and related physical parameters observations.

7(9).8 The Commission acknowledged and supports the Mutual Recognition Arrangement between WMO and the Bureau International des Poids et Mesures (BIPM) to cooperate in ensuring both traceability and compatibility of measurements in global networks. The Commission especially appreciated the actions by USA (NOAA) and Switzerland (EMPA and World Radiation Centre in Davos) in taking a responsibility to represent WMO, ensuring the high quality of WMO measurement standards.

7(9).9 The Commission further noted that capacity-building is an important element of the quality assurance and appreciated training activities and stations twinning performed by Members in support of GAW.

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

GLOBAL ATMOSPHERE WATCH PROGRAMME

1. The Global Atmosphere Watch (GAW) quality assurance (QA) system impacts all aspects of atmospheric chemistry observations, including training of station personnel; assessment of infrastructures, operations and the quality of observations at the sites; documentation of data submitted to the World Data Centers (WDCs); and improvement of the quality and documentation of legacy data at the WDCs. The GAW Central Facilities (http://www.wmo.int/pages/prog/arep/gaw/gaw_cent_facil.html) assist Members to respond to requirements to quality of observations. GAW Central Facilities include Central Calibration Laboratories (CCLs), World and Regional Calibration Centers (WCCs and RCCs), Quality Assurance/Scientific Activities Centers (QA/SACs) and World Data Centers (WDCs) with their terms of reference formulated in the GAW Strategic Plan: 2008-2015 (GAW Report No. 172).

2. A number of Central Facilities have been established during intersessional period. Developments in the gas standards preparation allowed achieving stable standards for a number of volatile organic compound (VOCs). Two CCLs hosting primary standards for two groups of VOCs, namely CCL for non-methane hydrocarbons (National Physical Laboratory, UK, http://www.npl.co.uk/science-technology/chemical-metrology/vocs) and CCL for monoterpenes (National Institute of Standards, USA, http://www.nist.gov/mml/csd/gas/wmogaw.cfm) were established in close collaboration with BIPM.

3. Substantial developments of the Quality Assurance methods for nitrogen oxide measurements have taken place with the support of the European project ACTRIS. The World Calibration Center for nitrogen oxide (NO and NO_2) was established in the Research Center Juelich, Germany. A group of greenhouse gases was complimented by the new World Calibration Center for SF6, supported by the Republic of Korea.

4. The development of the harmonized methods of observations is an essential element in the network harmonization. GAW Scientific Advisory Groups in collaboration with internationally recognized experts outside of the WMO community and other relevant organizations are responsible for development of GAW Measurement Guidelines and standard operating procedures (SOPs), which are available as GAW Reports. New Standard Operating Procedures (SOPs) for ozonesonde observations and data reporting were published as GAW Report No. 201, and the "Guidelines for Reporting Total Ozone Data in Near Real-Time" are summarized in the GAW Report No. 193. Total ozone data submitted in NRT are used for preparation of Ozone Bulletins.

5. WMO/GAW and the International Ozone Commission under IAMAS established in 2009 an ad hoc expert team to standardize the use of absorption cross sections in global ozone observations. The need for such a group was due to the historical differences between the total ozone reference instruments used by the European Calibration Centers (RBCC-E, RDCC-E). The application of the new developed Bremen cross sections to the CEOS Calibration campaign data of reference instruments eliminates the bias and reduces the seasonal differences if the temperature dependence of the algorithm is taken into account. The ad hoc expert team held four workshops between 2009 and 2013, and, to ensure compatibility, it has been agreed to adopt the new ozone absorption cross sections published by the University of Bremen for the Dobson and Brewer measurements.

6. The GAW Scientific Advisory Group for UV Radiation (SAG-UV) and its subgroup on instruments have finalized publishing the series Instruments to Measure Solar Ultraviolet Radiation

(four Parts). In collaboration with the International Commission on Illumination SAG-UV it published a technical report "Rationalizing Nomenclature for UV Doses and Effects on Humans".

7. The group of reactive gases prepared several measurement guidelines, including the Measurement of Atmospheric Carbon Monoxide (GAW Report No. 192), Standard Operating Procedures (SOPs) for Air Sampling in Stainless Steel Canisters for Non-Methane Hydrocarbons Analysis (GAW Report No.204) and Guidelines for Continuous Measurements of Ozone in the Troposphere (GAW Report No. 209). GAW will undertake further efforts on analysis of ozone trends especially in connection with the analysis of the variability of its precursors utilizing both observations and model simulations. The results will be used to establish a reactive gases bulletin.

8. The GAW Scientific Advisory Group prepared WMO/GAW Standard Operating Procedures for In-situ Measurements of Aerosol Mass Concentration, Light Scattering and Light Absorption (GAW Report No. 200) and several papers on aerosol trend and Black Carbon measurements interpretation.

9. NOAA/ESRL is the WMO/GAW Central Calibration Laboratory (CCL) for CO_2, CH_4, N_2O, SF_6, and CO. NOAA/ESRL serves as a World Calibration Centre (WCC) for CO_2. The WCC carried out the 5th greenhouse gas round robin campaign in 2009-2012. In total 39 labs participated in this exercise. The WCC started the 6th greenhouse gas round robin campaign in 2014. In total 43 labs plan to participate in this exercise.

10. The JMA serves as the Calibration Centre and Quality Assurance/Science Activity Centre (QA/SAC) for methane in Asia and the southwest Pacific. The Asian comparison campaign took place from June 2011–March 2012 and included JMA, Korea Meteorological Administration (KMA), and China Meteorological Administration (CMA). The Japan comparison campaign took place from October 2012–February 2013. The fourth South-West Pacific comparison campaign is on-going. Results of the comparison are summarized at http://ds.data.jma.go.jp/gmd/wcc/.

11. The Seventh Intercomparison Campaign of the Regional Brewer Calibration Center Europe (RBCC-E) was held from 16-27 July 2012 at the Arosa Observatory, Switzerland. This seventh intercomparison campaign was a joint exercise of the Regional Dobson Calibration Center for Europe (RDCC-E) and RBCC-E in collaboration with the Arosa Observatory of MeteoSwiss. Nine Brewer instruments managed by eleven experts from five countries participated in the campaign. The 8th Intercomparison Campaign of the Regional Brewer Calibration Center-Europe (RBCC-E) was held in El Arenosillo Atmospheric Sounding Station, Huelva, Spain from 10–20 June 2013. Seventeen instruments from ten countries participated. An ESA-CALVAL campaign was organized in Izaña, Tenerife, from 20 October to 20 November 2013, aiming at investigating the stray-light in single monochromator Brewer spectrophotometers. Five Brewer instruments operating in the Nordic countries have participated

12. Quality Assurance/Scientific Activity Center (America) that operates in support of precipitation chemistry group and is sponsored by the NOAA Air Resources Laboratory performed six laboratory comparisons since 2010. In total 78 laboratories reported measurements for the last comparison. The 50th Laboratory Intercomparison Study started in April 2014.

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

SUGGESTED ACTION ON THE RESOLUTIONS AND RECOMMENDATIONS ADOPTED BY THE COMMISSION PRIOR TO ITS SIXTEENTH SESSION AND STILL IN FORCE

I. RESOLUTIONS ADOPTED BY CIMO-XV

Res. Number	Title	Suggested action	Comments
1	Vision Statement of the Commission for Instruments and Methods of Observation	To be kept in force	Still corresponding to present vision of CIMO
2	Working Structure of the Commission for Instruments and Methods of Observation	Not to be kept in force	Will be replaced by a new resolution (agenda item 9)
3	CIMO Open Programme Area Groups	Not to be kept in force	Will be replaced by a new resolution (agenda item 9)
4	CIMO Management Group	Not to be kept in force	Will be replaced by a new resolution (agenda item 9)
5	Generic Terms of Reference of CIMO Testbeds and Lead Centres	To be kept in force	Term of Reference of Testbeds and Lead Centre are still appropriate, but not included in other documents
6	Revision of previous resolutions and recommendations of the Commission	Not to be kept in force	Will be replaced by a new resolution (agenda item 10)

II. RESOLUTIONS ADOPTED PRIOR CIMO-XV AND STILL IN FORCE

Res. Number	Title	Suggested action	Comments
13 (CIMO-XIV)	Participation of women in the work of the Commission	To be kept in force	Still need to encourage participation of women in Commission activities

III. RECOMMENDATIONS ADOPTED BY CIMO-XV

Rec. Number	Title	Suggested action	Comments
1 (CIMO-XV)	Regional Instrument Centre Capabilities and Communication with Members	To be kept in force	On-going need for improvement of communications of RICs with Members, improvements in traceability, and regular evaluation of RICs

Rec. Number	Title	Suggested action	Comments
2 (CIMO-XV)	Terms of Reference of the Commission for Instruments and Methods of Observation	Not to be kept in force	Terms of Reference of CIMO were approved by Congress-XVI (Res. 43) and WMO General Regulations were modified accordingly
3 (CIMO-XV)	Review of the resolutions of the Executive Council related to the Commission for Instruments and Methods of Observation	Not to be kept in force	Will be replaced by a new resolution (agenda item 10)

IV. RECOMMENDATIONS ADOPTED PRIOR TO CIMO-XV AND STILL IN FORCE

Rec. Number	Title	Suggested action	Comments
1 (CIMO-XIV)	Measurements in severe icing conditions	To be kept in force	Work not completed
5 (CIMO-XIV)	Development of UV Calibration Centres	To be kept in force	On-going need for the establishment of UV calibration centres
7 (CIMO-XIV)	WRC infrared radiometry section	To be kept in force	On-going need to improve traceability of infrared irradiance measurements to SI units
9 (CIMO-XIV)	Suitable temperature measurements for high quality reference upper-air stations	To be kept in force	Work not completed
10 (CIMO-XIV)	Usefulness of interoperable upper-air systems	To be kept in force	Guidance provided in the recommendation is still valid
1 (CIMO-XII)	Possible conflicts with external standardization organizations	To be kept in force	On-going need to coordinate activities to avoid conflicts between standards of WMO and other standardizing bodies
3 (CIMO-XII)	Introduction of new meteorological instruments	To be kept in force	Guidance provided in recommendation is still valid
4 (CIMO-XI)	Calibration of meteorological and related geophysical instruments	To be kept in force	On-going need for development of standards for the calibration of advanced sensor instrumentation
6 (CIMO-XI)	Improvement of instrumentation used in observing systems of developing countries	To be kept in force	On-going need to ensure maintenance of network instruments
8 (CIMO-XI)	Correction of upper-air measurements	To be kept in force	On-going need for information on corrections applied to upper-air data, especially in view of climate requirements
12 (CIMO-XI)	Education and training for capacity building	To be kept in force	On-going need for training of instrument specialists

Rec. Number	Title	Suggested action	Comments
13 (CIMO-XI)	Intercomparisons of instruments	To be kept in force	On-going need to conduct instrument intercomparisons

V. RESOLUTIONS OF THE EXECUTIVE COUNCIL RELATED TO THE COMMISSION AND STILL IN FORCE

Resolution	Title	Suggested action	Comments
13 (EC-XXXIV)	Development and comparison of radiometers	To be kept in force	On-going need for regular international pyrheliometer intercomparisons

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