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COMMISSION FOR BASIC SYSTEMS

OPAG ON INTEGRATED OBSERVING SYSTEMS

**INTER-PROGRAMME EXPERT TEAM ON THE OBSERVING
SYSTEM DESIGN AND EVOLUTION (IPET-OSDE)**

FIRST SESSION

(IPET-OSDE1)

Geneva, Switzerland, 31 March – 3 April 2014

FINAL REPORT



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EXECUTIVE SUMMARY

The First Session of the Inter-Programme Expert Team on Observing System Design and Evolution (IPET-OSDE) of the Commission for Basic Systems (CBS) Open Programme Area Group (OPAG) on Integrated Observing Systems (OPAG-IOS) was held at the WMO Headquarters in Geneva, Switzerland from 31 March to 3 April 2014 and was chaired by the Chair of the IPET-OSDE, Dr John Eyre (United Kingdom).

The Team received guidance from its Chair and from the OPAG-IOS Chair, and it reviewed progress on WIGOS framework implementation activities relevant to the IPET-OSDE and guidance from the Third meeting of the Inter-Commission Coordination Group on the WMO Integrated Global Observing System (ICG-WIGOS).

The Team received an update on several activities related to its work, and particularly from the Global Cryosphere Watch (GCW), the Global Framework for Climate Services (GFCS) and activities subsequent to the African Monsoon Multidisciplinary Analysis (AMMA).

As part of the Rolling Review of Requirements (RRR) process, the Team reviewed the status of the WMO database of observational user requirements and observing systems capabilities, which has been integrated into the Observing System Capability Analysis and Review tool (OSCAR). The Team noted with appreciation the recent developments of OSCAR in partnership with MeteoSwiss, and it proposed a mechanism for managing OSCAR from the WMO perspective, including for the development phases and for the long term operations and maintenance, to be passed to CBS for its consideration through the CBS Implementation Coordination Team on Integrated Observing Systems (ICT-IOS). The Team thanked MeteoSwiss, Germany and the Secretariat for their contributions in the development of OSCAR. It also thanked Germany for the availability of a Junior Professional Officer (JPO) who helped to develop OSCAR to its current state.

Also in the context of RRR, the Team reviewed the status of the Statements of Guidance (SoGs) for WMO Application Areas (see list in the table below). The Team reviewed available updates to individual SoGs as provided by the nominated Point of Contacts. The Team responded to the request of CBS-15 (2012) to ensure that all requirements, including those of the GCW and the GFCS, are captured through the ongoing RRR process. The IPET-OSDE assessed which SoGs should be revised, and it discussed whether there were any new areas requiring SoGs. A synthesis of the Team's review and decisions with regard to the SoGs is summarized in the table below.

Application Area	New version reviewed	Adopted	To be updated / provided
Global Numerical Weather Prediction	√		√
High Resolution Numerical Weather Prediction	√		√
Nowcasting and Very Short Range Forecasting	√		√
Seasonal to Inter-Annual Forecasting	√		√
Aeronautical Meteorology	√		√
Atmospheric Chemistry			√
Ocean Applications	√		√
Agricultural Meteorology			√
Hydrology and Water Resources			√
Climate Monitoring (GCOS)		n/a	GCOS
Climate Applications (other aspects, CCI)			√
Space Weather	√		√
GTOS (non-GCOS requirements of GTOS)			√

The Team noted the plans of the GCW and of the Global Atmosphere Watch (GAW) to define Application Areas consistent with the RRR process, and then to provide user requirements for observations for these Application Areas. It also noted the plans of the WMO-IOC-UNEP-ICSU Global

Climate Observing System (GCOS) to work closely with GFCS, with the expectation that updated user requirements for observations and associated gap analyses to be provided in the next two years by GCOS would also reflect the needs of the services of GFCS.

The Team reviewed the current activities regarding observing system studies, with emphasis on the design of future observing systems contributing to WIGOS. It considered proposals for new studies to be promoted by the IPET-OSDE, and it agreed to propose a new list by June 2014. The Team noted issues with regard to the availability of Tropical moored buoy data and the risk of reduced funding of the barometers on drifting buoys, and it agreed to assist as appropriate. The Team discussed preparations for the next WMO workshop on the impact of various observing systems on numerical weather prediction (NWP). It agreed that a workshop should be organized in 2016, and to make this recommendation to the ICT-IO. The Team also discussed cost-benefit studies for observing systems. It developed the elements of a strategy for assessing the cost-effectiveness of observing systems, and it agreed to provide guidance on how such a strategy might be developed further.

The Team reviewed guidance from recent Executive Councils, the Sixteenth Congress and the Inter-Commission Group on WIGOS (ICG-WIGOS) on issues related to the current (new) Implementation Plan for the Evolution of Global Observing Systems (EGOS-IP) and its status as part of WIGOS implementation. The Team also reviewed a retrospective analysis of progress against the old EGOS-IP (responding to the Vision for the GOS in 2015). Concerning the current EGOS-IP (responding to the Vision of the GOS for 2025 and WIGOS needs), the Team started a review of progress on Actions contained in the Plan since its approval. It identified groups/bodies proposed to take responsibility for reporting progress against each Action in EGOS-IP and developed a plan for obtaining and collating this information and providing it in a progress report. The Team also reviewed interactions with the National Focal Points (NFPs) concerning the EGOS-IP, and it considered how the role of NFPs might be enhanced and how their work might be supported in future. To this end, it prepared a list of suggestions for facilitating progress on Actions and for supporting NFPs in their work.

A key and new issue discussed at the meeting was the drafting of observing system network design principles and guidance. The Team noted the outcome of the *ad hoc* Workshop on Observing System Design (OSDW1, Geneva, Switzerland, 12-14 November 2014) and follow-up activities until this IPET-OSDE Session, and it reviewed draft observing system network design (OSND) principles and guidance. The Team reviewed the actions from the OSDW1 workshop, revised the draft OSND principles, and drafted a more complete plan for preparing OSND guidance whereby IPET-OSDE members will draft specific material in close coordination with their respective Teams and groups. Noting the timelines for the development of WIGOS Regulatory Materials, the Team agreed to submit the OSND principles to the ICG-WIGOS Task Team on Regulatory Materials by the requested deadline (4 April 2014).

The Team tasked the Chair to elaborate IPET-OSDE input to be proposed for activities on observing system design and evolution for the future WMO and CBS Operating Plans for the period 2016 to 2019. It reviewed and took note of the existing mechanism for keeping track of proposed additions to the "Vision for the GOS in 2025". The Team also discussed the initiation of a new Vision for global observing systems, which would eventually succeed the "Vision for the GOS in 2025", and provided some proposals in this regard.

The Team tasked the Chair with providing the IPET-OSDE report and updated workplan that will be reviewed and presented to the eight session of CBS OPAG on Integrated Observing Systems' Implementation and Coordination Team (ICT-IO) (Geneva, 7-11 April 2014). The Team also discussed the preparation of documents to the CBS Extraordinary Session in late 2014 according to the discussions during this IPET-OSDE1 Session.

The Team agreed on its action plan for the period until the next IPET-OSDE meeting.

GENERAL SUMMARY

1. ORGANIZATION OF THE SESSION

1.1. Opening of the meeting

1.1.1. The first Meeting of the Inter Programme Expert Team on Observing System Design and Evolution (IPET-OSDE) the Open Programme Area Group for Integrated Observing Systems (OPAG-IO) of the Commission for Basic Systems (CBS) opened at 10.00 hours on Monday, 31 March 2014, at the WMO Headquarters in Geneva, Switzerland.

1.1.2. Dr Wenjian Zhang, Director, WMO Observing and Information Systems Department, opened the meeting on behalf of WMO. He welcomed the participants and explained the significant developments relevant to CBS and especially OPAG-IO since seventh Session of the former CBS Expert Team on the Evolution of Global Observing System (ET-EGOS) in May 2012. He particularly recalled the WMO sixteenth Congress decision to implement the WMO Integrated Global Observing System (WIGOS) through Resolution 50 (Cg-16) and the implications for the work of the Team. The IPET-OSDE is expected to play a crucial role in the WIGOS framework implementation by addressing a number of Kea Activity Areas (KAA) of the WIGOS Framework Implementation Plan (WIP), and particularly KAA#3: design, planning and optimized evolution of WIGOS and its regional, sub-regional and national component observing systems.

1.1.3. Dr Zhang explained that the third Session of the Inter-Commission Coordination Group on WIGOS (ICG-WIGOS) had provided guidance that is relevant to the activities of the Team. He invited the Team to take the guidance into account during this IPET-OSDE1 Session.

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

1.1.5. Dr John Eyre (United Kingdom), Chair of IPET-OSDE, also greeted the participants and expressed his confidence that the session would work hard to fulfill its obligations.

1.1.6. The Team acknowledged apologies from Team members, Ali Mafimbo (Kenya, retired), Jean-Blaise Ngamini (ASECNA) and Thomas Szybnorski (USA), for not being able to attend the meeting. Jeff Key (USA) and Russell Stringer (Australia) attended the meeting via teleconference. The list of participants is given in **Annex I**.

1.2. Adoption of the agenda

1.2.1. The Team adopted the Agenda for the meeting, which is reproduced at the beginning of this report.

1.3. Working arrangements

1.3.1. The Team agreed on its working hours and adopted a tentative time table for consideration of the various agenda items.

1.3.2. The Team established the following working groups for the duration of this IPET-OSDE Session (working group leads are underlined):

- **Group 1 – Status of actions of new Implementation Plan for the Evolution of Global Observing Systems (EGOS-IP) (space part)**
John Eyre, Anthony Rea, Paolo Ambrosetti, Rosemary Munro, Sid Boukabara, Werner Thomas, Yoshiaki Sato. Secretariat provided by Stephan Bojinski and Lars Peter Riishojgaard.
- **Group 2 – Status of actions of new EGOS-IP (surface part)**

Jay Lawrimore, Erik Andersson, Frank Grooters, Guimei Liu, Jochen Dibbern, Jan Rene Larsen, Jitze van der Meulen, Li Bai, Paolo Ambrosetti, Stuart Goldstraw, Stefan Klink, Werner Thomas. Secretariat provided by Dean Lockett.

- **Group 3 – Observing System Capability Analysis and Review tool (OSCAR) technical issues**

Paolo Ambrosetti, Anthony Rea, Guimei Liu, Jan Rene Larsen, Jitze van der Meulen, Stuart Goldstraw. Secretariat provided by Stephan Bojinski.

- ⇒ Review the DB actions from ET-EGOS-7 (Doc.5, Appendix B)
- ⇒ Breakout group to review the updating and maintenance procedure
- ⇒ Discussion on terminology

- **Group 4 – OSCAR project**

Jochen Dibbern, John Eyre. Secretariat provided by Etienne Charpentier and Lars Peter Riishojgaard.

- **Group 5 – Observing system network design (OSND) principles and guidance**

John Eyre, Erik Andersson, Jay Lawrimore, Stuart Goldstraw, Stefan Klink, Yoshiaki Sato. Secretariat provided by Luis Nunes and Etienne Charpentier.

- **Group 6 – Atmospheric Composition within WIGOS**

Rosemary Munro, Werner Thomas, John Eyre. Secretariat provided by Lars Peter Riishojgaard and Oksana Tarasova.

2. REPORT OF THE CHAIRPERSON

2.1. The IPET-OSDE Chairperson, Dr John Eyre (United Kingdom), welcomed all members of the Team, with a particular welcome to those who were new to the work of OPAG-IOS. He reported on the activities carried out since the last meeting of the predecessor of the IPET-OSDE, i.e. the seventh Session of the Expert Team on the Evolution of Global Observing Systems (ET-EGOS-7, Geneva, Switzerland, 7-11 May 2012), and the establishment of the IPET-OSDE by the fifteenth Session of the CBS (Jakarta, Indonesia, 10-15 September 2012). The Terms of Reference of the IPET-OSDE are provided on the WMO website¹.

2.2. The Chair recalled the IPET-OSDE is established as a Team under the Open Programme Area Group for Integrated Observing Systems (OPAG-IOS) of the CBS of WMO. Most of the tasks assigned to IPET-OSDE follow on from those previously conducted under the former OPAG-IOS Expert Team on the Evolution of Global Observing Systems (ET-EGOS). The IPET-OSDE Work Programme as proposed by the CBS Management Group, approved by the CBS President, and with updated status as provided in **Annex III**.

2.3. All the Terms of Reference of IPET-OSDE and all the elements of its Work Programme are related to the goals and activities of the WMO Integrated Global Observing System (WIGOS). IPET-OSDE-1 would therefore be briefed on WIGOS progress and issues that are relevant to our activities, under item 4 of the agenda.

2.4. Since the inception of IPET-OSDE, work has progressed to consolidate the membership of the new IPET and to continue work on the Actions list from the last meeting of ET-EGOS (ET-EGOS-7, May 2012). The meeting would review the status of Actions from ET-EGOS-7 and decide which of these to continue or amend as its own Actions (agenda item 4).

2.5. John Eyre reported that the first Workshop on Observing System Design (OSDW-1) was organized under the auspices of IPET-OSDE, and it was held in Geneva, 12-14 November 2014. The

1 http://www.wmo.int/pages/prog/www/OSY/WorkingStructure/OPAG-IOS_ExpertTeams.html

main outcome of the meeting was material to form the basis for a set of WIGOS “Principles” for Observing System Network Design (OSND) and also high-level guidance elaborating these Principles. Since OSDW-1, further progress had been made to develop this material into a set of draft Principles and associated Guidance. This document was made available to the Inter-Commission Coordination Group for WIGOS (ICG-WIGOS) for its meeting, 10-14 February 2014. ICG-WIGOS encouraged IPET-OSDE to continue the work to develop these “Principles”, which would be addressed under item 10 of our agenda.

2.6. He then drew the Team’s attention to the following activities and achievements relevant to the Team’s work since mid-2012:

- The creation of the Observing System Capabilities Analysis and Review tool (OSCAR): <http://www.wmo-sat.info/oscar/> and plans to transfer the OSCAR Platform to MeteoSwiss.
- The publishing of the report from the next Workshop on “The Impact of various observing systems on NWP” (Sedona, Arizona, USA; May 2012).
- In recent months, concerns had been expressed over the future support of the buoy network, and the Team would consider this problem during the meeting.
- Adoption by the Executive Council at its 65th Session in May 2013 through Resolution 10 (EC-65) of the new Implementation Plan for the Evolution of Global Observing Systems (EGOS-IP) per Recommendation 6 (CBS-15), and the availability of EGOS-IP in four official WMO languages (English, French, Russian and Spanish).
- CBS contribution to the Arctic Observing Summit, Vancouver, Canada, 30 April - 2 May 2013 with presentation of a “Community White Paper” on “WMO CBS activities relevant to observations in the Arctic”.
- The review of GOS regulatory materials and the development of regulatory materials for WIGOS. The Chair of IPET-OSDE had made some input to these developments.
- A GRUAN²-GSICS³-GNSSRO⁴ Workshop on “Upper-air observing system integration and application” will be held, 6-8 May 2014, at the WMO Headquarters in Geneva, Switzerland. The IPET-OSDE Chair has been participating in the activities of the planning committee for this workshop, on behalf of OPAG IOS. This workshop will consider how to realize benefits from observations of the “upper air” with qualities which make them well suited for use as “reference” observations, and thus to a special role within WIGOS.

2.7. The Chair finally proposed that this meeting give particular attention to the following issues:

- The continuation and extension of the OSCAR facility (agenda items 7.1 and 7.2).
- The review, improvement and elaboration of the draft Principles for Observing System Network Design and associated guidance material (agenda item 10);
- The role of observing systems studies to inform our work, including the extension of this work to applications other than Numerical Weather Prediction (NWP), and to considerations of the cost-effectiveness of observing systems (agenda item 8);
- Progress on Actions in EGOS-IP. The final version of this Plan was recommended by the most recent meeting of CBS, and so IPET-OSDE-1 represents the first opportunity to monitor progress against the Plan, and this is an important task for the Team. However, monitoring is

2 GCOS Reference Upper Air Network

3 Global Space-based Inter-calibration System - <http://gsics.wmo.int/>

4 Global Navigation Satellite System (GNSS) Radio Occultation (RO)

not sufficient; it should be the role of IPET-OSDE, with the support of OPAG-IOS and WIGOS as a whole, not only to monitor progress but also actively to promote it. These issues will be considered under item 9.

2.8. The Team agreed to give consideration to the above items. It agreed that cost-effectiveness of observing systems is an important issue, and noted that the Executive Council Working group on Satellite Matters is interested in the outcome of the IPET-OSDE activities in this area.

3. GUIDANCE FROM CHAIRPERSON OF THE OPAG-IOS

3.1. The chair of the OPAG-IOS, Mr Jochen Dibbern (Germany), provided guidance to the Team in the light of recommendations and resolutions of CBS-15 and of relevant resolutions by the sixty-fourth and sixty-fifth Sessions of the WMO Executive Council (EC-64, 25 June – 3 July 2012, and EC-65, 15-23 May 2013), and preparations for the eighth Session of the CBS Implementation-Coordination Team on Integrated Observing System (ICT-IOS-8, Geneva, Switzerland, 7-10 April 2014) and the CBS 2014 Extraordinary Session (Asuncion, Paraguay; 8-12 September 2014).

3.2. Since the Workshop on Observing System Design in Geneva, Switzerland, November 2013 the most relevant meeting for the work of IPET-OSDE was the third Session of the Inter-Commission Coordination Group on the WMO Integrated Global Observing System (ICG-WIGOS), held from 10-14 February 2014 in Geneva. Mr Dibbern provided an overview of ICG-WIGOS-3 discussions, recommendations and decisions that are relevant to the activities of the CBS OPAG IOS, and particularly with regard to areas of interest of the IPET-OSDE. He particularly mentioned the following points, as well as other issues discussed under agenda item 4.1:

- (i) ICG-WIGOS reiterated its concern about the sustainability of the observing systems/networks, especially in developing and less developed countries (see agenda item 9.4.2);
- (ii) ICG-WIGOS emphasized in particular that there should be insistence on donors taking an end-to-end approach when projects are considered, so that initial investments in acquisition, installation, etc., are supplemented with maintenance, training and operational funds to ensure the sustained operation of observing systems and supporting activities. In order to maximize sustainability, ICG-WIGOS recommended that the Resource Mobilization Office of the WMO Secretariat should pay appropriate attention to this critical issue when considering any donation from major development partners as investment in observing systems of WMO Members. Sustainability of such an observing system should be guaranteed by the donors.

3.3. The Team noted that the Terms of Reference of the IPET-OSDE and the OPAG-IOS Inter-Programme Expert Team on WIGOS Framework Implementation Matters (IPET-WIFI) are complementary with regard to WIGOS framework implementation.

4. WMO INTEGRATED GLOBAL OBSERVING SYSTEM (WIGOS)

4.1. WIGOS progress relevant to the activities of IPET-OSDE

4.1.1. Dr Lars Peter Riishojgaard (Secretariat) reported on the status of the WIGOS framework implementation following guidance from Cg-16, and Congress decision to implement WIGOS through Resolution 50 (Cg-16). He recalled that the Third Session of the Inter-Commission Coordination Group on the WMO Integrated Global Observing System (ICG-WIGOS), held in Geneva, 10-14 February 2014, considered the status of the most critical WIGOS Implementation Activities of the Key Activity Areas (KAA) of the WIP (v.2.0, see website⁵), Table 2, based on the evaluation of the progress provided by WIGOS-PO. In doing so, several issues and aspects were considered. The KAAs most relevant to the activities of the Team are the following:

5 http://www.wmo.int/pages/prog/www/WIGOS-WIS/meetings/ICG-WIGOS-3/Doc-5.1_Implementation-Status.doc

- KAA#3, design, planning and optimized evolution of WIGOS and its regional, sub-regional and national component observing systems,
- KAA#7, the WIGOS Operational Information Resource (WIR), which includes the Observing Systems Capability Analysis and Review Tool (OSCAR),
- KAA#9, capacity development,
- KAA#10, communications and outreach.

4.2. Guidance of ICG-WIGOS-3 to IPET-OSDE

4.2.1. The meeting identified potential activities contributing to WIGOS and reviewed relevant guidance from the third Session of the ICG-WIGOS, Geneva, Switzerland, 10-14 February 2014. In particular, the Team noted the following outcome of ICG-WIGOS-3, and agreed to take it into account in the discussions during the meeting.

RRR Process

4.2.2. ICG-WIGOS had suggested that the Rolling Requirements Review (RRR) process had been GOS/CBS-centred in the past. It invited the Team to consider how the RRR can be broadened to apply to other application areas, and on whether the existing framework of an Expert Team, Rapporteurs and regular Impact Workshops is adequate to support the broader scope of WIGOS. The Team stressed that, in the past, the RRR has been CBS-led but has extended to Application Areas beyond the scope of CBS. However, the Team agreed that the transition of the former ET-EGOS to the new IPET-OSDE as an Inter Programme Expert Team is helping to broaden access to expertise to improve the RRR process. The Team agreed that it was important to broaden the success of the RRR for applications in operational meteorology into other Application Areas, and that there is more work to do to identify applications that use observations directly (rather than as products from other Application Areas).

4.2.3. ICG-WIGOS recognized that the RRR documentation produced by the IPET-OSDE Chair had been used as a basis for the RRR related regulatory materials under development by the TT-WRM for consistency with the current RRR process and terminology. ICG-WIGOS thanked the IPET-OSDE Chair for his contribution to this work, and agreed that such material could indeed be used.

Observing System Network Design principles and guidance (see also agenda item 10)

4.2.4. The Team noted that the ICG-WIGOS agreed that the Observing System Network Design (OSND) principles drafted at IPET-OSDE1 are expected to be included in the Manual on WIGOS. Regarding the draft OSND principles themselves, ICG-WIGOS noted that that long term/medium term funding should be assured for sustained observing systems.

OSCAR (see also agenda item 7)

4.2.5. When considering the WIGOS Information Resource (WIR), ICG-WIGOS-3 stressed the importance of OSCAR in particular, and noted that the launch of the OSCAR will mark the first time that all the information regarding requirements and observing systems are available in the same place (although surface capabilities are missing for the time being).

4.2.6. ICG-WIGOS-3 noted and discussed the recent agreement to move the management of the RRR database (OSCAR⁶) from the WMO Secretariat to MeteoSwiss. The RRR databases are an important component of WIGOS and have gained enormous visibility through the excellent work of the Secretariat. They are becoming very widely used and they should be promoted as the unique repository of observation requirements. The need for a diligent and effective hand-over process from the Secretariat to MeteoSwiss was emphasized, so that the continuous further development of the databases should not be interrupted through the transition process. The RRR databases are one of the tangible and visible “successes” of WIGOS to date, and therefore continuous support must be

⁶ OSCAR: Observing Systems Capability Analysis and Review Tool – www.wmo.int/oscar

secured.

4.2.7. ICG-WIGOS-3 agreed that the OSCAR should be the repository of a sub-set of the WIGOS metadata; in particular those on observing system capabilities that are required for the RRR process, and those which are requirement for operational use such as the planned evolution of WMO No. 9, Volume A. Most of the remaining metadata will have to be collected, maintained, and archived by Members. ICG-WIGOS requested the TT-WMD to clarify what metadata shall be included in the OSCAR, and which ones shall be mandatory.

4.2.8. Noting the invitation to consider the implications of this approach for OSCAR and to make recommendations on whether or not this is a good approach, the Team agreed to discuss this under agenda item 7.2.

WIGOS Regulatory Materials

4.2.9. Based on the consideration of the individual Agenda Items, ICG-WIGOS formulated its recommendations to EC-66 (see Item 9 of the Final Report). In particular, it was recognized that WIGOS will not be fully implemented by Cg-17 in 2015, and it is proposed that the projects extends into a Pre-Operational Phase covering the 2016-2019 Financial Period. During this phase, the Guidance Material will be further developed and increased emphasis will be put on Regional and National Implementation activities.

4.2.10. The Team noted that extensive drafting efforts of the Task Team on WIGOS Regulatory Material (TT-WRM) had successfully resulted in a key milestone being achieved, that is preparation of a consolidated version of the WMO Technical Regulations (WMO-No. 49), Volume I, PART I – WIGOS, as well as the first edition of the Manual on WIGOS. Further refinement is needed (in particular the sections for Definitions, Observational Metadata, and the Space-Based Sub-system). Significant progress had been made in capturing advances of WIGOS in the Technical Regulations, while further advances that are still under development will be captured in future updates and editions.

4.2.11. ICG-WIGOS decided to adopt the plan proposed by the TT-WRM to obtain endorsement of the WIGOS relevant Technical Regulations through Presidents of Technical Commissions rather than at full sessions of all Technical Commissions, after noting that it had been explained and accepted at the PTC-2015 meeting.

4.2.12. ICG-WIGOS noted that extensive documentation and instructions on the WIGOS Operational Information Resource (WIR) and its OSCAR tool would need to be published as separate guidance material with only key points to be included in the Manual on WIGOS.

4.2.13. ICG-WIGOS noted the intention for a "thin layer" approach to the future WIGOS Guide, providing pointers to all the related information available from other sources.

WIGOS Metadata

4.2.14. Regarding classification of WIGOS metadata (as mandatory, complementary and optional), the President of the Commission for Instruments and Methods of Observation (CIMO) suggested proceeding with a two-stage process as follows: deciding on (1) what WIGOS metadata are mandatory, and (2) what more complete set of metadata relevant for climate applications shall be made available to Members.

Quality Management

4.2.15. ICG-WIGOS agreed that more dedicated work is needed to improve the current quality control and monitoring practices and procedures, including availability of monitoring results in real-time and feed-back to the data providers; the team should build on experiences and lessons learned by the Economical Interest Group (EIG) of European Meteorological Services (EUMETNET), Aircraft Meteorological Data Relay (AMDAR) and other observing systems, as well as on the relevant sections

on Quality Management (QM) in the CIMO Guide in the future. ICG-WIGOS requested its Task Team on WIGOS Quality Management (TT-WQM) to undertake specific tasks and to have a meeting in March or April 2014.

4.2.16. IPET-OSDE was invited to follow the developments around the WIGOS Quality Management framework very closely, and to make recommendations on the approach taken to monitoring and reporting of observational data quality control in particular.

Vision for the WIGOS in 2040 (see also agenda item 11.3)

4.2.17. ICG-WIGOS recommended the development of a "Vision for WIGOS in 2040" and requested CBS to lead this development, with involvement of the other Technical Commissions (TCs). The target for approval should be Cg-18 (2019), following endorsement by CBS-16 (2016). This was also discussed during the last CBS Management Group meeting in January 2014, and IPET-OSDE was requested to start discussion on this issue.

4.2.18. The Team agreed to discuss this under agenda item 11.3, with the aim of making a proposal to ICT-IO-8 that can then be taken forward to the CBS Extraordinary Session in Asunción, Paraguay from 8-12 September 2014 (CBS Ext.(2014)),

5. REVIEW OF ACTIONS FROM ET-EGOS-7

5.1. The Chair reported on progress on actions from the ET-EGOS-7. These Actions were structured as follows:

- I. RRR process – general
- II. RRR process – user requirements (URs) and SoGs
- III. RRR process – observing system capabilities
- IV. Impact studies, including Observing System Experiment (OSEs) and Observing System Simulation Experiment (OSSEs)
- V. Preparation of the new EGOS-IP
- VI. Other issues

5.2. The Team reviewed progress made against each item. It noted that most of the Actions have been completed; for the remainder, it updated them or continued them as the actions from the IPET-OSDE-1, as appropriate. These, together with additional actions decided by this meeting, are listed in **Annex II**.

5.3. The Team also reviewed the status of actions on the outstanding issues concerning the RRR Database under agenda item 7.1.1.

6. REVIEW OF OTHER ACTIVITIES RELATED TO IPET-OSDE AND OPAG-IO

The Team was informed by designated experts and the WMO Secretariat on the activities within WMO and other international programmes / projects relevant to the OPAG-IO and IPET-OSDE.

6.1. Update on GCW activities

6.1.1. Dr Jeff Key (USA) reported via teleconference on the WMO Polar activities, and the development of the Global Cryosphere Watch (GCW), which is planned to provide an integrated, authoritative, continuing assessment of the cryosphere.

6.1.2. He described the GCW working structure, which is composed of the GCW Steering Group (GSG) and six Task Teams. In particular, the CryoNet Team, and the Requirements and Capabilities Team are particularly relevant to the activities of the IPET-OSDE, and have been activated.

6.1.3. The GSG currently reports to the WMO Executive Council through the Panel of Experts on Polar Observations, Research and Services (EC-PORS) and provides recommendations for GCW development and implementation for consideration by the WMO Executive Council and the WMO Congress. Regional groups are also formed where it fosters multi-national collaboration between Members with interests in the same region, e.g. in Asia for Third Pole issues and for the pan-Arctic for high latitude northern issues.

6.1.4. The Team noted that the GCW Implementation Plan (GCW-IP⁷), which includes key implementation tasks and activities to be performed by various teams. The need to develop metrics of success was recognized as an important element in developing GCW, CryoNet and its other activities.

6.1.5. One of the immediate priorities in GCW development and implementation is to establish the core network of GCW surface measurement sites, CryoNet, covering all components of the cryosphere (glaciers, ice shelves, ice sheets, snow, permafrost, sea ice, river/lake ice) through an extensive approach of in-situ observations. CryoNet is one part of the whole GCW observing system, which is, in turn, a component observing system of the WIGOS. CryoNet will initially be comprised of existing stations/sites, rather than creating new sites.

6.1.6. The Team noted the development aims of the Cryonet with respect to the GCW Implementation Plan, i.e. (i) extensive monitoring of cryosphere through harmonized measurements; (ii) providing cryospheric-data for improved process understanding and modelling; (iii) providing calibration and validation data for satellite data; (iv) linking cryospheric ground truth observations to cryospheric models; (v) training for cryospheric observations; and (vi) standardized guidelines for cryospheric observations.

6.1.7. Based on its general objectives, three highly interlinked core tasks of activity are relevant for CryoNet: (i) observations, (ii) coordination and capacity building, and (iii) service. Observations will be providing essential cryospheric variables from existing cryospheric observational networks (such as the Global Terrestrial Network for Permafrost (GTN-P), national networks (PROMICE⁸, GC-Net⁹, etc.)) and potential new networks in standardized and traceable format for the GCW data portal which will be the link to the various users of CryoNet data.

6.1.8. To meet different user-needs and because of the spatially distributed nature of different components of the cryosphere, the CryoNet network of in-situ observations is structured into three different classes of sites, e.g. Baseline, Reference and Integrated sites. All classes of sites make measurements according to standardized methods and best practices.

6.1.9. The Team noted with appreciation that GCW observational requirements are being formulated. They will draw from various sets of existing user requirements and will be vetted by the scientific community. They will become part of the WMO Rolling Review of Requirements (RRR) and will be accessible through the Observing Systems Capability Analysis and Review Tool (OSCAR¹⁰), the official source for WMO requirements, which has a cryosphere theme¹¹. The Integrated Global Observing Strategy (IGOS) Cryosphere Theme Report¹² contains the most comprehensive set of observational capabilities and requirements for the cryosphere. The GCW Requirements and Capabilities Team will ensure the coordination with the OSCAR database. See the GCW website¹³ for a compilation of IGOS Cryosphere Theme and OSCAR observational requirements.

6.1.10. The Team also noted that a CryoNet design has to be developed in order to define all specific elements of the network (e.g. a site should be defined by a polygon which could include either a baseline or an integrated station; density of stations; spatial distribution (X, Y and Z) etc.). Those

7 http://www.wmo.int/pages/prog/www/polar/GCW/GCW_IP_v1.3.pdf

8 Programme for Monitoring of the Greenland Ice sheet

9 Greenland Climate Network

10 <http://www.wmo.int/oscar>

11 <http://www.wmo-sat.info/oscar/themes/view/5>

12 http://globalcryospherewatch.org/reference/documents/files/igos_cryosphere_report.pdf

13 http://globalcryospherewatch.org/reference/obs_requirements.php

specifications will be identified and compiled in a technical document (e.g. Principles of Design for CryoNet). CryoNet should be composed not only of operational observation sites but also include experimental observation sites with specific information on the experiment conducted. Data policy should also be included in the site inclusion requirements. A design feature for reference and integrated sites should be developed to allow calibration and validation studies.

6.1.11. See also agenda item 7.3.3 for the section related to Polar Meteorology and the GCW.

6.2. Update on GFCS activities relevant to observing systems

6.2.1. Veronica Grasso (Secretariat) reported on latest developments with regard to the Global Framework for Climate Services (GFCS). It was recalled that the GFCS was established with the aim 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.

6.2.2. Ms Grasso recalled that the GFCS identified four initial priority areas; agriculture and food security, water, health and disaster risk reduction. To ensure that the entire value chain for the production and application of climate services is effectively addressed in support of effective decision-making in the four priority areas the GFCS is built on five interrelated components or pillars: (1) the User Interface Platform; (2) the Climate Services Information System; (3) Observations and Monitoring; (4) Research, Modelling and Prediction; and (5) Capacity Development.

6.2.3. The Team noted the outcome of the first session of the Intergovernmental Board on Climate Services (IBCS-1¹⁴), which was held in Geneva from 1-5 July 2013. IBSC-1 particularly approved the Implementation Plan of the GFCS and a Compendium of initial GFCS projects for immediate implementation, established a stakeholder engagement mechanism, elected its Chair and vice-Chairs, and selected the Members forming the Management Committee of the Board.

6.2.4. The Team noted that, with the approval of the Implementation Plan and its governance structure, the GFCS has entered into an implementation phase. 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 website¹⁵). These consultations are allowing 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. They are also facilitating the identification of critical elements that are supporting the development of guidelines for the establishment of frameworks for climate services at national level.

6.2.5. With respect to observations, major gaps identified through extensive consultations that preceded the development of the GFCS relate to inadequate systematic gathering of high quality data with the required spatial density and temporal frequency using standardized, well maintained instruments with standardized and sustained observing practices and the exchange and sharing of as much of this data as is needed for the development of effective climate services. In addition, the use of Quality Management Framework approach based on standards and agreed regulation at national level, particularly in developing countries where capacities are limited was seen as a major gap. The specific gaps identified through the consultative process that underpinned the development of the Implementation Plan of the GFCS and its Annex on Observations and Monitoring are discussed in agenda item 7.3.4.

6.2.6. It was also noted that, to improve data access and application, data rescue activities are

¹⁴ http://library.wmo.int/opac/index.php?lvl=notice_display&id=15878

¹⁵ <http://gfcs.wmo.int/events>

underway in five countries in West Africa as part of the West Africa Climate Assessment and Data Rescue (WACA-DARE) and in the Pacific Islands as part of a project supported by Australia.

6.2.7. Finally, the Team noted that GCOS organized, in February 2013, a workshop on Observations for Adaptation to Climate Variability and Change, which considered observation requirements for adaptation, linking these with the needs of the GFCS. The workshop was aligned with the implementation plan of the GFCS in that it addressed the requirements of the priority areas of the GFCS (agriculture and food security, water, health and disaster risk reduction) as well as data rescue, data management and observations for research, modelling and assessment that are highly relevant to the User Interface Platform and the Research, Modelling and Prediction pillars of the GFCS.

6.2.8 The Team agreed that, in taking forward the observational requirements of and perceived gaps identified by GFCS, the relationships between GCOS and the GFCS need to be fully understood, and looked forward to the discussions under item 7.3 (see 7.3.2.52 to 7.3.2.55, and 7.3.3.5 to 7.3.3.9).

6.3. Update on the Architecture for Climate Monitoring from Space

6.3.1. Dr Wenjian Zhang (Secretariat) reported on latest developments with regard to the Architecture for Climate Monitoring from Space.

6.3.2. The Team recalled that through Resolution 19¹⁶ (Cg-16), WMO decided that an architecture be developed to provide a framework for the sustained and coordinated monitoring of the Earth's climate from space, and that the development be undertaken as a major initiative of the WMO Space Programme, as an important component of WIGOS, with the support of relevant technical commissions, and in coordination with satellite operators, the Committee on Earth Observation Satellites (CEOS), the Coordination Group for Meteorological Satellites (CGMS), the Global Climate Observing system (GCOS), the Group on Earth Observation (GEO) and the WMO-IOC-ICSU World Climate Research Programme (WCRP).

6.3.3. The Team noted that the first action in this framework was completed by an *ad hoc* group composed of WMO, CEOS and CGMS representatives in developing a Strategy towards an "Architecture for Climate Monitoring from Space"¹⁷, which was published in February 2013.

6.3.4. The Team also noted that an inventory of climate data sets related to the GCOS Essential Climate Variables (ECV) was then initiated. This ECV inventory is available on line and contains over 200 datasets related to a number of ECV in the atmospheric, oceanic or terrestrial domain.

6.3.5. At the 41st meeting of CGMS held in Tsukuba, Japan in July 2013, the WMO Secretariat presented a mapping of the ECV product sources which showed that most of the registered ECV data sets were relying on satellite missions identified by CGMS as part of the "CGMS Baseline". The CGMS recognized that its long-term plans summarized in the "CGMS Baseline" could be a foundation for the climate monitoring architecture and took action to review this baseline and to "define a list of Fundamental Climate Data Records (FCDRs) that CGMS members would commit to provide on a sustained basis, building on the CGMS Baseline". It was furthermore proposed "to establish an inventory of FCDRs in addition to, and in consistency with, the ECV product inventory". The FCDRs are data sets related to a sensor, or a series of comparable sensors, and their planning is directly resulting of the long-term satellite mission plans.

6.3.6. The Team noted that in response to CGMS, WMO has performed, with the OPAG-IOE Expert-Team on Satellite Systems (ET-SAT) guidance, an analysis of all the missions planned in the CGMS Baseline, as a first step towards an inventory of planned FCDRs. The study specifies for each mission which FCDRs they have the potential to generate, for which ECV, in which time frame, and with which degree of relevance. The study analyzes 39 ECV observable from space, involving 173 types of FCDRs, 275 classes of sensors able to produce these FCDRs, which leads to a total of

16 http://www.wmo.int/pages/prog/sat/documents/SAT-GEN_ST-13-Climate-space-monitoring-architecture-Res19-Cg16.pdf

17 http://www.wmo.int/pages/prog/sat/documents/ARCH_strategy-climate-architecture-space.pdf

around 2500 records where each record identifies a particular FCDR from a given sensor on a given satellite and supporting a given ECV.

6.3.7. As a further contribution to the analysis of the architecture, WMO initiated an action, involving the OPAG-IOS Expert Team on Satellite Utilization and Products (ET-SUP), to identify end user requirements for climate services and infer the satellite-based product requirements and specifications. Requirements are analyzed in particular in some of the GFCS priority areas. The aim of this action is to highlight possible gaps in terms of products and underpinning data sets that may not be included in the GCOS list of ECVs.

6.3.8. The Team noted that in order to formalize their collaboration on the development of the architecture, CEOS and CGMS decided to establish a Joint Working Group on Climate (JWGC). WMO, being an active member of CGMS and an associate member of CEOS, is a full member of the JWGC. In practice, the JWGC is a continuation of the earlier CEOS Working Group on Climate (WGC).

6.3.9. It was also noted that a first meeting of the JWGC (or fourth meeting of the CEOS WGC) (Darmstadt, Germany, 5 - 7 March 2014) reviewed and improved the ECV inventory.

6.3.10. WMO indicated the ongoing actions related to end user requirement analysis and introduced the study performed on FCDRs. At this stage there is no clear indication, however, that the "Joint Working Group on Climate" will be able to address these issues that are beyond those initially defined by the former CEOS Working Group on Climate.

6.3.11. In the terms of reference of this JWGC, the emphasis is on maximizing the use of existing observation data sets to generate climate data records, rather than on planning satellite missions able to acquire the required observations. Both objectives are equally important. The understanding of WMO is that the scope of the climate monitoring architecture cannot be limited to organizing the processing of observation data, but should include a high-level observing system design, including identification of sensor types, processes and respective roles of agencies and international coordination mechanisms.

6.3.12. The Team noted with appreciation that significant effort has been made on the analysis of the FCDRs potentially available from CGMS Baseline missions, on one hand, and on the inventory of ECV products, on the other hand. The way forward towards defining the Architecture for Climate Monitoring from Space, from both a logical and a physical perspective, remains under discussion.

6.4. Post-AMMA activities

6.4.1. Dr Doug Parker (United Kingdom) reported on post African Monsoon Multidisciplinary Analyses (AMMA) activities.

6.4.2. He recalled that AMMA had goals: (i) to improve our understanding of the West African Monsoon and its influence on the physical, chemical and biological environment, regionally and globally; (ii) to provide the underpinning science that relates variability of the West African monsoon (WAM) to issues of health, water resources, food security and demography for West African nations and defining and implementing relevant monitoring and prediction strategies; and (iii) to ensure that the multidisciplinary research carried out in AMMA is effectively integrated with prediction and decision making activity.

6.4.3. AMMA was also successful in establishing a much enhanced observational network over West Africa. This included the reactivation and expansion of the radiosonde network in the region. Lessons learnt during AMMA have significance for the upper-air network in WMO Region I, and probably more generally for sustaining and improving observation networks in the context of WIGOS.

6.4.4. The Team recalled that the AMMA radiosonde programme and its implications for future

observations have been documented by Parker et al. (2008) (available as background document no.2 on the IPET-OSDE1 webpage¹⁸). The AMMA observing network contribution to GCOS was also documented in a paper for the GCOS Steering Group in 2009 (available as background document no.3 on the IPET-OSDE1 webpage¹⁹). In addition, former members of the AMMA TT1 Radiosonde Coordination Group met at the International AMMA Conference in 2012 and produced a Recommendation for international coordination and implementation of support for the West African upper air network (see Appendix A of IPET-OSDE-1 doc 6.4²⁰).

6.4.5. The Team noted that, in the context of the work of IPET-OSDE and of WIGOS, the experiences of the AMMA observation network are interesting in several respects: (i) they show how it is possible to make substantial improvements to an observational network in a group of developing countries with an input of resources which (at least by the standards of developed countries) is comparatively modest; (ii) they show the importance of providing support and coordination, and of the effectiveness of appropriate support; (iii) they show the dangers of withdrawing coordination and support, in terms of the subsequent degradation of the network; and (iv) they provide a very good illustration of the type of problems that WIGOS is attempting to solve.

6.4.6. The Team noted a proposal to be discussed under agenda item 9.4.2 for improving support for EGOS-IP implementation activities (mainly in developing countries) through a new structure whereby those responsible for maintaining and implementing observing systems can be linked with centres of expertise for advice and support. The evidence from AMMA shows how such a mechanism might work in practice to address the specific problems that arise in West Africa. The Team noted that the WMO Voluntary Cooperation Programme (VCP) and the GCOS funding mechanism can be used, although it is more difficult to use them for the longer term.

6.4.7. The Team agreed on the importance of having impact study results for tropical region in RA-I in order to improve engagement with the relevant countries.

6.4.8. The Team noted that new quantity and quality monitoring tools are planned under WIGOS, and these should help better to identify problems and to find ways to address them. Substantial improvements should be possible with relatively small investments. The Team agreed that efforts should be made through ICG-WIGOS and appropriate Teams to identify more precisely what is needed in order to achieve those improvements. IPET-OSDE is ready to assist if needed.

7. ROLLING REVIEW OF REQUIREMENTS AND STATEMENTS OF GUIDANCE

The Secretariat recalled the concept and structure of WMO database of observational user requirements²¹ and of observing system capabilities, which is now called the Observing System Capability Analysis and Review Tool (OSCAR²²) and its on-going updating process in the context of RRR. The Team recalled that OSCAR is a key element of the RRR process, which is planned to play a crucial role within WIGOS. OSCAR is also one of the components²³ of the WIGOS Operational Information Resource (WIR).

7.1. Review database of User Requirements (OSCAR/Requirements)

7.1.1. The Meeting reviewed progress regarding the operations, maintenance and further development of the WMO database of observational user requirements, included as OSCAR/Requirements into OSCAR. The Team recalled that OSCAR/Requirements has been operationally available on line since 2011 and is now widely used.

18 http://www.wmo.int/pages/prog/www/OSY/Meetings/IPET-OSDE1/documents/parker_etal_2008_amma_sondes.pdf

19 http://www.wmo.int/pages/prog/www/OSY/Meetings/IPET-OSDE1/documents/07_5_AMMA_Contribution_to_GCOS.pdf

20 <http://www.wmo.int/pages/prog/www/OSY/Meetings/IPET-OSDE1/documents/IPET-OSDE1-Doc-6.4-Post-AMMA-activities.pdf>

21 User requirements refer to the observational data requirements for the Application Areas identified in the Rolling Review of Requirements.

22 <http://www.wmo.int/oscar>

23 The 3 components of the WIR are (i) the Portal – www.wmo.int/wigos/wir (ii) the SORT (under development), and (iii) OSCAR

7.1.2. The Team noted the following changes since ET-EGOS-7:

- Paolo Ambrosetti (Switzerland) was nominated as contact point for Nowcasting and Very Short Range forecasting. He completed a thorough update of the requirements of this Application Area.
- The Application Areas GOOS²⁴ and Marine Biology and their requirements were removed from OSCAR in January 2014, after the GOOS project office indicated that they were not in a position to update these requirements in a foreseeable time frame.
- Ms Guimei Liu (China) was nominated as contact for Ocean Applications.
- The point of contact for Hydrology has retired in January and no successor has yet been notified to the Secretariat.

7.1.3. With regard to the status of observational user requirements in the database, the Team noted the following:

- The requirements of Nowcasting and Very Short Range Forecasting (NVS RF), High Resolution Numerical Weather Prediction (NWP) (HRNWP), Global NWP (GNWP), Ocean applications and Space Weather were updated very recently or recent years by the respective points of contacts;
- Most of the WCRP and Atmospheric Chemistry requirements have not been updated since more than 12 years;
- The requirements of Aeronautical Meteorology, Agricultural Meteorology and Hydrology are still to be completed and updated.

7.1.4. The Team also noted with appreciation that the following developments were made to OSCAR/Requirements in 2013 in response to ET-EGOS-7 recommendations²⁵ and user feedback:

- The concept of “layer” has been clarified. The geographical domain of applicability of a requirement is now characterized by two attributes: “Layer” and “Coverage”;
- Regional requirements can now be recorded in OSCAR in specifying a particular WMO Region as the “Coverage”;
- Upon request of GCOS, an optional field has been created to record the stability over a decade. The unit can be specified for this stability. This new functionality has not been used yet by any Application Area;
- For easy reference and filtering, the Variables are classified into large Domains (Atmosphere, Ocean, Terrestrial, Outer space) and Sub-domains (e.g. Clouds and precipitations, Sea ice, Land surface, space energetic particles). It is also possible to “tag” any variable with one or more cross-cutting Theme such as e.g. Cryosphere, Volcanoes, Tropical meteorology. This provides the means to filter the requirements along an additional criterion which is cross-cutting to the Domains or Sub-domains and cross-cutting to the Application Areas. In particular, this addresses the ET-EGOS request to identify the “Cryosphere” requirements without identifying “Cryosphere” as a specific Application Area. When “Cryosphere” is selected in the list of “Themes”, OSCAR displays the requirements related to “Cryosphere” variables, from any Application Areas.
- The editor’s interface has been improved (e.g. simplified workflow for the contact points; entering only once a requirement applicable to multiple layers; possibility to email the contact points), additional help included, and user manuals updated.

7.1.5. The Team noted the updating and maintenance procedure of the OSCAR Space capabilities module, which was developed and endorsed by ET-SAT. The Team concurred with the OSCAR/Space part of the procedure, and approved the proposed revision of this procedure for the OSCAR/Requirements part. The procedure is provided in **Annex X**.

7.1.6. The Team agreed that OSCAR/Requirements should be further promoted as the unique

²⁴ GOOS: IOC-WMO-UNEP-ICSU Global Ocean Observing System

²⁵ See Annex IX of ET-EGOS-7 Final Report, Outstanding issues concerning the RRR Database, and their status in IPET-OSDE1 document No. 5, Appendix B.

repository of observations requirements from WMO. Therefore efforts should continue to update requirements for Application Areas that have only been marginally addressed so far, such as agricultural meteorology, hydrology, aeronautical meteorology, or to include new requirements for example Cryosphere Theme direct requirements that may arise from the activities proposed under the GCW recommendations detailed in paragraph 7.3.3.12.

7.1.6.1. Action: Secretariat to review relevant RRR documentation on the website, and make the definition of the breakthrough consistent (deadline: ASAP).

7.1.6.2. Action: GCOS to better define the stability criterion (deadline: July 2014).

7.1.6.3. Action: GCOS to document the stability requirements for climate monitoring (deadline: July 2014).

7.1.6.4. Action: Secretariat through OSD, to manage the OSCAR/Requirements database according to a well-defined procedure, in a coherent and sustained manner (ongoing).

7.1.6.5. Action: Secretariat to ensure that there is an annual review of the user requirements by the Points of Contact (Ongoing).

7.1.6.6. Action: IPET-OSDE Chair to write to the Point of Contacts (PoCs) and remind them about their role, and thank them for their contributions (deadline: ASAP).

7.1.6.7. Action: All PoCs References to the sources of requirements (documents, papers) should be provided in the "Source" field of OSCAR/Requirement, where available (with assistance from the Secretariat) (ongoing).

7.2. Review database of Observing System Capabilities (OSCAR/Space & OSCAR/Surface)

7.2.1. The Meeting reviewed the status of the observing system capabilities part of OSCAR.

Space-based capabilities

7.2.2. Dr Stefan Bojinski (Secretariat) reported on the status of the space-based observing system capabilities part of OSCAR (OSCAR/Space²⁶), which contains an inventory of satellite instruments, missions and programmes, and an assessment of the variables that the instruments have the potential to measure. The Team recalled that OSCAR/Space is operationally available on line since September 2012, and now consulted by users worldwide (>150 visits a day). OSCAR/Space currently records references of 852 instruments, including 535 for Earth Observation, 267 for space weather, and 50 for other purposes such as positioning, data collection and search and rescue.

7.2.3. In OSCAR/Space, a complete overhaul of Earth Observation instrument assessments was performed, as well as an initial assessment of more than 200 space weather instruments.

7.2.4. The Team noted that the most original information provided by OSCAR/Space for each instrument, which is also the biggest challenge, is the correspondence established between instruments and the variables they can potentially measure. For each instrument, OSCAR provides a "Tentative evaluation of measurements", which lists the variables that can **typically** be retrieved from instruments of the same category, with a gross ranking into five levels. Reciprocally, for each variable, the "Gap Analysis" view of OSCAR provides a list of instruments that are **potentially** relevant to measure the said variable.

7.2.5. The Team noted that although this correspondence between instruments and variables is based on objective criteria, i.e. the main design characteristics of the instrument, it can only be an approximate correspondence which does not replace a detailed assessment and gap analysis. The

26 <http://www.wmo.int/oscar/space>

reasons for that were noted by the Team, and it agreed that the “Gap Analysis” in OSCAR must be understood as a “short list” of instruments that can be used as a starting point for a detailed evaluation.

7.2.6. In order to support the Rolling Review of Requirements, OSCAR/Space provides also a comparison of the actual or planned capabilities with the capabilities expected in the Vision of the GOS. This analysis is normally kept under review by the ET-SAT and updated on a yearly basis.

7.2.7. The evaluation of instruments which is the basis for the “Gap Analysis” is currently done manually by an expert for each instrument. The feasibility of an automatic assessment of the compliance with the requirements has been investigated. However, the Team noted that a meaningful classification algorithm would require entering massive amounts of performance parameters for each instrument as an input, which did not appear a sustainable approach.

7.2.8. Dr Bojinski, also reported on the following developments currently under consideration, while noting that these developments have been put on hold because of the absence of the OSCAR developer and the plan to migrate OSCAR to MeteoSwiss:

- Extending the current data model to add links to data access information, links to calibration information, and instrument status information.
- It is also envisaged to replace the current evaluation of instrument classes by a more flexible scheme.

Surface-based capabilities and evolution of OSCAR

7.2.9. Mr Etienne Charpentier (Secretariat) reported on the status of the evolution of OSCAR, including the development of the Surface-Based Observing System Capabilities part of OSCAR (OSCAR/Surface).

7.2.10. The Team noted with appreciation that the WMO Secretariat has engaged negotiations with MeteoSwiss in order to rewrite OSCAR and operate it in the MeteoSwiss IT infrastructure, to develop the surface module, and to establish a long term partnership for the OSCAR Platform operations and maintenance. The negotiations with MeteoSwiss have been successful and a Memorandum of Understanding (MoU) signed by both parties. The MoU clarifies the roles and responsibilities of the WMO Secretariat, and MeteoSwiss. In particular, the Team noted with concurrence that (i) the WMO will continue to specify the functional requirements, and control the content of the database, and (ii) plans are to ensure the operational continuity and further development of the OSCAR. The necessary developments will be undertaken in two phases:

- Phase 1 (By Cg-17, May 2015):
 - Adapting OSCAR/Requirements for operation in the MeteoSwiss environment (this module will continue to operate at Infomaniak during this phase in order to assure its linkage with OSCAR/Space which will remain at the WMO Secretariat initially)
 - Developing OSCAR/Surface for basic observing network types (see list in the Appendix A)
 - Developing a critical review (analysis) module
- Phase 2 (by 2017):
 - Adapting OSCAR/Space to the MeteoSwiss environment
 - Complementing OSCAR/Surface with the missing observing network types (see list in the Appendix A)
 - Integrating the Space and Surface into the critical review module

7.2.11. The Team agreed that OSCAR was not only critical for the RRR but also one of the tangible and visible “successes” of WIGOS to date, and therefore it is critical that we continue to assure continuity and operations, and the continuous support must be secured.

7.2.12. The Team noted that pending full implementation of OSCAR at MeteoSwiss, no development is envisaged on OSCAR/Requirements and OSCAR/Space that is running at the WMO Secretariat.

7.2.13. The Team thanked Germany for providing a JPO who helped to develop OSCAR until now, Switzerland for investing substantial resources into the migration of OSCAR and the development of OSCAR/Surface, and the Secretariat for their contributions in the past and future developments of OSCAR.

7.2.14. The Team noted that NASA is developing a database of *in situ* systems contributing to ECVs, and agreed that this database could potentially contribute to OSCAR/Surface.

7.2.14.1. Action: Secretariat to investigate how the new NASA database of in situ systems contributing to ECVs could contribute to OSCAR/Surface (deadline: end 2014).

7.2.14.2. Action: Secretariat to investigate the implementation of the surface-based observing capabilities within the RRR process in the early stage of the RRR development (ET-ODRRGOS²⁷) (deadline: end 2014).

7.2.15. The Team recalled that OSCAR/Space also includes future capabilities, and agreed that it would be useful if OSCAR/Surface could also include future capabilities for the surface-based observing systems.

7.2.16. The Team agreed that quality control of the database content was important, and that sufficient resources should be provided by the Secretariat to this activity.

7.2.17. The Team discussed ownership, overall coordination mechanisms, as well as reporting requirements concerning the development and operations of OSCAR. The Team agreed to propose the following split of responsibilities to the ICT-IOS for its consideration and further submission to the CBS and other appropriate bodies such as the ICG-WIGOS:

WMO Group or Team	Role	Reporting to
ICG-WIGOS	High level guidance	EC/Cg
ICG-WIGOS TT-WMD ²⁸	Definition of WIGOS core metadata	ICG-WIGOS
ICG-WIGOS TT-WRM	Related Regulatory Materials	ICG-WIGOS
ICG-WIGOS TT-WQM	Related quality management	
ICT-IOS	Owner	ICG-WIGOS
IPET-WIFI	1) Overall coordination and leadership at the technical level 2) Regulatory Materials and metadata required in liaison with ICG-WIGOS and its dedicated Task Teams	ICT-IOS
IPET-OSDE	1) Functional requirements with regard to the tools required for the RRR process 2) Review content required for the RRR process	IPET-WIFI
ET-SAT ²⁹	1) Space-based observing systems capabilities	IPET-WIFI
ET-ABO ³⁰	Aircraft-based observing systems capabilities	IPET-WIFI
ET-SBO ³¹	Surface-based observing	IPET-WIFI

27 Former OPAG-IOS Expert Team on Observational Data Requirements and Redesign of the Global Observing System

28 ICG-WIGOS Task Team on WIGOS Metadata

29 ET-SUP and IPET-OSDE have a role of reviewing OSCAR content proposed by ET-SAT

30 OPAG-IOS Expert Team on Aircraft-Based Observing Systems

31 OPAG-IOS Expert Team on Surface-Based Observing Systems

	systems capabilities	
CIMO	Surface-based observing systems ³² , and Instrument metadata	ICG-WIGOS
JCOMM OCG ³³	Ocean observing systems capabilities	IPET-WIFI

Table 1: Proposed split of responsibilities regarding OSCAR

7.2.18. The Team reviewed the role and responsibilities of the WMO with regard to OSCAR project development and long term maintenance and operations as foreseen in the MoU with MeteoSwiss, and agreed to recommend the following reporting mechanism to the ICT-IOS (Tables 2 and 3 below):

Role and responsibility	Reporting to	IPET-OSDE comment
Collaborate with MeteoSwiss in further specifying the project goals and functional requirements of OSCAR (lead: WMO)	IPET-WIFI	
Provide human resources, including project lead and requirements engineer, in support of the project;	WMO Secretariat	
Establish the necessary conditions and WMO-internal support for the migration of the "Requirements", "Space" and "Vol. A" components of OSCAR to MeteoSwiss;	IPET-WIFI	Quality should be maintained during migration.
Establish agreements with the data owners and/or operators of external data sources regarding operational delivery of metadata needed for OSCAR	IPET-WIFI	
Inform MeteoSwiss on milestones achieved and major deviations from the project plan	WMO Secretariat	

Table 2: WMO responsibility and proposed reporting mechanisms for the OSCAR project development

Role and responsibility	Reporting to	IPET-OSDE comment
WMO shall seek contributions from WMO Members to the WIGOS Trust Fund for OSCAR; such contributions shall then be earmarked to OSCAR	ICG-WIGOS	
WMO shall establish a line item into the WIGOS Trust fund dedicated to the operations, maintenance, and future evolutions of OSCAR.	ICG-WIGOS	
Recognizing that the cost of operating, maintaining, and evolving OSCAR will	WMO Secretariat	

³² E.g. CIMO Guide Annex 1.D contains for each variable a column with the required uncertainty and a column with "Achievable measurement uncertainty"

³³ JCOMM Observations Coordination Group

be directly supported by MeteoSwiss, the WMO shall contribute financially to such cost through a contract to be established with MeteoSwiss in due course		
Maintain the content of the OSCAR system [overall data owner] and provide human resources for quality monitoring of the system, coordination with Members contributing information to the system, reporting, and liaison with MeteoSwiss regarding maintenance, and future evolutions of the system	IPET-WIFI in consultation with IPET-OSDE	
Ensure the cooperation of the external (machine-to-machine) data providers	WMO Secretariat	
Propose future evolutions of the system	IPET-WIFI	
Inform MeteoSwiss on any issues concerning this collaboration	WMO Secretariat	

Table 3: WMO responsibility and proposed reporting mechanisms for the long term maintenance and operations of OSCAR

7.2.18.1. **Action:** IPET-OSDE Chair to propose the split of responsibilities regarding OSCAR (Table 1), as well as the WMO responsibility and proposed reporting mechanisms for the OSCAR project development (Table 2) and long term maintenance and operations of OSCAR (Table 3) to the ICT-IOIS for its consideration) (deadline: April 2014).

7.2.19. Finally, the Team agreed that it was important to assure consistency with regard to the terminology used across the RRR process and in particular in OSCAR. The Team agreed that in the preparation of OSCAR/Surface, a clear identification of station type should be defined in a matrix form according to (i) technology, and (ii) application areas (to be filled/completed by PoC).

7.2.19.1. **Action:** All PoCs to check if the list of station (and platform) types is complete or needs to be updated (deadline: June 2014).

7.2.19.2. **Action:** Secretariat to add a column for application areas in the list of station (and platform) types, and to invite the PoCs to review and update it (deadline: July 2014).

7.3. Statements of Guidance (SoGs)

7.3.1. Overview of status

7.3.1.1. The IPET-OSDE Chair recalled that the SoG is a gap analysis and is meant to help CBS formulate plans to address gaps in the observing system with respect to user requirements. Recommendations derived from these gap analyses eventually go into the Implementation Plan and the Vision for the GOS. The RRR process informs the Points of Contact (PoCs) of all WMO Application Areas (and indirectly all Members, WMO constituent bodies, WMO Programmes and co-sponsored Programmes) on the extent to which their requirements are met by present systems, will be met by planned systems, or would be met by proposed systems. This would also allow Members, WMO constituent bodies, WMO Programmes and co-sponsored Programmes, to check whether their requirements have been correctly interpreted and update them through the relevant POC according to the RRR process. The procedure agreed by the Team for update, validation and approval of SoGs is provided in **Annex VI**.

7.3.1.2. The Team noted that, following ET-EGOS-7 recommendations and further guidance from the Chair, some of SoGs have been updated during the last intersessional period. The Team reviewed available updates on individual SoGs as provided by the PoCs. Current status of SoGs is summarized

in **Annex VII**.

7.3.1.3. The Team recommended that the Points of Contact use the template of Statements of Guidance as provided in **Annex XI**.

7.3.1.4. **Action:** Points of Contact to update their SoG to be consistent with the agreed template (deadline: IPET-OSDE-2).

7.3.1.5. The Team recalled the definition of an Application Area, i.e. an activity involving primary use of observations, in a chain of activities which allow National Meteorological Services or other organizations to render services contributing to public safety, socio-economic well-being and development in their respective countries, in a specific domain related to weather, climate and water. The concept of a WMO Application Area is used in the framework of the WMO Rolling Review of Requirements (RRR) and describes a homogeneous activity for which it is possible to compile a consistent set of observational user requirements agreed by community experts working operationally in this area.

7.3.2. Consider newly revised SoGs

7.3.2.1. The Meeting reviewed available updates on individual SoGs as provided by the nominated Point of Contacts within specific application areas.

Global Numerical Weather Prediction (GNWP)

7.3.2.2. The Team reviewed the SoG for GNWP as provided by the Point of Contact, Erik Andersson (ECMWF³⁴). The Team noted that the new version proposed is taking into account recent changes in the global observing systems, and the increased importance of coupled assimilation with ocean and land surfaces. The PoC has involved experts on satellite data assimilation, conventional data and ocean analysis in preparing this update. The SoG has also been updated to take into account most of the recommendations from ET-EGOS-7, in particular with regard to the comments by the OceanObs'09 review team. However, it was noted that the THORPEX³⁵ Data Assimilation and Observing Systems working group (DAOS) produced a summary statement about the impact of targeted observations, which includes a sentence indicating the targeted dropsondes and rapid-scan Atmospheric Motion Vectors (AMVs) have a significant impact on the forecast of tropical cyclones; such a sentence still remains to be added to the SoG.

7.3.2.3. **Action:** PoC for GNWP to update the SoG for GNWP to reflect impact of targeted dropsondes and rapid-scan AMVs on the forecast of tropical cyclones (deadline: April 2014).

7.3.2.4. **Action:** IPET-OSDE members to review the SoG for GNWP and provide feedback to the Chair (deadline: May 2014).

7.3.2.5. **Action:** IPET-OSDE Chair to review the SoG for GNWP, and possibly approve it (deadline: June 2014).

High Resolution Numerical Weather Prediction (HRNWP)

7.3.2.6. The Team reviewed the SoG for HRNWP as provided by the Point of Contact, Thibaut Montmerle (France). The Team noted that the PoC reviewed the SoG in March 2014. He essentially added MODE-S observations that provide information on wind, and eventually on temperature, at the airplane location. Some recent work, performed in particular at KNMI³⁶, has shown that this new type of AMDAR-like observation is worth considering in the future. The PoC has also made some minor modifications to the observational user requirements in OSCAR, mainly for reducing uncertainties and

³⁴ European Centre for Medium-Range Weather Forecast

³⁵ Observing System Research and Predictability Experiment

³⁶ Royal Netherlands Meteorological Institute

spatial resolutions which were found a bit too large with hindsight.

7.3.2.7. Action: IPET-OSDE members to review the SoG for HRNWP and provide feedback to the Chair (deadline: May 2014).

7.3.2.8. Action: IPET-OSDE Chair to review the SoG for HRNWP, and possibly approve it (deadline: June 2014).

Aeronautical Meteorology

7.3.2.9. The Team reviewed the SoG for Aeronautical Meteorology as provided by the Point of Contact Jitze van der Meulen (the Netherlands). The Team noted that, as of May 2012, a significant number of comments and suggestions from various experts (CAeM³⁷, Volcanic Ash, EUMETNET) were received to update the SoG. Valuable changes are made because of significant progress in technologies used for observations. A significant modification concerning Volcanic Ash has been made, largely because of the introduction of new applications based on satellite data. Also, the item on Space Weather was updated after the introduction of this new Application Area.

7.3.2.10. The database (OSCAR) was updated as well. However, for a large number of variables, the requirements are indicated as 'to be defined (TBD)' or 'tentative'. Consultation with experts in aerometeorology needs to be carried out to obtain objective figures on firm uncertainty requirements, time intervals and coverage.

7.3.2.11. Action: PoC for Aeronautical Meteorology to invite CAEM to consider updating Technical Note No. 195 (WMO No. 770), Methods of Interpreting NWP output for Aeronautical Meteorology, which is outdated (deadline: July 2014).

7.3.2.12. Action: IPET-OSDE members to review the SoG for Aeronautical Meteorology and provide feedback to the Chair (deadline: May 2014).

7.3.2.13. Action: IPET-OSDE Chair to review the SoG for Aeronautical Meteorology (deadline: June 2014).

Nowcasting and Very Short Range Forecasting (NVSRF)

7.3.2.14. The Team reviewed the SoG for Nowcasting and Very Short Range Forecasting (NVRSF) as provided by the Point of Contact, Paolo Ambrosetti (Switzerland). The Team noted that the user requirements of Synoptic Meteorology were merged with those of NVSRF in OSCAR in April 2013, and the SoG was updated accordingly. A further revised version of the SoG was proposed in March 2014 better to reflect requirements for lightning detection, and for consistency with proposed changes in OSCAR. The user requirements in OSCAR have been also been edited, and some further changes related to lightning detection proposed. The Point of Contact suggested to introduce two separate variables "Total lightning density" and "Intra Cloud lightning density". The Team agreed to seek assistance of CIMO and lightning experts for reviewing the way lightning detection is defined in OSCAR.

7.3.2.15. Action: IPET-OSDE members to review the SoG for NVRSF and provide feedback to the Chair (deadline: May 2014).

7.3.2.16. Action: IPET-OSDE Chair to review the SoG for NVSRF (deadline: June 2014).

7.3.2.17. Action: IPET-OSDE Chair, PoC/NVSRF & CIMO to find experts for reviewing the way lightning detection is defined in OSCAR (deadline: June 2014).

Atmospheric Chemistry

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7.3.2.18. The Team reviewed the SoG for Atmospheric Chemistry as provided by the Point of Contact, Oksana Tarasova (WMO Secretariat). The Team recalled that, at ET-EGOS-7 in 2012, a strategy was proposed by the GAW Programme on how RRR process is to be established for atmospheric chemistry variables. GAW thematic areas are coordinated through Scientific Advisory Groups (SAG). Those groups expressed concerns that atmospheric chemistry is too broad application area and requirements cannot be formulated for the whole area. This request was brought for discussion at ET-EGOS-7 meeting and initial steps have been done only recently to allow sub-applications in requirements data base.

7.3.2.19. The Team noted the following developments since ET-EGOS-7:

- 1) SAG on greenhouse gases met in June 2013. SAG decided that climate application is one of the primary sub-applications for greenhouse gas observations. SAG plans to review the requirement table by July 2014 and will work on the list of sub-applications for greenhouse gas observations.
- 2) SAG on reactive gases met in November 2013. SAG reviewed a list of variables and recommended to add priority Volatile Organic Compounds (VOCs) in the list of variables. SAG acknowledged the need for RRR, but given that this is a new and emerging process which should involve different stakeholders and not simply reflect the view from the providers (i.e. most SAG members), it proposed that the GAW secretariat organizes a larger international meeting to sample input on user requirements in different areas.
- 3) SAG aerosol met in February-March 2014. The SAG will work on a journal paper presenting and justifying the requirements for aerosol observations with the first draft ready by May 2015. In a view of that paper SAD will revise the requirement table in OSCAR.
- 4) SAG ozone met in September 2012 and recommended the inclusion of the user requirements of the CCI-Programme of ESA, in the work on RRR. Two members of the Ozone SAG have been given the task to screen the relevant documents in order to assess how far present and future satellites can accomplish the threshold/target tables for ozone. SAG reviewed current user requirement for total ozone and ozone vertical profiles and concluded that they are still relevant.
- 5) In addition to SAG discussions on RRR, the Task Team of satellite requirement has been formed in February 2014. This Task Team will contribute to establishment of RRR by SAGs starting from formulation of user requirements. Task Team plans its first meeting in June 2014.

7.3.2.20. Action: PoC for AC to discuss with the Commission for Atmospheric Sciences (CAS) and provide the list of sub-application areas (under responsibility of CAS) directly requiring observations, and independent from each other and other Application Areas (deadline: IPET-OSDE-2).

7.3.2.21. The Team noted the outcome of the breakout group on Atmospheric Composition, which included representatives from CBS and CAS and in particular the GAW Programme. The breakout group had met to discuss the way forward for providing an update to the Atmospheric Chemistry SoG (which has not been updated since 2004) and for provision of support to the RRR process. The breakout group discussion is reflected below:

- In the course of the initial discussion it became clear that, whilst there are a number of Atmospheric Composition applications that the GAW Programme is mandated to support, there are others, e.g. operational air quality forecasting, that fall outside their area of responsibility. As a consequence an essential first step is the clear identification of those Atmospheric Composition application areas that fall under the mandate of the GAW Programme and those that do not.
- In order to support the activities of IPET-OSDE, and specifically the RRR, GAW is in the process of forming a Task Team to support the establishment and evaluation of observing system independent atmospheric composition requirements for application areas which are the responsibility of the GAW Programme. A first activity of this Task Team is expected to be a clear identification of those application areas to be addressed. Subsequent activities are expected to include an assessment of existing requirements with respect to the identified application areas

including the need for changes to the requirements, provision of a gap analysis, and an assessment of the potential contribution of different observing systems, including the specificities of different observation types. The Task Team is expected to involve and inform the GAW Scientific Advisory Groups.

- Once this process has been initiated and the application areas to be addressed by the GAW Programme clearly identified, appropriate mechanisms for adequately capturing and monitoring the requirements for application areas that are not under the responsibility of GAW can be addressed. In the specific case of operational air quality forecasting for urban areas, which was already identified during the breakout group as being an application area not covered by GAW, this issue will be brought to the attention of ICT-IOS and CBS Management, and a potential Point of Contact identified. A similar approach will be needed for other Atmospheric Composition Application areas which are not being addressed by the GAW programme.

7.3.2.22. Action: IPET-OSDE Chair to relay a proposal to the ICT-IOS for introducing a new Application Area under OPAG DPFS responsibility regarding air quality forecasting ⇒ April 2014.

Ocean Applications

7.3.2.23. The Team reviewed the SoG for Ocean Applications as provided by the Point of Contact, Guimei Liu (China). The Team noted that the user requirements for ocean application variables in OSCAR and the Statement of Guidance for Ocean Applications have been reviewed and updated in March 2014.

7.3.2.24. Action: PoC for Ocean Applications to discuss with the Secretariat for adding a nutrient variable in OSCAR, and populate the database (deadline: July 2014).

7.3.2.25. Action: PoC for Ocean Applications to update the SoG for Ocean Applications to include the sub-application requirements for biogeochemical measurements (deadline: IPET-OSDE-2).

7.3.2.26. Action: IPET-OSDE members to review the SoG for Ocean Applications and provide feedback to the Chair (deadline: May 2014).

7.3.2.27. Action: IPET-OSDE Chair to review the SoG for Ocean Applications (deadline: June 2014).

7.3.2.28. Action: PoC for Ocean Applications to consider changing the name of the Application Area, for example to “Met-ocean Forecasting and Services”, and make a proposal to the Chair (deadline: IPET-OSDE-2).

7.3.2.29. Action: Guimei Liu (China) to review relevant Statements of Guidance from an Ocean Application perspective, and make proposals for updating them to the respective Points of Contact (deadline: IPET-OSDE-2).

7.3.2.30. The Team noted the existing interaction between marine meteorology users and fisheries undertaken through collaboration between JCOMM and CAgM (see discussion below under Agricultural Meteorology).

7.3.2.31. The Team noted some comments of the JCOMM Expert Team on Sea-Ice (ETSI) which has discussed its contribution to the RRR process for sea-ice requirements. The Team noted that the ETSI generally agreed to the RRR's approach for identifying sea ice requirements, through the IGOS Cryosphere Theme and through the ongoing process of the GCW. In the meantime, ETSI noticed that the currently used terms and general requirements for sea ice in the RRR process are sometimes inconsistent with the sea ice terms defined in relevant documents, including the WMO Sea Ice Nomenclature (WMO-No.259³⁸).

38 http://www.aari.nw.ru/gdsidb/XML/wmo_259.php

7.3.2.32. Action: PoC for Ocean Application to check terminology for sea-ice requirements, and make proposal to the Secretariat on how to fix inconsistencies (deadline: end 2014).

Agricultural Meteorology

7.3.2.33. The Team reviewed the SoG for Agricultural Meteorology as provided by the Point of Contact, Robert Stefanski (Secretariat). The Team noted that no progress was made with regard to the SoG since ET-EGOS-7. A CAgM³⁹ / JCOMM Task Team on the Weather, Climate and Fisheries met in 2013 and has not completed the review of requirements for the fisheries side of the Agricultural Meteorology Programme. Therefore these have not been included in this SoG, but it is anticipated that the SoG will be updated once the fisheries review is completed. This review will probably not be completed until the last quarter of 2014.

7.3.2.34. There was difficulty in organizing a CAgM group to address these issues in the past two years. The 16th Session of CAgM will take place from 10-15 April 2014 and a new Open Panel Structure of the CAgM will be proposed. A dedicated Task Team or Expert Team will be created to look at the observation issues in agricultural meteorology. A dedicated Point of Contact will be named from this Team to liaise directly with the IPET-OSDE.

7.3.2.35. CAgM team will examine all of these outstanding issues. A revised requirements table and SoG for agricultural meteorology will be provided at the next session of IPET-OSDE. The Point of Contact will liaise with the WMO Secretariat involved in this process to ensure that the revision is done properly. A revision of these documents is proposed to take place by June 2015.

7.3.2.36. The Team recognized the anticipated progress, and encouraged CAgM to move as proposed and to report progress at IPET-OSDE-2.

7.3.2.37. Action: PoC for Agricultural Meteorology to propose an update version of the SoG for Agricultural Meteorology (deadline: IPET-OSDE-2).

Hydrology

7.3.2.38. The Team reviewed the SoG for Hydrology as provided by the Point of Contact, Bruce Stewart (Secretariat). The Team noted that the SoG has been updated as of February 2014, to reflect the requirements of the WMO Hydrology and Water Resources Programme.

7.3.2.39. The PoC suggested that hydrological in situ observations are very different from climate and weather in situ observations in that climate and weather data are representative of a single point. For both surface-water (discharge) and groundwater (pumping rates), the measurement, while taken at a point, is representative of an entire catchment area or an aquifer and is this directly related to a measurement taken upstream or downstream or at other points of the aquifer. Therefore, a gridded or areal map of discharge is a complex and difficult concept to fully comprehend, especially across catchment boundaries.

7.3.2.40. The PoC also suggested that satellite remote sensing, though increasingly used for the monitoring of precipitation and soil moisture, is generally of more limited utility in hydrology. Although altimeters on spacecraft have been demonstrated to measure the water surface elevation of major water bodies and very large rivers, the sensing of stream discharge and groundwater levels remains problematic at this time. Importantly, hydrological applications of remote sensing remain largely an expensive research activity, of little or no applicability to most National Hydrological Services around the world.

7.3.2.41. Action: IPET-OSDE members to review the SoG for Hydrology and provide feedback to the Chair (deadline: May 2014).

³⁹ Commission for Agricultural Meteorology

7.3.2.42. Action: IPET-OSDE Chair to review the SoG for Hydrology (deadline: June 2014).

7.3.2.43. The Team recognized that the hydrology community had not provided sufficient input during the elaboration of the current EGOS-IP. The Team invited the hydrological community to review the EGOS-IP and the Vision of the GOS in 2025 in order to clarify to what extent the list of Actions in the EGOS-IP addresses the needs of the Hydrology community.

7.3.2.44. Action: PoC for Hydrology to invite the Commission for Hydrology (CHy) to review the EGOS-IP, and the Vision and provide feedback to the Chair (deadline: end 2014).

Seasonal to Inter-annual Forecasting (SIAF)

7.3.2.45. The Team reviewed the SoG for SIAF as provided by the Point of Contact, Laura Ferranti (ECMWF). The Team noted that observation requirements for the monthly forecasting (defined in more general terms as forecasts on sub-seasonal time scales) are the same of the ones for the seasonal forecasting. Considering the growing interest in applications in the "gap" between SIAF and Climate Monitoring (CM), i.e. decadal forecasting, the IPET-OSDE may wish to provide guidance whether it will be necessary to address the decadal forecast requirements in this SIAF SoG.

7.3.2.46. The Team further noted that the meeting of the CBS/CCI⁴⁰ Expert Team on Operational Predictions from Sub-Seasonal to Longer-Time Scales (ET-OPSLS, UK, March 2014) expressed the interest of adding an additional paragraph to deal with the observational needs for decadal predictions. ET-OPSLS also proposed also to change the name of the Application Area to "Sub-Seasonal to longer time scale predictions" in order better to reflect the content of the SoG, since it now includes observational needs for sub-seasonal to longer time scale predictions. ET-OPSLS discussed and approved a new version of the Statement of Guidance, and proposed that Dr. Yuhei Takaya (Japan) should be the new Point of Contact.

7.3.2.47. The Team noted that, with regard to the proposed name of the Application Area, some parts of the longer time scale will already covered by the climate monitoring Application Area.

7.3.2.48. Action: IPET-OSDE members to review the SoG for SIAF and provide feedback to the Chair (deadline: May 2014).

7.3.2.49. Action: IPET-OSDE Chair to review the SoG for SIAF (deadline: June 2014).

7.3.2.50. Action: Chair IPET-OSDE to discuss with PoC and Richard Graham (UK) what the title of the SoG might be (deadline: June 2014).

7.3.2.51. Action: Secretariat to invite the chair of the OPAG DPFS to confirm the nomination of the new PoC for SIAF (deadline: June 2014).

Climate Monitoring - GCOS

7.3.2.52. The Team recalled that ET-EGOS-2 (July 2006) accepted as SOG the following documents:

- (i) GCOS Reports on the Adequacy of the global climate observing systems
- (ii) GCOS Implementation Plans and their updates
- (iii) Satellite Supplements to the GCOS Implementation Plan and their updates
- (iv) Progress Reports on the Implementation of the Global Observing System for Climate in Support of the UNFCCC

7.3.2.53. The Team further noted that GCOS initiated effort for producing a new progress report (target 08/2015), and implementation plan update (target Mid-2016). The next GCOS progress report

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and implementation plan will be highly relevant to WMO programmes, especially in the light of the evolving Global Framework for Climate Services (GFCS). The progress report will be prepared for submission to the sponsors and UNFCCC Parties in the course of 2014 and early 2015, to be submitted to the UNFCCC Secretariat in late summer (August) 2015. It will document how actions in the 2010 Implementation Plan have been or are being addressed, reviewing the overall status of each ECV and identifying gaps. The new Implementation Plan should include a chapter on the assessment of the adequacy of global observations for climate, which will draw on the progress report. A draft of the plan should be available for public review in October 2015, with finalization in summer 2016 for delivery to meet the timescale that had already been indicated to the UNFCCC Subsidiary Body for Scientific and Technological Advice (SBSTA).

7.3.2.54. Action: IPET-OSDE members to review relevant GCOS new [draft] documentation once available (deadline: ad hoc until IPET-OSDE-2).

7.3.2.55. The Team noted with particular interest the plan of GCOS, when developing its new user requirements, gap analyses and implementation plan, to work closely with GFCS in order to capture observational requirements of GFCS. This would then allow the RRR process to capture the observational requirements of GFCS (either wholly or mainly) via the detailed input that is expected from GCOS over the next two years. The Team supported this approach and encouraged GCOS and GFCS to work together in this way.

Climate Applications (other aspects - CCI)

7.3.2.56. The Team reviewed the SoG for Climate Applications (other aspects – CCI) as provided by the Point of Contact, Dr William Wright through the Secretariat. The Team noted that the SoG, which was provided in 2012 remains valid until next CCI intersession period when CCI will appoint a Task Team on SoG and an Expert Team on Voluntarily Observing Networks.

7.3.2.57. For the present, the WMO Commission for Climatology (CCI) considers that GCOS Essential Climate Variable (ECV) specifications constitute a good basis for addressing quantitative gap analysis and observation requirements. However the new and evolving requirements for climate services under the Global Framework for Climate Services (GFCS) go beyond this understanding of observations requirements, which are mainly pertinent to climate monitoring.

7.3.2.58. CCI emphasises other requirements and specifications that ensure good observational practices and related data management aspects, which by their nature are often non-quantitative, have been essential for CCI in its current intersession period (2010-2014). CCI perspective in this area was highlighted in its contribution to the Statement of Guidance (SoG) for Climate Applications (other aspects, CCI) in 2012. From a Climate Applications viewpoint it is important these requirements are captured and understood, to ensure that observations collected are also well quality controlled, homogenized and made available with the required timeliness and completeness for use in providing useful products and services.

7.3.2.59. CCI will decide on a new structure at its sixteenth session, Heidelberg, Germany 3-8 July 2014. As part of its Open Panel of CCI Experts (OPACE) on climate data management (OPACE-1), CCI will decide on establishing a Task Team on Statement of Guidance which should address the gap analysis aspects. This will include reviewing the applicability of the GCOS specifications for observations to broader climate services, and developing requirements for non-ECV variables such as phenomena and evaporation. The Team stressed that the observational user requirements should be developed from a technology free perspective.

7.3.2.60. Furthermore CCI will decide on the potential for setting up an Expert Team on Volunteered Observing Networks (i.e. those networks, which are not regulated by WMO, and can for example be operated by the private sector, universities, etc.) to guide Members on the minimum observational and metadata requirements and best practices for these networks. This will contribute to the provision of an updated SoG on observational requirements for local climate services. The Team noted that the

new Expert Team would not be addressing data policy issues, but rather looking at proposing best practices and assessing how volunteer networks could provide benefit to climate application and services.

7.3.2.61. Noting that GCOS will take on some of the new observational user requirements articulated by the GFCS, the Team encouraged the CCI to consolidate its discussion with GCOS and the GFCS so that the activities required for the RRR process are complementary.

Space Weather

7.3.2.62. Jerome Lafeuille (Secretariat) presented by teleconference and on behalf of the Point of Contact, Terry Onsager (USA), the latest developments with regard to the SoG for Space Weather within the WMO Inter-Programme Coordination Team on Space Weather (ICT-SW).

7.3.2.63. New requirements have been proposed within ICT-SW regarding radiation dose at aircraft cruising altitude, and wind and density in the thermosphere. As a result of these new requirements, a comprehensive analysis has been drafted and is under consideration for inclusion into a revised SOG,

7.3.2.64. The Team noted that the impact of space weather on global aviation is addressed within ICAO by the International Airways Volcano Watch Operations Group (IAVWOPSG⁴¹). WMO Secretariat is actively participating in this group through the work of ICT-SW who has reviewed the draft ICAO Concept of Operations (currently version 3.0) and the draft Standard And Recommended Practices (SARP). Both the concept of Operations (CONOPS) and the SARP will be discussed at the forthcoming conjoint session of International Civil Aviation Organization (ICAO) Meteorological Divisional meeting and CAeM in July 2014. It is understood that the observation requirements captured in OSCAR should enable the provision of services required by ICAO.

7.3.2.65. Action: IPET-OSDE Chair to read the additional materials proposed to be added in the SoG for Space Weather, and provide feedback to the Point of Contact (deadline: June 2014).

Summary

7.3.2.66. The Team agreed on a number of actions regarding the SoGs above to be updated. These are reflected in ***Annex II***.

7.3.3. Consider areas requiring revised SoGs

7.3.3.1. The IPET-OSDE considered the request of CBS-15 (2012) to ensure that all requirements, including in particular those of the GCW, and the GFCS are captured through the ongoing RRR process. The IPET-OSDE discussed the need to revise some SoGs. The Team's discussion in this regard is reflected in the section 7.3.2 above.

GTOS (i.e. the non GCOS requirements of GTOS)

7.3.3.2. The Team noted that the situation with regard to the Global Terrestrial Observing System (GTOS) has evolved. The Chairman of GTOS Steering Committee resigned in March 2013, and John Latham (FAO) has no longer been responsible for GTOS since 2012. WMO is trying to resolve this issue with the Food and Agriculture Organization of the United Nations (FAO) at higher level, and is discussing new responsibilities and resources with FAO management. Meanwhile, GCOS has taken over full responsibility for the GCOS Terrestrial Observation Panel for Climate (TOPC) and the Global Energy and Water Exchanges Project (GEWEX). The Point of Contact is now the Director of the OBS Department at the WMO Secretariat, Wenjian Zhang.

7.3.3.3. The Team noted that GTOS may not be seen as a true Application Area, and may include

41 <http://www.icao.int/safety/meteorology/iavwopsg>

observational user requirements for several applications. For example, some of the requirements may fall under Hydrology. Also, in an attempt to make progress on some terrestrial applications, the Team proposed to contact leaders of the Global Land/Atmosphere System Study of the Global Energy and Water Exchanges Project (GEWEX/GLAS).

7.3.3.4. **Action:** IPET-OSDE Chair to write to GEWEX/GLAS concerning the development of requirements for some land applications (deadline: June 2014).

Global Framework for Climate Services (GFCS)

7.3.3.5. Regarding the GFCS requirements, the Team noted that GFCS had identified “major gaps and deficiencies” in the observations as they relate to the GFCS, reported in the Annex on Observations and Monitoring of the Implementation Plan of the GFCS.

7.3.3.6. To address these gaps and shortcoming, particularly with respect to network design, GFCS has suggested that it is necessary to design networks based on requirements to address user needs for climate services as well as the requirements from the research, modelling and prediction pillars of the GFCS to advance knowledge of the climate system, its predictability and impacts of climate variability and chance.

7.3.3.7. GFCS has also suggested that currently only the Statement of Guidance for Climate Services (other aspects - CCI) specifically attempts to address data needs for the GFCS, while GCOS has addressed data requirements for the GFCS through a workshop on Observations for Adaptation to Climate Variability and Change, which considered observation requirements for adaptation, linking these with the needs of the GFCS. Thus, there is need for the other application areas to consider the data requirements for the GFCS in their Statements of Guidance. The Observations and Monitoring Annex of the Implementation Plan of the GFCS⁴² and the report of the GCOS workshop on Observations for Adaptation to Climate Variability⁴³ and Change provide relevant information.

7.3.3.8. In responding to these comments, the Team noted that it is normal practice, within the RRR methodology, to assess user requirements for observations in some detail before attempting to identify gaps and deficiencies in observing capabilities in relation to these requirements. Nevertheless, the team encouraged GFCS to continue its engagement with the RRR process, and to identify detailed requirements for observations that are not already covered by GCOS. In this regard, the Team welcomed the plan to work more closely with GCOS as discussed in paragraphs 7.3.2.52 to 7.3.2.55 above.

7.3.3.9. **Action:** IPET-OSDE members to review the O&M annex of the GFCS-IP and provide feedback to the Chair (deadline: July 2014).

Polar Meteorology and Global Cryosphere Watch (GCW)

7.3.3.10. Regarding Polar Meteorology and Global Cryosphere Watch (GCW) requirements, the Team noted that there are considerable differences between the lists of cryosphere variables from the IGOS Cryosphere Theme Report, the entries currently in OSCAR’s cryosphere theme, and those that the various application areas above have identified in their SoGs.

7.3.3.11. The Team further noted that the Polar Space Task Group (PSTG) has recently begun compiling space-based observational requirements for the polar regions. To date, the focus has been on the cryosphere as observed from Synthetic Aperture Radar (SAR) instruments.

7.3.3.12. The Team noted and concurred with the following recommendations from GCW:

42 <ftp://ftp.wmo.int/Documents/gfcs/ImplementationPlan/>

43 <http://www.wmo.int/pages/prog/gcos/Publications/gcos-166.pdf>

- GCW will identify application areas for each variable in the IGOS Cryosphere list (Table 1 above). New application areas for OSCAR may be suggested. Note that GCW itself is not an application area as it is too broad.
- Requirements for non-cryosphere variables will be identified for some application areas, as appropriate.
- GCW may engage the cryosphere community to update the IGOS Cryosphere requirements. This would be a major endeavor.
- GCW will work with the application areas and the PSTG to clarify their needs and to resolve any ambiguities and inconsistencies in cryosphere requirements.

7.3.3.13. Action: Jeff Key to address the GCW recommendations in paragraph 7.3.3.12 (deadline: end 2014).

7.3.3.14. The Team stressed the following different aspects: (i) GCW providing requirements for several Application Areas, and (ii) any new Application Area of interest to the GCW which uses observations directly.

7.3.4. Consider any new areas requiring SoGs

7.3.4.1. Taking above discussion into account, the Team discussed whether there are any new areas requiring SoGs, noted possible requirements for road meteorology and urban meteorology, and deferred the discussion to agenda item 12 (any other business). Meanwhile, it requested its members to consider whether there is any new area requiring SoG.

7.3.4.2. Action: IPET-OSDE members to consider whether this is any new area requiring SoG (deadline: IPET-OSDE-2).

8. OBSERVING SYSTEM STUDIES

8.1. Update on recent observation impact experiments

8.1.1. Dr Erik Andersson (ECMWF) presented an overview of the current activities with observing system studies, summarizing recent progress on the several observing systems in terms of benefit to NWP since the seventh session of ET-EGOS. His report had been prepared by the co-Rapporteurs on Scientific Assessment of Impact Studies undertaken by NWP Centres (R-SAIS), i.e. Dr Andersson, and Dr Yoshiaki Sato (Japan).

8.1.2. The Team noted the latest developments with regard to Observing System Experiments (OSEs), and Observing System Simulation Experiments (OSSEs), and in particular:

1. Impact studies for the early morning orbit satellite with contribution from many National Meteorological and Hydrological Services (NMHSs);
2. Impact studies performed by JMA for the advanced microwave scanning radiometer 2 (AMS2) onboard the global change observation mission 1st – water (GCOM-W1) satellite;
3. Impact of radiosonde balloon over the stratosphere by the Japan Meteorological Agency (JMA);
4. Impact of radiosonde balloon position information performed by Environment Canada and JMA;
5. Impact studies for FY3C polar orbiting satellite performed by the China Meteorological Administration (CMA);
6. The international Joint OSSE;
7. OSSE activities dedicated to study the contribution of future GEO/Air Quality instruments to the global observing system of atmospheric composition using OSSEs;
8. OSSEs performed by USA based on airborne survey conducted by the US National Oceanic and Atmospheric Administration (NOAA) during the Deepwater Horizon oil spill;
9. Adjoint-based sensitivity to forecast error studies performed by the United Kingdom (UK), and

the Republic of Korea;

10. Observation impact tool for ensemble Kalman filters performed by the NOAA National Centers for Environmental Prediction (NCEP);
11. Land surface data assimilation performed by ECMWF and USA;
12. Studies by EUMETNET for regional observation networks in Europe; and
13. Saturation of the number of Radio occultation profiles performed by ECMWF.

8.1.3. Details on the above studies can be found in IPET-OSDE-1 doc. 8.1.

8.1.4. The Team discussed these and other studies, and agreed with the following:

1. A recommendation on Impact Studies focusing on the following items should be promoted through ICT-IOS to:
 - encourage continued development and research of adjoint-based observation impact assessment tools, as a complement to traditional OSEs,
 - encourage OSEs for the optimization of regional composite networks,
 - encourage NMHSs to conduct OSEs and OSSEs to address specific science questions.
2. The user requirements of various application areas for marine meteorological and oceanographic observations should be reinforced, the existing or potential gaps should be more clearly identified, and the SoGs of the relevant Application Areas updated as needed (e.g. GNWP, Climate monitoring, SIAF, Ocean Applications).

8.2. Proposal for new observation impact experiments to be promoted by IPET-OSDE

8.2.1. The Team recalled that a comprehensive proposal of specific studies and science questions of particular interest to IPET-OSDE had been developed for the Fifth WMO Workshop on “The impact of various observing systems on NWP” (Sedona, USA, 22-25 May 2012). Dr Erik Andersson (ECMWF) proposed an updated list to the Team. The Team reviewed and agreed on the updated list reproduced in **Annex VIII**, and to be submitted to the ICT-IOS-8 noting that further changes might be proposed until the end of June 2014. The Team requested the R-SEIS to coordinate the efforts for reviewing and proposing an updated the list to CBS Ext.(2014).

8.2.2. The Team agreed that impact studies on snow and soil moisture are needed, in particular for addressing SIAF requirements. GCOS is also interested in formulating some science questions.

8.2.3. The Team also noted that there has been a loss of surface pressure measurements in the Arctic, which is having a negative impact on NWP. The lack of wind observations in polar regions for NWP was also noted. The Team noted that feasibility of cost-effective solutions could be investigated. For example there are a large number of existing Automatic Weather Stations (AWS) in polar regions established for research applications; it should be relatively easy to add barometers on such stations, and/or to have such valuable observations distributed in real-time. The EC-PORS could be a mechanism for undertaking such investigations.

8.2.3.1. Action: GCOS to provide proposal of climate monitoring science questions to the R-SEIS (deadline: ASAP).

8.2.3.2. Action: R-SEIS to review and update the list of science questions (deadline: end June 2014).

8.2.4. The Team noted the issue of data availability from tropical moored buoys, especially in the Tropical Pacific Ocean. The Team noted the development of the Tropical Pacific Ocean Observing (TPOS) system, and noted that Erik Andersson et al. had prepared a white paper for TPOS on Operational Forecasting Systems⁴⁴. TPOS project is looking at the best mix of observing systems to

44 on http://ioc-unesco.org/index.php?option=com_oe&task=viewDocumentRecord&docID=12511

address various user requirements taking into account the evolution of the ocean observing systems in the last decade. The target is of TPOS is for achieving this best mix in 2020. The Team agreed that the CBS could provide technical expertise on the impact of marine meteorological and oceanographic observations on operational applications.

8.2.5. Acknowledging the substantial impact of the sea level observations on NWP on a per observation basis as shown by recent impact studies, the Team noted that the funding of the barometers on drifters was currently at risk of being reduced. A document summarizing the cost-effectiveness of the barometer drifter technology for addressing multiple requirements was prepared by the Secretariat and reviewed by the IPET-OSDE Chair.

8.2.5.1. Action: Secretariat to provide a copy of the document on the cost-effectiveness of the barometer drifter technology for addressing multiple requirements to the Team members for their review (deadline: ASAP).

8.2.5.2. Action: IPET-OSDE members to review the document on the cost-effectiveness of the barometer drifter technology for addressing multiple requirements, and provide feedback to the Chair (deadline: end April 2014).

8.2.5.3. Action: Chair to perform a final review of the document on the cost-effectiveness of the barometer drifter technology for addressing multiple requirements, on the basis of feedback from the Team members, and to approve the document on behalf of the Team (deadline: end May 2014).

8.2.5.4. Action: Secretariat to write to relevant WMO Members to invite them to properly fund the barometer drifter array, and provide a copy of the IPET-OSDE approved document on the cost-effectiveness of the barometer drifter technology for addressing multiple requirements (deadline: ASAP).

8.2.6. The Team discussed the need for new impact studies on marine and ocean observation, and noted with appreciation that ECMWF is undertaking an impact study requested by the Data Buoy Cooperation Panel (DBCP) on the impact of SLP from drifters on NWP.

8.3. Next workshop on the impact of observations in NWP

8.3.1. The Team recalled that since 1997, a comprehensive review of the impact of the different operational observing systems has been carried out through the WMO Workshops on the Impact of Various Observing Systems on NWP in Geneva, Switzerland (1997), Toulouse, France (2000), Alpbach, Austria (2004), Geneva (2008), and Sedona, USA (2012). The series of workshops has proved very successful providing substantial input for reviewing the Statements of Guidance for Global and High-resolution NWP, the Vision of the GOS for 2025 and the EGOS-IP.

8.3.2. The Team further noted that with this fruitful result, CBS-15 requested OPAG-IO to organize the Sixth WMO Impact Workshop in 2016.

8.3.3. The Team agreed that since the last workshop provided very successful result, the next workshop should be organized with similar size and set-up. The location and exact date are under consideration.

8.3.3.1. Action: IPET-OSDE Chair to relay the Team's recommendation regarding the organization of the next NWP impact of observations workshop to the ICT-IO-8 for its consideration to submit a proposal to CBS Ext. (2014) (deadline: April 2014).

8.4. Cost-benefit studies for observing systems

8.4.1. The Meeting discussed cost-benefit studies for observing systems. It reviewed a proposed strategy from the Chair for assessing the cost-effectiveness of observing systems. The elements of the "cost-benefit chain" are described in the strategy. Two elements of this chain are the assessment

of costs of observing systems and the assessment of the impact of observations on a given application. Together they allow the impact per cost of observations for this application to be assessed. This process is illustrated in the draft strategy using an example in which impact per cost is evaluated for global numerical weather prediction. The extensions of this general approach to other applications areas and to other elements of the cost-benefit chain are also discussed in the strategy.

8.4.2. The Team considered how the suggestions in this draft strategy might be taken forward, and suggested actions (i) to improve the estimates/guesses of observing system costs presented in section 3 and to generalize the results to more than one NWP centre; (ii) to promote the development of appropriate metrics for other Application Areas; and (iii) to extend impact per cost assessments to other parts of the cost-benefit chain, and eventually to an integrated assessment of cost-benefit over many applications and services. The Team strongly supported efforts in this regard, and agreed that its ideas should be promoted at the ICG-WIGOS level.

8.4.3. The Team encouraged the undertaking of similar study and results for the regional models.

8.4.3.1. Action: Secretariat to propose inviting the IPET-OSDE Chair to participate at the next ICG-WIGOS and present the work of the IPET-OSDE with regard to cost-benefit studies for observing systems (deadline: Jan. 2015).

8.4.3.2. Action: IPET-OSDE members to assist the chair in providing feedback on the methodology, as well as input on the estimates of the cost of the observing systems (deadline: Jul. 2014).

8.4.3.3. Action: IPET-OSDE Chair to write to the PoCs and explain the need to provide appropriate impact metrics for their Application Areas (deadline: July 2014).

8.4.3.4. Action: All PoCs to start considering appropriate impact metrics for their Application Areas (deadline: end 2014).

9. IMPLEMENTATION PLAN FOR THE EVOLUTION OF GLOBAL OBSERVING SYSTEMS (EGOS-IP)

9.1. Review of Guidance from Congress, the Executive Council, and ICG-WIGOS on the EGOS-IP and its status as part of WIGOS implementation

9.1.1. The Meeting reviewed Guidance from the last Executive Councils, the Sixteenth Congress and the Inter-Commission Group on WIGOS (ICG-WIGOS) on issues related to the EGOS-IP and its status as part of WIGOS implementation.

9.1.2. The Team recalled that 16th World Meteorological Congress, in its Resolution 3 (Final Report on the web⁴⁵), reaffirmed that “*sustainable operation of GOS has a vital role and highest priority for WMO in providing observational data to meet the requirements of weather forecasts and warnings, climate monitoring and other strategic tasks of the Organization*”, and further urged Members to “*follow guidelines and recommendations contained in the Implementation Plan for Evolution of Space and Surface-Based Sub-systems of the GOS (EGOS-IP), published as WMO/TD-No. 1267, and nominate/update a national point of contact responsible for reporting progress and plans in their country related to EGOS-IP.*”

9.1.3. At its 65th Session (Final Report on the web⁴⁶), the WMO Executive Council urged Members, in collaboration with partner organizations and identified agents in the EGOS-IP, to address the 115 actions listed in the and requested Members, who have not yet done so, to nominate National Focal Points tasked to monitor the implementation of the EGOS-IP nationally, report on implementation issues, and to provide feedback to the CBS Inter-Programme Expert Team the Observing Systems Design and Evolution through the Secretariat.

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

46 ftp://ftp.wmo.int/Documents/PublicWeb/mainweb/meetings/cbodies/governance/executive_council_reports/english/pdf/1118_en.pdf

9.1.4. ICG-WIGOS-3 updated the WIGOS Implementation Plan (see the version updated after the session: WIP, v 2.9 on the web⁴⁷), making specific reference to the EGOS-IP in two places in Table two of the WIP, namely entries 3.2.1 and 3.3.1. These address regional and national aspects, respectively, and although the current delivery dates for these elements is still listed as occurring during the current financial period, the reality is that many of the activities will not commence until after Cg-17 in 2015. This will delay the reporting of progress listed as deliverables in the table. The meeting is invited to make recommendation on the methods for collecting and reporting this feedback from the Regions and individual Members.

9.2. Review of interactions with NFPs

9.2.1. Russell Stringer (Australia) provided by teleconference an overview of the interactions with the National Focal Points (NFPs) concerning the EGOS-IP, including a review of the 2013 national reports from the NFPs regarding the new EGOS-IP.

9.2.2. The Team agreed that there is a need to raise the awareness of EGOS-IP amongst stakeholders. This is needed both to: (i) ensure the agents for implementation are aware of their role and prompted to carry out the relevant actions, and (ii) encourage information sharing and reporting of progress. The Team agreed with the following recommendations from Mr Stringer:

- The template for reporting by NFPs may be further improved to facilitate both NFP responses and the subsequent compilation, interpretation and analysis of responses;
- The forty-five NFPs who have already reported at least once since 2007 may provide a good target group for increasing the level of reporting against the new EGOS-IP;
- Further efforts need to be made to raise the awareness of and commitment to action on the EGOS-IP amongst stakeholders; and
- An effective focal point for the EGOS-IP needs to be identified within each of the "agents for implementation", helping to raise awareness, progress and reporting on Actions for which they are nominated as "lead".

9.2.3. Through this discussion, the Team also agreed with the following principles:

- More than one focal point may be needed for some countries. The largest countries seem to be the ones where it's the most difficult to receive feedback, and some specific efforts should be made with those;
- The template must be developed in such a way that it should facilitate the work of the NFPs (checkboxes, focusing on some actions where input is the most useful, etc.);
- Regional Associations and CBS Sessions can be used for receiving feedback provided proper preparation is organized in this regard;
- Direct communication with the Permanent Representatives is also important; and
- We also need to look at this from the wider WIGOS perspective.

9.2.4. A version proposed by Russell Stringer of the updated template for annual reporting by the NFPs is provided in **Annex IX**. This template will be further updated and refined before the requesting the NFPs to provide their feedback for 2014.

9.2.5. Action: Russell Stringer to propose ideas on the basis of the Team's discussion under

47 http://www.wmo.int/pages/prog/www/WIGOS-WIS/reports/App-II_WIP_v.2.9_ICG-WIGOS-3_ver_19-03-14.doc

paragraph 9.2 for the Team to consider regarding how to receive more and better feedback from the NFP on the EGOS-IP (e.g. members not necessarily report on every action (e.g. space ones)) (deadline: end August 2014).

9.2.6. **Action:** Secretariat to post the received NFPs reports on the FTP site and inform the Team accordingly (deadline: ASAP).

9.3. Retrospective analysis of progress against old EGOS-IP (2015)

9.3.1. The meeting recalled that ET-EGOS-7 agreed that it would be both informative and good practice to conduct a retrospective analysis of progress against the “old EGOS-IP”, i.e. the version of the Implementation Plan for Evolution of Space- and Surface-based Sub-systems of the Global Observing System (WMO/TD No. 1267) that was approved by CBS-13 in 2005, and responding to the “Vision for the GOS in 2015”. Following ET-EGOS-7 such a review was conducted, led by the Chair of ET-EGOS with contributions from the Secretariat, from ET-EGOS members and from other stakeholders.

9.3.2. The Team reviewed the outcome of the analysis (see Appendix A of IPET-OSDE-1 doc. no. 9.3). It sets out all the Actions in the original EGOS-IP and summarizes progress against them at the assessment date in 2012. It also scores the progress as green (good progress), amber (some progress) or red (little or no progress).

9.3.3. Although the old EGOS-IP was shorter and less systematic than its successor, it was a plan of the same type, and progress against it was monitored regularly by ET-EGOS. It is therefore informative to know in which areas good progress was made and in which it was more difficult to achieve. The meeting agreed that this information should be helpful to the Team when monitoring the new EGOS-IP and when performing and recommending activities to facilitate effective actions to implement the new Plan.

9.4. Current EGOS-IP (2025)

9.4.1. Review of progress since ET-EGOS-7, including Actions

9.4.1.1. The Meeting reviewed the progress on Actions contained in the current EGOS-IP (responding to the Vision of the GOS for 2025 and WIGOS needs) since ET-EGOS-7 and made proposals for updating these Actions.

9.4.1.2. The Team requested its Session breakout groups to start updating the status of actions of the EGOS-IP and propose a plan for further updating it in the next few months. It agreed that a more systematic review of the actions is needed (see proposed actions under paragraph 9.4.3).

9.4.2. Proposals for facilitating progress on Actions and for supporting NFPs

9.4.2.1. The Team agreed that an important task for IPET-OSDE will be to monitor progress against the Actions in the new EGOS-IP – to record this progress (or lack of it), to note problems and issues as they arise, and to revise or supplement the Actions as necessary. This task is anticipated in the Work Plan of IPET-OSDE and is seen as an important contribution to WIGOS.

9.4.2.2. The Team recalled that the EGOS-IP, responding to the Vision for Global Observing Systems in 2025, represents a major achievement under the umbrella of WIGOS. Whilst monitoring progress against this Plan is important and necessary, the Team recognized that it is not enough; and it is the role of IPET-OSDE, with the support of OPAG-IO and WIGOS as a whole, not only to monitor progress but actively to promote it. Monitoring is essentially passive, whereas the EGOS-IP requires implementation action by many agents.

9.4.2.3. The Team noted that experience with the old EGOS-IP (responding to the old Vision for the

GOS in 2015) is that some agents are very effective and that they supervise action that is fully consistent with the Implementation Plan. This has included progress on (i) space-based observations, via the WMO Space Programme working directly with CGMS and space agencies); (ii) ocean observations, via JCOMM; and (iii) aircraft observations, via the AMDAR Programme.

9.4.2.4. However progress was relatively slow in areas dependent on action by WMO Members and Regions. A network of National Focal Points (NFPs) was established to facilitate reporting by Members against the Actions in EGOS-IP. This network could also be used to facilitate the necessary activity, but it needs support. The Team agreed that a mechanism to do this should be developed, supported by adequate resources.

9.4.2.5. The Team recalled the interesting experience of AMMA at this point. During the AMMA project, the observation network in West Africa was considerably enhanced and then maintained at a high level of effectiveness throughout the campaign (see item agenda 6.4). Problems with the observations network were often quickly detected and fixed, through effective interaction both between the project participants and with experts in North America and Europe. This included some input of technical resources but usually of relatively low value. The Team agreed that this model – of central coordination, together with effective technical support – could be considered as a model for a network to support NFPs in their work on EGOS-IP Actions.

9.4.2.6. The Team agreed that there should in principle be a strong incentive for the NMSs of developed countries to support such a network. For a relatively modest investment of resources (mainly the time of experienced observation specialists), it should be possible to enhance greatly the making and delivery of observations, to the benefit of the NMSs making the observations, for their internal applications, and to the benefit of other NMSs for applications that are regional or global in nature.

9.4.2.7. The Team drafted the ideas listed in **Annex V** for facilitating progress on Actions of the EGOS-IP and for supporting the NFPs.

9.4.2.8. Action: Secretariat to prepare with the IPET-OSDE Chair a high level document (e.g. 4 pages) targeted to the Permanent Representatives on why we have the EGOS-IP, and what are the benefits (deadline: Sept. 2014).

9.4.2.9. Action: WIGOS PO to prepare correspondence to Members on the basis of the ideas listed in **Annex V**, reminding them about their required actions to implement EGOS-IP, nominate NFPs, and monitor progress (deadline: end 2014).

9.4.2.10. Action: Secretariat to prepare a time table for the next 2 years regarding IPET-OSDE interaction with the focal points (deadline: ASAP).

9.4.3. Proposals for future review and reporting

9.4.3.1. The Meeting developed other proposals for future review of and reporting against EGOS-IP.

9.4.3.2. Action: IPET-OSDE Chair & Secretariat to propose a split of responsibility for monitoring progress of actions against the EGOS-IP for specific actions. Each “owner” of action(s) will consult with relevant experts for feedback (deadline: end April 2014).

9.4.3.3. Action: EGOS-IP action “owners” to review progress of actions against the EGOS-IP (possibly in consultation with relevant experts), and provide feedback to the Secretariat on the status of actions (deadline: end May 2014).

9.4.3.4. Action: Secretariat to compile a synthesis of the feedback received from the Team members regarding status of actions of the EGOS-IP, and to submit it to the chair for his review (deadline: end June 2014).

9.4.3.5. Action: IPET-OSDE members to review the synthesis on the status of actions of the EGOS-IP, and provide feedback to the Chair and Secretariat (deadline: July 2014, then ongoing).

9.4.3.6. Action: Chair to review final version of the first synthesis on the status of actions of the EGOS-IP, approve it, and to keep it updated (deadline: July 2014, then ongoing).

9.4.4. Communication plan

9.4.4.1. The meeting discussed the need for a communications plan for the EGOS-IP. The Team agreed that such a communication plan should be part of the wider WIGOS communications plan.

9.4.4.2. The Team noted that the ICG-WIGOS agreed on a communication and outreach strategy, which should be communicated to the NFPs. Through EC reporting, the EC is regularly invited to address the EGOS-IP actions, monitor progress of actions, and nominate NFPs.

9.4.4.3. The Team agreed on the following points:

- A short report on progress should be produced in the next 3 months;
- There is a need to clarify the interactions with the NFPs in the next 12 months (more NFPs, better communication; what to feed back to them); and
- Once CBS and EC have approved a communication plan, we need to identify what more is needed to communicate the plan better.

9.4.4.4. Action: IPET-OSDE members to review the WIGOS Communications and Outreach Strategy (deadline: Jul. 2014).

10. OBSERVING SYSTEM NETWORK DESIGN (OSND) - PRINCIPLES AND GUIDANCE

10.1. Outcome of the OSDW1 workshop (Geneva, Nov. 2013)

10.1.1. The Team recalled that according to its Terms of Reference, the IPET-OSDE is tasked to propose guidance regarding observing system network design principles. To initiate the work in this regard, an ad hoc Workshop on Observing System Design (OSDW1) was organized in Geneva, Switzerland, from 12 to 14 November 2014. The final report of the workshop is available on the WMO website⁴⁸.

10.1.2. The Chair reported on the outcome of the workshop, and explained that the workshop developed material from which OSND principles could be extracted, and agreed on a roadmap for the development of principles and guidance for OSND.

10.1.3. Following the workshop, work on developing OSND Principles and associated guidance material has proceeded according to the plan.

10.1.4. A set of "OSND Principles" was extracted by the workshop Chair from the material generated at the workshop, by separating out "design principles" from guidance on how such principles should be interpreted or executed. Useful material was also identified which, although not relevant to network design, may be relevant to observing system design in general. The draft OSND Principles were sent to workshop participants for comment, and they were revised following comments received.

10.1.5. A report on the outcome of the workshop was provided to the third session of the Inter-Commission Coordination Group on WIGOS (ICG-WIGOS) Task Team on Regulatory Material (Geneva, 25-29 November 2013). A version of the draft OSND Principles was also presented to the third session of the ICG-WIGOS (Geneva, 10-14 February 2014). ICG-WIGOS noted the progress on

⁴⁸ <http://www.wmo.int/pages/prog/www/OSY/Reports/OSDW1-Final-Report.pdf>

the draft OSND Principles.

10.2. Review of draft OSND Principles and Guidance

10.2.1. The Team reviewed the actions from the OSDW1 workshop, as well as the latest version of the draft OSND Principles. The draft material was organized in 3 parts: (A) a proposed set of 12 Observing System Network Design (OSDN) Principles; (B) the OSND Principles and, for each Principle, points that amplify or explain them, or that indicate how appropriate guidance material could be developed for each; and (C) additional material related to guidance on observing system design, but not network design. The second (B) and third (C) parts were presented as still incomplete; further work by the Team and other groups will be needed to develop them further. The Team proposed some changes to the draft OSND Principles - see **Annex XII**.

10.2.2. ICG-WIGOS had agreed that the OSND design principles should go in the WIGOS Manual through the agreed ICG-WIGOS process for the WIGOS Regulatory Materials, assuming that the OSND principles are indeed mature enough.

10.2.3. The Team also agreed that the guidance materials would be incorporated in the WIGOS Regulatory Material at some later stage.

10.2.4. Noting the deadline of 4 April 2014, and with approval from the OPAG IOS Chair, the Team agreed to submit the OSND principles it has drafted during this session to the ICG-WIGOS Task Team on Regulatory Materials for inclusion in the WIGOS Manual.

10.2.4.1. Action: IPET-OSDE Chair to submit the OSND principles to the Chair of the TT-WRM (deadline: 4 April 2014).

10.3. Roadmap for the development of OSND Principles and Guidance

10.3.1. The meeting reviewed and updated the roadmap for the development of OSND Principles and Guidance. The Team tasked IPET-OSDE members to draft specific materials in close coordination with their respective Teams and groups. As part of the roadmap, IPET-OSDE recommendations will particularly be submitted to the eight session of CBS OPAG on Integrated Observing Systems' Implementation and Coordination Team (ICT-IOS) (tentatively scheduled in Geneva from 7 to 11 April 2014) in preparation for CBS Extraordinary Session in late 2014. The revised roadmap is provided in **Annex IV**.

10.3.2. The Team noted that the WMO Manual on the Global Data Processing and Forecasting System (WMO No. 485) is also addressing procedures for the elaboration of observational data requirements. The Manual is now under review, and there should be an opportunity for the Team to make comments in this regard.

10.3.3. Action: Secretariat to request the OPAG-DPFS to invite the Chair of the IPET-OSDE and the WIGOS PO to comment on the proposed revision to the Manual on GDPFS in relation to observational data requirements (deadline: end July 2014).

11. PREPARATION FOR FORTHCOMING CBS ACTIVITIES AND MEETINGS

11.1. IPET-OSDE input to future WMO Operating Plan 2016-2019

11.1.1. The Meeting discussed the possible input to be provided by the IPET-OSDE from its perspective to the future WMO Operating Plan for the period 2016 to 2019. The Team also noted that the CBS Operating Plan will also have to be updated.

11.1.1.1. Action: Secretariat to provide with existing Operating Plan, and CBS one to the Chair as a

starting point (deadline: ASAP).

11.1.1.2. Action: IPET-OSDE Chair to review the existing WMO and CBS Operating Plans, and propose IPET-OSDE input to the new Operating Plans for 2016 to 2019 (deadline: April 2014).

11.2. Mechanism for keeping track of additions to the Vision for the GOS in 2025

11.2.1. The meeting recalled that the Vision for the Global Observing System (GOS) in 2025 was approved by EC-61 (Geneva, 2009) and provides high-level goals to guide the evolution of the GOS in the coming decades.

11.2.2. It further recalled that the fifth Session of the Expert Team on the Evolution of the Global Observing System (ET-EGOS), Geneva, December 2009, had noted a couple of issues which should be considered by the Team and monitored, as well as other observing capabilities that might have been omitted in the Vision for the GOS in 2025. Since then, the former ET-EGOS (and now the IPET-OSDE) has maintained (is maintaining) a list of such issues on the WMO website⁴⁹.

11.2.3. The Team agreed that the web page above provides for a simple mechanism of recording proposed additions to the Vision.

11.2.3.1. Action: IPET-OSDE members to review the webpage on additions to the Vision of the GOS, and propose other additions or changes to the Secretariat and Chair if needed; ongoing (deadline: ongoing).

11.3. Initiation of new Vision for global observing system(s)

11.3.1. The Team noted that the OPAG IOS is initiating discussions for producing a new vision for global observing systems in 2035/2040/2045, eventually to succeed to the "Vision for the GOS in 2025". Exact title and time frame remains to be decided.

11.3.2. The Team noted that the process needs to be initiated by the CBS this year, and agreed that the following questions could for example be addressed for feeding into a new Vision:

- If the current Vision were implemented in full, which current requirements for observations would remain unfulfilled?
- Which requirements for observations are likely to reduce?
- Which observing technologies that could not fully contribute to the Vision for 2025 are likely to mature the extent that they may contribute significantly to a vision with a later date?

11.3.2.1. Action: All PoCs to review their SoG against the 2025 Vision, and inform on which current requirements would remain unfulfilled (deadline: end 2014).

11.3.2.2. Action: OPAG IOS Teams to review the observing systems capabilities against the 2025 Vision, and inform on which new capabilities may be sufficiently mature to be included in a 2040 Vision (deadline: end 2014).

11.3.2.3. Action: GCOS to share first drafts of its visionary documents for consideration as part of a new Vision (deadline: end 2014).

11.3.2.4. Action: Secretariat to review (with assistance from IPET-OSDE members) the Vision of the GOS in 2025, compare it with current capabilities, and derive lessons for producing a new Vision (deadline: end 2014).

11.3.2.5. Action: IPET-OSDE Chair to prepare a draft of the Vision in 2040, in consultation with Team

49 <http://www.wmo.int/pages/prog/www/OSY/Documentation/Vision2025.html>

members (deadline: IPET-OSDE-2).

11.4. Reports to ICT-IOS-8 and CBS Ext. (2014)

11.4.1. The Team tasked the Chair with providing the IPET-OSDE report and updated workplan that will be reviewed and presented to the eighth session of ICT-IOS to be held the week after IPET-OSDE1. The Team also discussed the preparation of documents to the CBS Extraordinary Session (CBS Ext. (2014), Asunción, Paraguay, 8-12 September 2014) consistent with discussions at this IPET-OSDE1 Session.

11.4.2. The Team acknowledged the current CBS focus on regulatory materials in the WIGOS framework.

11.4.2.1. Action: IPET-OSDE Chair to present the IPET-OSDE report to ICT-IOS-8 (deadline: April 2014).

12. ANY OTHER BUSINESS

12.1. Under this agenda item, Mr Scylla Sillayo (WMO Secretariat) reported on recent WMO efforts to address the requirements for land transportation. He explained that WMO intends to pursue an integrated approach to the meteorological services to transport sector, based on experience in specific sub-sectors, such as aviation and marine. It is well recognized that the land transport with its different modes is very different to aviation or marine; while some general approaches from aviation/marine could be useful, land transport will require new developments in many aspects. The most important at this initial stage is to conduct a scoping exercise considering different aspects: institutional (local, national, international), technical, service delivery, etc. The Team noted that the CIMO guide and two Instruments and Observing Methods (IOM) reports⁵⁰ included information on requirements for land transportation and on urban observations.

12.2. The Team noted that the anticipated services for land transportation will probably require input from NWP and existing Application Areas, but not only these. The Team agreed that before deciding whether there is a need for a new Application Area for the land transportation sector, one would have to identify whether there is a need to address direct needs for observations that are not currently being addressed indirectly via existing Application Areas. It invited the group in charge of elaborating a strategy with regard to land transportation requirements to consider this point.

12.3. The Team supported the idea and agreed that conducting a scoping exercise to identify requirements for products and services was the most logical way to do it. The Team is looking forward to see further developments in this regard in order to be in a position to provide appropriate advice in due course. However, the group also noted that the consent and further guidance of EC-66 and Cg-17 is necessary for the work to be progressed.

13. ACTION PLAN

13.1. Actions decided by this meeting, are recorded in **Annex II**. The updated workplan – with status of tasks – for the IPET-OSDE, taking into account the outcome of this IPET-OSDE1 Session, is provided in **Annex III**.

14. CLOSURE OF THE SESSION

14.1. The meeting tentatively agreed to have the Second Session of the IPET-OSDE in Geneva, Switzerland, in early 2016.

50 IOM 77, Road Measurements, and IOM 81, Urban Observations; see <https://www.wmo.int/pages/prog/www/IMOP/publications-IOM-series.html>

14.2. The session closed at 17:00 on Thursday, 3 April 2014.

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ACTION SHEET RESULTING FROM IPET-OSDE¹

No.	Ref ¹	TOR ²	WP ³	Action	By	Deadline	Comment/Status
				I. RRR PROCESS – general			
1	O1/7.1.6.1.	(c)	4	to review relevant RRR documentation and the website, and make the definition of the breakthrough consistent	Secretariat	ASAP	
				II. RRR process – OSCAR/Requirements (URs) and Statements of Guidance (SoGs)			
				1) General actions			
2	O1/7.1.6.2.	(a)	2	to better define the stability criterion	GCOS	July 2014.	
3	O1/7.1.6.3.	(a)	2	to document the stability requirements for climate monitoring	GCOS	July 2014.	
4	O1/7.1.6.4. E5/8.1.8	(a)	2	through OSD, to manage the OSCAR/Requirements database according to a well-defined procedure, in a coherent and sustained manner	Secretariat	Ongoing.	
5	O1/7.1.6.5.	(a)	2	to ensure that there is an annual review of the user requirements by the Points of Contact.	Secretariat	Ongoing	
6	O1/7.1.6.6.	(a) (c)	2, 4	to write to the PoCs and remind them about their role, and thank them for their contributions	Chair	ASAP.	
7	O1/7.1.6.7.	(a)	2	References to the sources of requirements (documents, papers) should be provided in the “Source” field of OSCAR/Requirement, where available (with assistance from the Secretariat).	All PoCs	ongoing.	
8	O1/7.2.1 8.1.	(a) (b)	2, 3	to propose the split of responsibilities regarding OSCAR (Table 1), as well as the WMO responsibility and proposed reporting mechanisms for the OSCAR project development (Table 2) and long term maintenance and operations of OSCAR (Table 3) to the ICT-IOS for its consideration)	Chair	April 2014.	
9	O1/7.3.1.4.	(c)	4	to update their SoG to be consistent with the agreed template	Points of Contact	IPET-OSDE-2.	

1 Ref: reference to paragraph number of IPET-OSDE and ET-EGOS meeting reports as appropriate (e.g. E6/8.1.11 = Para 8.1.11 of ET-EGOS-6 Final Report, O1 refers to IPET-OSDE-1).

2 TOR: reference to the IPET-OSDE Terms of Reference to which the action item applies

3 WP: reference to the item number of the CBS work programme for IPET-OSDE to which this action item applies.

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No.	Ref ¹	TOR ²	WP ³	Action	By	Deadline	Comment/Status
10	O1/7.3.4.2.	(d)	4	to consider whether this is any new area requiring SoG	IPET-OSDE members	IPET-OSDE-2.	Possible requirements for road meteorology and urban meteorology noted.
11	O1	(a)	2	To add a reference on the statement on uncertainty (confidence interval) in the OSCAR website; this reference (by weblink) will be an on-line document, containing explanations and advise on how to determine the required uncertainties in line with the internationally adopted rules	J. Eyre in consultation with J. vd Meulen	Jul. 2014	Apr13: Some discussion re SoG-Aero. Latest email 29Nov12.
12	E6/8.1.11	(a)	2	Review URs in database; address the open issues (see list of actions in Annex VIII of ET-EGOS-6 report, and Annex IX of ET-EGOS-7 report); report back to Chair	IPET-OSDE & PoCs	end 2012 where possible	
13	E4	(c)	4	Review all revised SoG	Chair	ongoing	
14	E4	(c)	4	Refer revised SoGs to appropriate "owners" for endorsement	Chair	ongoing	
2) Global NWP							
15	E5/8.3.2.4	(c)	4	Consider comments by the OceanOBS'09 review team and propose a response	E Andersson	June 2012	Open (E. Andersson to provide feedback)
16	E7/8.3.2.4	(c)	4	Update SoG for GNWP with latest information from THORPEX on targeting (e.g. for tropical regions)	E Andersson	June 2012	
17	O1/7.3.2.3.	(c)	4	to update the SoG for GNWP to reflect impact of targeted dropsondes and rapid-scan AMVs on the forecast of tropical cyclones	PoC for GNWP	April 2014.	
18	O1/7.3.2.4.	(c)	4	to review the SoG for GNWP and provide feedback to the Chair	IPET-OSDE members	May 2014.	
19	O1/7.3.2.5.	(c)	4	to review the SoG for GNWP, and possibly approve it	Chair	June 2014.	
3) High Resolution NWP							
20	E7/8.3.2.5	(c)	4	Update SoG as necessary	T Montmerle	Ongoing	
21	O1/7.3.2.7.	(c)	4	to review the SoG for HRNWP and provide feedback to the Chair	IPET-OSDE members	May 2014.	
22	O1/7.3.2.8.	(c)	4	to review the SoG for HRNWP, and possibly approve it	Chair	June 2014.	
4) Nowcasting and very short range forecasting							
23	O1/7.3.2.	(c)	4	to review the SoG for NVRSF and provide	IPET-OSDE	May 2014.	

IPET-OSDE1, Final report

No.	Ref ¹	TOR ²	WP ³	Action	By	Deadline	Comment/Status
	15.			feedback to the Chair	members		
24	O1/7.3.2.16.	(c)	4	to review the SoG for NVSRF	Chair	June 2014	
25	O1/7.3.2.17.	(a)	2	to find experts for reviewing the way lightning detection is defined in OSCAR	Chair, PoC/NVSRF & CIMO	June 2014.	
				5) Seasonal to inter-annual forecasting			
26		(c)	4	Update SoG as necessary	L Ferranti	Ongoing	New SoG available
27	O1/7.3.2.48.	(c)	4	to review the SoG for SIAF and provide feedback to the Chair	IPET-OSDE members	May 2014.	
28	O1/7.3.2.49.	(c)	4	to review the SoG for SIAF	Chair	June 2014.	
29	O1/7.3.2.50.	(c)	4	to discuss with PoC and Richard Graham (UK) what the title of the SoG might be	Chair IPET-OSDE	June 2014.	
30	O1/7.3.2.51.	(c)	4	to invite the chair of the OPAG DPFS to confirm the nomination of the new PoC for SIAF	Secretariat	June 2014.	
				6) Aeronautical Meteorology			
31	E7/8.3.2.9	(c)	4	Check status of volcanic ash in various WMO documentation and identify whether updating will be needed. Relevant documents should be identified, and then reviewed, and updating proposed. Better feedback from ICAO is needed (joint CAeM/ICAO session in July).	D. Ivanov	end 2012	
32	O1/7.3.2.11.	(c) (g)	4	to invite CAEM to consider updating Technical Note No. 195 (WMO No. 770), Methods of Interpreting NWP output for Aeronautical Meteorology, which is outdated	PoC for Aeromet	July 2014.	
33	O1/7.3.2.12.	(c)	4	to review the SoG for Aeromet and provide feedback to the Chair	IPET-OSDE members	May 2014.	
34	O1/7.3.2.13.	(c)	4	to review the SoG for Aeromet	Chair	June 2014.	
				7) Atmospheric Chemistry			
35	E6/8.3.2.16	(c)	4	Liaise with GAW community with a view to updating further the SoG, taking into account the ET-EGOS-7 comments and the conclusions from the breakout group.	O Tarasova	end 2013	Consultation made; roadmap proposed at ET-EGOS-7
36	O1/7.3.2.	(c)	4	to discuss with CAS and provide the list of sub-	PoC for AC	IPET-	

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No.	Ref ¹	TOR ²	WP ³	Action	By	Deadline	Comment/Status
	20.			application areas (under responsibility of CAS) directly requiring observations, and independent from each other and other Application Areas		OSDE-2.	
37	O1/7.3.2.22.	(c) (h)	4	to relay a proposal to the ICT-IO for introducing a new Application Area under OPAG DPFS responsibility regarding air quality forecasting	Chair	April 2014.	
				8) Ocean Applications			
38	E7/8.3.2.26	(c)	4	Review new SoG for Ocean Applications once available, and provide feedback to the PoC	Chair	end 2012	
39	O1/7.3.2.24.	(a)	2	to discuss with the Secretariat for adding a nutrient variable in OSCAR, and populate the database	PoC for Ocean Applications	July 2014.	
40	O1/7.3.2.25.	(c)	4	to update the SoG for Ocean Applications to include the sub-application requirements for biogeochemical measurements	PoC for Ocean Applications	IPET-OSDE-2.	
41	O1/7.3.2.26.	(c)	4	to review the SoG for Ocean Applications and provide feedback to the Chair	IPET-OSDE members	May 2014.	
42	O1/7.3.2.27.	(c)	4	to review the SoG for Ocean Applications	Chair	June 2014.	
43	O1/7.3.2.28.	(c)	4	to consider changing the name of the AA, for example to "Metocean forecasting and services", and make a proposal to the Chair	PoC for Ocean Applications	IPET-OSDE-2.	
44	O1/7.3.2.32.	(a) (c)	2, 4	to check terminology for sea-ice requirements, and make proposal to the Secretariat on how to fix inconsistencies	PoC for Ocean Applications	End 2014.	
45	O1/7.3.2.29	(c)	4	to review relevant Statements of Guidance from an Ocean Application perspective, and make proposals for updating them to the respective Points of Contact	PoC for Ocean Applications	IPET-OSDE-2.	
				9) Agricultural Meteorology			
46	E5/8.3.1.2 (9)	(a)	2	Complete user requirements	R Stefanski	end 2012	Open for completing the URs
47	E7/8.3.2.32	(f)	9	Review latest draft of EGOS-IP as soon as possible, and propose changes if required	PoC for Agromet	ASAP	EGOS-IP adopted; n/a anymore.
48	O1/7.3.2.37.	(c)	4	to propose an update version of the SoG for Agromet	PoC for Agromet	IPET-OSDE-2.	
				10) Hydrology			
49	O1/7.3.2.41.	(c)	4	to review the SoG for Hydrology and provide feedback to the Chair	IPET-OSDE members	May 2014.	

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No.	Ref ¹	TOR ²	WP ³	Action	By	Deadline	Comment/Status
50	O1/7.3.2.42.	(c)	4	to review the SoG for Hydrology	Chair	June 2014.	
51	O1/7.3.2.44.	(c)	4	to invite CHy to review the EGOS-IP, and the Vision and provide feedback to the Chair	PoC for Hydrology	End 2014.	
11) Climate monitoring (GCOS)							
52	O1/7.3.2.54.	(c)	4, 6	to review relevant GCOS new [draft] documentation once available	IPET-OSDE members	ad hoc until IPET-OSDE-2.	
12) Climate Applications (other aspects – CCI)							
53	E7/8.3.2.45 E6/8.3.2.44 E5/8.3.2.26-27	(c)	4	Update further the SoG for Climate Applications (other aspects, CCI) to take into account the issues identified by ET-EGOS-7.	W Wright	end 2012	The GFCS-IP, drafted with wide community review, was approved by the WMO Extraordinary Congress in 2012.
54	E7/8.3.2.45	(a)	2	Provide quantitative URs for the database; update further the SoG consistently with the URs	W Wright	end 2012	
13) GTOS							
55	E7/8.3.2.49	(a) (c)	2, 4	Write to PoC for GTOS, and remind him about the issues that had been raised by ET-EGOS-6	Secretariat	Sept 2012	Situation with regard to GTOS evolved. The Chairman of GTOS Steering Committee resigned in March 2013, and the Director John Latham is not responsible anymore for GTOS since 2012. WMO is trying to resolve this issue with FAO, discussing new responsibilities and resources with FAO management. GCOS took over full responsibility for the TOPC and GEWEX. Point of contact is D/OBS of WMO (W. Zhang) GTOS not seen as a true Application Area, and may include observational user requirements for several applications. For example, some of the requirements may fall under Hydrology. IPET-OSDE needs to identify the requirements that are not currently considered by other AAs.

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No.	Ref ¹	TOR ²	WP ³	Action	By	Deadline	Comment/Status
56	E5/8.2.4.2	(a) (c)	2, 4	Provide user requirements for the WMO RRR Database; provide SoG	J Latham	end 2012	Ongoing SoG yet to be drafted Contact to be re-established
57	O1/7.3.3.4.	(a) (c)	2, 4	to write to GEWEX/GLAS concerning the development of requirements for some land applications	Chair	June 2014.	
14) Space weather							
58	O1/7.3.2.65.	(c)	4	to read the additional materials proposed to be added in the SoG for Space Weather, and provide feedback to the Point of Contact	Chair	June 2014.	
15) Global Cryosphere Watch							
59	E6/8.3.3.4	(a)	2, 8	Consult GCW community in a view to checking terminology; either remove obsolete requirements from the database or update them.	Secretariat	end 2012	This was addressed during the 1 st GCW Implementation meeting (GE, 21-24.11.2011) with subsequent follow-up. Terminology exists on websites that need to be reviewed.
60	E7/6.1.5	(a)	2, 8	Review how requirements for cryospheric variables and observations in polar regions are taken into account in the UR database and in their SoGs	All PoCs	end 2012	IPET-OSDE: there is a need to identify the user requirements that are specific to this community and not already covered by other AAs.
61	E7/6.1.5	(a)	2, 8	Investigate adding a new Cryosphere "Theme" in the database to facilitate management of the URS for cryospheric variables in the database	Secretariat	end 2012	Cryosphere "Theme" added in OSCAR Assignment of requirements to this Theme needs to be checked
62	E7/6.1.8	(a)	2, 8	Review current definitions of the cryospheric variables in the RRR Database	GCW PoC	end 2013	Open 12/11/2013: Comment from M. Ondras: The GCW Terminology Group should develop a GCW glossary. This Group has not yet started and we expect this group to be activated in 2014. Only after the glossary is developed, the review current definitions of the cryospheric variables in the RRR Database could be done.

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No.	Ref ¹	TOR ²	WP ³	Action	By	Deadline	Comment/Status
63	O1/7.3.3.13.	(c)	4, 8	to address the GCW recommendations in paragraph 7.3.3.12	Jeff Key	End 2014.	
				16) Global Framework for Climate Services			
64	O1/7.3.3.9. E7/6.3.9 E7/8.1.5	(c)	4, 7	to review the O&M annex of the GFCS-IP and provide feedback to the Chair	IPET-OSDE members	July 2014.	
				17) Global Ocean Observing System (GOOS)			
65	E6/8.1.12 E6/ANX-VIII	(a)	2	IOC to be reminded about the need to provide their requirements	Secretariat	Sept 2012	IOC confirmed its intention to update the GOOS requirements
				III. RRR PROCESS – OSCAR/Space and OSCAR/Surface			
66	O1/7.2.1 4.1.	(a)	2	to investigate how the new NASA database of in situ systems contributing to ECVs could contribute to OSCAR/Surface	Secretariat	End 2014.	
67	O1/7.2.1 4.2.	(b)	3	to investigate the implementation of the surface-based observing capabilities within the RRR process in the early stage of the RRR development (ET-ODRRGOS)	Secretariat	End 2014.	
68	O1/7.2.1 9.1.	(b)	3	to check if the list of station (and platform) types is complete or needs to be updated	All PoCs	June 2014.	The word 'Platform' is only defined by WMO for off-shore installations (e.g. gas or oil platform). For surface based observations, the word 'station' is used as defined by the Man. GOS. If an instrument is pretty large or a combination of instruments than the word 'system' is used (e.g. 'weather observing system'), but confusion may arise because 'system' is also used for other meanings (like in GOS).
69	O1/7.2.1 9.2.	(b)	3	to add a column for application areas in the list of station (and platform) types, and to invite the PoCs to review and update it	Secretariat	July 2014.	
70	E4	(b)	3	Update of Observing System Capabilities by space agencies – seek review by ET-SAT, ET-SUP and IPET-OSDE	J.Lafeuille	Ongoing	On-going, OSCAR/Space is regularly updated based on space agencies' reports to ET-SAT and CGMS, and bilateral contacts. The performance assessments requires further involvement of thematic application

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No.	Ref ¹	TOR ²	WP ³	Action	By	Deadline	Comment/Status
							expert groups.
71	E4	(b)	3	Pursue updates of observing capability database for remaining elements with 1st priority on WIN PROF, RADARs, and AMDAR.	R. Stringer in collab. with ICT-IOSETs, ET-AIR, ET-SBRSO	Ongoing	
IV. IMPACT STUDIES, OSEs, OSSEs							
72	O1/8.2.3.1.	(e)	5	to provide proposal of climate monitoring science questions to the R-SEIS	GCOS	ASAP.	
73	O1/8.2.3.2.	(e)	5	to review and update the list of science questions	R-SEIS	end June 2014.	
74	O1/8.2.5.1.	(e)	5	to provide a copy of the document on the cost-effectiveness of the barometer drifter technology for addressing multiple requirements to the Team members for their review	Secretariat	ASAP.	
75	O1/8.2.5.2.	(e)	5	to review the document on the cost-effectiveness of the barometer drifter technology for addressing multiple requirements, and provide feedback to the Chair	IPET-OSDE members	end April 2014.	
76	O1/8.2.5.3.	(e)	5	to perform a final review of the document on the cost-effectiveness of the barometer drifter technology for addressing multiple requirements, on the basis of feedback from the Team members, and to approve the document on behalf of the Team	Chair	end May 2014.	
77	O1/8.2.5.4.	(e)	5	to write to relevant WMO Members to invite them to properly fund the barometer drifter array, and provide a copy of the IPET-OSDE approved document on the cost-effectiveness of the barometer drifter technology for addressing multiple requirements	Secretariat	ASAP.	
78	O1/8.3.3.1.	(e)	5	to relay the Team's recommendation regarding the organization of the next NWP impact of observations workshop to the ICT-IOSE-8 for its consideration to submit a proposal to CBS Ext. (2014)	Chair	April 2014.	
V. COST.BENEFIT STUDIES							
79	O1/8.4.3.1.	(d)	1	to participate at the next ICG-WIGOS and present the work of the IPET-OSDE with regard to cost-	Chair	Jan. 2015.	

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No.	Ref ¹	TOR ²	WP ³	Action	By	Deadline	Comment/Status
				benefit studies for observing systems			
80	O1/8.4.3.2.	(d)	1	to assist the chair in providing feedback on the methodology, as well as input on the estimates of the cost of the observing systems	IPET-OSDE members	Jul. 2014.	
81	O1/8.4.3.3.	(d)	1	to write to the PoCs and explain the need to provide appropriate impact metrics for their Application Areas	Chair	July 2014.	
82	O1/8.4.3.4.	(d)	1	to start considering appropriate impact metrics for their Application Areas	All PoCs	End 2014.	
				VI. PREPARATION OF THE NEW EGOS-IP, AND FOLLOW UP			
83	O1/9.2.5	(f)	9	to propose ideas on the basis of the Team's discussion under paragraph 9.2 for the Team to consider regarding how to receive more and better feedback from the NFP on the EGOS-IP (e.g. members not necessarily report on every action (e.g. space ones))	Russell Stringer	end August 2014.	
84	O1/9.2.6	(f)	9	to post the received NFPs reports on the FTP site and inform the Team accordingly	Secretariat	ASAP.	
85	O1/9.4.2.8.	(g)	1	to prepare with the IPET-OSDE Chair a high level document (e.g. 4 pages) targeted to the Permanent Representatives on why we have the EGOS-IP, and what are the benefits	Secretariat	Sept. 2014.	
86	O1/9.4.2.9.	(g)	1	to prepare correspondence to Members on the basis of the ideas listed in Annex XIII, reminding them about their required actions to implement EGOS-IP, nominate NFPs, and monitor progress	WIGOS PO	end 2014.	
87	O1/9.4.2.10.	(f) (g)	9	to prepare a time table for the next 2 years regarding IPET-OSDE interaction with the focal points	Secretariat	ASAP.	
88	O1/9.4.3.2.	(f)	9	to propose a split of responsibility for monitoring progress of actions against the EGOS-IP for specific actions. Each "owner" of action(s) will consult with relevant experts for feedback	Chair & Secretariat	end April 2014.	
89	O1/9.4.3.3.	(f)	9	to review progress of actions against the EGOS-IP (possibly in consultation with relevant experts), and provide feedback to the Secretariat on the status of actions	EGOS-IP action "owners"	end May 2014.	
90	O1/9.4.3.4.	(f)	9	to compile a synthesis of the feedback received from the Team members regarding status of	Secretariat	end June 2014.	

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No.	Ref ¹	TOR ²	WP ³	Action	By	Deadline	Comment/Status
				actions of the EGOS-IP, and to submit it to the chair for his review			
91	O1/9.4.3.5.	(f)	9	to review the synthesis on the status of actions of the EGOS-IP, and provide feedback to the Chair and Secretariat	IPET-OSDE members	July 2014, then ongoing.	
92	O1/9.4.3.6.	(f)	9	to review final version of the first synthesis on the status of actions of the EGOS-IP, approve it, and to keep it updated	Chair	July 2014, then ongoing.	
93	O1/9.4.4.4.	(g)	1	to review the WIGOS Communications and Outreach Strategy	IPET-OSDE members	Jul. 2014.	
94	E7/10.2.3.4	(c) (d) (f)	1	Lead development of a communication strategy on EGOS-IP (see Annex XI)	R Stringer & Chair	Dec 2012	WIGOS Communications & Outreach strategy has been developed but more detailed guidance from ICG-WIGOS-4 is needed. Template prepared at ET-EGOS-7. Coordination required with IPET-WIFI. EGOS-IP translated in 5 languages.
95	E7/Anx-XI	(c) (d) (f)	1	Agree relationship between EGOS-IP and WIGOS-IP communication plans	Secretariat	July 2012	Open (wait for guidance from ICG-WIGOS-4)
				VII. OBSERVING SYSTEM NETWORK DESIGN PRINCIPLES			
96	O1/10.2.4.1.	(i)	10	to submit the OSND principles to the Chair of the TT-WRM	Chair	4 April 2014.	
97	O1/10.3.3	(i)	10	to request the OPAG-DPFS to invite the Chair of the IPET-OSDE and the WIGOS PO to comment on the proposed revision to the Manual on GDPFS in relation to observational data requirements	Secretariat	End July 2014	
				VIII. VISION			
98	O1/11.2.3.1.	(h)	1	to review the webpage on additions to the Vision of the GOS, and propose other additions or changes to the Secretariat and Chair if needed; ongoing	IPET-OSDE members	ongoing.	
99	O1/11.3.2.1.	(h)	1	to review their SoG against the 2025 Vision, and inform on which current requirements would remain unfulfilled	All PoCs	End 2014.	
100	O1/11.3.2.2.	(h)	1	to review the observing systems capabilities against the 2025 Vision, and inform on which new	OPAG IOS Teams	End 2014.	

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No.	Ref ¹	TOR ²	WP ³	Action	By	Deadline	Comment/Status
				capabilities may be sufficiently mature to be included in a 2040 Vision			
101	O1/11.3.2.3.	(h)	1	to share first drafts of its visionary documents for consideration as part of a new Vision	GCOS	end 2014.	
102	O1/11.3.2.4.	(h)	1	to review (with assistance from IPET-OSDE members) the Vision of the GOS in 2025, compare it with current capabilities, and derive lessons for producing a new Vision	Secretariat	end 2014.	
103	O1/11.3.2.5.	(h)	1	to prepare a draft of the Vision in 2040, in consultation with Team members	Chair	IPET-OSDE-2.	
				IX. OTHER ISSUES			
104	O1/11.1.1.1.	(j) (k)	1	to provide with existing Operating Plan, and CBS one to the Chair as a starting point	Secretariat	ASAP.	
105	O1/11.1.1.2.	(j) (k)	1	to review the existing WMO and CBS Operating Plans, and propose IPET-OSDE input to the new Operating Plans for 2016 to 2019	Chair	April 2014.	
106	O1/11.4.2.1.	(k)	1	to present the IPET-OSDE report to ICT-IO8-8	Chair	April 2014.	
107	E5/11.3	(c) (d)	6	Coordinate responses to any issue regarding GRUAN implementation with regard to CBS	Secretariat with L P Riishojgaard and J Eyre	Ongoing	Ongoing Chair is participating in the organising committee for the GRUAN-GSICS-GNSSRO WIGOS Workshop, 6-8 May 2014.
108	E7/10.1.1.9	(j)	9	Circulate the ET-EGOS report on feedback from NFPs (e.g. this ET-EGOS-7 doc no. 10.1.1) to the NFPs	Secretariat	Sept 2012 and ongoing	Not done
109	E7/10.1.1.10	(j)	9	Request NFPs to provide feedback for 2012 on the basis of the new EGOS-IP	Secretariat	Jan 2013	Not done in 2012. Feedback requested for 2013 in late February 2014.
110	E7/10.1.1.10	(j)	9	Compile synthesis of 2012 national reports	R Stringer	June 2013	No feedback received
111	E7/10.1.1.10	(j)	9	Reply to the NFPs who raised some questions for clarification on some of the EGOS-IP actions, and provide them with further clarification and guidance	R Stringer	ASAP	Open (not done)
112	E7/10.1.1.10	(j)	9	Give ASECNA the opportunity to provide feedback on the implementation of the EGOS-IP in RA-I	Secretariat & ASECNA	Jan 2013	Open (reminder to be sent to ASECNA)

UPDATED IPET-OSDE WORKPLAN WITH STATUS OF TASKS

<i>Id</i>	<i>Pr ior ity</i>	<i>Objective</i>	<i>Outcome</i>	<i>Deliverabl e</i>	<i>Activity</i>	<i>Leader</i>	<i>Due</i>	<i>OtherETs</i>	<i>Effort</i>	<i>StatusRepor t</i>
1	1	To contribute to the implementation of WIGOS, including WIGOS Manual, and provide relevant advice and support to the chairperson of ICT-IOS	Address relevant items of WIGOS Implementation Activities agreed by Congress XVI, and then ICG-WIGOS	Relevant WIP activities addressed	Meeting	Chair IPET-OSDE	Ongoing	ICG-WIGOS, IPET-WIFI		GOS Manual and Guide to be reviewed, and made consistent with WIGOS Manual and Guide while avoiding duplication Input provided to the TT-WRM Ongoing; PoCs regularly contacted for updates
2	1	Survey and collate user requirements for observations for WMO and WMO-sponsored programmes	Review and update WMO database of observational user requirements, through Points of Contact for application areas.	OSCAR/Requirements up to date	Review by FPs	Chair IPET-OSDE	Ongoing / Annual review			
3	1	Survey and collate observing systems capabilities for surface-based and space-based systems that are components or candidate components of WIGOS	Review and update WMO database of observing system capabilities, in collaboration with other OPAG IOS ETs and other Technical Commissions as appropriate.	OSCAR/Space & OSCAR/Surface up to date	Review by Members (coordination via NFPs)	Chair IPET-OSDE	Ongoing / Annual review	ICT-IOS, ET-ABO, ET-SBO, ICG-WIGOS/TT-WMD		Ongoing for space-based, and recorded in OSCAR/Space. Ongoing for surface-based through feedback from the

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Id	Pr ior ity	Objective	Outcome	Deliverable	Activity	Leader	Due	OtherETs	Effort	StatusReport
										NFPs although not recorded in OSCAR/Surface, which does not exist for now
4	1	Maintain Rolling Review of Requirements (RRR) for observations in several application areas, using subject area experts, including appropriate liaison with Technical Commissions and programmes and co-sponsored programmes (e.g. CAS, JCOMM, CAeM, CAgM, CHy, CCI, GCOS, GFCS, and GCW)	Continue RRR process for the listed application areas and expand to new areas as required: review and update as necessary Statements of Guidance on the extent to which present/ planned observing system capabilities meet user requirements, through Points of Contact on application areas.	Statements of Guidance for all Application Areas	Application Area Contact Points; Meeting	Chair IPET-OSDE	Ongoing / Annual review			Ongoing; some SoG reviewed. Overall review by IPET-OSDE1
5	1	Prepare and maintain reviews of observation impact studies undertaken by NWP centres and provide information for consideration by IPET-OSDE and OPAG-IOs	Rapporteurs on Impact Studies and NWP experts, review results of impact studies relevant to the evolution of observing systems. Organize and hold next NWP Impact Studies Workshop in 2016.	Findings of impact studies	Impact studies	Rapporteurs on Scientific Evaluation of Impact Studies undertaken by NWP Centres	2016: workshop			Report of the 5 th NWP "Impact" workshop (Sedona, 2012) Published. Ongoing; recent findings, and proposals for new impact studies

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Id	Pr ior ity	Objective	Outcome	Deliverable	Activity	Leader	Due	OtherETs	Effort	StatusReport
										discussed at IPET-OSDE1
6	1	Promote CBS activities in support of GCOS goals	Review the implications of the progress on the GCOS Implementation Plan for the activities of CBS. Bring relevant issues to the attention of the IPET-OSDE	RRR consistent with GCOS	Meeting	Rapporteur on GCOS matters	2013 2016			Ongoing interactions between IPET-OSDE Chair and GCOS.
7	1	Promote CBS activities in support of GFCS goals	Review the implications of the GFCS IP for the activities of CBS. Bring relevant issues to the attention of the IPET-OSDE	RRR consistent with GFCS	Meeting	Chair IPET-OSDE	2016			Relevant activities reviewed at IPET-OSDE1. GCOS/GFCS interaction encouraged. Relevant activities reviewed at IPET-OSDE1. CBS CWP submitted to the AOS1.
8	1	Promote CBS activities in support of GCW goals	Review the implications for the activities of CBS of the GCW developments, including the GCW Implementation Strategy, and the Cryosphere theme report for the IGOS partnership. Bring relevant issues to the attention of the IPET-OSDE	RRR consistent with GCW	Meeting	Chair IPET-OSDE	2016			

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Id	Pr ior ity	Objective	Outcome	Deliverable	Activity	Leader	Due	OtherETs	Effort	StatusReport
9	1	Monitor progress and actions by Members and partner Organizations per the approved Implementation Plan for the Evolution of the global observing systems (EGOS-IP), fully responding to the "Vision for the GOS in 2025", and promote activities in support of progress	Seek feedback from National Focal Points, Expert Teams, relevant Technical Commissions, and other groups on the implementation of EGOS-IP, and keep the EGOS-IP progress report up to date. Initiate and monitor activities which promote progress.	EGOS-IP progress report	Survey with FPs, TCs; meeting	Chair IPET-OSDE	Ongoing / Annual review			Ongoing. Feedback against the new EGOS-IP requested to the NFPs for 2013. Reviewed at IPET-OSDE1
10	1	Propose guidance regarding observing system network design principles	Draft guidance document on network design (to be further discussed at IPET-OSDE-1 in 2014)	Guidance document on network design	Meeting	Chair IPET-OSDE	End 2013 2014			Workshop organized in Nov. 2013. Draft OSND principles & guidance developed, as well as roadmap. OSND Principles provided for draft WIGOS Manual.

UPDATE ROADMAP FOR THE DEVELOPMENT OF OSND PRINCIPLES AND GUIDANCE

Time	Milestone	Tasks
Nov. 2013	OSDW1 TT-WRM	Produce input to OSND principles Provide input on OSND principles and guidance to WIGOS RM
Dec.		Draft OSND principles (J. Eyre)
Jan. 2014		Review by OSDW1 participants New draft of OSND principles produced based on feedback (J. Eyre by 27 Jan.)
Feb.	ICG-WIGOS	Review draft OSND principles Propose framework into which OSND principles & guidance will fit
Mar/Apr.	IPET-OSDE-1	Review and revise OSND principles Draft plan for preparing OSND guidance, and tasks for Team members for drafting materials
4 Apr.	TT-WRM	OSND principles submitted to the TT-WRM, and the WRM review process through Technical Commissions, and WMO Executive Bodies
Apr.	ICT-IOS-8	Notes the OSND principles Review/revise and approve plan for preparing OSND guidance
May		IPET-OSDE members to review draft OSND guidance and provide feedback to the Chair
Jun.	EC	
Jul.		
Aug.		
Sep.	CBS Ext. (2014)	Consideration by CBS of (i) the OSND principles (to be noted by CBS), and (ii) the roadmap for producing the OSND guidance, as part of WIGOS materials for approval
Oct.		
Nov.		Review of Cg-17 WIGOS RM by Members
Dec.		Review of Cg-17 WIGOS RM by Members
Jan. 2015		Review of Cg-17 WIGOS RM by Members
Feb.	OSDW2 ICG-WIGOS-4	OSDW2 to review/update OSND guidance Draft OSND guidance reviewed by ICG-WIGOS New experts invited to address all AAs
Mar.		
Apr.		
May.	Cg-17	Approve WIGOS Regulatory Material
Jun.		
Jul.		
Aug.		
Sep.		
Oct.		
Nov.	ET-SBO	
Dec.		
Jan. 2016	IPET-OSDE-2 (TBD) ICG-WIGOS-5	Draft version of OSND guidance reviewed by IPET-OSDE (slow track) Draft version of OSND guidance available and reviewed by ICG-WIGOS Draft OSND guidance submitted to EC (fast-track)
Feb.		
Mar.		
Apr.		

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May	ICT-IOIS-9	Final draft version of OSND guidance available (slow track)
Jun	EC	OSND guidance approved by EC (fast track)
Jul.		
Aug.		
Sep.		
Oct.	CBS	OSND Principles and Guidance endorsed by CBS (slow track)
Nov.		
Dec.		
Jan. 2017		Draft OSND guidance submitted to EC (slow-track)
Feb.		
Mar.		
Apr.		
May	EC	OSND Guidance approved by EC (slow track)

IDEAS FOR FACILITATING PROGRESS ON ACTIONS AND FOR SUPPORTING NFPs

The IPET-OSDE agreed with the following ideas for facilitating progress on Actions and for supporting NFPs:

- Ensure a good fit with more general WIGOS implementation. Further coordination and integration under WIGOS Framework Implementation Plan. The next opportunity for us is that the next ICG-WIGOS session, and it will be an opportunity for the further integration of EGOS-IP with WIGOS Pre-operation plan with the new draft.
- It is not enough simply to monitor progress; we need to stimulate awareness and uptake of the Actions
- It is not enough to rely solely on the NFPs to stimulate and achieve all the necessary uptake and progress; for many things they need some coordination and leadership.
- EGOS-IP focal points are needed within each of the “implementation agents” who LEAD any of the Actions.
- Guidance should be given to the PRs when asking them to nominate the NFPs.
- There should be a better connection to the WMO Programmes, including for providing feedback at the Regional level.
- Regional WIGOS focal points are being established. We should ensure that there is consistency between those focal points and the RRR NFPs (same people, or different but communicating with each other).
- Connection with existing programmes, like AMDAR, Space Programme response, etc, is important to merge the EGOS/WIGOS actions and projects into the programme activities. The experience with space programme communicating with CGMS members is an excellent example.
- Some of the actions should be prioritized, and these actions connected with some of the major WMO Priorities & programmes (like GFCS, DRR, Aviation, etc). Some of these actions should then be transferred into these programme activities through communication and promotion at the higher political level for facilitating the decision making process (e.g. through resolution of Congress, EC, RA sessions).
- Connection is also needed to the Regional working structure. At working level, the connection with the Regional working structures (including some key active National Focal Points) is important and critical for future success. RA is one of the appropriate levels for the IPET-OSDE to move actions forward, and check the progress against both WIGOS IP and EGOS-IP on regular basis (ever two years).
- Each CBS session will be natural cycle to communicate with all the CBS members for the actions. OPAG-IOs Chair need draw attention at CBS sessions as a standing action.
- Establishment of WIGOS regional or sub-regional centres is planned for the next financial period, as a key measure for the pre-operational phase of WIGOS (or WIGOS CENTER, hosted by 1 + strong NMHSs, and at Africa, the Center at sub-regional level, to fully take care of the both EGOS IP and WIGOS IP, together with WIS actions). These could be used as a mechanism for promoting implementation of the EGOS-IP, and collection of feedback on the implementation of actions of the EGOS-IP.

**PROCEDURE FOR UPDATE, VALIDATION AND APPROVAL
OF STATEMENTS OF GUIDANCE WITHIN THE WMO ROLLING
REVIEW OF REQUIREMENTS PROCESS**

(As of 3 April 2014, and approved by IPET-OSDE-1)

1. The Point-of-Contact (PoC) for the Application Area reviews the latest version of the SoG and proposes amendments, in the form of a Microsoft Word document using the “track changes” option. (If there is no pre-existing version, then the PoC drafts the first version of the SoG.) In performing this update, the PoC is expected to refer to some or all of the following: (i) the latest version of the user requirements for the Application Area; (ii) the latest version of the database Observing System Capabilities; (iii) his / her own expertise on the Application Area; (iv) advice from other international experts on the Application Area including, where relevant, WMO constituent bodies, and WMO Programmes and co-sponsored Programmes);
2. The PoC refers the new draft version of the SoG to the Chair of the ET-EGOS, with copy to the WMO Secretariat staff responsible for ET-EGOS;
3. The Chair of the ET-EGOS decides the appropriate review process for the new draft. If a meeting of ET-EGOS is imminent, the new draft becomes a document for this meeting and is reviewed by the Meeting. If a meeting is not imminent, the new draft may be referred to the ET-EGOS for comment(s) by correspondence;
4. The Chair of the ET-EGOS refers the comments of the ET-EGOS to the PoC, either by reference to the report of an ET-EGOS meeting or otherwise, as appropriate;
5. The PoC updates the draft to take account of comments received. Contentious issues are discussed with the Chair of ET-EGOS, as necessary. Microsoft Word “track changes” option continues to be used at this stage;
6. The PoC refers the revised draft version of the SoG to Chair of ET-EGOS, with copy to WMO Secretariat staff responsible for the ET-EGOS;
7. The Chair of the ET-EGOS considers the revised draft and adopts it, or refers it back to the PoC with comments for further revision (by steps 5 and 6 mentioned above);
8. The Chair of the ET-EGOS informs the WMO Secretariat staff responsible for the ET-EGOS when the revised version has been adopted;
9. The WMO Secretariat staff responsible for the ET-EGOS updates the WMO documentation (website, etc.) with the new version of the SoG, with due attention to version control procedures; and
10. At each ET-EGOS meeting, the WMO Secretariat staff responsible for the ET-EGOS reports to the ET on changes since the last meeting, in relation to the SoG version and its review and adoption status.

STATUS OF EXISTING STATEMENTS OF GUIDANCE
(March 2014)

This document provides for an overview of the status of statements of guidance regarding the WMO Application Areas.

No.	Application	Contact	Formal version – web (date)	New draft version (date)	Comment
1	Global NWP	Erik Andersson (ECMWF)	May 2012 (approved by ET-EGOS-7)	March 2014	<p>Consider the need to update the SoG to take account of recent NWP developments including the findings of recent observation impact studies.</p> <p>The new version proposed is taking into account recent changes in the global observing systems, and the increased importance of coupled assimilation with ocean and land surfaces. The PoC has involved experts on satellite data assimilation, conventional data and ocean analysis in preparing this update.</p> <p>Need to include a sentence that targeted dropsondes and rapid-scan AMVs have a significant impact on the forecast of tropical cyclones (THORPEX DAOS working group statement about the impact of targeted observations).</p>
2	High Resolution NWP (previously Regional NWP)	Thibaut Montmerle (France)	May 2012 (approved by ET-EGOS-7)	March 2014	<p>The PoC reviewed the SoG in March 2014. He essentially added MODE-S observations that allow to retrieve the wind and eventually the temperature at the airplane location. Some recent works, performed in particular at KNMI, have proved that this new type of AMDAR-like observation is worth to be considered in the future.</p> <p>The PoC has also made some minor modifications to the observational user requirements in OSCAR, mainly for reducing uncertainties and spatial resolutions which were found a bit too large with hindsight.</p>
3	Nowcasting and Very Short Range Forecasting	Paolo Ambrosetti (Switzerland)	June 2013 (approved by IPET-OSDE Chair)	March 2014	<p>ET-EGOS-7 requested the PoC, then to merge the user requirements for Synoptic Meteorology into those for NVSRF in the database. This was done in April 2013, and a new draft SoG provided to the Chair. A slightly revised draft was then provided.</p> <p>A further revised version was proposed in March 2014 to better reflect requirements for lightning detection, and for being consistent with proposed changes in OSCAR.</p> <p>The UR in OSCAR have been also been edited, and some further changes</p>

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No.	Application	Contact	Formal version – web (date)	New draft version (date)	Comment
					related to lightning detection proposed. The Point of Contact suggested to introduce two separated variables “Total lightning density” and “Intra Cloud lightning density”. IPET-OSDE-1 agreed to seek assistance of CIMO for reviewing the way lightning detection is defined in OSCAR
4	Seasonal to Inter-annual Forecasts	Laura Ferranti (ECMWF)	May 2012 (approved by ET-EGOS-7)	March 2014	<p>It was noted that observation requirements for the monthly forecasting (defined in more general terms as forecasts on sub-seasonal time scales) are the same of the ones for the seasonal forecasting.</p> <p>Considering the growing interest in applications in the "gap" between SIAF and Climate Monitoring (CM), i.e. decadal forecasting, the IPET-OSDE may wish to provide guidance whether it will be necessary to address the decadal forecast requirements in this SIAF SoG.</p> <p>The meeting of the CBS/CCI Expert Team on Operational Predictions from Sub-Seasonal to Longer-Time Scales (ET-OPSLs, UK, March 2014) expressed the interest of adding an additional paragraph to deal with the observational needs for decadal predictions. ET-OPSLs also proposed also to change the name of the Application Area to “<i>Sub-Seasonal to longer time scale predictions</i>” in order to better reflect the content of the SoG since it now includes observational needs for sub-seasonal to longer time scale predictions. ET-OPSLs discussed and approved a new version of the Statement of Guidance, and proposed that Dr. Yuhei Takaya (Japan) should be the new Point of Contact.</p>
5	Aeronautical Meteorology	Jitze van der Meulen (NL)	May 2012 (approved by ET-EGOS-7)	March 2014	<p>ET-EGOS-7 agreed that the measurement uncertainty had to be consistent in the RRR framework with the WMO-No. 8 (CIMO Guide), and the recommendations from the outcome of the WMO-BIPM Report¹ of the workshop on Measurement Challenges for Global Observing Systems for Climate Change Monitoring - Traceability, Stability and Uncertainty, Geneva, 30 March - 1 April 2010.</p> <p>Starting May, 2012 a significant number of comments and suggestions from various experts (CAeM, Volcanic Ash, Eumetnet) were received to update the SoG. Valuable changes are made because of significant progress in technologies used for observations.</p> <p>A significant modification on Volcanic Ash can be observed, largely because of</p>

1 IOM report 105 (WMO TD No. 1557), http://www.wmo.int/pages/prog/www/IMOP/publications/IOM-105_WMO-BIPM%20Conf.pdf

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No.	Application	Contact	Formal version – web (date)	New draft version (date)	Comment
					<p>the introduction of new applications based on satellite data. Also, the item on Space Weather was updated after the introduction of this new application area.</p> <p>The database (OSCAR) was updated as well. However, for a large number of variables, the requirements are indicated as TBD or 'tentative'. Consultancies with experts in aero-meteorology need to be carried out to obtain objective figures on firm uncertainty requirements, time intervals and coverage.</p>
6	Atmospheric Chemistry	Oksana Tarasova (WMO)	Dec 2005 (Approved by ET-EGOS-1)	Not available	<p>ET-EGOS-7 proposed roadmap for updating the SoG (Annex XIV of the meeting report). IPET-OSDE-1 requested the PoC to discuss with CAS and provide the list of sub-application areas (under responsibility of CAS) directly requiring observations, and independent from each other and other Application Areas. The IPET-OSDE Chair was also requested to relay a proposal to the ICT-IOS for introducing a new Application Area under OPAG DPFS responsibility regarding air quality forecasting</p>
7	Ocean Applications	Guimei Liu (China)	May 2012 (approved by ET-EGOS-7)	Mar. 2014	<p>Ocean applications variables UR in OSCAR and the Statement of Guidance for Ocean applications were reviewed and updated in March 2014. Proposing nutrients variables to be added into OSCAR, and the SoG to include the sub-application requirements for biogeochemical measurements. IPET-OSDE-1 proposed to consider changing the name of the AA , for example to Metocean forecasting and services (PoC to make a proposal to the Chair)</p>
8	Agricultural Meteorology	Mr Robert Stefanski (WMO)	June 2011 (approved by ET-EGOS-6)	Not available	<p>ET-EGOS-7 noted that a CAgM / JCOMM Task Team on Weather, Climate and Fisheries would meet in 2013 and would undertake a review of requirements for the fisheries side of the Agricultural Meteorology Programme. Therefore these have not been included in the SoG at the time but it was anticipated that the SoG would be updated once the fisheries review is completed.</p> <p>Based on the discussions at the ET-EGOS-7, several outstanding issues still need to be reviewed or revised (no progress ET-EGOS-7).</p> <p>A CAgM / JCOMM Task Team on the Weather, Climate and Fisheries met in 2013 and has not completed the review of requirements for the fisheries side of the Agricultural Meteorology Programme. Therefore these have not been included in this SoG but it is anticipated that the SoG will be updated once the fisheries review is completed. This review will probably not be completed until the</p>

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No.	Application	Contact	Formal version – web (date)	New draft version (date)	Comment
					<p>last quarter of 2014.</p> <p>There was difficulty in organizing a CAgM group to address these issues in the past two years. The 16th Session of CAgM will take place from 10-15 April 2014 and a new Open Panel Structure of the CAgM will be proposed. A dedicated Task Team or Expert Team will be created to look at the observation issues in agricultural meteorology. A dedicated Point of Contact will be named from this Team to liaise directly with the IPET-OSDE.</p> <p>CAgM team will examine all of these outstanding issues. A revised requirements table and SoG for agricultural meteorology will be provided at the next session of IPET-OSDE. The Point of Contact will liaise with the WMO Secretariat involved in this process to ensure that the revision is done properly. A revision of these documents are proposed to take place by June 2015.</p> <p>IPET-OSDE-1 recognized the anticipated progress, and encouraged CAgM to move as proposed and to report progress at IPET-OSDE-2.</p>
9	Hydrology	Bruce Stewart (WMO)	July 2008 (Approved by ET-EGOS-4)	Feb. 2014	<p>Revised SoG proposed by the acting PoC, B. Stewart (WMO Secretariat).</p> <p>The PoC provided the following comments (not discussed at depth at IPET-OSDE-1, so discussions with the PoC are still needed):</p> <p>“Hydrological in situ observations are very different to climate and weather in situ observations in that climate and weather data are representative of a single point. For both surface-water (discharge) and groundwater (pumping rates), the measurement while taken at a point, is representative of an entire catchment area or an aquifer and is this directly related to a measurement taken upstream or downstream or at other points of the aquifer. Therefore, a gridded or areal map of discharge is a complex and difficult concept to fully comprehend, especially across catchment boundaries.</p> <p>Satellite remote sensing, though increasingly used for the monitoring of precipitation, is generally of more limited utility in hydrology. Although altimeters on spacecraft have been demonstrated to measure the water surface elevation of major water bodies and very large rivers, the sensing of stream discharge and groundwater levels remains problematic at this time. Importantly, hydrological applications of remote sensing remain largely an expensive research activity, of little or no applicability to most National Hydrological Services around the world.”</p>

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No.	Application	Contact	Formal version – web (date)	New draft version (date)	Comment
10	Climate Monitoring	GCOS Secretariat	2010 (GCOS IP) and 2011 (Sat. supplement)	Not available	<p>ET-EGOS-2 (July 2006) accepted as SOG the following documents: (i) GCOS Reports on the Adequacy of the global climate observing systems, (ii) GCOS Implementation Plans and their updates, (iii) Satellite Supplements to the GCOS Implementation Plan and their updates, and (iv) Progress Reports on the Implementation of the Global Observing System for Climate in Support of the UNFCCC.</p> <p>GCOS initiated effort for producing a new progress report (target 08/2015), and implementation plan update (target Mid-2016).</p>
11	Climate Applications (other aspects - CCI)	William Wright (Australia)	May 2012 (approved by ET-EGOS-7)	Not available	<p>ET-EGOS-7 recalled that the SoG is a gap analysis and not a discussion about qualitative requirements. It requested the PoC to further update the SoG for Climate Applications (other aspects, CCI) to take into account the issues identified by the meeting. The Team also requested the PoC to provide quantitative requirements to the Database, and further update the SoG from that perspective.</p> <p>GFCS Implementation Plan, adopted by Cg. Ext.(2012) should also be considered. ET-EGOS-7 encouraged GFCS to follow the WMO RRR in the view to eventually contribute to it.</p> <p>The SoG which was provided in 2012 remains valid until next CCI intersession period when CCI will appoint a Task Team on SoG and an Expert Team on Voluntarily Observing Networks.</p>
12	GTOS	Wenjian Zhang (WMO Secretariat)	No	No	<p>Situation with regard to GTOS evolved. The Chairman of GTOS Steering Committee resigned in March 2013, and the John Latham (FAO) is not responsible anymore for GTOS since 2012. WMO is trying to resolve this issue with FAO at the higher level, and discussing new responsibilities and resources with FAO management. Meanwhile, GCOS took over full responsibility for the TOPC and GEWEX. The Point of contact is now the Director of the OBS Department at the WMO Secretariat, Wenjian Zhang.</p> <p>IPET-OSDE-1 noted that GTOS may not be seen as a true Application Area, and may include observational user requirements for several applications. For</p>

No.	Application	Contact	Formal version – web (date)	New draft version (date)	Comment
					example, some of the requirements may fall under Hydrology.
13	Space Weather	Terry Onsager (USA)	May 2012 (approved by ET-EGOS-7)	Not available	ET-EGOS-7 noted the excellent progress on the Space Weather SoG but gave no specific guidance regarding updating of the SoG. Since ET-EGOS-7, new UR were identified by ICT-SW and included in OSCAR. A systematic review of the definition and names of the space weather variables was undertaken and is still in progress. ICT-SW-4 agreed to include in the revised SOG a summary of new material which reviews capabilities and shortcomings in the provision of the newly required observations. IPET-OSDE-1 noted that International Airways Volcano Watch Operations Group (IAVWOPSG ²) of ICAO is focusing on volcano issues on the first place, but also on space weather. WMO secretariat is participating in this group. They have a dedicated webpage ³ , which is containing a Concept of Operations and information on user requirements. The Team agreed that the next CAeM in July 2014 will offer an opportunity to stimulate harmonization of requirements on space weather observations between ICAO and WMO

Notes:

ET-EGOS-7 considered that the GCW could not be regarded as an Application Area. However, there are many sub-applications to be addressed in the GCW context, and the Team agreed to use the IGOS Cryosphere Theme document as a basis for addressing GCW requirements in the new EGOS-IP.

ET-EGOS-6 responded to the requirements of CBS-Ext.(2010) to ensure that any particular requirements of Polar Meteorology are captured through the ongoing RRR process. The Team agreed that the Global Cryosphere Watch (GCW) should not be regarded as this stage as a specific Application Area. Instead, the Team requested the Points of Contact of all Application Areas to review the information provided by the Secretariat during the meeting (ET-EGOS-6 doc 8.3.2(10/3)) and revise their user requirements and SoGs if necessary. ET-EGOS-6 proposed to adopt the same approach than for GCOS, i.e. regarding a list of documents maintained by the GCW as Statement of Guidance. Such documents include for example the Integrated Global Observing Strategy (IGOS) Cryosphere Theme (“CryOS”) report.

Per ET-EGOS-5 recommendation, the Synoptic Meteorology Application Area has been merged into the Nowcasting and Very Short Range Forecasting Application Area.

ET-EGOS-5 suggested that the following applications should be addressed:

- (i.) Space Weather. Space weather events affect the meteorological infrastructure through their impact on environmental satellites, navigation satellites (e.g. GPS)

² <http://www.icao.int/safety/meteorology/iavwopsg>

³ <http://www.icao.int/safety/meteorology/iavwopsg/Space%20Weather>

and space-based telecommunication systems; they also represent a potential hazard for aviation and some large ground-based facilities. Critical phenomena to be monitored include solar radiation storms, high-energy particle rain, ionospheric and geomagnetic storms, and radio black-out by X-ray photons. This requires permanent measurements in the area of e.g. Solar imagery, High- and Low-energy particle detection, and Electron density. Refining these observation requirements is a prerequisite towards the standardization of Space Weather instruments that WMO is now expected to support.;

- (ii.) GTOS requirements for understanding the global carbon cycle and related climate change issues. For consistent and comprehensive monitoring of the carbon cycle, ecosystems, forests and land dynamics in general, both long-term sustained observations of Essential Climate Variables as well as regionally-focussed, intermittent measurements of other variables (and their fluxes) for process-type studies are required. A comprehensive gap analysis of existing capabilities in relation to needs is yet to be undertaken. Such an analysis should build on the existing SoG for Climate Monitoring (ie. the GCOS Second Adequacy Report, the GCOS IP and its 2010 Update) as well as the status reports on the development of standards for terrestrial ECV (<http://www.fao.org/gtos/topcECV.html>).

ET-EGOS-5 recognized that many GTOS requirements are being already considered by GCOS, but not all of them. The Team requested the Secretariat to identify PoC who should be invited to identify those requirements that are not covered by GCOS (i.e. the non GCOS requirements of GTOS) (action: Secretariat; Mar 2010).

ET-EGOS-5 invited the Inter-programme Coordination Team on Space Weather (ICT-SW) to address user requirements on space weather, and provide feedback to the ET-EGOS Chair on the list of relevant Applications.

Reference: Current versions of Statements of Guidance - <http://www.wmo.int/pages/prog/www/OSY/GOS-RRR.html#SOG>

**PROPOSED TOPICS FOR NWP IMPACT STUDIES RELEVANT TO THE EVOLUTION OF
GLOBAL OBSERVING SYSTEMS (REVISED 2014)**

(as proposed by IPET-OSDE1, 3 April 2014, and submitted to ICT-IO8 for its review; the list may be further updated until the end of June 2014 by the R-SEIS, and for submission to CBS Ext. (2014))

Short name: Full name	Science question
Surface-based	
S1MarinePs: Surface pressure over ocean	What density of surface pressure observations over ocean is needed to complement high-density surface wind observations from satellites
S2AMDAR: Coverage of AMDAR	What are the priorities for expansion of the network?
S3Radar: Radar observations	What are the impacts of current radar observations, including radial winds and reflectivities?
Space-based	
S4SatLand: Satellite radiances over land	What is the impact of new developments in the assimilation of radiance data over land?
S5Sounders: Impact of multiple satellite sounders	What benefits are found when data from more than one passive sounder are available from satellites in complementary orbits, e.g. European, American and Chinese sounders
S6AMVs: AMVs	What AMVs function should be enhanced especially for the next generation geostationary satellite? And what are the impacts of new types of AMVs such as HEO-AMV, MISR-AMV?
General	
S7PBL: Observations of the PBL for regional / high-resolution NWP	What should be the focus of improvements for observations of the PBL in support of regional/high-resolution NWP? Which variables and what space-time resolution?
S8UA: EUCOS-like upper air OSEs	Can EUCOS-like upper air studies be performed for other regions?
S9AdjEns: Application of adjoint and ensemble methods	What insights can be gained from more tailored use of adjoint- and ensemble-based measures of observation impact, for severe weather and for weather parameters where metrics other than global energy may be appropriate?
S10ExtRange: Impact of observations on extended range forecasts	Which observations are particularly important for the 7-14 day forecast range? Investigate the role of ocean observations in coupled atmosphere-ocean data assimilation.
S11 Time frequency	What time frequency data from GEO satellites and ground based remote sensing observations (such as Doppler radar, wind profiler, ground based GNSS receivers) should be needed (exchanged) for the global / regional NWP?
S12 Non-atmospheric geophysical parameters	What is the impact of non-atmospheric geophysical observation parameters (e.g. upper-ocean land-surface parameters or atmospheric composition)

FURTHER IMPROVEMENTS TO THE TEMPLATE FOR ANNUAL REPORTING BY NFPs

(as proposed by Russell Stringer, 1 April 2014)

The agenda paper providing a summary of reports for 2011 can be found at:

http://www.wmo.int/pages/prog/www/OSY/Meetings/ET-EGOS_Geneva2012/documents/EGOS7-Doc-10.1.1-NFP-feedback.doc

this includes some comments about improvements to the reporting template (as it was for the previous EGOS-IP):

"3. PATTERN OF REPORTS FOR 2011

3.1 Use of a template for NFP reports

In the first couple of years of reporting, NFP annual reports were submitted as a free-form commentary. This allowed flexibility for respondents but had a number of shortcomings. At the 5th meeting of ET-EGOS a new template was composed and has been sent to NFPs each year since then as part of the request for annual reports. The template has several goals including:

- to make it easier for NFPs to compose a report;
- to guide NFPs on which Recommendations are the highest priority for response;
- to provide some additional explanation and background for some of the Recommendations; and
- to collect responses in a structured way to better enable their collation and analysis.

Since their adoption it has been found that:

- some reports can be prepared with great simplicity, involving just a few ticks against relevant boxes;
- for the EGOS-IP Recommendations most relevant to NMHS, there was a more complete response rate than in the first couple of years. Conversely, there was a reduced response rate for the Recommendations on the space-based sub-system of the GOS, which is appropriate given that they call for action by bodies other than individual NMHS;
- less interpretation of the reports was needed in order to complete the collation and analysis."

A similar exercise is needed to:

- decide which of the new 115 Actions are the highest priority for NFPs to report against. My simple list based on who is "leading" the action is: C3, C4, C5, C6, C8, C13, G26 and G28. This is a starting point but needs further thought;
- then set out a more lengthy template similar to the previous version (see attached).

IMPLEMENTATION PLAN FOR EVOLUTION OF GLOBAL OBSERVING SYSTEMS (EGOS-IP)

TEMPLATE FOR ANNUAL REPORT FOR 2010 ON PROGRESS AND PLANS BY NATIONAL FOCAL POINTS (NFPs)

I. BACKGROUND INFORMATION

During 2007 and in subsequent communications, WMO Member countries were invited to nominate an NFP for reporting progress and plans related to EGOS-IP. The role of NFPs includes the reporting of progress and plans in their country related to the EGOS-IP, in particular to:

1. Report annually on the status of the national components of the Surface- and Space-Based Sub Systems of the Global Observing System vis-à-vis recommendations of the EGOS-IP; and
2. Report annually on national plans for the evolution of the national components of the Surface- and Space-Based Sub Systems of the Global Observing System taking into account recommendations of the EGOS-IP.

This will be the fourth year for which national reports are provided by NFPs. The analysis of national reports for 2008 was presented to the CBS Expert Team on Evolution of the GOS (ET-EGOS) at its fifth meeting in December 2009 and may be accessed from the WMO web site at:

http://www.wmo.ch/pages/prog/www/OSY/Meetings/ET-EGOS_Geneva2009/documents/Doc10.1-Feedback-NFP.doc

The analysis of national reports for 2009 will be presented to the upcoming CBS Expert Team on the Evolution of the global observing systems (ET-EGOS) at its sixth meeting in June 2011. The meeting documents can be accessed from the WMO web site at:

http://www.wmo.int/pages/prog/www/OSY/Meetings/ET-EGOS_Geneva2011/DocPlan.html

For reference, the EGOS-IP was published as WMO/TD No. 1267 and may be accessed at:

http://www.wmo.int/pages/prog/www/OSY/Publications/TD1267_Impl-Plan_Evol-GOS.pdf

At each of its meetings the ET-EGOS notes some new plans and actions in the form of updates to the EGOS-IP document. These may be found in the final reports of meetings at:

<http://www.wmo.int/pages/prog/www/CBS-Reports/IOS-index.html>

Format for reports on progress and plans for 2010

During the initial years, reports have been composed as free-form responses. Reports can be submitted in this format again, however it is preferred that the template included below be used to prepare reports for 2010 as done in the previous year.

The template has several goals including:

- to make it easier for NFPs to compose a report;
- to guide NFPs on which Recommendations are the highest priority for response;
- to provide some additional explanation and background for some of the Recommendations; and
- to collect responses in a structured way to better enable their collation and analysis.

If you have any questions or would like to discuss your report, you are welcome to contact:

Miroslav Ondráš
WMO Secretariat
MOndras@wmo.int

and/or

Russell Stringer
Member of the CBS Expert Team on
Evolution of the GOS
(Australian Bureau of Meteorology)
R.Stringer@bom.gov.au

II PREVIOUS REPORT

Please indicate whether your previous annual report can be regarded as containing up-to-date information on recommendations that you haven't made new comments on in the template (below):

YES

NO

III REPORT FOR 2010

The template for responses is set out below in three sections:

- Section A (highest priority for reply) – these recommendations are relevant to all or many of the WMO Member countries, and have received the most replies in previous reports by NFPs;
 - Section B (next priority for reply) – these recommendations have relevance for a smaller subset of WMO Member countries, have received fewer replies in previous reports by NFPs, or are not directed to WMO Member countries but nevertheless have attracted some interest and response from NFPs in previous reports; and
 - Section C (other items) – NFPs may comment against these recommendations if they wish to, however the recommendations are not directed to WMO Member countries or the progress and plans for implementation can be monitored in other ways (for example through various groups dealing with satellite activities, or the WMO/IOC Joint Commission for Marine Meteorology, JCOMM).
-

Section A (highest priority for reply)

Recommendation G1 - Distribution

Distribution - Some observations made routinely are not distributed in near real-time but are of interest for use in meteorological applications.

- (a) Observations made with high temporal frequency should be distributed globally at least hourly.
- (b) Observational data that are useful for meteorological applications at other NMHSs should be exchanged internationally, taking into account Res. 40 (Cg-XII). Examples include high resolution radar measurements (i.e. products, both reflectivity and radial winds, where available) to provide information on precipitation and wind, surface observations, including those from local or regional mesonets, such as high spatial resolution precipitation networks, but also other observations, such as soil temperature and soil moisture, and observations from wave rider buoys. WMO Members summarize the data available in their regions and strive to make these data available via WMO real time or near-real-time information systems, whenever feasible.

Some further information:

- studies have shown that 4D-Var data assimilation systems or analysis systems with frequent update cycles can make excellent use of hourly data, e.g. from SYNOPs, buoys, profilers, and other automated systems, in particular Automatic Weather Systems (AWS).
- CBS has urged WMO Members to implement this recommendation at the earliest possible date. Availability to hourly surface pressure data is important for NWP and should be improved. Drifting buoy hourly pressure data are now exchanged routinely.
- More frequent data than 1 hour from AWS are encouraged to be shared between Members in real-time.

With respect to recommendation G1:

National observing systems are currently involved in this activity and responding to this recommendation, or have capacity and plans that will lead to progress on this recommendation.

National observing systems are currently not involved in this activity, and/or have no capacity or plans for evolution in this manner.

Explanation:

Recommendation G2 - Documentation

Documentation - All observational data sources should be accompanied by good documentation including metadata, QC, and monitoring.

For some recommendations, additional guidance on exactly is asked of NMHS, or Case Study / further explanatory material / references may be inserted

With respect to recommendation G2:

National observing systems are currently involved in this activity and responding to this recommendation, or have capacity and plans that will lead to progress on this recommendation.

National observing systems are currently not involved in this activity, and/or have no capacity or plans for evolution in this manner.

Explanation:

Recommendation G3 - Timeliness and Completeness

Timeliness and Completeness - There should be a timely distribution of radiosonde observations with all observation points (not just mandatory levels) included in the message (together with the time and the position of each data point; information on instrument calibration prior to launch, and information on sensor type and sub-sensor type). Appropriate coding standards should be used to assure that the content (e.g. vertical resolution) of the original measurements, sufficient to meet the user requirements, is retained during transmission.

For some recommendations, additional guidance on exactly is asked of NMHS, or Case Study / further explanatory material / references may be inserted

With respect to recommendation G3:

National observing systems are currently involved in this activity and responding to this recommendation, or have capacity and plans that will lead to progress on this recommendation.

National observing systems are currently not involved in this activity, and/or have no capacity or plans for evolution in this manner.

Explanation:

Recommendation G4 - Baseline system

Baseline system - Provide comprehensive and uniform coverage with at least 12-hour frequency of temperature, wind, and moisture profiles over mid-latitude continental areas and coastal regions. In tropical regions the wind profile information is particularly important.

For some recommendations, additional guidance on exactly is asked of NMHS, or Case Study / further explanatory material / references may be inserted

With respect to recommendation G4:

National observing systems are currently involved in this activity and responding to this recommendation, or have capacity and plans that will lead to progress on this recommendation.

National observing systems are currently not involved in this activity, and/or have no capacity or plans for evolution in this manner.

Explanation:

Recommendation G8 - RAOBs

RAOBs - Optimize the distribution and the launch times of the rawinsonde sub-system (allowing flexible operation while preserving the GUAN network and taking into consideration regional climate requirements of the RBCN). Examples include avoiding duplication of Automated Ship-borne Aerological Program (ASAP) soundings whenever ships are near a fixed rawinsonde site (freeing resources for observations at critical times) and optimizing rawinsonde launches to meet the local forecasting requirements.

For some recommendations, additional guidance on exactly is asked of NMHS, or Case Study / further explanatory material / references may be inserted

With respect to recommendation G8:

- National observing systems are currently involved in this activity and responding to this recommendation, or have capacity and plans that will lead to progress on this recommendation.
- National observing systems are currently not involved in this activity, and/or have no capacity or plans for evolution in this manner.

Explanation:

Recommendation G9 - AMDAR

AMDAR technology should provide more ascent/descent profiles, with improved vertical resolution, where vertical profile data from radiosondes and pilot balloons are sparse as well as into times that are currently not well observed such as 2300 to 0500 local times.

For some recommendations, additional guidance on exactly is asked of NMHS, or Case Study / further explanatory material / references may be inserted

With respect to recommendation G9:

- National observing systems are currently involved in this activity and responding to this recommendation, or have capacity and plans that will lead to progress on this recommendation.
- National observing systems are currently not involved in this activity, and/or have no capacity or plans for evolution in this manner.

Explanation:

Recommendation G13 - Ground GPS

Ground GPS - Develop further the capability of ground-based GPS systems for the inference of vertically integrated moisture with an eye toward operational implementation. Ground based GPS processing (Zenith Total Delay and Precipitable Water, priority for ZTD) should be standardized to provide more consistent data sets. Data should be exchanged globally.

For some recommendations, additional guidance on exactly is asked of NMHS, or Case Study / further explanatory material / references may be inserted

With respect to recommendation G13:

- National observing systems are currently involved in this activity and responding to this recommendation, or have capacity and plans that will lead to progress on this recommendation.
- National observing systems are currently not involved in this activity, and/or have no capacity or plans for evolution in this manner.

Explanation:

Recommendation G20 - More profiles in Tropics

More profiles in Tropics - Temperature, wind and if possible humidity profile measurements (from radiosondes, PILOTs, and aircraft) should be enhanced in the tropical belt, in particular over Africa and tropical America.

For some recommendations, additional guidance on exactly is asked of NMHS, or Case Study / further explanatory material / references may be inserted

With respect to recommendation G20:

National observing systems are currently involved in this activity and responding to this recommendation, or have capacity and plans that will lead to progress on this recommendation.

National observing systems are currently not involved in this activity, and/or have no capacity or plans for evolution in this manner.

Explanation:

Recommendation G21 - AWS

AWS - Noting the widespread adoption of AWS, there should be coordinated planning that includes:

- Appropriate codes and reporting standards,
- Global standard for quality management and the collection / sharing of metadata, and
- Expanded range of measured parameters.

For some recommendations, additional guidance on exactly is asked of NMHS, or Case Study / further explanatory material / references may be inserted

With respect to recommendation G21:

National observing systems are currently involved in this activity and responding to this recommendation, or have capacity and plans that will lead to progress on this recommendation.

National observing systems are currently not involved in this activity, and/or have no capacity or plans for evolution in this manner.

Explanation:

Section B (next priority for reply)

Recommendation G6 - Ozone Sondes

Ozone Sondes - Near real-time distribution of ozone sonde data is required for calibration and validation of newly launched (satellite) instruments and for potential use in NWP.

National observing systems are currently involved in this activity and responding to this recommendation, or have capacity and plans that will lead to progress on this recommendation.

National observing systems are currently not involved in this activity, and/or have no capacity or plans for evolution in this manner.

Explanation:

Recommendation G7 - Targeted Observations

Targeted Observations - Observation targeting to improve the observation coverage in data sensitive areas for NWP should be transferred into operations once the methodology has matured. Non-linear methods in targeting have been studied and should also be considered. The operational framework for providing information on the sensitive areas and responding to such information needs to be developed.

National observing systems are currently involved in this activity and responding to this recommendation, or have capacity and plans that will lead to progress on this recommendation.

National observing systems are currently not involved in this activity, and/or have no capacity or plans for evolution in this manner.

Explanation:

Recommendation G10 - Transmission of AMDAR reports

Transmission of AMDAR reports - Optimize the transmission of AMDAR reports taking into account, en route coverage in data-sparse regions, vertical resolution of ascent/descent reports, and targeting related to the weather situation.

- National observing systems are currently involved in this activity and responding to this recommendation, or have capacity and plans that will lead to progress on this recommendation.
- National observing systems are currently not involved in this activity, and/or have no capacity or plans for evolution in this manner.

Explanation:

Recommendation G11 - Humidity sensors on AMDAR

Humidity sensors on AMDAR - Further development and testing of water vapour sensing systems is strongly encouraged to supplement the temperature and wind reports from AMDAR.

- National observing systems are currently involved in this activity and responding to this recommendation, or have capacity and plans that will lead to progress on this recommendation.
- National observing systems are currently not involved in this activity, and/or have no capacity or plans for evolution in this manner.

Explanation:

Recommendation G12 - TAMDAR & AFIRS

TAMDAR & AFIRS - To expand ascent/descent profile coverage to regional airports, the development of TAMDAR, and use of AFIRS should be monitored with a view towards operational use.

National observing systems are currently involved in this activity and responding to this recommendation, or have capacity and plans that will lead to progress on this recommendation.

National observing systems are currently not involved in this activity, and/or have no capacity or plans for evolution in this manner.

Explanation:

Recommendation G22 - New systems

New systems - In the context of THORPEX, the feasibility of new systems should be demonstrated as much as possible. These possible operational sub-systems include but are not limited to:

- ground based interferometers and radiometers (e.g. microwave) that could provide continuous vertical profiles of temperature and humidity in selected areas;
- Unmanned Aeronautical Vehicles (UAVs);
- High altitude balloons; and
- Lidars.

National observing systems are currently involved in this activity and responding to this recommendation, or have capacity and plans that will lead to progress on this recommendation.

National observing systems are currently not involved in this activity, and/or have no capacity or plans for evolution in this manner.

Explanation:

Recommendation O1 - Observing System Study

Observing System Study - Support well-resourced studies of re-designed observing systems. This is an ongoing process.

National observing systems are currently involved in this activity and responding to this recommendation, or have capacity and plans that will lead to progress on this recommendation.

National observing systems are currently not involved in this activity, and/or have no capacity or plans for evolution in this manner.

Explanation:

Recommendation S5 - LEO (satellite) data timeliness

LEO data timeliness - More timely data are needed. Improved communication and processing systems should be explored to meet the timeliness requirements in some applications areas (e.g. Regional NWP).

National observing systems are currently involved in this activity and responding to this recommendation, or have capacity and plans that will lead to progress on this recommendation.

National observing systems are currently not involved in this activity, and/or have no capacity or plans for evolution in this manner.

Explanation:

OSCAR UPDATING/MAINTENANCE PROCEDURE ¹

(Version reviewed by IPET-OSDE1, 3 April 2014)

1. INTRODUCTION

1.1 **Purpose and scope**

This procedure defines the roles, responsibilities and steps to be followed to update content, functionality and interface of the **OSCAR/Requirements** and OSCAR/Space modules with the aim to ensure that OSCAR content is up-to date, correct, quality-controlled, accessible and fit for purpose.

Note: OSCAR/Space feeds another information resource, the CGMS Satellite Status list, which is thus indirectly covered by this procedure.

1.2 **Document plan**

The document contains seven sections:

- Section 1: Introduction
- Section 2: Roles
- Section 3: OSCAR/Requirements updating process**
- Section 4: OSCAR/Space content updating process
- Section 5: Updating of functionality and interface
- Section 6: User feedback and evaluation
- Section 7: Resources for Oscar updating and maintenance
- Section 8: Evolution of the procedure

1.3 **Background documents**

- OSCAR/Space Software Requirements Specification
- WIGOS Information Resource (WIR) functional requirements specification
- ISO/IEC 14764:2006 Software Maintenance
- [CIMO Guide Part 3 Chapter 1 Quality management](#)
- [Rolling Review of Requirements \(RRR\) process](#)

1.4 **Definitions**

Acronym	Definition
OSCAR	Observing System Capability Analysis and Review Tool
WIGOS	WMO Integrated Global Observing system
WIR	WIGOS Information Resource
CEOS	Committee on Earth Observation Satellites
CGMS	Coordination Group for Meteorological Satellites

2. Roles

The updating and maintenance processes involve the following roles. In practice, one person can take multiple roles.

¹ Note: the OSCAR/Requirements parts added to the ET-SAT approved document are highlighted in green. IPER-OSDE concurred with the Space part, and approved the Requirements part.

Role name	Description
SP Office	Space Programme Office (Including external contractors acting by delegation of the SP Office staff and in accordance with the present procedure)
PoC	Point of Contact in charge of reviewing and updating the requirements for a given Application Area identified in the RRR process
IPET-OSDE	CBS Inter-Programme Expert Team on Observing System Design and Evolution
ET-SAT	CBS Expert Team on Satellite Systems
Satellite Operators	Satellite operators with missions recorded in OSCAR
Science Groups	International Science Groups that partner with WMO, e.g. IPWG, IROWG, ICT-SW
WIR Project Manager	Person responsible for coordinating the overall WIGOS Information Resource (WIR) developments including OSCAR developments
OSCAR Developer	Person(s) responsible for the technical developments of the OSCAR tool
OSCAR Technical Administrator	Person(s) responsible for the maintenance and operation of the OSCAR tool

3. OSCAR/REQUIREMENTS UPDATING PROCESS

Scope: This section applies to the updating of the contents of OSCAR/Requirements. For changes to the functionality of OSCAR, please refer to Section 5.

3.1 NEW VARIABLES OR CHANGES TO THE ATTRIBUTES OF A VARIABLE

Note: The variables registered in OSCAR are generally shared by several application areas. Each variable has the following attributes, which can only be updated by the administrator.

TABLE 1: Attributes of a variable in OSCAR

Attribute	Example
Name	<i>Sea surface temperature</i>
Applicable cross-cutting tags	<i>Cryosphere, Tropical Meteorology</i>
Domain or sub-domain	<i>Ocean</i>
Definition	<i>Temperature of the sea water at surface. The “bulk” temperature refers to the depth of typically 2 m, the “skin” refers to within the upper 1 mm.</i>
Comment	<i>Detailed SST definitions are available from GHRSSST: https://www.ghrsst.org/ghrsst-science/sst-definitions/</i>

Measuring unit	<i>K</i>
Uncertainty unit ²	<i>K</i>
Stability unit per decade	<i>K</i>
Unit for horizontal resolution	<i>km</i>
Unit for vertical resolution	
Applicable layers	<i>Sea surface, Bulk</i>

The following steps shall be followed to update any attribute of a variable, or to enter a new variable:

Step	Description	Responsibility	Frequency
1	When identifying the need to either register a new variable or amending the attributes of an existing variable, the Point of Contact or a relevant expert submits the proposed attributes (as listed in Table 1) to the administrator with a brief justification.	PoC or other expert	When needed
2	The administrator checks the formal consistency of the recommended change, seeking clarification from the initiator if necessary. If the change is minor (e.g. adding a layer, or editorial correction on the definition, etc.) the administrator jumps to step 5.	Administrator	When contacted by a PoC or other expert
3	If the recommended change is substantial and/or has a potential impact on the requirements of several applications, the administrator seeks confirmation from the IPET-OSDE Chair	Administrator	When appropriate
4	The IPET-OSDE Chair either confirms the proposed change, or contacts the expert for further discussion, or submits the proposal to discussion by IPET-OSDE	IPET-OSDE Chair	When appropriate
5	Upon confirmation by the IPET-OSDE Chair, or endorsement by the IPET-OSDE group, or if the recommended change is minor, the OSCAR/Requirements administrator implements the change.	Administrator	When a proposed change is confirmed

3.2 REQUIREMENTS APPLICABLE TO AN EXISTING VARIABLE

The provisions below are applicable when a requirement is updated, or a new requirement is entered, for a variable which is recorded in OSCAR, without changing the definition, unit, or applicable layers of this variable.

Step	Description	Responsibility	Frequency
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² The uncertainty unit should be chosen from the perspective of user requirements, but the constraints of available technologies should also be taken into account and, where there are conflicts, an acceptance compromise should be sought

1	The PoC reviews the requirements of his/her application area in consistency with the Statement of Guidance, taking into account the evolution occurred in the application area.	PoC	Yearly
2	If updates are necessary, the PoC logs in as Editor, and updates the requirements or enters new requirements as appropriate. If necessary he/she contacts the administrator for assistance.	PoC	Yearly
3	When the update is ready, the PoC informs the OSCAR/Requirements administrator that requirements are in draft status	PoC	When update is ready for validation
4	The administrator checks the formal consistency of the new or updated requirement. If the updates are purely editorial or a factual correction, the administrator jumps to step 7	Administrator	
5	If the updates are substantial, the administrator seeks confirmation from the IPET-OSDE Chair	Administrator	
6	The IPET-OSDE Chair either confirms the updated requirement, or contacts the PoC for further discussion, or submits the proposed update to IPET-OSDE for discussion.	IPET-OSDE Chair	
7	Upon confirmation by the IPET-OSDE Chair, or endorsement by IPET-OSDE, or if the draft update is minor, the OSCAR/Requirements administrator validates the update.	Administrator	

4. OSCAR/SPACE Content updating Process

There are two levels of content updates:

- First level: updates based on non-controversial factual evidence,
- Second level: other updates, resulting of expert assessment.

4.1 First level: updating of factual content

Scope: Refers to update, insertion or deletion of factual content, based on non-controversial factual evidence (e.g. satellite launch dates, new satellite plans, start or end of operational service, orbit characteristics, instrument specifications, ground segment and programme description).

Step	Description	Responsibility	Frequency
1	SP Office keeps track of publicly available information from official satellite operator sources and updates OSCAR accordingly [If necessary, updates are confirmed with Satellite Operator focal points]	SP Office	Continuous, Delay of max 2 months
2	Satellite Operators inform SP Office of important changes or factual errors in OSCAR	Satellite operators	As necessary
3	CGMS satellite operators regularly validate factual information within their responsibility through annual reports to CGMS	Satellite operators	yearly
4	For non-CGMS members, updates are collected either via CEOS or, if relevant (e.g. non-CEOS Members), through direct call from the SP Office	SP Office in consultation with CEOS	yearly

4.2 **Second level: updating of assessments**

Scope: Refers to assessments of the suitability of certain instruments for fulfilling pre-defined capabilities or measuring specific variables. Since these assessments can be subject to discussion, effort is made to seek endorsement by representative or authoritative experts.

Step	Description	Responsibility	Frequency
1	Instruments are classified and assessed according to objective design features	SP Office	As new satellites/instruments are added
2.1	Thematic science groups are invited to review the instrument rating per product, in their respective fields of expertise	Science groups (e.g. IPWG, IROWG, ICT-SW)	Typically 2-yearly, or when major updates are entered
2.2	ET-SAT validates the assessments and other details in their field of expertise	ET-SAT	yearly
3	SP Office implements changes requested by ET-SAT and/or science groups,	SP Office	yearly

4.3 **Traceability of updates**

All operations (insert, update, delete) are automatically recorded by the system. An administrator can access these logs and reverse changes if necessary.

A list of major content updates (e.g. structural changes, assessments) is maintained by the SP Office.

5. Updating of functionality and interface of the tool

Conceptual and/or technical changes to the structure, functionality and interface of the tool can be differentiated in “system maintenance”, “adaptive/corrective maintenance” and “feature updates”.

5.1 **System maintenance**

Scope: Maintenance tasks necessary to provide 24/7 accessibility and recovery services in case of failure. Includes the regular maintenance of hosted server environment.

	Description	Responsibility	Frequency
Process 1	Ensure maintenance of application backups and keep recovery versions. (Application and Content)	OSCAR Technical Administrator	Continuous
Process 2	Monitor and configure technical platform (web server, database systems etc) Inform OSCAR Developer of any significant changes in environment	OSCAR Technical Administrator	As needed, at least bi-annually, or if necessary

5.2 **Adaptive/corrective maintenance**

Scope: Refers to analysis and correction of discovered bugs or incompatibilities arising through

the use of new devices and browsers, as well as minor changes to the presentation (wording, layout).

Step	Description	Responsibility	Frequency
1	Recording, prioritizing and validating requests	SP Office	continuous
2	Implementation and test of update, inform users (if applicable / relevant)	OSCAR Developer	as applicable, with delay of max 2 months

5.3 *New features, new functionalities and presentation*

Scope: This refers to adding new functionalities, or significantly changing current behaviour of the tool, including presentation and user interface.

Step	Description	Responsibility	Frequency
1	Recording of general feedback and feature requests from Expert Groups, Satellite operators, users, OSCAR development team	SP Office	Continuous
2	ET-SAT provides guidance on evolution of functionality and interface [WIR development team is consulted if requests have effects on other OSCAR modules]	ET-SAT [WIR project manager]	yearly
3	Approved features are recorded in the Software Requirements Specification for OSCAR/Space	SP Office	
4	Changes are implemented in accordance with overall OSCAR procedures and schedules	OSCAR Developer	
5	OSCAR manual(s) are updated as necessary	SP Office, OSCAR Developer	

5.4 *Traceability*

- A list of discovered bugs, incompatibilities and problems, along with their priority and status is maintained by the OSCAR Developer
- A list of all feature requests is maintained by the WMO SP
- Approved functionalities/ features or changes of such are recorded in the Oscar “Software Requirements Specification” (SRS) Document.

6. User feedback and evaluation

User feedback is collected through an email address indicated on the OSCAR homepage, which is checked on a regular basis by the administrator.

User emails are responded and appropriate actions are taken in accordance with the processes outlined in Section 3 and Section 4, for instance:

- an explanation is provided to the user, added in OSCAR views or in the user manual;
- a modification is brought to the interface or the functionality;
- contents are corrected, or a proposal for correction submitted to a satellite operator or a science group for validation.

Structured online surveys are used at regular intervals (every 1-2 years, as appropriate) to collect information on visitor characteristics and feedback on user satisfaction and possible areas for improvement.

Visitor statistics (number, origin, access characteristics) are collected. These statistics are reviewed on an annual basis within the SP Office.

7. Resources for Oscar updating and maintenance

The CBS Recommendation 1 (CBS-15) on Implementation and Sustainability of the Database of Observation Requirements and Observing Capabilities states:

(1) That resources be assigned with high priority within the Secretariat to complete the software development and, on a sustained basis, for technical maintenance, first-level contents updating and, through consultancy, for technical-level updating and quality control, as a key activity of the WMO Integrated Global Observing System;

(2) That Members, expert teams of the Open Programme Area Group on Integrated Observing Systems, satellite operators including the Expert Team on Satellite Systems and members of the Coordination Group for Meteorological Satellites, support the database updating process through submitting inputs and providing reviews and feedback.

8. Evolution of the Procedure

This procedure is maintained by the SP Office, in consultation with the WIR development team, IPET-OSDE and ET-SAT.

TEMPLATE FOR STATEMENTS OF GUIDANCE (SOGs)

(as approved by IPET-OSDE-1, April 2014)

The Statement of Guidance (SoG) for a WMO Application Area¹ is a gap analysis; it provides an assessment of the adequacy of observations to fulfill the observational user requirements and suggests areas of progress towards improved use of space-based and surface-based observing systems. Only the most significant variables in a given Application Area are analyzed in the SoGs.

The aims of the SoG are:

- to inform WMO Members on the extent to which their requirements are met by present systems, will be met by planned systems, or would be met by proposed systems. The Statement of Guidance is essentially a gap analysis with recommendations on how to address the gaps. It also provides the means whereby Members, through the Technical Commissions, can check that their requirements have been correctly interpreted.
- to provide resource materials useful to WMO Members for dialogue with observing system agencies regarding whether existing systems should be continued or modified or discontinued, whether new systems should be planned and implemented, and whether research and development is needed to meet unfulfilled aspects of the user requirements.

The Statement of Guidance for an Application Area is one element of the Rolling Review of Requirements (RRR²) process. It is used by the Commission for Basic Systems to complete the RRR process and contribute to the "Vision for the GOS"³, and hence to the Implementation Plan for the Evolution of Global Observing Systems (EGOS-IP⁴).

The SoG is prepared by the Point of Contact (PoC) nominated for the considered Application Area. The PoC is responsible for coordinating the development of the SoG with his/her community. He/she shall submit the SoG and future updates to the Chair of the Commission for Basic Systems (CBS) Inter-Programme Expert Team on the Observing System Design and Evolution (IPET-OSDE) for his/her review and submission to the IPET-OSDE for discussion. SoGs are approved by the Chair of IPET-OSDE and/or the IPET-OSDE.

The SoG shall be structured as follows. The inclusion of annexes is discouraged.

1 <http://www.wmo.int/pages/prog/www/wigos/wir/application-areas.html>
2 <http://www.wmo.int/pages/prog/www/OSY/GOS-redesign.html>
3 <http://www.wmo.int/pages/prog/www/OSY/gos-vision.html>
4 <http://www.wmo.int/pages/prog/www/OSY/gos-vision.html#egos-ip>

STATEMENT OF GUIDANCE FOR
[NAME OF APPLICATION AREA]

*(Point of contact: name of point of contact who prepared the SoG)
(Version number, approval status, and date)*

1. Introduction

[1/2 to 1 page]

This section shall briefly describe the Application Area and its possible sub-areas addressed in the document, and provide some information on the purpose and end users of those applications.

It also provides some general information on how the Application Area depends on observations.

2. Description of requirements

[1 to 2 pages]

As observational user requirements are not independent between Application Areas, duplication shall be avoided. This section shall therefore explain how the requirements of other Application Areas could be relevant to this Application Area; such requirements shall not be repeated in this SoG.

This section shall briefly describe the observational user requirements. They are listed by observed variable, and if needed by sub-application.

As the observational user requirements are described quantitatively and exhaustively in the User Requirements Database (i.e. OSCAR/Requirements⁵), the requirements listed in this section shall not duplicate the database, and therefore remain short and generic. It shall include a textual description of the issues that it is necessary to understand in order to interpret the numbers in the OSCAR/Requirements⁵.

3. Gap analysis

[n pages]

This section provides the results of the critical review and gap analysis for the most important variables to highlight where the main gaps exist. The critical review involves comparing the capabilities of the surface- and space-based observing systems with the quantitative observational user requirements from the OSCAR/Requirements⁵ database.

The process of preparing the gap analysis is necessarily more subjective than that of the critical review. Moreover, whilst a review attempts to provide a comprehensive summary, a Statement of Guidance is more selective, drawing out key issues. It is at this stage that judgements are required concerning, for example, the relative importance of observations of different variables. If impact studies have been conducted, the results of such studies should also be considered for the gap analysis.

As in section 2 above, duplication shall be avoided between Statements of Guidance when one Application Area depends on the requirements of another Application Area.

This section shall be organized by observed variable, and for each variable, and possibly for each sub-application, describe where there are gaps and how they might be addressed in order to have

⁵ <http://www.wmo-sat.info/oscar/observingrequirements>

substantial impact on the Application Area.

The following terminology has been adopted in the SoGs.

- **"Marginal"** indicates minimum user requirements are being met,
- **"Acceptable"** indicates greater than minimum but less than maximum requirements (in the useful range) are being met, and
- **"Good"** means close to maximum requirements are being met.

4. Recommendations on how to address the gaps.

[1/2 to 1 page]

This section shall summarize the recommendations on how to address the gaps described in section 3 above. It may include a first section with some generic recommendations, followed by a second section listing the critical variables that are not adequately measured by current or planned systems are (in order of priority).

References

This section may include sources of additional relevant information concerning the Application Area and its requirements.

DRAFT OBSERVING SYSTEM NETWORK DESIGN PRINCIPLES

(as proposed by IPET-OSDE-1, 3 April 2014)

Members should follow the following principles when designing and evolving their observing system networks:

1. SERVING MANY APPLICATION AREAS

Observing networks should be designed to meet the requirements of multiple application areas within WMO and WMO co-sponsored programmes.

2. MEETING USER REQUIREMENTS

Observing networks should be designed to address stated user requirements, in terms of the geophysical variables to be observed and the space-time resolution, uncertainty, timeliness and stability needed.

3. MEETING NATIONAL, REGIONAL AND GLOBAL REQUIREMENTS

Observing networks designed to meet national needs should also take into account the needs of the WMO at the regional and global levels.

4. DESIGNING APPROPRIATELY SPACED NETWORKS

Where high-level user requirements imply a need for spatial and temporal uniformity of observations, network design should also take account of other user requirements, such as the representativeness and usefulness of the observations.

5. DESIGNING COST-EFFECTIVE NETWORKS

Observing networks should be designed to make the most cost-effective use of available resources. This will include the use of composite observing networks.

6. ACHIEVING HOMOGENEITY IN OBSERVATIONAL DATA

Observing networks should be designed so that the level of homogeneity of the delivered observational data meets the needs of the intended applications.

7. DESIGNING THROUGH A TIERED APPROACH

Observing network design should use a tiered structure, through which information from reference observations of high quality can be transferred to and used to improve the quality and utility of other observations.

8. DESIGNING RELIABLE AND STABLE NETWORKS

Observing networks should be designed to be reliable and stable.

9. MAKING OBSERVATIONAL DATA AVAILABLE

Observing networks should be designed and should evolve in such a way as to ensure that the observations are made available to other WMO Members, at space-time resolutions and with a timeliness to meet the needs of regional and global applications.

10. PROVIDING INFORMATION SO THAT THE OBSERVATIONS CAN BE INTERPRETED

Observing networks should be designed and operated in such a way that the details and history of instruments, their environments and operating conditions, their data processing procedures and other factors pertinent to the understanding and interpretation of the observational data (i.e. metadata) are documented and treated with the same care as the data themselves.

11. ACHIEVING SUSTAINABLE NETWORKS

Improvements in sustained availability of observations should be promoted through the design and funding of networks that are sustainable in the long term including, where appropriate, through the

transition of research systems to operational status.

12. MANAGING CHANGE

The design of new observing networks and changes to existing networks should ensure adequate consistency, quality and continuity of observations across the transition from the old system to the new.

ACRONYMS

AA	Application Area
AMDAR	Aircraft Meteorological Data Relay
AMMA	African Monsoon Multidisciplinary Analyses
AMV	Atmospheric Motion Vector
AntON	Antarctic Observing Network
AOPC	Atmospheric Observation Panel for Climate
ASAP	Automated Shipboard Aerological Programme
ASECNA	Agency for Aerial Navigation Safety in Africa and Madagascar
AWS	Automatic Weather Station
CAeM	Commission for Aeronautical Meteorology
CAGM	Commission for Agricultural Meteorology
CAS	Commission for Atmospheric Sciences
CBS	Commission for Basic Systems
CBS-LC-GCOS	CBS Lead Centres for GCOS
CCI	Commission for Climatology
CD	Capacity Development
CEOS	Committee on Earth Observation Satellites
Cg	Congress
CGMS	Coordination Group for Meteorological Satellites
CHy	Commission for Hydrology
CIMO	Commission for Instruments and Methods of Observation
CM	Climate Monitoring
CMA	China Meteorological Administration
CryoNet	Core network of GCW surface measurement sites
DAOS	Data Assimilation and Observing Systems working group
DoD	US Department of Defense
E-AMDAR	EIG EUMETNET AMDAR programme
E-ASAP	EIG EUMETNET Automated Shipboard Aerological Programme
EC	Executive Council
ECMWF	European Centre for Medium-Range Weather Forecast
EC-PORS	Executive Council Panel of Experts on Polar Observations, Research and Services
ECV	Essential Climate Variable
EGOS-IP	Implementation Plan for the Evolution of Global Observing Systems
E-GVAP	EIG EUMETNET GNSS water vapour programme
EIG	Economical Interest Group
E-PROFILE	EIG EUMETNET Radar Wind Profilers and Backscatter Lidars programme
E-SURFMAR	EIG EUMETNET Surface Marine observation programme
ET-ABO	OPAG-IOS Expert Team on Aircraft-Based Observing Systems
ET-EGOS	Former OPAG-IOS Expert Team on the Evolution of Global Observing Systems
ET-ODRRGOS	Former OPAG-IOS Expert Team on Observational Data Requirements and Redesign of the Global Observing System
ET-OPSLs	CBS/CCI Expert Team on Operational Predictions from Sub-Seasonal to Longer-Time Scales
ET-SAT	OPAG-IOS Expert-Team on Satellite Systems
ET-SBO	OPAG-IOS Expert Team on Surface-Based Observing Systems
ETSI	the JCOMM Expert Team on Sea-Ice
ET-SUP	OPAG-IOS Expert Team on Satellite Utilization and Products
EUMETNET	EIG Grouping of European Meteorological Services
EUMETSAT	European Organisation for the Exploitation of Meteorological Satellites
E-WINPROF	EIG EUMETNET Operational Networking of Wind Profilers in Europe
FAO	Food and Agriculture Organization of the United Nations
FCDR	Fundamental Climate Data Record
FSO	Forecast Sensitivity to Observation
GAW	Global Atmosphere Watch

GCM	GCOS Cooperation Mechanism
GC-Net	Greenland Climate Network
GCOS	WMO-IOC-UNEP-ICSU Global Climate Observing System
GCW	Global Cryosphere Watch
GCW-IP	GCW Implementation Plan
GEO	Group on Earth Observations
GEO	Operational geostationary satellites
GEWEX	Global Energy and Water Exchanges Project
GFCS	Global Framework for Climate Services
GLAS	GEWEX Global Land/Atmosphere System Study
GNSS	Global Navigation Satellite System
GNSSRO	GNSS Radio Occultation
GNWP	Global NWP
GOOS	IOC-WMO-UNEP-ICSU Global Ocean Observing System
GOS	Global Observing System
GPS	Global Positioning System
GPSRO	GPS Radio Occultation
GRUAN	Global Reference Upper Air Network
GSG	GCW Steering Group
GSICS	Global Satellite Intercalibration System
GSN	GCOS Surface Network
GSNMC	GSN Monitoring Centre
GTN-P	Global Terrestrial Network for Permafrost
GTOS	FAO-WMO-UNESCO-UNEP-ICSU Global Terrestrial Observing System
GTS	Global Telecommunications System
GUAN	Global Upper Air Network
HRNWP	High Resolution NWP
IAVWOPSG	International Airways Volcano Watch Operations Group
IBCS	Intergovernmental Board on Climate Services
ICAO	International Civil Aviation Organization
ICG-WIGOS	Inter-Commission Coordination Group on WIGOS
ICT-IOS	CBS Implementation Coordination Team on Integrated Observing Systems
ICT-SW	WMO Inter-Programme Coordination Team on Space Weather
IGOS	Integrated Global Observing Strategy
IPET-OSDE	OPAG-IOS Inter-Programme Expert Team on the Observing System Design and Evolution
IPET-WIFI	OPAG-IOS Inter-Programme Expert Team on WIGOS Framework Implementation Matters
IPO	International Project Office
ITU	International Telecommunication Union
JCOMM	Joint WMO-IOC Technical Commission for Oceanography and Marine Meteorology
JMA	Japan Meteorological Agency
JPO	Junior Professional Officer
JWGC	Joint Working Group on Climate
KAA	Key Activity Area
KNMI	Royal Netherlands Meteorological Institute
LAM	Limited Area Model
LEO	Operational low-Earth orbit satellites
MoU	Memorandum of Understanding
NASA	National Aeronautics and Space Administration
NCEP	NOAA National Centers for Environmental Prediction
NFP	National Focal Point
NMHSs	National Meteorological and Hydrological Services
NOAA	US National Oceanic and Atmospheric Administration
NVSRF	Nowcasting and Very Short Range Forecasting
NWP	Numerical Weather Prediction

OCG	JCOMM Observations Coordination Group
OPA	JCOMM Observations Programme Area
OPACE	Open Panel of CCI Experts
OPAG	Open Programme Area Group
OPAG-DPFS	CBS OPAG on Data-Processing and Forecasting System
OPAG-IOS	CBS OPAG on Integrated Observing Systems
OPERA	EIG EUMETNET Operational Programme for the Exchange of Weather Radar Information
OQIS	WIGOS Observations Quality Information System
OSCAR	Observing System Capability Analysis and Review tool
OSE	Observing System Experiment
OSDW	Observing System Design Workshop
OSND	Observing system network design
OSSE	Observing System Simulation Experiment
PoC	Point of Contact
PROMICE	Programme for Monitoring of the Greenland Ice sheet
QM	Quality Management
R&D	Research and Development
RA	Regional Association
RBCN	Regional Basic Climatological Network
RBSN	Regional Basic Synoptic Network
R-MAR	OPAG-IOS Rapporteur on Marine Observing Systems
RRR	Rolling Review of Requirements
R-SEIS	OPAG-IOS Co-Rapporteur on Scientific Evaluation of Impact Studies undertaken by NWP centres
RTH	Regional Telecommunication Hub
R-WIP	Regional WIGOS Implementation Plan
SAG	Scientific Advisory Groups
SARP	Standard And Recommended Practices
SG-RFC	OPAG-IOS Steering Group on Radio-Frequency Coordination
SIAF	Seasonal to Inter-Annual Forecasting
SoG	Statement of Guidance
TBD	To be defined
TC	Technical Commission
TDCF	Table Driven Code Form
THORPEX	WMO Observing System Research and Predictability Experiment
TOPC	GCOS Terrestrial Observation Panel for Climate
TT-WMD	ICG-WIGOS Task Team on WIGOS Metadata
TT-WQM	ICG-WIGOS Task Team on WIGOS Quality Management
TT-WRM	ICG-WIGOS Task Team on WIGOS Regulatory Materials
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UR	User Requirement
USA	United States of America
VCP	Voluntary Cooperation Programme
VOSs	Volatile Organic Compounds
WACA-DARE	West Africa as part of the West Africa Climate Assessment and Data Rescue
WAM	West African monsoon
WCRP	WMO-IOC-ICSU World Climate Research Programme
WHOS	WMO Hydrological Observing System
WIGOS	WMO Integrated Global Observing System
WIP	WIGOS Framework Implementation Plan
WIR	WIGOS Information Resource
WIS	WMO Information System
WRF	Weather Research and Forecasting
WWW	World Weather Watch

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