

# **WORLD METEOROLOGICAL ORGANIZATION**

## **MEETING OF THE COMMISSION FOR BASIC SYSTEMS OPEN PROGRAMME AREA GROUP ON PUBLIC WEATHER SERVICES (PWS) IMPLEMENTATION / COORDINATION TEAM ON PWS (CBS/OPAG-PWS ICT/PWS)**

Dublin, Republic of Ireland, 7-11 December 2015



***FINAL REPORT***

## EXECUTIVE SUMMARY

The “Meeting of the Commission for Basic Systems Open Programme Area Group on Public Weather Services (PWS) Implementation / Coordination Team on PWS (CBS/OPAG-PWS ICT/PWS)”, was held in Dublin, Republic of Ireland from 7 to 11 December 2015. In addition to the Chairperson of the OPAG/PWS, the meeting was attended by the Chairpersons of two of PWS Expert Teams, the representative of the Chairperson of the Inter-Commission Task Team (ICTT) on Meteorological Services for Improved Humanitarian Planning and Response, the Chairperson of the Task Team on Impact of Multi-hazard Prediction and Communication (TT/IMPACT), and a few of the experts within the expert teams. The Co-Chairperson of the OPAG/PWS tendered her apologies for her inability to attend due to unforeseen circumstances.

The ICT discussed the decisions of the recent Cg-17 that were relevant to the OPAG/PWS, and reviewed how best these decisions might be addressed through the structure and work of the OPAG/PWS in both the current and the forthcoming CBS inter-sessional periods.

Matters of particular note arose from the reports to the ICT/PWS from the Chairperson of the OPAG/PWS and the Chairpersons of the ETs and TTs, and from subsequent discussions, including consideration of the following:

- (a) The WMO Strategy for Service Delivery and its Implementation Plan;
- (b) Linkages with the User Interface Platforms of the GFCS;
- (c) Impact-based forecasts and warnings services;
- (d) Application of technologies to PWS delivery;
- (e) The issues and challenges surrounding Big Data;
- (f) Assessment of the Social and Economic Benefits of Met/Hydro services;
- (g) Communication aspects of PWS;
- (h) Application of the Competency Assessment framework within PWS;
- (i) Provision of decision support to Humanitarian Agencies;
- (j) A future vision for national PWS Delivery.

The ICT decided to make the following proposals to the Commission for Basic Systems:

- (a) That the OPAG be re-named the “OPAG on Public Weather Services Delivery”;
- (b) That the structure of the OPAG move towards the establishment of Task Teams (TTs) which would be focused on specific, time-bound, objectives;
- (c) That the areas of Competency Assessment, Communications, Service Delivery and Quality Management are key enablers of the work of the OPAG, and that work in these areas should be coordinated directly by the ICT
- (d) That the existing Expert Team on Communication, Outreach, and Public Education Aspects of PWS (ET/COPE) should be disbanded;
- (e) That the existing Expert Team on Meeting the User Needs in Reducing the Impacts of Hydrometeorological Hazards (ET/DPM) should be re-named ET/IMPACT, with a renewed focus on impact-based forecasts and risk-based warning;
- (f) That the existing Expert Team on Services and Products Improvements and Innovation (ET/SPII) should continue to address the challenges and

opportunities of developing technology as applied to the delivery of public weather services;

- (g) That the Chair of the OPAG/PWS should bring forward proposals to the forthcoming meeting of the CBS Management Group to seek the agreement of the Commission for these developments.

## **1. OPENING**

1.1 At the kind invitation of the Government of the Republic of Ireland, a meeting of the Commission for Basic Systems Open Programme Area Group on Public Weather Services (PWS) Implementation/Coordination Team (CBS/OPAG-PWS ICT/PWS) was held in Dublin, Republic of Ireland from 7 to 11 December 2015. The meeting was chaired by Mr Gerald Fleming, Chairperson of the CBS OPAG/PWS. The Meeting opened at 0900 hours at the Bedford Hall Suite, Dublin Castle. In his opening remarks, Mr Fleming welcomed the participants and outlined some of the logistical arrangements for the week.

1.2 Speaking on behalf of the Secretary General of WMO, Dr Xu Tang, Director of the WDS Department of WMO, welcomed Mr. Ivan Cacic, President of RA VI and PR of Croatia, Mr. Gerald Fleming, Chair of ICT/PWS, Mr. Ken Mylne, Chairperson of OPAG on Data-Processing and Forecasting System (DPFS), representative of the Chairperson of the ICTT, the Chairperson of TT/IMPACT, and members of ET/DPM, ET/COPE, and ET/SPII. The list of participants is attached as Annex I and the programme of the meeting as Annex II to this report.

1.3 Dr. Tang first thanked Met Éireann, Mr. Liam Campbell, the PR of Ireland with WMO, Mr. Gerald Fleming and their colleagues for their hospitality and efforts to make this meeting happen in the historic Bedford Hall Suite, Dublin Castle and in the beautiful city of Dublin. He also extended sincere thanks to all colleagues for their dedicated work on the WMO PWS Programme and associated crosscutting activities, their participation in this meeting and their upcoming contributions and insights to the future work of the WMO PWS Programme.

1.4 Dr Tang noted that this PWS-ICT meeting comes at a very opportune time - following the WMO Congress 17 in May 2015, and before the CBS-MG meeting in February 2016 and as an important preparation for the next 16th session of CBS. For this meeting, ICT/PWS will look into progress, achievement and challenges through the relevant Reports on Deliverables submitted by Chairs of OPAG/PWS, ET/DPM, ET/COPE, and ET/SPII as well as the TT/IMPACT established by the extra-ordinary session of CBS in 2014. The ICT/PWS would discuss how to best move the WMO PWS Programme forward through respective major milestones which have been adopted by Cg-16 and Cg-17, including the Implementation of the WMO Strategy for Service Delivery, Impact-Based Forecasting and Risk-Based Warning Services, and Social and Economic Assessments of National Meteorological and Hydrological Services (NMHSs) services and products. Challenges are faced by the meteorological community to do its work in an effective and efficient manner, using integrated and holistic approaches, and better linkages between Global Societal Needs with the role of NMHSs. He encouraged the ICT/PWS members to provide their knowledge, wisdom, expertise and experience for the discussions during the meeting in preparation of the 16th Session of CBS to be held in Nov. 2016, in Guangzhou, China. He wished the ICT/PWS a successful meeting.

## **2. ORGANIZATION OF THE MEETING**

2.1 The Meeting agreed on its working hours as 0900 - 1700 with appropriate time allowed for lunch and coffee breaks.

### 3. REPORT OF THE OPAG CHAIRPERSON ON ACTIVITIES OF THE OPAG/PWS

3.1 The Chairperson reviewed matters relevant to the OPAG which had emerged at meetings of various WMO constituent bodies over the previous two years, including CBS-Ext. (2014) and Cg-17. The Chairperson referred to the work carried out since its last meeting in Melbourne in 2014. The Chairperson noted that the ICT/PWS meeting was being held on the cusp of change. Following Cg-17 in May 2015, the ICT/PWS had the outcome of Congress discussions on PWS-related topics to consider. It was also noted that the new Secretary General would take up his office as from 1 January 2016. In addition, the Chairperson noted that CBS-16 will be held in late 2016 at which time the OPAG/PWS would need to report on past work and present a plan for future challenges. In view of the above, he cited that a successful outcome to the deliberations of the ICT/PWS should encompass the following:

1. An examination of all the issues and challenges faced by WMO Members in the areas associated with Public Weather Services;
2. A realistic prioritisation of which of these issues and challenges can be taken up, given the resources at the disposal of the OPAG/PWS;
3. A proposal for the restructuring of the OPAG/PWS which reflects these issues and their prioritisation;
4. Revised and updated Terms of Reference for the OPAG/PWS ICT consequent on the above

3.2 In relation to the CBS Ext. (2014) Session, the Chairperson noted that the Session had endorsed the WMO Guidelines on Multi-Hazard Impact-Based Forecast and Warnings Services, (WMO No. 1150), which had been prepared by the PWS Programme and invited experts, and had also recommended that Cg-17 endorse the PWS Competency Frameworks.

3.3 The discussion at Congress on PWS matters was, as usual, lively and largely positive, with a number of interventions on the PWS document. Most NMHSs are fully aware of the need to strengthen user interaction, improve service delivery, and exploit fully the latest media technologies. There was a keen interest among Members in the concept of impact-based forecasting and Congress welcomed the preparation and publication of the WMO Guidelines on Multi-Hazard Impact-Based Forecast and Warnings Services.

3.4 Congress had also adopted the PWS Competency Frameworks, the preparation of which had been a focus of significant work within the OPAG in recent years. Congress has requested the Commission for Basic Systems to develop appropriate training material on the competency assessment of PWS forecasters and advisors.

3.5 Looking forward, the Chairperson noted that a primary purpose for the current meeting was to review the structure of the OPAG/PWS and, in view of the recent developments in the areas of work of PWS, to propose a restructuring of the OPAG. In order to do so, he identified the principal thematic areas which the OPAG would need to consider and integrate into its Work Programme over the coming years. These included:

- a) **WMO Strategy for Service Delivery.** The strategy which was prepared through the PWS Programme has been approved and the Implementation Plan (IP) has been published. How does the ICT now proceed to help Members and their NMHSs to work through this IP and put in place a progressive programme of service improvements? The IP has been designed to be useful to NMHSs at all stages of evolution in Service Delivery, but clearly some NMHSs will benefit from assistance in applying the IP within their own domains. How can this best be achieved?
- b) **Impact-based forecast and warnings services.** Here again the OPAG has achieved the publication of a substantial document. The challenge will be how to encourage and assist

Members to adopt the approach advocated by Impact-based forecasting, recognising that to do so requires a high degree of engagement with users. The ICT/PWS will also need to recognise that many NMHSs have some reservations with the concept of impact-based forecasting, as in certain member countries the forecasting of impacts is the responsibility of organisations other than the NMHS itself (such as Civil Protection). Any progress towards impact-based forecasting will probably need to be focused on improving the links between NMHSs and partner organisations, and in particular improving the operational working relationships. In this regard the templates for MoUs between NMHSs and partner organisations, as prepared by ET/DPM, will be a significant tool.

- c) **Social and Economic Assessments of NMHSs.** The work on this topic has largely been carried out under the umbrella of the “*WMO Forum on Social and Economic Applications and Benefits of Weather, Climate and Water Services*” (established under PWS Programme in 2006), which is a broader-based entity than the OPAG/PWS; however the OPAG/PWS has a role in promoting and contributing to this work, in integrating it within the Commission structure, and in ensuring that this work is aligned with parallel initiatives within CBS. With the publication of the WMO/World Bank book “*Valuing Weather and Climate: Economic Assessment of Meteorological and Hydrological Services*” in May 2015, and the holding of three workshops to promote the approaches underlying the book, considerable progress has been made to address the request by the Madrid Conference (2007) in addressing the needs of NMHSs for assessing the value of their services. The challenge for the PWS community is how best to build on this work to assist NMHSs everywhere to clearly demonstrate the benefit they bring to society through their PWS activities, using the guidance provided in the book.
- d) **PWS Competency Framework.** This topic took a considerable amount of effort from many members of the OPAG/PWS over the past four years, and it is a real achievement that there are now five Competency Frameworks in the PWS area approved by Congress. This achievement is all the more noteworthy considering that one of the frameworks – that of the PWS or “bench” forecaster – is now the foundation framework for all forecasting, including aviation and marine forecasting etc. There are a number of matters which require attention under this heading. Up to now all the PWS documents have been “Guidance” documents which are in the lowest tier of WMO documentation, after “Mandatory” and “Recommended Practices” documents. The Competency Framework has been positioned as “Recommended Practices” and as such will be referred to within the appropriate WMO Manuals. A resolution on this topic will be presented to the Executive Council (EC-68) in 2016. More pertinently, there is now a need to prepare implementation guidelines and other supporting documentation to assist NMHSs and others to translate the Competency Framework into a practical training and assessment scheme. This will allow clear and unambiguous competency tests to be applied to the work and competency of forecasters. The work of the Commission for Aeronautical Meteorology (CAeM) in developing this material within the realm of aviation meteorology provides a template for this work.
- e) **Application of new technologies to PWS.** The rapid development of technologies affects each and every link in the chain that brings weather information to the user. Mr. Ken Mylne, chair of OPAG/DPFS, who joined the ICT/PWS meeting for the first two days, provided insight into the likely impact of technologies on forecast systems and NWP. The increases in broadband speeds and the rapid development of mobile telecommunications provides tremendous opportunities for improved dissemination of weather information, but harnessing these opportunities is a significant challenge for many NMHSs. The enhanced ability for graphical presentation of information is especially noteworthy in the context of weather. Allied to this is the desire of many users to integrate weather information with other spatial data, which leads to the need to provide weather information in GIS-

compatible formats which can be accessed in an interactive manner. GIS, however, is not well-structured to deal with the multi-dimensionality of weather forecast information, so this too presents challenges. Nowcasting has long been identified as a priority technology for assisting with the forecasting of extreme rain events, which bring a substantial threat of flooding in the increasingly urbanised world. Another technology which is just beginning to be exploited is the Common Alerting Protocol (CAP) format for warning messages, which enables wider distribution and easier use of weather warnings. A technology that has been in the domain of OPAG/PWS, under the leadership of Hong Kong, China, and oversight of the OPAG for a number of years is the World Weather Information Service (WWIS) website which is a source of official weather forecasts and climate information provided by NMHSs. The website has continued to evolve over the years and benefited from new communications technology. It is expected that this popular website will continue to develop over the coming years and provide operational information to the public and other users. Finally the ICT/PWS should not neglect the “traditional” means for communicating PWS weather information (e.g., through radio and television). These pathways are holding up surprisingly well in the “digital” age and are still highly relevant in all countries, but especially so in developing countries where radio, with its simpler technology, is widely accessible.

- f) **Big data.** There are a myriad of technological challenges in dealing with big data in a meteorological context, but the focus of PWS consideration should be on how best to utilise big data for improved services. These considerations might include the visualisation systems which are necessary if a forecaster is to make sense of the vast amounts of information now available; the optimum use of probabilistic information coming from Ensemble Prediction Systems; the evolving role of the meteorologist who has to deal with this tremendous increase in information and mould it into improved products and services; and the degree to which the public should be exposed to this world of complexity or, alternatively, shielded from it. While the technologies and the data volumes are changing rapidly, the essentials of good communication do not change; the challenge is to employ these essentials in an optimal manner within the evolving informational landscape.
- g) **Addressing key user sectors.** The traditional sectors of focus for NMHSs have been aviation, marine, agriculture and, more lately, emergency management. To these sectors can now be added others such as land transportation, water resource management, energy, health, and service provision in megacities. These all have different requirements, and all sectors will come under increasing pressure from considerations of environmental sustainability as the traditional basis for economic growth is challenged by governmental actions to mitigate climate change. Identifying the current needs of these sectors and anticipating future needs will help NMHSs to remain relevant to the user communities through the provision of public weather services.

3.6 The Chairperson noted that there is, therefore, an abundance of material for the ICT/PWS to discuss during its session. As is inferred above, it would be impossible for the OPAG/PWS to tackle all of these areas within the resources available – which is primarily made up of the time of the experts who contribute to the Expert Teams, the Task Teams and the ICT/PWS itself. The ICT/PWS would have to make some clear and realistic decisions as to the priorities of the OPAG/PWS.

#### 4. REVIEW OF THE TERMS OF REFERENCE (TORS) OF THE ICT/PWS

4.1 At its Fifteenth Session, the Commission for Basic Systems (CBS-XV, Jakarta, Indonesia, 2012), approved the Terms of Reference (TORs) of the ICT/PWS; these have been adjusted by the ICT/PWS and are now as appears below:

- (a) Coordinate the implementation of Congress, the Executive Council and the Commission for Basic Systems (CBS) decisions with respect to Public Weather Services, especially those relating to “The WMO Strategy for Service Delivery”;
- (b) Keep under review the work of the PWS Expert Teams and coordinate and guide their work programmes;
- (c) Consult and collaborate to ensure coordination of the work of the Open Programme Area Group (OPAG) on PWS (OPAG/PWS) with that of other CBS OPAGs, technical commissions (TCs), EC Working Groups, regional associations (RAs) and WMO Programmes and initiatives;
- (d) Continue to encourage stronger dialogue between National Meteorological and Hydrological Services (NMHSs) and development partners and users (e.g., media, health, emergency management) in areas relevant to PWS;
- (e) Continue to encourage and provide guidance to Members to assert the authority of NMHSs as the sole providers of official high-impact weather warnings;
- (f) Evaluate and report on the effectiveness of the information and guidance material produced by the PWS Programme, and the demonstration projects and other WMO initiatives to which the Programme contributes, in building the capacity of NMHSs;
- (g) Develop and keep under review a competency framework appropriate to PWS forecasting and related activities;
- (h) Collaborate with development partners and other WMO entities to assist NMHSs in the identification and assessment of societal, economic and environmental impacts and benefits of hydrometeorological services; and
- (i) Continue to promote awareness in the WMO community of material arising from the work of the OPAG/PWS.

4.2 The ICT/PWS reviewed the TORs. It agreed to propose a new set of TORs for the forthcoming intersessional period as outlined under Item 15 below.

## **5. REVIEW OF THE DELIVERABLES FROM THE PREVIOUS MEETING OF THE ICT (Melbourne, Australia, 2014)**

5.1 The ICT reviewed the Deliverables as agreed at the Melbourne meeting in June 2014 and was brought up-to-date on the progress in each case. This list, with the progress noted, is provided as Annex III to this Report.

## **6. REPORT OF THE CHAIRPERSON OF THE ET/DPM**

6.1 The CBS/OPAG-PWS Expert Team on PWS in Support of Disaster Prevention and Mitigation (ET/DPM) (proposed to change to Expert Team on User Engagement for Service Improvement, ET/UESI in Melbourne) had not met since the last ICT/PWS meeting, held in June 2014.

6.2 The Chairperson of ET/DPM, Mr. Eli Jacks, reviewed the history of his Expert Team in the context of the movement towards Impact-Based Forecasting and user collaboration. For example he recounted that, as early as 2009, the ET had considered how NMHSs should provide guidance to developing countries on connecting with users and developing partnerships with them.

In 2011, the ET was renamed to reflect a focus on service delivery and it also identified the need to develop an MoU template for NMHSs to engage with Disaster Management Authorities and to foster collaboration and partnerships with them. In 2013, the ET's business was dominated by the subject of impact-based information, forecasts and warning services, and a decision was made to draft a set of guidelines on this topic.

6.3 Given the importance of these guidelines to the future work of the OPAG/PWS, the Chief of PWS Programme in the WMO Secretariat suggested holding a special meeting to refine an early version of the deliverable. This meeting was held in Geneva (July of 2014), with participation of a number of ET/DPM members, the OPAG/PWS Chair and other experts. Following iteration and edits, the final document was completed and approved by CBS Ext. (2014) prior to Cg-17.

6.4 The guideline features four major sections. The first section focuses on making the case to evolve from the legacy approach ("what the weather will be"), to an Impact-based system ("what the weather will do"). The second section provides key concepts that comprise impact forecasting, including factors related to vulnerability and exposure that need to be used in combination with factors relating to the hazard(s) and its (their) probability of occurrence. The third section describes the process of moving towards Impact-based forecasting, which requires an evolution from forecasting using general thresholds towards inclusion of user-based thresholds that vary in space and time, and finally, to the impact-based paradigm. The fourth section describes the additional supporting capabilities required for a successful impact-based system, including partnership development, provision of additional tools and training to forecasters, and a societally-based evaluation framework.

6.5 To conclude his remarks, Mr. Jacks mentioned the meeting of the Task Team on impact-based Forecasting (TT/IMPACT) that was held in February of 2015 and cited the need to align the goals of this Team with those of the ET/DPM during the course of the ICT meeting.

## **7. REPORT OF THE CHAIRPERSON OF THE ET/COPE**

7.1 The most recent meeting of the CBS/OPAG-PWS Expert Team on Communication, Public Education and Outreach (ET/COPE) was held in Nanjing, China in 2013. The Chairperson of ET/Cope, Mr Jon Gill, was unable to attend ICT meeting, but had provided some thoughts to be shared with the meeting on a number of the key topics. These included:

7.2.1 Consideration to further alignment of the OPAG ET structure with the cyclic, 4-step Service Delivery model (1. User Engagement; 2. Service Design; 3. Operational Delivery; 4. Evaluation and Improvement).

7.2.2 Quality Management (QM) could become an area of particular focus of the OPAG/PWS. Given that QM is based on universally applicable principles and deploys standard tools, NMHSs' capabilities in QM that have been developed for Aviation can be leveraged and applied to other areas.

7.2.3 In terms of Impact-Based Forecasting, from experience and observation, the optimum effective mechanism is to engage partners and users for example, by embedding the forecaster in the operational structures of the user (e.g. outposting) to nurture the relationship through face-to-face contact and to allow the forecaster to learn first-hand how decisions are made, how the forecasts are being used, and identify gaps and opportunities for further collaboration. Equally, the user can develop a much improved understanding of the capability of the NMHS and what the forecaster can bring to the table.

7.2.4 The OPAG should consider leading an international benchmarking exercise in Social and Economic Benefit Assessment that measures socio-economic benefit, across a broad range of



NMHSs, using a sensible, practical and manageable selection of approaches and tools that the recently-published WMO/WB book covers. Obviously, resources to do this would be an issue which needs to be addressed.

## **Application of new technologies to PWS**

7.2.5 In terms of the application of new technologies to PWS, the key point is to be agile and to evolve as new technologies mature and get replaced. In-house videography is becoming increasingly affordable, for example, and there are many communication and outreach opportunities offered by this.

7.2.6 Big Data is a poorly-understood concept; a succinct summary of what it is and what it might mean for the future of Service Delivery and PWS might be of value.

7.2.7 The evolving role of forecasters (reduced focus on underpinning science and increased focus on user engagement and decision support) should be an explicit theme that guides some of the OPAG/PWS work. Exploring issues around things like a 'Service Desk' within an NMHS could be a rich area of attention.

7.2.8 On the matter of crowd-sourced information, there is a sense that this is a relatively untapped area of opportunity for PWS operations. There are interesting opportunities for leveraging interested members of the general community to be NMHS ambassadors, storm spotters, focus group members, etc.

## **8. REPORT OF THE CHAIRPERSON OF THE ET/SPII**

8.1 The Chairperson of the CBS/OPAG-PWS Expert Team on Services and Products Innovation and Improvement (CBS/OPAG-PWS ET/SPII) provided a review of the Team's work progress since the last meeting of the ICT in June 2014. The Team has not met since the last ICT/PWS meeting, but has continued to work on the activities associated with the Team's deliverables as defined at its last meeting held in Hong Kong, China, in May 2014. The Team identified a total of eight deliverables, which include those that were either modified and/or carried over from its previous work plan. Since the last ICT meeting, two deliverables have been completed. The following summarizes the Team's work.

### **8.2 Deliverable 1: *Publish Guidance on the Adoption of a Service-Driven Approach to Development of Nowcast Systems***

Status: Open. The Expert Team completed step one and is in the process of analysing the questionnaire responses. Remaining steps include engaging Members who offer to share their nowcast system knowledge/expertise, produce a report to include a review of the current status of members' nowcasting capability from the analysed survey and guidance on recommended processes to improve nowcast services based on user requirements and available resources. Once complete, the report will be circulated to the Commission for Instruments and Methods of Observations (CIMO) and the OPAG/DPFS for review and input. The final report will be distributed to NMHSs.

### **8.3 Deliverable 2: *Provide Comments/Input on Impact-based Forecasting Document Developed by ET/DPM.***

Status: Closed. Input provided and guideline published.

### **8.4 Deliverable 3: *Coordinate with WMO ETR to Develop Training Material on Forecast Uncertainty for Use by NMHSs and WMO Training Activities***

Status: Open. A summary of training material has been completed. Remaining activities include identification of Ensemble Prediction System (EPS) application-focused training resources, and creating a complementary presentation to the summary document highlighting EPS applications and interpretation (e.g., the European Centre for Medium-Range Weather Forecasts (ECMWF) Extreme Forecast Index) with examples of user coordinated/collaborated uncertainty products from NMHSs.

**8.5 Deliverable 4:** *Assess the Needs and Interest in Verification of World Weather Information Service (WWIS) Max/Min Temperature Forecasts from Participating NMHSs and Assess Uptake and Usability by Those Participating NMHSs.*

Status: Open. Initial deliverable has been completed with a successful pilot project. Remaining activities including the development and distribution of a questionnaire to assess the usability of WWIS verification reports, analysing the feedback, and reporting the results back to the ET/SPII for possible follow-up actions to improve forecast quality.

**8.6 Deliverable 5:** *Enhancement of WWIS and Severe Weather Information Centre (SWIC) Websites.*

Status: Open/Ongoing. Initial proposed enhancements to the WWIS and SWIC websites completed. Remaining activities include investigation of feasibility of adding participating NHMS warnings and real-time weather information.

**8.7 Deliverable 6:** *Assist in the Adoption of the Service Delivery Approach to Delivering Forecast and Warning Services Through Mobile Platform.*

Status: Closed. Team developed a fact sheet as guidance for members to help them decide on the best method for them to provide their users with weather information via mobile platforms.

**8.8 Deliverable 7:** *Explore the Issue of Increasing Amounts of Data in the Forecast Process – Confronting the “Big Data” Issue.*

Status: Open. Following discussions on the big data topic at the ICT/PWS in June 2014, the Team engaged the OPAG/DPFS Chair in discussions surrounding the big data issue. The ET/SPII discussed potential collaborative opportunities to address the challenge of managing the increasing amount of data available to forecasters within the forecast process. If the combined man/machine working model for hydro-meteorological forecasting is to remain effective, a data management concept needs to be developed which prioritises and filters the data in a manner that allows forecasters to make the best possible forecasts. As a result of the Team discussions, it was agreed that a joint DPFS-PWS collaborative approach would be optimal to effectively tackle this challenging issue. The ET/SPII further agreed that DPFS would serve as the technical lead for defining the problems/ opportunities while PWS would serve as the lead for identifying operational/user requirements.

The big data issue was identified by the ICT/PWS as a topic for further discussion during the “Future Direction of PWS” portion of the meeting agenda (Section 13 of this report). Mr Ken Mylne, Chair OPAG/DPFS, attended the meeting to participate in these discussions. Additional information regarding the big data issue, including key points from the ICT deliberations and proposed actions, are documented in Section 13.

**8.9 Deliverable 8:** *Investigate NMHS Application of Geo-Spatial Data (GIS).*

Status: Open. Team noted that a growing number of NMHSs partners/users are utilizing GIS datasets and have an interest in ingesting GIS-formatted NMHS forecast, warning, and other available environmental information. The Team is in the process of exploring and defining NMHS GIS needs.

## **9. REPORT OF THE CHAIRPERSON OF TT-IMPACT**

9.1 At the extraordinary session of the Commission for Basic Systems (CBS-Ext.(2014), Asunción, Paraguay, September 2014), the Commission requested the OPAG/PWS and the PWS Programme to work closely and assist Members with implementing impact-based forecasting and warning services through training workshops, and, where possible, pilot projects. In response to this request, the OPAG/PWS established the “CBS Task Team on Impact of Multi-hazard Prediction and Communication (TT-IMPACT)”, whose purpose was to promote and advance the development and implementation of Multi-hazard Impact-based Forecast and Warning Services by NMHSs and key partner agencies. This Task Team held its first meeting at the WMO headquarters in Geneva, Switzerland, from 16 to 18 February 2015.

9.2 The TT-IMPACT meeting comprised representatives from a cross-section of stakeholders in impact-based warning service delivery including NMHSs, the health sector, The Global Facility for Disaster Reduction and Recovery (GFDRR), the World Bank Group, humanitarian agencies (the United Nations Office for the Coordination of Humanitarian Affairs (OCHA)), private consulting service providers, social sciences and communication.

9.3 Among the main outcomes of the meeting was the emphasis on a pragmatic approach toward promoting impact-based forecast and warning service delivery in NMHSs. This approach would be characterized by practical implementation activities such as region- or country-specific pilot projects that would be scalable to other countries and regions. One such project was recently initiated in Myanmar.

9.4 At the invitation of the Government of Myanmar and Department of Meteorology and Hydrology (DMH), WMO, in collaboration with the World Bank Group/GFDRR convened a Stakeholder Workshop in the capital Nay Pyi Taw (28-30 September 2015) to provide guidance and assistance to the DMH and national stakeholders on the design of a pilot project on impact-based forecasting for Myanmar

9.5 A main goal of the workshop was to help stakeholders develop individual (a) hazard matrices for those hazards that impacted their particular sector and to separate those into primary, secondary and tertiary hazards, (b) impact matrices to show the impact of a hazard on their particular sector and classify it in terms of the severity of the impact, and (c) mitigation advice matrices for each hazard. This exercise was a clear first step as to how to proceed with thinking about cascading consequences of hazards into impacts. A follow-up plan for the actions to be taken and associated timelines was developed by WMO and GFDRR, and a subsequent mission was supported by WMO to further develop the necessary tools for impact-based forecasting. Two similar projects have been developed for Mozambique and Mauritius.

9.6 TT-IMPACT also recognized that in implementing impact-based forecasting, it would be important to apply the guidance provided through “The WMO Strategy for Service Delivery and its Implementation Plan” as the Strategy contains tools that could guide the practical implementation of impact-based forecasting.

## **10. REPORT OF THE COORDINATOR OF THE DISASTER RISK REDUCTION (DRR) TASK TEAM ON SUPPORT TO HUMANITARIAN ORGANIZATIONS**

10.1 A second meeting of the “Task Team on the Provision of Operational Meteorological Assistance to Humanitarian Agencies” was held in late July 2014. The Task Team recalled the outcomes of the first meeting which identified a number of actions supporting arrangements (Appendix I-5 of the *Manual on the Global Data-processing and Forecasting System*) between WMO and Humanitarian Agencies (HA). These included the development of an institutional framework as part of the global and regional arrangements, incorporating designation criteria for RSMCs, a list of standard products to be provided to HA, the use of the Global Seasonal Climate

Update (GSCU) to support the Early Warning Early Action report, and the use of the WMO Severe Weather Information Centre (SWIC) website as a resource within the Global Disaster Alert Coordination System (GDACS).

10.2 Deliverables 1 and 3 were completed prior to the PWS/ICT in 2014.

10.3 Deliverable 2: In its second meeting in July 2014, the Task Team outlined the requirements for operational meteorological and hydrological products and services by HA and included the additional input from a representative from the United Nations Office for the Coordination of Humanitarian Affairs (OCHA) which included OCHA's organizational structures and practices in gathering weather, climate and water information to support its activities. Although requirements have been identified and compiled, it is noted that the assessment of requirements should become an on-going process as user needs, science, technologies and policy context evolve.

10.4 In the context of using WIS and sharing information with HAs, a Humanitarian Pilot Project for Development and Dissemination of Value-Add Products through the GTS/WIS was developed with European Commission's Joint Research Center and the GDACS. This project assessed the feasibility of external users extracting information through the SWIC and the WWIS, building value added information and using WIS as the dissemination mechanism. Lessons learned from this project identified the need to have access to geo-referenced alerting information as well as challenges associated with interfacing external partners with a proprietary system, and in particular issues with the identification of message and bulletin headers in WIS, as well as non-NMHS sourced alerts and warnings. This is currently being addressed by WMO Secretariat.

10.5 Deliverable 4: Delivery structure of WMO in the context of national operations of Humanitarian Response. The Task Team noted that EC-66 had requested that CBS review the governance procedures relating to the provision and availability of information on meteorological, hydrological and other environmental hazards, with a view to developing appropriate guidance for consideration by Cg-17 (2015). The Task Team developed a proposed framework for supporting global, regional and national scale arrangements of WMO with HA and subsequent short-term and longer-term road maps to address HA requirements for information. This concept was presented at the CBS extra-ordinary session held in Paraguay in September 2014. A few delegations indicated discomfort with the cascading approach proposed.

10.6 These challenges were discussed by the ICT/PWS in the context of the recent humanitarian crisis involving refugees in south-east Europe, bringing about the need to revisit the proposed road map actions and reiterating the requirement to establish governing frameworks and mechanisms supporting requirements for meteorological information which would facilitate tactical and strategic large-scale or high-impact humanitarian efforts.

10.7 A further meeting of the Task Team is proposed for the first half of 2016.

10.8 The report from the CBS DRR coordinator indicated the following activities related to Disaster Risk Reduction: (1) expansion of the network of DRR Focal Points to include Regional Associations (RA) following Cg-17 recommendations, thus encompassing representations from Technical Commissions, Programs and the RAs, (2) a proposal for an integrated multi-hazard pilot project in Southeast Asia, building on CBS, CHy, JCOMM and CAeM existing and planned activities, to be refocused towards strengthening Multi-Hazard Early Warning Systems (MHEWS) in the region through a phased approach, (3) A DRR Road Map.

10.9 The DRR Focal Points of Regional Associations, Technical Commissions and Programmes held a second meeting in November 2015 where a new governance structure was proposed and a series of draft recommendations regarding further steps for the DRR Road Map & Work Plan 2016-2017 was agreed. The need for inter- & intra-commission / programme engagement for implementation, as well as monitoring and reporting indicators and mechanisms for DRR activities to WMO constituent bodies was also discussed.

## **11. REVIEW OF THE RELEVANT DECISIONS OF CBS-EXT (2014) AND CG-17**

11.1 The ICT/PWS noted that Cg-17 had defined the seven strategic priorities of the organisation to be Disaster Risk Reduction (DRR), the Global Framework for Climate Services (GFCS), WMO Integrated Global Observing System (WIGOS), Aviation Meteorological Services, Polar and High Mountain regions, Capacity Development and Governance.

11.2 The ICT/PWS noted that Public Weather Services were central to at least three of these priority areas, and also that the relationship between PWS and the “User Interface Platforms” (UIPs) of the GFCS had yet to be defined or addressed.

11.3 Cg-17 had, in Resolution 2, requested CBS to “develop a mechanism to focus on Service Delivery to coordinate and guide the implementation of the Strategy as provided for in its Implementation Plan” and also to “support the further development of service delivery by Members in the area of Impact-based forecasting and Risk-based warning”. In regard to both of these requests, it would fall primarily to the PWS community to lead the response.

11.4 Cg-17 had approved the top-level PWS competencies as developed through the OPAG over the past couple of years (Resolution 4).

11.5 In Resolution 5, Cg-17 decided that “the WMO Strategy for Service Delivery should guide the implementation of the PWS Programme”.

11.6 The WMO Strategic Plan, as adopted by Resolution 69 of Cg-17, in addition to defining the seven strategic priorities of the organisation as noted in 11.1 above, also listed the “Expected Results” for the forthcoming period. First amongst these is “Improved service quality and service delivery”. The ICT noted that the OPAG/PWS had a central role in promoting the delivery of this result through Members.

## **12. REVIEW OF WORK ON THE “VISION FOR THE GLOBAL DATA-PROCESSING AND FORECASTING SYSTEM (GDPFS)” AND IMPLICATIONS FOR PWS**

12.1 The ICT of the OPAG/PWS heard from Mr Ken Mylne, Chair of the OPAG/DPFS on the exercise recently carried out to develop a “Vision for the GDPFS”. Mr Mylne explained that each person present at the relevant meeting had been asked to put together a few points that encapsulated their ideas as to what the GDPFS might look like in 2025, and that this process had been facilitated and supported by the president of CBS, Mr Fred Branski.

12.2 In like manner, all those attending the meeting of the ICT took time to consider where they thought NMHSs should be vis-à-vis PWS in about 10 years’ time. For the exercise, those present considered what might be feasible to achieve by the years 2020 and 2025. A summary of the ideas and themes that came out of this exercise are as follows:

12.3 By the year 2020, all NMHSs should recognise the need to be better connected to society; the need to incorporate soft skills and social science knowledge fully into service delivery, and to build strong and improving relationships with users through the provision of impact-based weather and environmental information to users, delivered through all available technology and tools.

12.4 By the year 2025, all NMHSs should be strongly connected to users and partners, confident in their skills and abilities. NMHSs should be acknowledged as a key part of the informational infrastructure of society, bringing scientific and technological development quickly through to improved services. NMHSs should be fully incorporated into their national social and economic development process and should be part of their national social and economic development agendas.

12.5 The individual thoughts and points raised by ICT/PWS participants during this exercise are outlined in Annex IV of this report.

### **13. FUTURE DIRECTION OF PWS IN VIEW OF THE OUTCOMES OF CONGRESS DECISIONS AND OTHER CONSIDERATIONS:**

13.1 The ICT/PWS considered the position and responsibilities of the OPAG/PWS with respect to a number of WMO priority areas and expected results, and how the OPAG could best address these. This section summarized the outcome of presentations and discussions under different agenda items.

13.2 It was clear that the OPAG/PWS had a central position within WMO in the promotion and advancement of Service Delivery among NMHSs. The key document – the Service Delivery Implementation Plan – was effectively “owned” by the PWS Programme. However there was also recognition that the concepts of Service Delivery had a broader-based applicability than the traditional areas of responsibility of PWS - for example in the area of Climate Services, as well as services provided through other application areas of meteorology, such as agriculture, aviation and marine. However the Service Delivery Progress Model, as defined in the Implementation Plan, was applicable across all of these areas.

13.3 The ICT/PWS recognised that a framework was needed which would promote the cascading of best practice in Service Delivery from NMHSs which were advanced in this area to those who would benefit from support and mentoring to improve their delivery of services to users.

13.4 The ICT/PWS reflected on proposals for the OPAG/PWS to change its name from the “OPAG on Public Weather Services” to the “OPAG on Service Delivery”. It considered that such a change was not appropriate because of the importance of Service Delivery to other areas beyond the remit of the OPAG – and indeed beyond the remit of the Commission for Basic Systems.

13.5 In recognition of the importance of Service Delivery, however, and also acknowledging that much of the work of the OPAG since its foundation had, in fact, been focused on aiding NMHSs to improve their Service Delivery, the ICT/PWS decided to propose to CBS that the name of the OPAG should be changed to the “OPAG on Public Weather Services Delivery (OPAG/PWSD)”. The ICT felt that this formulation accurately reflected both the importance of Service Delivery and the remit of the OPAG within CBS.

13.6 The ICT noted the outcome of the meeting of the Task Team on Impact-Based Forecasting, held in Geneva in February 2015, and in particular the proposed structure of an “Impact Advisory Group” which would oversee the establishment of a resource group of experts who could facilitate projects in Impact-Based Forecasting and also assist in the establishment and oversight of individual projects, helping to bring together both development partners and experts to focus on specific challenges. It considered that this approach may be useful for the new OPAG structure.

13.7 In considering important applications of technology to the work of public weather services delivery, the ICT/PWS identified broader use of GIS-compatible formats as being a key enabler of merging meteorological information with other data, to help optimise decision-making. It was recognised that the multi-dimensional nature of meteorological information posed particular challenges to adapting such information to GIS-compatible formats. However, given that the impact of a weather event was a function of three elements; meteorological hazard, vulnerability and exposure, the ability to combine and visualise information on all three elements was a key enabler of impact-based forecasting.

13.8 The ICT/PWS discussed issues around the “big data” problem. Noting that there were very specific IT challenges around the handling and visualisation of “big data”, the ICT considered that there were also very real human issues in assimilating such volumes of data in a usable fashion, and that there were implications for the work of forecasters. Reflections on the myriad challenges

posed by “big data” might prove a suitable theme for a side event at the CBS-16, or perhaps even a TECO.

13.9 In examining the particular issues around the provision of meteorological services to megacities and other large urban environments, the ICT/PWS noted that air quality was frequently a major challenge and that the provision of information on and forecasts of air quality by NMHSs was mainly done in conjunction with other partners.

13.10 The ICT/PWS recognised that there were many other specific vulnerabilities associated with large urban environments, and that these included the Urban Heat Island effect, Street Canyons, coastal threats, fog/smog, and threats to essential infrastructure such as underground metro systems, water and sewage systems, power grids and communication networks.

13.11 Considering that many of the issues specific to Megacities and large urban environments could be addressed within the over-arching context of impact-based forecasting, the ICT/PWS was of the view that a major challenge for the meteorological community was to transition current research through to improved services.

13.12 With the launch of the joint World Bank/WMO book “Valuing Weather and Climate; Economic Assessments of Meteorological and Hydrological Services” at Cg-17, the next focus in this area of endeavour would be the “Madrid + 10” conference tentatively scheduled for 2017. A concept note for this conference had been drafted within the Secretariat, and funding would need to be found from extra-budgetary sources.

13.13 The ICT/PWS reflected on the optimum role of the OPAG/PWS with respect to Social and Economic Benefit (SEB) issues. For the first Madrid Conference (Secure and Sustainable Living, Madrid 2007) regional workshops had played an important role in preparing NMHSs for the event and for generating material for conference presentations and discussions. RA VI in particular has been very active in SEB-related issues and has an existing working group in this area.

13.14 In preparation for the “Madrid + 10” conference, the ICT/PWS identified a number of initiatives to which it might contribute in the area of SEB issues. Among these were the promotion of seminars on SEB at Regional Association level, the presentation of a side-event at EC68 or the organisation of a TECO, TECO Focus Session or other side event at CBS.

13.15 Communication is clearly a core issue for Public Weather Services, and much effort has been focused over the years on improving the standards of communication within NMHSs, and especially the communications capabilities of those on the front line of delivering weather information and services to specific user groups (e.g., civil protection) and to the public. . In addition, communication skills are vital in communicating the value of NMHSs to their governments, other decision makers and the public.

13.16 The development of websites and apps represented a significant challenge for NMHSs in that significant effort was required to develop and maintain appropriate weather services through these media. The challenges were many and varied. In the more developed countries, where broadband speeds were considerable, the new media allowed the delivery of “TV-style” broadcasts directly from NMHSs to users. In less developed countries, there were challenges in using limited bandwidth capacity to best effect and in accessing the technology to allow NMHSs to have their own “presence” through websites and apps.

13.17 The development of social media provided new opportunities and threats, and the conundrum of how best to exploit this new approach in the delivery of weather information and services was still not clear. What was clear was the capability of social media both to allow focused delivery of weather services and the collection of impact data following significant weather events. The ICT/PWS noted that the effective use of social media for the communication of weather information required the use of very different language as was typically employed in weather

broadcasting. The insights of the social sciences might assist the meteorological community in making best use of this new and developing resource.

13.18 The ICT/PWS members were informed of the arrangements which had been recently put in place, in conjunction with the DRR Programme, to address the needs of the Humanitarian Community in dealing with the influx of refugees to the South-East and Central Europe. These arrangements engaged the collaboration of 18 separate NMHSs in the south-east of Europe and were being facilitated by the UK Met Office. The intent was to ensure the provision of appropriate forecasts and warnings that would meet the needs both of the refugees and of the humanitarian agencies that were caring for them.

13.19 The situation in the south-east Europe was but one example of the need, frequently expressed by representatives of the humanitarian community in meetings with WMO, for the delivery of trans-national forecast and warnings services through a single point of contact. The recent establishment of the arrangements as outlined in 13.18 represented an operational component of DRR/PWS and prompted consideration of whether an RSMC-type structure might be put in place to deal with the needs of the humanitarian community in the longer term.

#### **14. RESTRUCTURING OF OPAG/PWS: VIEWS OF ICT/PWS**

14.1 Having reflected on the matters outlined in Section 13, and other relevant deliberations, the ICT made the following decisions:

14.2 That a proposition would be brought forward to CBS to change the name of the OPAG to that of the “*OPAG on Public Weather Services Delivery (OPAG/PWSD)*”

14.3 That the structure of the OPAG would henceforth move towards the establishment of Task Teams (TTs) which would be focused on specific, time-bound, objectives.

14.4 That the areas of Communications, Competency Assessment, Service Delivery and Quality Management were fundamental enablers to the work of the OPAG, and that any Task Teams formed to address these areas would report directly to the ICT/PWSD.

14.5 That the existing Expert Team on Communication, Outreach and Public Education (ET/COPE) would be disbanded and its responsibilities transferred to the ICT, to be devolved to specific Task Teams as may be established to address particular issues.

14.6 That a Task Team be established to work closely with the WMO/ETR Programme to assist in the development of suitable material to support Members in the implementation of the “Competency Framework for PWS Forecasters and Advisors” as approved by Resolution 4 of Cg-17.

14.7 That the existing Expert Team on Meeting User Needs in Reducing the Impact of Hydro-Meteorological Hazards (ET/DPM) be re-named ET/IMPACT. This Expert Team would effectively take over the responsibilities of the “Impact Advisory Group” as referred to in 13.6 above.

14.8 That possible focus areas for Task Teams to be established under ET/IMPACT would include specific country or region-based projects, social and economic benefit assessments, and the interface with users.

14.9 That the existing Expert Team on Services and Products Innovation and Improvement (ET/SPII) would be retained to assist Members (whenever needed, through the Regional Associations partnership) with the application/implementation of technological developments to the effective delivery of public weather services.



14.10 That possible focus areas for Task Teams to be established under ET/SPII would include Big Data, Nowcasting, application of the Common Alerting Protocol (CAP), further development of WWIS/SWIC, GIS-compatibility of meteorological information, and the optimum exploitation of smartphone technology.

14.11 The ICT/PWS envisaged that the ET/SPII would also work in close collaboration with the OPAG/DPFS to facilitate the rapid and efficient application of new and emerging science and technology to improved service delivery.

14.12 A diagrammatic representation of the proposed revised structure for the OPAG/PWS is given in Annex V of this report. This diagram also attempts to capture the relevance of the OPAG with other Programmes and constituent bodies of WMO.

## **15. TERMS OF REFERENCE OF THE NEW OPAG STRUCTURE**

15.1 Having agreed on a restructuring of the OPAG/PWS as described in section 14, the ICT discussed and revised its ToRs so that they would properly reflect and address the revised structure. The adjusted ToRs are given in Annex VI to this report, and will be brought to the forthcoming meeting of the CBS Management Group for ratification.

15.2 Draft ToRs for the proposed two Expert Teams in the re-structured OPAG were also discussed and are also appended in Annex VI.

## **16. COLLABORATIVE ARRANGEMENTS WITH OTHER CBS OPAGS AND PRIORITY AREAS OF WMO**

16.1 The engagement of the OPAG/PWS with the relevant priority areas of WMO is outlined in sections 11 and 13.

16.2 The collaborative arrangements with other CBS/OPAGs are outlined in section 14 and illustrated in Annex VII.

## **17. PREPARATION OF THE REPORT OF THE MEETING.**

17.1 The ICT/PWS prepared contributions to a draft report of its work, led by the Chair of the OPAG/PWS, who agreed to work with the Secretariat to finalise the report.

## **18. ANY OTHER BUSINESS**

18.1 There was no other business which had not already been covered in the agenda and discussions.

## **19. CLOSURE.**

19.1 The meeting closed at 15.45 hours on Friday, December 11<sup>th</sup> 2015.

**MEETING OF THE COMMISSION FOR BASIC SYSTEMS OPEN PROGRAMME AREA  
GROUP ON PUBLIC WEATHER SERVICES (PWS) IMPLEMENTATION / COORDINATION  
TEAM ON PWS (CBS/OPAG-PWS ICT/PWS, DUBLIN, REPUBLIC OF IRELAND  
(7-11 DECEMBER 2015)**

**LIST OF ANNEXES TO THE FINAL REPORT**

- Annex I:** List of Participants
- Annex II:** Meeting Programme
- Annex III:** ICT/PWS Team Deliverable and Action Sheets for the Inter-sessional Period 2014/2016
- Annex IV:** Elements of the PWS vision for 2020 - 2030
- Annex V:** Diagrammatic representation of proposed new structure for the OPAG/PWS
- Annex VI:** Draft Terms of Reference (TORs) of the ICT/PWS
- Annex VII:** List of actions

**MEETING OF THE COMMISSION FOR BASIC SYSTEMS OPEN PROGRAMME AREA  
GROUP ON PUBLIC WEATHER SERVICES (PWS) IMPLEMENTATION / COORDINATION  
TEAM ON PWS (CBS/OPAG-PWS ICT/PWS, DUBLIN, REPUBLIC OF IRELAND)**

**LIST OF PARTICIPANTS**

**PROVISIONAL LIST OF PARTICIPANTS**

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**MEETING OF THE COMMISSION FOR BASIC SYSTEMS OPEN PROGRAMME AREA  
GROUP ON PUBLIC WEATHER SERVICES (PWS) IMPLEMENTATION / COORDINATION  
TEAM ON PWS (CBS/OPAG-PWS ICT/PWS, DUBLIN, REPUBLIC OF IRELAND)**

**MEETING PROGRAMME**

**PROVISIONAL PROGRAMME**

<i>Monday, 7<sup>th</sup> December 2015</i>			
<b>DAY 1</b>			
0900-0945	1. Opening  2. Organization of the meeting  <ul style="list-style-type: none"> <li>• Adoption of the agenda</li> <li>• Working arrangements</li> </ul>	<ul style="list-style-type: none"> <li>• Mr Liam Campbell, PR for Ireland with WMO</li> <li>• Dr Xu Tang (WMO Secretariat)</li> <li>• Mr Gerald Fleming</li> </ul>	45 minutes
0945-1015	11. Review of relevant decisions of Cg-17, CBS-Ext(2014), EC-67 and ECWG-SD	<ul style="list-style-type: none"> <li>• Mr G. Fleming</li> <li>• Ms H. Kootval</li> </ul>	30 minutes
1015-1045	4. Review of the current Terms of Reference (ToRs) of the ICT	<ul style="list-style-type: none"> <li>• Mr G. Fleming</li> <li>• Ms H. Kootval</li> </ul>	30 minutes
<b>1045-1115</b>	<b>COFFEE / TEA BREAK</b>		<b>30 minutes</b>
1115-1145	5. Review of the deliverables from the 2014 Meeting of the ICT (Melbourne, Australia)	<ul style="list-style-type: none"> <li>• Mr G. Fleming</li> <li>• Ms H. Kootval</li> </ul>	30 minutes
1145-1215	3. Report of the OPAG Chairperson on activities of the OPAG, including relevant decisions of CBS-MG Meetings in the inter-sessional period, and ensuing discussion	<ul style="list-style-type: none"> <li>• Mr G. Fleming</li> <li>• All</li> </ul>	30 minutes
1215-1245	3. Discussions of the Report of the Chairperson of the OPAG/PWS	<ul style="list-style-type: none"> <li>• All Participants</li> </ul>	30 minutes
<b>1245-1345</b>	<b>LUNCH BREAK</b>		<b>60 minutes</b>
1345-1415	12. Report of the Chairperson of the OPAG / DPFS on the "Vision for the GDPFS"	<ul style="list-style-type: none"> <li>• Dr Ken Mylne, (Chairperson of the CBS/OPAG-DPFS)</li> </ul>	30 minutes

1415-1500	12. Discussions on the implications for PWS and the work of the OPAG/PWS arising from the "Vision for the GDPFS"	<ul style="list-style-type: none"> <li>All Participants</li> </ul>	45 minutes
<b>1500-1520</b>	<b>COFFEE / TEA BREAK</b>		<b>20 minutes</b>
1520-1550	6. Report of the Chairperson of the ET/DPM	<ul style="list-style-type: none"> <li>Mr Elliott "Eli" Jacks (Chairperson of the CBS/OPAG-PWS ET/DPM)</li> </ul>	30 minutes
1550-1620	6. Discussions of the Report of the Chairperson of the ET/DPM	<ul style="list-style-type: none"> <li>All Participants</li> </ul>	30 minutes
1620-1700	7. Report of the Chairperson of the ET/COPE and ensuing discussion	<ul style="list-style-type: none"> <li>Mr Jon. Gill (Chairperson of the CBS/OPAG-PWS ET/COPE) via Mr G Fleming</li> </ul>	40 minutes

**Tuesday, 8<sup>th</sup> December 2015**

**DAY 2**

0900-0930	8. Report of the Chairperson of the ET/SPII	<ul style="list-style-type: none"> <li>Mr John L. Guiney (Chairperson of the CBS/OPAG-PWS ET/SPII)</li> </ul>	30 minutes
0930-1000	8. Discussions of the Report of the Chairperson of the ET/SPII	<ul style="list-style-type: none"> <li>All Participants</li> </ul>	30 minutes
1000-1045	9. Report of the Chairperson of the TT/IMPACT	<ul style="list-style-type: none"> <li>Mr Paul Davies (Chairperson of the CBS/OPAG-PWS TT/IMPACT)</li> </ul>	45 minutes
<b>1045-1115</b>	<b>COFFEE / TEA BREAK</b>		<b>30 minutes</b>
1115-1145	9. Discussions on report from the Chairperson of the TT/IMPACT	<ul style="list-style-type: none"> <li>All Participants</li> </ul>	30 minutes
1145-1215	10. Report of the Coordinator of the DRR Task Team on Support to Humanitarian Organizations	<ul style="list-style-type: none"> <li>Mr Michel Jean (Coordinator of DRR TT / Humanitarian to be presented by Ms Jennifer Ann Milton.</li> </ul>	30 minutes
1215-1245	10. Discussions on the report of the Coordinator of the DRR Task Team on Support to Humanitarian Organizations	<ul style="list-style-type: none"> <li>All Participants</li> </ul>	30 minutes
<b>1245-1345</b>	<b>LUNCH BREAK</b>		<b>60 minutes</b>

1345-1400	13. Future directions for the Public Weather Services (PWS) Programme and for OPAG/PWS - Introduction	<ul style="list-style-type: none"> <li>• Mr G. Fleming</li> <li>• Ms H. Kootval</li> <li>• All</li> </ul>	15 minutes
1400-1500	13 (a). Future directions for the Public Weather Services (PWS) Programme and for OPAG/PWS – Service Delivery Strategy	<ul style="list-style-type: none"> <li>• Mr G. Fleming</li> </ul>	60 minutes
<b>1500-1530</b>	<b>COFFEE / TEA BREAK</b>		<b>30 minutes</b>
1530-1615	13 (b). Future directions for the Public Weather Services (PWS) Programme and for OPAG/PWS – Impact-based Forecast and Warnings Services	<ul style="list-style-type: none"> <li>• Mr P Davies</li> <li>• Mr E Jacks</li> </ul>	45 minutes
1615-1700	13 (c). Future directions for the Public Weather Services (PWS) Programme and for OPAG/PWS – Applications of technology to PWS Service Delivery	<ul style="list-style-type: none"> <li>• Mr J Guiney</li> <li>• Mr W Lang</li> </ul>	45 minutes
<b>Wednesday, 9<sup>th</sup> December 2015</b>			
<b>DAY 3</b>			
0900-0945	13 (c). Future directions for the Public Weather Services (PWS) Programme and for OPAG/PWS – Big Data; issues and challenges	<ul style="list-style-type: none"> <li>• Mr J Guiney</li> <li>• Mr W Lang</li> <li>• Dr K Mylne</li> </ul>	45 minutes
0945–1045	13 (d). Future directions for the Public Weather Services (PWS) Programme and for OPAG/PWS – Assessment of Social and Economic Benefits of Met/Hydro Services	<ul style="list-style-type: none"> <li>• Mr G. Fleming</li> <li>• Ms H. Kootval</li> <li>• Mr I Cacic</li> </ul>	60 minutes
<b>1045-1115</b>	<b>COFFEE / TEA BREAK</b>		<b>30 minutes</b>
1115-1200	13 (e). Future directions for the Public Weather Services (PWS) Programme and for OPAG/PWS – Special Themes; Health, Megacities, Road Transport, Energy, Water etc.	<ul style="list-style-type: none"> <li>• Mr G. Fleming</li> <li>• All</li> </ul>	45 Minutes
1200-1245	13 (f). Future directions for the Public Weather Services (PWS) Programme and for OPAG/PWS – Communications Aspects	<ul style="list-style-type: none"> <li>• Mr G. Fleming</li> <li>• Mr I Cacic</li> </ul>	45 minutes
<b>1245-1345</b>	<b>LUNCH BREAK</b>		<b>90 minutes</b>
1345-1500	14. Re-structuring of the OPAG	<ul style="list-style-type: none"> <li>• All Participants</li> </ul>	75 minutes
<b>1500-1530</b>	<b>COFFEE / TEA BREAK</b>		<b>30 minutes</b>
1530-1700	14. Re-structuring of the OPAG; Teams, ToRs, People	<ul style="list-style-type: none"> <li>• All Participants</li> </ul>	90 minutes



1700-1800	Guided Tour of Dublin Castle	<ul style="list-style-type: none"> <li>All</li> </ul>	60 minutes
<b>Thursday, 10<sup>th</sup> December 2015</b>			
<b>DAY 4</b>			
0900-0945	13 (g). Future directions for the Public Weather Services (PWS) Programme and for OPAG/PWS – PWS Competency Framework	<ul style="list-style-type: none"> <li>Mr G. Fleming</li> <li>Ms H. Kootval</li> </ul>	45 minutes
0945-1045	13 (g). Future directions for the Public Weather Services (PWS) Programme and for OPAG/PWS – PWS Competency Framework; Preparation of Guidance and Support Documentation	<ul style="list-style-type: none"> <li>Mr G. Fleming</li> </ul>	60 minutes
<b>1045-1115</b>	<b>COFFEE / TEA BREAK</b>		<b>30 minutes</b>
1115-1230	14. Re-structuring of the OPAG; Teams, ToRs, People	<ul style="list-style-type: none"> <li>All Participants</li> </ul>	75 minutes
<b>1230-1330</b>	<b>LUNCH BREAK</b>		<b>60 minutes</b>
1330-1500	14. Re-structuring of the OPAG; Teams, ToRs, People	<ul style="list-style-type: none"> <li>All Participants</li> </ul>	90 minutes
<b>1500-1530</b>	<b>COFFEE / TEA BREAK</b>		<b>30 minutes</b>
1530-1630	15. Terms of Reference of new OPAG Structure	<ul style="list-style-type: none"> <li>All Participants</li> </ul>	60 minutes
1630-1700	16. Collaborative arrangements with other CBS OPAGs and priority areas of WMO	<ul style="list-style-type: none"> <li>Mr G. Fleming</li> <li>Ms H. Kootval</li> </ul>	30 minutes
<b>Friday, 11<sup>th</sup> December 2015</b>			
<b>DAY 5 (AGRICULTURE HOUSE, KILDARE ST)</b>			
0900-1030	17. Preparation of the report of the meeting and the Executive Summary	<ul style="list-style-type: none"> <li>All Participants</li> </ul>	90 minutes
<b>1030-1100</b>	<b>COFFEE / TEA BREAK</b>		<b>30 minutes</b>
1100-1230	17. Preparation of the report of the meeting and the Executive Summary (continued)	<ul style="list-style-type: none"> <li>All Participants</li> </ul>	90 minutes
<b>1230-1330</b>	<b>LUNCH BREAK</b>		<b>60 minutes</b>
1330-1500	17. Preparation of the report of the meeting and the Executive Summary (continued)	<ul style="list-style-type: none"> <li>All Participants</li> </ul>	90 minutes

<b>1500-1530</b>	<b>COFFEE / TEA BREAK</b>		<b>30 minutes</b>
1530-1700	17. Review and adoption of the report 18. Any other business	<ul style="list-style-type: none"> <li>• All Participants</li> <li>• Chairperson</li> </ul>	90 minutes
1700	<b>18. Closure of the Meeting</b>		

**COMMISSION FOR BASIC SYSTEMS OPEN PROGRAMME AREA GROUP ON PUBLIC WEATHER SERVICES (PWS) IMPLEMENTATION/COORDINATION TEAM (CBS/OPAG-PWS ICT/PWS)**

**ICT/PWS TEAM DELIVERABLES AND ACTION SHEETS FOR THE INTERSESSIONAL PERIOD 2014/2016  
(UPDATED DEC 2015)**

<b><i>Deliverable 1 (TOR a): Noting the publication of the “WMO Strategy for Service Delivery and its Implementation Plan”, ensure that actions relevant to PWS are carried out</i></b>					
	<b>Action(s):</b>	<b>Responsible Member(s):</b>	<b>Due Date:</b>	<b>Status 2014:</b>	<b>Status 2016:</b>
1.	Initiating the discussion on the re-alignment of the OPAG with the elements of Service Delivery	All ICT Members	6 June 2014	Done	Done
2.	Review and finalize draft TORs to reflect the re-alignment in 1 above	All ICT/PWS Members	Forthcoming ET Meetings		To be Done
3.	Present the draft TORs to CBS-16	OPAG Chair and Secretariat	2016		To be Done
<b><i>Deliverable 2 (TOR c): Establish contact with relevant people in other CBS OPAGs, Commissions, etc., as required</i></b>					
	<b>Action(s):</b>	<b>Responsible Member(s):</b>	<b>Due Date:</b>	<b>Status 2014:</b>	<b>Status 2016:</b>
1.	Contact Chairpersons of OPACE III/IV to explore possible collaboration	Chairperson	June 2012	Closed	Closed
2.	Contact representatives of CHy to explore possible collaboration	Chairperson	June 2012	Closed	Closed
<b><i>Deliverable 3 (TORs c and d): Facilitate the development of one or a number of “one-stop-shops” for the provision of advice and assistance to the Humanitarian Response Community</i></b>					
	<b>Action(s):</b>	<b>Responsible Member(s):</b>	<b>Due Date:</b>	<b>Status 2014:</b>	<b>Status 2016:</b>

1.	Finalize the Report of the ICTT and circulate as required	Chairperson/TT	End-2012	Completed	Completed
2.	Prepare an inventory of data and products that are currently available and can be used by Humanitarian Response agencies	Chairperson/TT and WMO Secretariat	End-2012	Undertaken through the work of the new CBS TT	Completed ??
3.	Compile a listing of PWS-based resources relevant to point 1 above and communicate this to Secretariat DPFS, to include basic warnings, basic public forecasts, SWIC, WWIS, etc.	WMO Secretariat	End-2012	Completed	Completed
4.	Investigate the use of the delivery structure of WMO (RSMCs, RCCs, etc.) and the network of National PWS Focal Points as a resource in the context of national operations of Humanitarian Response agencies	Chairperson/TT and WMO Secretariat	End-2012	PWS will organize the work of interpretation of climate outlooks of major global centre(s) for the use by Humanitarian agencies. The TT will have a meeting in July 2014 and this item will be on the agenda.	Ongoing / underway ??
<b><i>Deliverable 4 (TOR e): Promote the concept of NMHSs as the Single Official Voice at times of severe/high-impact weather</i></b>					
	<b>Action(s):</b>	<b>Responsible Member(s):</b>	<b>Due Date:</b>	<b>Status 2014:</b>	<b>Status 2016:</b>
1.	Make use of the new “WMO Register of Alerting Authorities” to promote and embed the SOV concept	Chairperson/OPAG and WMO Secretariat	Ongoing	Ongoing	Ongoing
2.	Designate an Expert Advisor to assist with the implementation of CAP at NMHSs and to promote registration of Members in the “WMO Register of Alerting Authorities”	ICT Members/ WMO Secretariat	May 2012	Completed	Completed

3.	Ensure inclusion of this principle in all relevant PWS documents	WMO Secretariat	Ongoing	Ongoing	Ongoing
<b>Deliverable 5 (TOR f): Detailed feedback from recipients of targetted PWS activities, such as SWFDP, Learning-Through-Doing (LTD) Projects, training, etc.</b>					
	<b>Action(s):</b>	<b>Responsible Member(s):</b>	<b>Due Date:</b>	<b>Status 2014:</b>	<b>Status 2016:</b>
1.	Organize the collection and analysis of feedback from training participants and PRs	WMO Secretariat	Ongoing	Ongoing	Ongoing
2.	Collate information flowing back from the feedback mechanisms built into the SWFDP and publish on the PWS Website	Co-Chairperson/OPAG and WMO Secretariat	Ongoing	Ongoing	Ongoing
3.	Organize the reception of bi-annual reports from Members participating in LTD Projects (through Focal Points where possible) and publish on the PWS Website	WMO Secretariat	Ongoing	Completed	Completed
<b>Deliverable 6 (TOR g): Develop a Competency Framework for PWS Forecasting and Activities.</b>					
	<b>Action(s):</b>	<b>Responsible Member(s):</b>	<b>Due Date:</b>	<b>Status 2014:</b>	<b>Status 2016:</b>
1.	Draft a Competency Framework relevant to PWS Forecasters and circulate to all ICT Members, ETR Representatives, etc.	Chairperson	May 2012	Completed	Completed
2.	Review draft and provide feedback to WMO Secretariat/ Chairperson	All ICT Members	July 2012	Completed	Completed
3.	Finalize PWS Competency Framework for CBS-Ext.(2014)	WMO Secretariat/ Chairperson	September 2014	Completed	Completed
<b>Deliverable 7 (TOR h): Develop materials on the Social and Economic Benefits of NMHSs as decided by the RA VI (Europe) Task Team and the World Bank Project.</b>					
	<b>Action(s):</b>	<b>Responsible Member(s):</b>	<b>Due Date:</b>	<b>Status 2014:</b>	<b>Status 2016:</b>

1.	Compile and carry out comparative analysis of the impact of the services provided by NMHSs through socio-economic benefits studies	RA VI TT on socio-economic benefits/ World Bank	Mid- to end-2012	Ongoing development through the joint WMO/World Bank publication	Completed
2.	Improve methodologies in SEB studies through concurrent field testing and training as part of specific demonstration/pilot projects as well as on-going NMHSs' investment programmes	World Bank/ WMO Secretariat	End-2012 through 2013	Ongoing development through the joint WMO/World Bank publication	Completed
3.	Disseminate an authoritative joint WMO-World Bank guidance document	WMO Secretariat/ World Bank	December 2014	Will be disseminated upon publication	Completed
<b>Deliverable 8 (TOR i): Future activities as a follow-up to WENS</b>					
	<b>Action(s):</b>	<b>Responsible Member(s):</b>	<b>Due Date:</b>	<b>Status 2014:</b>	<b>Status 2016:</b>
1.	Finalize "Concept Note" developed in Shanghai in November 2011 regarding the follow-up activities to WENS	Dr Tang Xu	End-2012	Completed	Completed
2.	Implement follow-up activities as defined in the "Concept Note"	Persons as defined in the "Concept Note"	Mid-2013	Closed	Closed
3.	Prepare publications, etc., as outlined in Section 12 of the WENS Final Report	Shanghai Meteorological Service (SMS)	End-2012	Closed	Closed
<b>Deliverable 9 (TOR i): Guidelines for Meteorological Support to Olympic Games.</b>					
	<b>Action(s):</b>	<b>Responsible Member(s):</b>	<b>Due Date:</b>	<b>Status 2014:</b>	<b>Status 2016:</b>

1.	Review current draft and bring it up-to-date, include the Beijing and Vancouver Games, then provide to IOC and other sporting organizations as appropriate, and publish on PWS Webpage	Chairperson ET/SPI/ WMO Secretariat	September 2014	Chair ET/SPII to follow-up	???
<b><i>Deliverable 10 (TOR j): Strengthen the involvement of the NMHSs' PWS Focal Points with the work of the OPAG and of the PWS Programme</i></b>					
	<b>Action(s):</b>	<b>Responsible Member(s):</b>	<b>Due Date:</b>	<b>Status 2014:</b>	<b>Status 2016:</b>
1.	Update the list of National PWS Focal Points periodically	WMO Secretariat	Ongoing	Ongoing	Ongoing
2.	Request PRs to appoint National PWS Focal Points in Member countries where none are, as yet, identified	WMO Secretariat	Ongoing	Ongoing	Ongoing
3.	Carry out a regular survey of the work of the National PWS Focal Points in relation to PWS functions and publish the results	WMO Secretariat	Ongoing	Ongoing	Ongoing
4.	Keep National PWS Focal Points fully involved and informed in the activities of the PWS Programme and of the OPAG	WMO Secretariat	Ongoing	Ongoing	Ongoing
<b><i>Deliverable 11 (TOR j): Market and promote the availability and use of PWS material among the NMHS/PWS Community</i></b>					
	<b>Action(s):</b>	<b>Responsible Member(s):</b>	<b>Due Date:</b>	<b>Status 2014:</b>	<b>Status 2016:</b>
1.	Periodically review statistics on the hits and usage of PWS pages on the WMO Website	WMO Secretariat	Ongoing	Ongoing	Ongoing
2.	Continue to implement strategies for increasing the ease of access to PWS pages through Google and other search engines	WMO Secretariat	Ongoing	Done	Ongoing

**MEETING OF THE COMMISSION FOR BASIC SYSTEMS OPEN PROGRAMME AREA  
GROUP ON PUBLIC WEATHER SERVICES (PWS) IMPLEMENTATION / COORDINATION  
TEAM ON PWS (CBS/OPAG-PWS ICT/PWS, DUBLIN, REPUBLIC OF IRELAND,  
7-11 DECEMBER 2015)**

As noted in Section 12 of the Report, those attending the meeting of the ICT engaged in an exercise to attempt to define the elements of a successful national PWS programme that a NMHS might strive towards in the coming decades. The individual thoughts of the participants are captured below.

**Ms Jennifer Milton**

WMO members (in particular developing countries) are enabled to:

- predict and provide relevant impact based weather and environmental information through increased collaboration and sharing with partners and users (public, governments, industry and NGOs)
- Dissemination of this information or these services is flexible and adaptable to the platforms and needs of the users, hence increasing the efficiency of the service (WIS)
- WMO members have the knowledge, tools and skills to predict, deliver and verify these services
- The governance of WMO should increasingly enable this through its various groups

**Dr Xu Tang**

Future PWS, 2020-2030: to assist Members to develop and implement *well designed* (Framework, QMS, Competency), *well developed* (System of systems, application of ST and State-of-art, Impact based and risk informed approaches), *people centered* (user friendly, solution based provision with integrated and holistic approach) and *adaptable* (block upgrade for the service delivery in relevant thematic areas as requested by Members) *User Interface Platform* to meet societal needs. *Service Delivery* is a *Framework* to link *societal needs* with *relevant stakeholders* (public-private and provider-user partnership and collaboration) building on a service-oriented operational infrastructure of NMHSs for the provision of service delivery “anywhere, anytime, and anyone” in order to reduce the negative impacts from met-hydro hazards to a minimum and to maximise the benefit from the application of hydro-meteorological information and technologies.

The future PWS will assist NMHSs to engage fully with their national social and economic development process and to be part of their national social and economic development agenda.

The future implementation of WMO Strategy for Service Delivery should become the Secretariat effort for the future PWS.



## **Mr Paul Davies**

Words considered

Network

Connected

Protection, well-being, prosperity

Global partner

Service excellence

Making a difference

Science to impacts

Science to action

Value

Innovate

Authoritative

Multi hazard, multi-disciplinary, multi-agency multi skilled

Trusted

World leading

At the heart of

By being truly connected, NMHSs around the world will be the authoritative voice in translating multi-disciplinary (meteorological, environmental based) science to impacts so that people, infrastructure and the environment are better protected, resilient and equipped to exploit the challenges associated with an ever increasing volatile climate.

## **Mr Gerald Fleming**

NMHSs to be connected strongly to users and partners, confident in their skills and abilities, acknowledged as a key element in the informational infrastructure of society, bringing scientific and technological development quickly through to improved services.

## **Mr Ivan Cacic**

Well-defined complimentary roles for RAs, TCs and Programmes. PWS to focus on existing priority areas. Standardisation of CAP with mutual cooperation between NMHSs and data integrators (Google etc.). Recognise complementary roles of public, private and media sectors. Consolidation of Big Data, (and when appropriate) crowd sourcing. Consolidation of observing systems. Higher visibility of weather services. Better use of the WMO Country Profile Database Portal, including practice of service self-assessment. Regular updates of graphics used to communicate weather

## **Dr Will Lang**

Common standards. User-orientated PWS adaptation to external change – continuous evolution of technology, changing climate etc. Improve awareness of impacts. Improved synergies – better global linkages.

## **Mr John Guiney**

High-quality environmental information. Clear and concise products and services. Collaborative user- and partner-orientated information.

## **Mr Eli Jacks**

1) Members have developed close relationships with disaster management partners to support their decision making.

- 2) Members are issuing hazards messages based on user-defined impacts
- 3) Members are providing clearly measurable socioeconomic benefits to their society.
- 4) Members clearly express forecast uncertainty to their users
- 5) Hazards messages are clear, concise and focused on impacts are recommended action
- 6) Members have the technological tools to provide timely environmental information for an increasingly mobile society.

**Ms Haleh Kootval**

Members will be able to provide fit-for -purpose information and services and disseminate them as widely as possible using all available technology (of the day) and tools , for impact -based forecasting and warnings, visualisation and dissemination within their capability, based on identified and required needs of users, as an essential ingredient for public safety and well-being.

**Mr Ken Mylne**

NMHSs seen as valued partners by governments, and seen as the authoritative sources of information and advice on environmental risks.

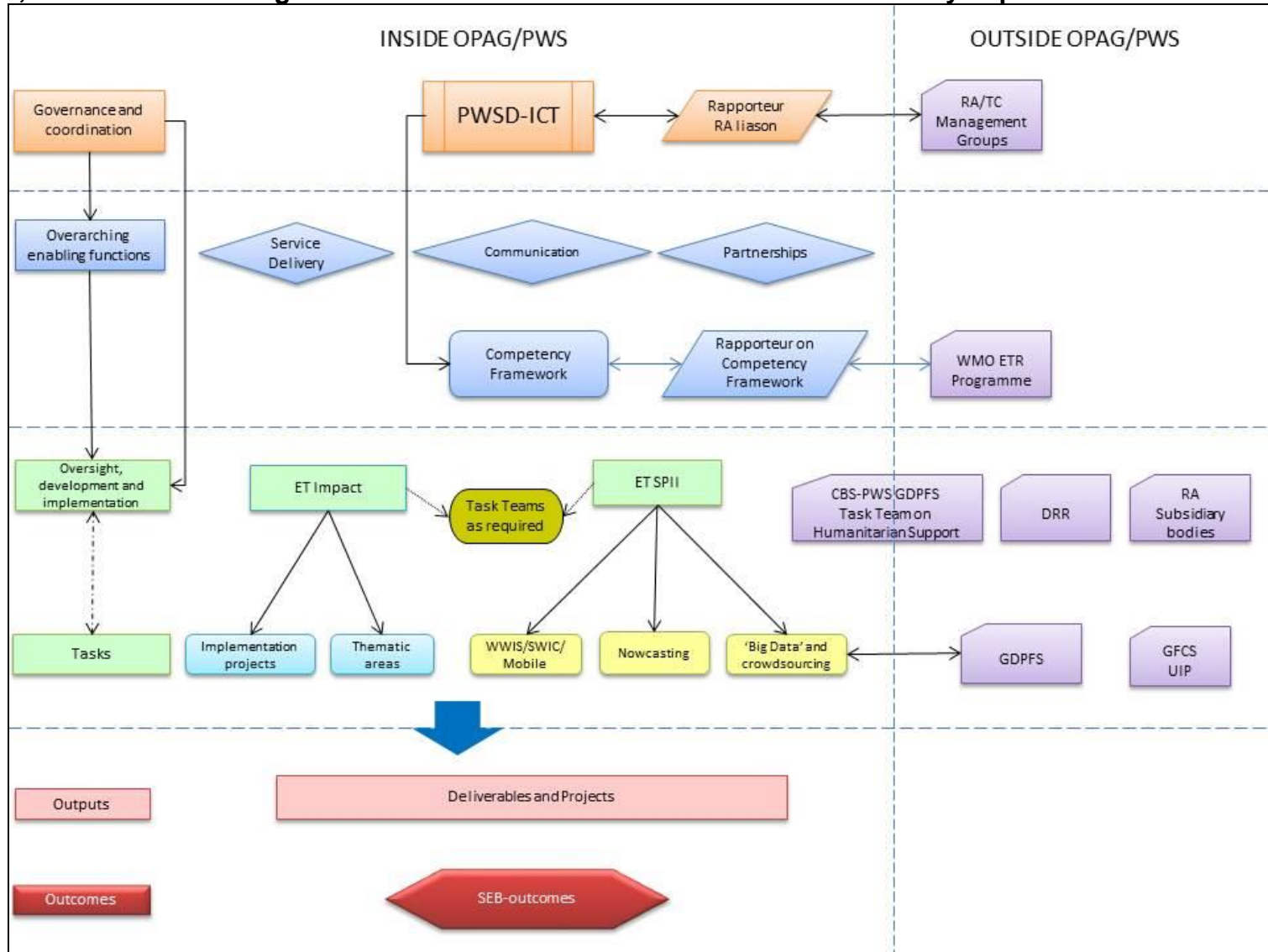
**Mr Zhihua Wang**

Promote good practice. Develop further impact-based forecast and warnings services for disaster mitigation. Help members to better communicate with media.

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**DIAGRAMMATIC REPRESENTATION OF THE PROPOSED NEW STRUCTURE OF THE OPAG ON PUBLIC WEATHER SERVICE DELIVERY**

**Governance, structure and linkages of the CBS- Public Weather Services and Delivery Implementation/Coordination Team**



**MEETING OF THE COMMISSION FOR BASIC SYSTEMS OPEN PROGRAMME AREA  
GROUP ON PUBLIC WEATHER SERVICES (PWS) IMPLEMENTATION / COORDINATION  
TEAM ON PWS (CBS/OPAG-PWS ICT/PWS, DUBLIN, REPUBLIC OF IRELAND, 7-11  
DECEMBER 2015)**

**DRAFT TERMS OF REFERENCE (TORS) OF THE ICT/PWS AND  
CONSTITUENT EXPERT TEAMS**

1. The following draft Terms of Reference (TORs) were agreed by the ICT/PWS for presentation to CBS-MG and ultimately to CBS-16 for consideration:

**Draft ToRs of the OPAG on Public Weather Service Delivery**

- (a) Coordinate the implementation of the decisions of Congress, the Executive Council and the Commission for Basic Systems (CBS) with respect to Public Weather Services;
- (b) Through the constituent teams of the OPAG, promote the implementation of the WMO Strategy for Service Delivery in the context of Public Weather Services;
- (c) Keep under review the work of the PWSD Expert Teams and co-ordinate and guide their work programmes;
- (d) Consult and collaborate to ensure coordination of the work of the Open Programme Area Group (OPAG) on PWSD with that of other CBS OPAGs, technical commissions (TCs), EC Working Groups, regional associations (RAs) and WMO Programmes and initiatives;
- (e) Support a strengthening of partnerships between National Meteorological and Hydrological Services (NMHSs), other agencies, and user sectors (e.g., media, health, emergency management) in areas relevant to PWSD;
- (f) Continue to encourage and provide guidance to Members to assert the authority of NMHSs as the sole providers of official high-impact weather warnings;
- (g) Facilitate the development of guidance and training material to underpin and support those elements of the WMO competency framework relevant to PWS-related activities;
- (h) Support and promote excellence in communication as a key enabler of quality service delivery;
- (i) Collaborate with development partners and other WMO entities to assist NMHSs in the identification and assessment of societal, economic and environmental benefits of hydro-meteorological services and communicate this value to governments, other decision makers and public; and
- (j) Continue to promote the awareness and use of guidance documents developed through the work of the OPAG, in collaboration with Regional Associations, and by other means.

**Draft ToRs of the Expert Team on Service Provision Innovation and Improvement**

- (a) Monitor, evaluate and advise on challenges and opportunities for Public Weather Service Delivery presented by developing science and technology;
- (b) Address the user requirements identified by ET/ IMPACT for data provision, management and visualisation, through collaboration with DPFS and other partners as necessary;
- (c) Take responsibility for, and review PWS guidance on, scientific and technical aspects of Service Delivery improvement, including nowcasting, uncertainty, CAP and mobile/web services.
- (d) Identify experts to advice on technical aspects of Service Delivery improvement as required.

- (e) Provide oversight, quality assurance and coordination of the continuing development of WWIS/SWIC

### **Draft ToRs of the Expert Team on Impact-Based Forecasting and Risk-Based Warning**

- (a) Building on the WMO Guidelines on Multi-hazard Impact-Based Forecast and Warning Services (WMO No. 1150), develop an implementation strategy which describes next actionable steps and evolution.
  - (b) Develop and maintain an expert resource to facilitate activities and projects in the area of Impact-Based Forecasting, including representatives from the social sciences.
  - (c) Create a network of champions, ambassadors, and change agents within NMHSs, their partners, and users to support and promote Impact-Based Forecasting.
  - (d) Actively promote Impact-Based Forecasting by sharing best practices through symposiums, journal papers and communication outlets.
  - (e) Provide NMHSs with guidance on how to standardize Impact-Based Forecasting messaging protocols and formats (e.g. colour-coding, language, icons etc.).
  - (f) Working with Technical Commissions, Regional Associations, and ET/SPII within the OPAG/PWSD, establish user requirements for service improvements through science and technological innovation and implementation.
  - (g) Evolve current methodologies for verification and evaluation to incorporate a focus on Socio-Economic Benefits.
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## LIST OF ACTIONS RESULTING FROM THE ICT MEETING

### Responsible: Chair, OPAG/PWS

1. Prepare a document on the topic of the WMO Service Delivery Strategy and how best to coordinate the IP across Commissions, for the President of CBS to bring to the PTC meeting (January 2016).
2. Prepare a version of a similar document for the President of RA-VI to introduce to the forthcoming meeting of the PRA (.January 2016)
3. Consider how best to advance the concept of an RSMC-type structure to address the needs of the Humanitarian Agencies, building on the recent experiences in the south-east of Europe.
4. Consider the establishment of national or regional projects in the area of Service Delivery.
5. Consider a survey to ascertain the true state of Services Delivery among NMHSs.
6. Explore the position of CAP vis-à-vis the WIS with the WMO Secretariat (Steve Foreman).
7. Promote SEB Assessments through the Regional Associations.
8. Consider a benchmarking survey of all WMO Members (or a selection, regionally-based?)
9. Explore the use of the Country Profile Database Portal as a resource in SEB Assessments
10. Engage with the Steering Committee of the “Madrid + 10” conference as appropriate.
11. Promote regionally-based workshops in advance of this conference.
12. Make contact with WMO/ETR Programme with regard to the establishment of a joint Task Team with PWS to develop material in support of the PWS Competency Frameworks.
13. Request the President of WMO to support the establishment of such a TT through agreeing to that Ms Jennifer Milton (Canada) lead this initiative.
14. Seek other appropriate members for this TT.

### Responsible: Will Lang

1. Follow up with the Deliverable 1 (now casting) ET/SPII
2. Participate at the meeting of ICT/DPFS in May 2016 and discuss further the issue of Big Data and respective roles of DPFS and PWS..

### Responsible: Paul Davies

1. Write a short document on the requirements for volunteer experts to be trained as trainers to assist with the implementation of the impact-based forecasting in NMHSs.