PROGRESS ACTIVITY REPORT OF THE
SEVENTEENTH SESSION OF THE REGIONAL
ASSOCIATION III (RA III-17)

(unedited and in official WMO languages when available)
MATERIAL ARRANGEMENTS FOR THE SESSION

Venue

At the kind invitation of the Government of Chile, the Seventeenth session of the Regional Association III (RA III-17) will be held in Santiago, Chile from 21 to 23 November 2018. The opening ceremony will be held at 9.30 am on 21 November at the hotel Marina Las Condes.

The Regional Conference (RECO) will be held at the same venue from 19 to 20 November 2018.

Working languages

During the session, simultaneous interpretation in two WMO official languages (English and Spanish) will be provided in the main conference room. Additional meeting rooms without interpretation facilities will also be available.

Documents

Delegations wishing to submit documents before the session are invited to send them to the WMO Secretariat, as soon as possible but not later than 60 days before the opening of the session, in accordance with the provisions of Regulation 173(b) of the WMO General Regulations to allow time for translation. According to Regulation 172 of the WMO General Regulations, session documents should be distributed as soon as possible and preferably not later than 45 days before the opening of the session. Any document presented by a delegation should be submitted in the name of the Member of the Organization and not by an individual person.

Processes and documents workflow

The presentation of session documents and organization of the work of the session will differ this year from the practice of previous sessions, as explained at the RA III-17 website. (See RA III-17/INF. 1(2)).

Distribution of documents

Documents will be posted before and during the session on the session website, in line with WMO greening efforts to promote paper-smart meetings. Therefore, participants are kindly invited to bring internet-enabled portable computers capable of handling Microsoft Word 2010 and Adobe PDF formats so that they can work in paper-smart mode during the session.

Provisional abridged report

Approved documents showing amendments in the two working languages of the Association will be posted as soon as possible after the session on the RA III-17 website, in the folder “Provisional Final Report”.


Registration of participants

Online pre-registration is required for all participants to the RECO and RA III-17. In view of their official status with WMO, Permanent Representatives of WMO Members (PRs) have been given access to an online Event Registration System allowing the pre-registration of their respective delegations.

More information concerning online pre-registration will be provided in due course on the RA III-17 session website (meetings.wmo.int/RA-III-17).

A conference information and registration desk will be set up close to the meeting rooms to facilitate the registration of participants and provision of general information.

Registration for the RECO and RA III-17 will take place at the conference information and registration desk at the Hotel Marina Las Condes and start on 18 November, from 4 to 6 p.m. It will continue throughout the RECO and the session. At the time of registration, participants will receive identification badges, which should be worn throughout the session.

Credentials

Pursuant to Regulation 21 of the General Regulations, prior to a session of a constituent body other than the Executive Council, each Member should, if possible, communicate to the Secretary-General the names of the persons composing the delegation to that body, indicating which of these shall be regarded as its principal delegate. In addition, a letter giving these particulars and signed by, or on behalf of, an appropriate governmental authority of the Member shall be sent to the Secretary-General or handed to his representative at the session. This letter shall be regarded as appropriate credentials for the participation of the individuals named therein in all activities of the constituent body.

Representatives of international organizations invited as observers to the session should provide in advance, or bring to the session, a letter of representation signed by the appropriate authority from their organization.

List of participants

A provisional list of participants will be uploaded on the session website shortly after the beginning of the meeting. This list will be updated on a daily basis.

Videoconference facilities

A videoconference connection will be set up, if possible, between the main meeting room and WMO headquarters in Geneva.

Internet facilities

Wireless Internet connection will be available in the main conference room and at the venue hotel.
Entry requirements

Citizens from the following countries require a visa which will need to be requested at the local or closest Chilean Consulate: Guyana, Suriname and Venezuela. The visa can be obtained at the nearest Chilean Embassy or Consulate.

To visit Chile, citizens from the following countries do not require a passport, just an ID card: Argentina, Brazil, Bolivia, Colombia, Ecuador, Paraguay, Peru, Uruguay.

Citizens with passports from Australia, Canada, the United States, and Mexico must pay a reciprocity tax before going through International Police.

Participants are recommended to arrive at Comodoro Arturo Merino Benítez International Airport (SCL) (website: https://www.nuevopudahuel.cl/fflights), where major companies operate daily flights as destination.

Currency

Currency exchange services are available at Comodoro Arturo Merino Benítez International Airport as well as in Money Exchange offices (opening hours are 9 a.m. to 6 p.m., weekends: 10 a.m. to 4 p.m.) and most of the banks (opening hours in weekdays are 9 a.m. to 2 p.m.)

Most businesses, tour operators, airlines and hotels accept major credit cards.

The local currency is the Chilean peso (CLP). The average exchange rate is as follows:

1 Euro = 738.4 CLP
1 US$ = 615.4 CLP
1 CHF = 618 CLP

Health requirements/medical services

Up-to-date information on international travel and health requirements are provided by the World Health Organization (WHO) at the following websites:

http://www.who.int/ith/en/
http://www.who.int/countries/chl/en/

It is suggested that you take out personal medical insurance for the duration of the trip.

Electricity and mobile phone connection

Power systems are generally 220 volts and 50 Hz. The plugs have two or three pins (see image). An adaptor may be necessary.

SIM cards for mobile phones are available. For more details, please visit the websites of the local mobile phone operators or contact your local service operator.
Local climate in November

Climate data during November in Santiago are listed below:

- Mean temperature: 17.7°C
- Mean maximum temperature: 26.1°C
- Mean minimum temperature: 10.3°C
- Mean relative humidity: 58.8%
- Mean precipitation: 6.2 mm
- Mean number of days with precipitation ≥1 mm: 1 day
- Mean duration of sunshine: 9.4 h/day

Updated weather information can be found on the DMC website or the World Weather Information Service website.

Hotel reservation

Participants are strongly recommended to stay at the Marina Las Condes Hotel, where the meeting will be held. The hotel offers a special rate of US$ 155/night (including accommodation, internet and breakfast) for single and double rooms. The reservation will be made on a first-come-first-serve basis.

To secure the special rates at this hotel, participants are requested to contact directly Reservation Office (reservas.scl@marinahoteles.cl) under the reservation name OMM/Reunion ARIII-17/Santiago, with a copy to the Local Secretariat no later than 1 November 2018.

Where applicable, the hotel reservation procedure above should also be used to reserve accommodation for those attending the Regional Conference (19 to 20 November 2018).

Transportation will be offered between the airport and the hotel to participants staying at the meeting hotel (Marina Las Condes Hotel).

A list of other hotels close to the meeting hotel is provided in Appendix A.

A guide for local transportation upon arrival to the Marina Las Condes Hotel is provided in Appendix B.

Information and contact details of the local organizing committee (LOC)

For any further information please contact the LOC at the following address:

Ms. Bárbara Tapia
Chief, Meteorological Affairs Office
Dirección Meteorológica de Chile
Santiago, Chile
Tel: (56) 22436 4564
Fax: (56) 22437 8212
Email: btapia@dgac.gob.cl

Appendices: 2 (available in English only)
APPENDIX A

LIST OF RECOMMENDED HOTELS

The following hotels are less than 10 minutes away from the meeting hotel. No corporate rate has been negotiated with them.

<table>
<thead>
<tr>
<th>Hotel</th>
<th>Room / Tarif</th>
<th>Address / Telephone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atton Las Condes Hotel ****</td>
<td>Single/Double US$ 198</td>
<td>Alonso de Córdova 5199, Las Condes Santiago Tel: +56229473666 <a href="mailto:Reservas.chile@atton.com">Reservas.chile@atton.com</a> <a href="http://www.atton.com">www.atton.com</a></td>
</tr>
<tr>
<td>Hotel Regal Pacific ****</td>
<td>Single/Double US$ 180</td>
<td>Av. Apoquindo 5680, Las Condes Santiago Tel. +56 2 23776304 <a href="mailto:regalpac@regalpacific.cl">regalpac@regalpacific.cl</a> cl.regal-pacific.com/es/index.html</td>
</tr>
<tr>
<td>ICON Hotel Santiago ***</td>
<td>Single/Double US$ 161</td>
<td>Alonso de Córdova 6050, Las Condes Santiago Tel. +56 2 24882500 <a href="mailto:info@iconchile.com">info@iconchile.com</a> <a href="http://www.iconchile.com">www.iconchile.com</a></td>
</tr>
</tbody>
</table>

For more tourist information, please visit: http://chile.travel/
List of hotels: http://serviciosturisticos.sernatur.cl/
APPENDIX B
Local Transportation Guide

Upon arrival at the airport, approach the respective counters (taxis, van, etc.) where you can check the rates to the sector where the suggested hotels are located (Las Condes).

The fare is approximately US$ 13 per person in minibus with shared service; US$ 37 exclusive car service for up to 3 people and US$ 48 exclusive minibus service.

The following official minibus companies are suggested:

<table>
<thead>
<tr>
<th>Company</th>
<th>Telephone</th>
<th>Website</th>
</tr>
</thead>
<tbody>
<tr>
<td>TRANS VIP</td>
<td>+56 2 2677 3000</td>
<td><a href="https://www.transvip.cl/">https://www.transvip.cl/</a></td>
</tr>
<tr>
<td>AEROCLASSVIP</td>
<td>+56 9 7296 9686</td>
<td><a href="http://aeroclassvip.cl/2018/#tarifas">http://aeroclassvip.cl/2018/#tarifas</a></td>
</tr>
</tbody>
</table>

For more information visit - - [https://www.santiago-airport.com/transport.php](https://www.santiago-airport.com/transport.php)
DOCUMENT PROCESSING FOR THE SEVENTEENTH SESSION OF THE REGIONAL ASSOCIATION III

Document types for the seventeenth session of the Regional Association III

(1) The seventeenth session of the Regional Association III (RA III-17) will use two types of document:

(a) **Doc.** (documents) whose contents are listed below; these will appear in the final report;

(b) **INF.** (information) papers, which provide additional information relevant to the decisions/recommendations/resolutions adopted at the meeting; these will appear only in Part II of the report.

(2) The first type of document (**Doc.**) will consist of up to three parts, and every document will contain at least one decision and/or one resolution and/or one recommendation:

(a) **Resolutions** (optional) are decisions of RA III that concern only the internal activities of the Association, such as actions to carry out its part of the strategic programme of the Organization, the establishment and terms of reference of a working group or the designation of a rapporteur, in line with General Regulation 163(a);

(b) **Decisions** (optional) place on record instructions/directives to the Management Group from RA III, Congress or EC resolutions or decisions, or provide records of RA III opinions/observations on a specific topic, procedural decisions and other decisions pertaining to the internal matters of RA III, in line with General Regulation 163(b);

The decision justification is additional information that is essential to support the decision being made. This should be short and should refer, as far as possible, to pre-existing documents. This part of the document will appear in the final report immediately after the corresponding decision.

(c) **Recommendations to Congress or the Executive Council** (optional) are decisions of RA III requiring financial support or implementation by Members, proposals for Secretariat action or requiring coordination with other WMO bodies or with bodies outside the Organization, in line with General Regulation 163(c);
Document processing

(3) The first version (DRAFT 1) of documents will be published on the RA III-17 website, and members of the Association will be invited to send suggestions for improving the document to the Secretariat (raiii17.plenary@wmo.int). These proposals will be assessed and the second draft (DRAFT 2) will be posted on the RA III-17 website. These documents will be available in the two working languages of the Association.

(4) Information documents will be posted on the RA III-17 website, but are not intended for amendment or discussion. These will normally be available in English only.

(5) During the session, the chairperson for an agenda item will lead the discussion on the documents for that item. Within a document, each decision will be discussed separately. In many cases each component of that decision, such as related annexes, will be discussed individually. Following current practice, component parts of a document may be approved by the session while other components may still need additional debate. Documents amended during the session will be posted successively as DRAFT 2, DRAFT 3, and so forth, and the final approved version will be marked APPROVED.

(6) Discussion of the document may end in two ways. The complete document may be approved, in which case any agreed changes to the document will be included and the approved version will be published on the RA III-17 website in the PROVISIONAL REPORT folder. Alternatively, the chairperson of the session may decide that no further progress can be made with the document at that time, in which case changes to the document will be included in the next draft, and the modified document will be published on the RA III-17 website in the DRAFTS FOR DISCUSSION folder. This will be published as the next draft in the sequence (DRAFT 2, DRAFT 3, and so forth), whereas the previous draft will be moved to the SESSION ARCHIVE folder.

(7) Versions of documents created during the session will be available in English and Spanish.

Post-session publication

(8) Approved documents from the session will be translated into the two working languages of the Association and placed on the RA III-17 website in the PROVISIONAL REPORT (Approved documents) folder.

(9) The approved documents, the agenda and the list of participants will be combined to form the abridged report of the session, which will be edited and published in the two working languages of the Association. A second part of the report, consisting of information documents will also be published.
PROCESAMIENTO DE DOCUMENTOS PARA LA DECIMOSÉPTIMA REUNIÓN DE LA ASOCIACIÓN REGIONAL III

Tipos de documentos para la decimoséptima reunión de la Asociación Regional III

1) En la decimoséptima reunión de la Asociación Regional III (AR III) se utilizarán dos tipos de documentos:
   a) **Doc.** (documentos), cuyo contenido se detalla más adelante; estos documentos figurarán en el informe final;
   b) **INF.** (documentos de información), en los que se proporciona información adicional pertinente para las decisiones/recomendaciones/resoluciones que se adopten en la reunión; figurarán solo en la parte II del informe.

2) El primer tipo de documento (**Doc.**) constará de hasta tres partes, y cada documento contará al menos con una decisión y/o una resolución y/o una recomendación:
   a) Las **resoluciones** (opcionales) son decisiones de la AR III que conciernen únicamente las actividades internas de la Asociación, como las medidas para llevar a cabo su parte del Plan Estratégico de la Organización, el establecimiento de un grupo de trabajo y la definición de su mandato o la designación de un ponente, de conformidad con la Regla 163 a) del Reglamento General.
   b) En las **decisiones** (opcionales) se recogen instrucciones/directivas al Grupo de Gestión formuladas por la AR III o en resoluciones o decisiones del Congreso o del Consejo Ejecutivo, o se proporcionan asimismo registros de las opiniones/observaciones de la AR III sobre un tema concreto, las decisiones procedimentales y otras decisiones relativas a los asuntos internos de la Asociación, de conformidad con la Regla 163 b) del Reglamento General.

La justificación de la decisión es información adicional que es esencial para respaldar la decisión que se adopta. Debe ser corta y referirse, en la medida de lo posible, a documentos preexistentes. Esta parte del documento aparecerá en el informe final inmediatamente después de la decisión correspondiente.

   c) Las **recomendaciones al Congreso o al Consejo Ejecutivo** (opcionales) son decisiones de la AR III que requieren apoyo financiero, la adopción de medidas por parte de los Miembros, propuestas de adopción de medidas por parte de la Secretaría o la coordinación con otros órganos de la Organización Meteorológica Mundial (OMM) o con órganos ajenos a ella, de conformidad con la Regla 163 c) del Reglamento General.
**Procesamiento de documentos**

3) La primera versión (versión 1) de los documentos se publicará en el sitio web de la decimoséptima reunión de la Asociación Regional III, y se invitará a los Miembros de la Asociación a enviar sus observaciones para mejorar el documento a la Secretaría, a la casilla de correo electrónico de la reunión: raiii17.plenary@wmo.int. Las propuestas serán evaluadas y, según proceda, una segunda versión (versión 2) se publicará en el sitio web de la reunión de la AR III. Estos documentos estarán disponibles en los dos idiomas de trabajo de la Asociación.

4) Los documentos de información se publicarán en el sitio web de la decimoséptima reunión de la AR III, pero no se modificarán ni se aceptarán propuestas de mejora. Por lo general estarán disponibles únicamente en inglés.

5) Durante la reunión, el presidente encargado de abordar un punto del orden del día dirigirá los debates sobre los documentos relativos a ese punto. Cada una de las decisiones que figura en un documento será debatida por separado. En muchos casos, cada sección de esa decisión, como los anexos a esta, se debatirá individualmente. De acuerdo con la práctica vigente, la reunión podrá aprobar algunas secciones de un documento mientras que las restantes deberán seguir debatiéndose. Los documentos modificados durante la reunión se publicarán sucesivamente como versión 2, versión 3 y así sucesivamente, y la versión final aprobada incluirá el estado “APROBADO”.

6) El debate del documento puede finalizar de dos maneras. Se puede aprobar todo el documento, en cuyo caso se incorporarán todos los cambios acordados, y su versión aprobada se publicará en el sitio web de la decimoséptima reunión de la AR III, en la carpeta “Versión provisional del informe”. O bien, el presidente de la reunión puede decidir que en ese momento no es posible avanzar más con el debate del documento, en cuyo caso los cambios al documento se incluirán en la siguiente versión y se publicará el documento modificado en el sitio web de la decimoséptima reunión de la AR III en la carpeta “Versiones para debate”. En ese caso el documento se publicará como la versión siguiente en la secuencia (versión 1, versión 2, etcétera), y la versión anterior se colocará en la carpeta “Archivo de la reunión”.

7) Las versiones de los documentos elaborados durante la reunión estarán disponibles en inglés y en español.

**Publicación posterior a la reunión**

8) Los documentos aprobados en la reunión se traducirán a los dos idiomas de trabajo de la Asociación y se publicarán en el sitio web de la decimoséptima reunión de la AR III en la carpeta “Versión provisional del informe (Documentos aprobados)”.

9) Los documentos aprobados, el orden del día y la lista de participantes se combinarán para así constituir el informe abreviado de la reunión, que se editará y publicará en los dos idiomas de trabajo de la Asociación. También se publicará una segunda parte del informe con los documentos de información.

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REPORT BY THE PRESIDENT OF THE ASSOCIATION

1. This report covers the period from the sixteenth session of the Association (September 2014) to November 2018.

Members of the Association

2. The number of Members of the Association has remained at 13.

Officers of the Association

3. Mr Julian Baez (Paraguay) served as president of the Association from the beginning of the period until December 2017. Mr Carlos Naranjo (Ecuador) served as vice-president of the Association since the beginning of the period until August 2015. Ms Amelia Diaz Pablo has served as vice-president of the Association from October 2015 to October 2017. After the resignation of Mr Julian Baez, in the absence of vice-president, Mr David Grimes assumed the Presidency of the Association, until March 2018.

4. Mr Guillermo Navarro assumed the presidency of the Association in March 2018, to date. All the officers have led the Association with dedication, enthusiasm and initiative, thus contributing to the development of weather, climate and water services in the region.

Subsidiary bodies of the Association

5. At its sixteenth session, the Association re-established the Management Group and the three existing working groups: Working Group on Climate (WG-CL), Working Group on Infrastructure and Technological Development (WG-ITD), and Working Group on Hydrology and Water Resources (GT-HWR).

6. The Management Group and the three working groups fulfilled their functions satisfactorily during the period. The chairpersons of the working groups presented reports on the activities carried out of the RA III subsidiary bodies during the intersessional period. The report is given in RA III-17/INF. 2.1(2).

7. The following meetings of the RA III subsidiary bodies were held during the intersessional period:

(a) Management Group Meetings:
   - Tenth session, during EC-67 (Geneva, Switzerland, 17 June 2015).
   - Eleventh session, during EC-68 (Geneva, Switzerland, 24 June 2016).
   - Twelfth session, during the Conference of Directors of Ibero-American Meteorological and Hydrological Services - CIMHET (Antigua, Guatemala, 23-25 November 2016).
   - Thirteenth session, EC-69 (Geneva, Switzerland, 21 May 2017).
   - Fourteenth session, during the Conference of Directors of Ibero-American Meteorological and Hydrological Services - CIMHET (Willemstad, Curacao, 7-9 March 2018).
   - Fifteenth session, during EC-70 (Geneva, Switzerland, 20–29 June 2018).
RA III-17/INF. 2.1(1), p. 2

(b) Joint meeting of the three working groups, GT-CL, GT-ITD and GT-HWR, (Asunción, Paraguay, 5-9 October 2015);

c) Joint meeting of the three working groups, GT-CL, GT-ITD and GT-HWR, (Asunción, Paraguay, 4-6 October 2017).

Major activities

8. During the intersessional period, the following activities were carried out:

(a) Since the sixteenth meeting of RA III held in 2014:
   - Participation in the Meeting of PRAs-PTCs (Geneva, Switzerland, January 2015).
   - Closure of Project Climandes I and start of Project Climandes II. (Lima, Peru, 18-21 November 2015).
   - XXXVIII Forum on Climate perspectives for the southern part of South America (Mar del Plata, Argentina, 27-28 May 2015).
   - XXXIX Forum on Climate perspectives for the southern part of South America, with the participation of hydrologists of the Plata Basin (Porto Alegre, Brazil, 15-17 December 2015).
   - Conference of Directors of Ibero-American Meteorological and Hydrological Services - CIMHET (Cartagena, Colombia, 4-6 March 2015).
   - Presentation of results concerning the strengthening of the institutional capacity of Paraguay’s NMHS and DINAC, (Asunción, Paraguay, 20 March 2015).
   - Participation in NOAA Satellite Conference (Greenbelt, Maryland, April 27 to May 1, 2015).
   - Workshop-Course on Coastal Floods (Cartagena de Indias, Colombia, 3-6 November 2015).

(b) Since Cg-17(June 2015):
   - Finalization and approval by the Management Group of the “RA III Management plan for 2016-2019” (Asunción, Paraguay, October 2015).
   - Participation in the Meeting of PRAs-PTCs (Geneva, Switzerland, January 2016)
   - Regional Climate Centers in RA III (RCCs):
     - The RCC of Western South-America (CRC-OSA) based in CIIFEN, in Guayaquil, Ecuador, has gone from its demonstration phase to a fully operational phase.
     - The RCC for the southern South America (CRC-SSA) comes into operation.

(c) Since EC-68 (June 2016):
   - Participation of the president of RA III in the PRA and PRA-PTC meeting (Geneva, January 2017).
   - Follow-up of the joint activities between GT-ITD and GT-HWR for the development of hydro-meteorological data exchange systems and procedures using the Hydrological Information System (HIS) and the WMO Information System (WIS). Similarly, the WG-CL and the GT-HWR work together to identify common needs in the development of long-term hydrological forecasts in the region.
The RCC for the southern South America (CRC-SSA) commenced its demonstration phase.

The LX Forum on Regional Climate Perspectives of the CRC-SSA was held in Santiago, Chile, with the participation of regional experts in climate and hydrology. The presence of hydrologists during the ENSO 2015-2016 episode was based on the Terms of Reference of the WG on Hydrology and Water Resources.

The LXI Forum on Regional Climate Perspectives of the CRC-SSA was held in Asunción, Paraguay, in December 2016.

(d) Since EC-69 (June 2017):

- Participation of Guillermo Navarro, PR of Chile as adviser of Mr. David Grimes, acting President of RA III in the PRA and PRA-PTC meetings (Geneva, January 2018)
- Participation in the NOAA Satellite Conference (New York, United States of America, 17-20 July 2017)
- Organization of the Workshop on sub-seasonal to seasonal prediction (Asunción, Paraguay, August 2017)
- Organization of the Drought Monitoring and Forecasting Workshop and preparation of a Strategic Plan for the Implementation of Drought Monitoring and Forecasting for the Southeastern part of South America (Buenos Aires, Argentina, August 2017).
- LXII Forum on Climate perspectives for the southern part of South America (RCOF) (Montevideo, Uruguay, September 2017).
- Joint meeting of the three working groups, GT-CL, GT-ITD y GT-HWR, (Asunción, Paraguay, 4-6 October 2017).
- Participation in the SOP Meeting (Geneva, October 2017).
- Participation as President of EC Working Group on Disaster Risk Reduction (Geneva, October 2017).
- Workshop for the implementation of the Global Framework for Climate Services in Colombia (Bogota, Colombia, November 2017).
- Election of Mr. Guillermo Navarro as president of RA III, after the resignation of Mr Julian Baez, in March 2018.
- Participation in the Conference of Directors of Ibero-American Meteorological and Hydrological Services - CIMHET (Willemstad, Curaçao, 7-9 March 2018).

(e) Since EC-70 (June 2018)

- Participation in the EC WG DRR and EC WG SOP held in Geneva, Switzerland, April 2018.
- Working meeting with Director of WMO Las Americas Office, Asunción, Paraguay, May 2018.
- Participation in the 65th session of the United Nations Joint Staff Pension Board”, Rome, Italy, from 25 July to 03 August 2018.
Main achievements

9. In addition to the activities listed above, among the achievements obtained in Region III, mention must be made of the following:

(a) Fully operationalized two WMO RA III RCC, WSA (at CIIFEN, Guayaquil, Ecuador) and SSA (network RCC between NMS of Argentina and Brazil).

(b) Establishment and operation of the Web site of RA III (http://ar3omm.org) as a repository and information channel of the working groups and SMHN of RA III.

(c) Implementation of the WIGOS-WHOS-Plata Project in the Plata Basin, consisting of a hydrological data infrastructure for the five countries of the basin, in order to improve the flow of basic data for hydrological monitoring and forecasting. The proposed infrastructure consists of one or more data provider nodes in each country, and a central node installed in INMET Brasilia. Three of the five countries are already providing information, and the remaining two will be operational by the beginning of 2019. This project will serve as a pilot and then extend it to the entire RA III and is based on a hydrological data standard proposed by the CHy.

(d) Implementation of the Flash Flood Guidance System (FFGS) in northwestern South America (Colombia, Ecuador, Peru) in the framework of the project NWSAFFGS.

(e) Implementation of a Hydro-meteorological Monitoring and Prediction Program and Early Warning System (PROHMSAT) for the Plata Basin. The system to be implemented is articulated within the WIGOS/WHOS Plata Project and is based on the functionalities of the FFGS.

Priorities and challenges

10. In the “Operating Plan (2016-2019) for the improvement of National Meteorological and Hydrological Services in WMO Region III”, the Members established four priorities, considered fundamental as follows:

(a) The WMO Integrated Global Observing System (WIGOS) and the WMO Information System (WIS);

(b) The Disaster Risk Reduction (DRR) Impacts Based Forecasts and Early Warning;

(c) The Capacity Development of NMHSs; and

(d) The Global Framework for Climate Services (GFCS).

The Association has worked to advance towards these priority objectives, as can be seen in this report. In addition, it is planned to create a third Regional Climate Centre for the North-East area of South America (CRC-NSA), seeking to achieve the RCCs have the ability to provide climate services to meet the requirements and needs of users in RA III, supplying also to decision makers sensitive information about climate events of high societal and economic importance. The meteorological services for aviation will also be reviewed, considering the current requirements of knowledge, qualifications and certifications, in addition to quality certifications required by ICAO.
Acknowledgements

11. The president of the Association would like to express his appreciation and gratitude to all those who have contributed to the work of the Association. Particular thanks are due to the chairs and vice-chairs of RA III Working Groups. Thanks are due to the Members of the Association who have hosted various meetings, conferences and training events during the intersessional period.

12. The president would also like to express his deep gratitude and appreciation to the Secretary-General of WMO and to the Secretariat, in particular the staff of the Regional Office for the Americas, for their valuable support and advice in the work of the Association.
INFORME DEL PRESIDENTE DE LA ASOCIACIÓN

1. El presente informe abarca el período comprendido desde la decimosexta reunión de la Asociación (celebrada en septiembre de 2014) y noviembre de 2018.

Miembros de la Asociación

2. El número de Miembros de la Asociación Regional III (AR III) sigue siendo 13.

Funcionarios de la Asociación


4. El señor Guillermo Navarro ejerce la presidencia de la Asociación desde marzo de 2018. Todos los funcionarios han dirigido la Asociación con dedicación, entusiasmo e iniciativa y han contribuido, por tanto, al desarrollo de los servicios meteorológicos, climáticos e hidrológicos de la Región.

Órganos subsidiarios de la Asociación

5. En su decimosexta reunión, la Asociación restableció el Grupo de Gestión y los tres grupos de trabajo existentes: el Grupo de Trabajo sobre el Clima, el Grupo de Trabajo sobre Infraestructura y Desarrollo Tecnológico y el Grupo de Trabajo sobre Hidrología y Recursos Hídricos.

6. El Grupo de Gestión y los tres Grupos de Trabajo desempeñaron satisfactoriamente sus funciones durante el período objeto de este informe. Los presidentes de los Grupos de Trabajo presentaron informes sobre las actividades de los órganos subsidiarios de la AR III durante el período entre reuniones, que se recogen en el documento RA III-17/INF. 2.1(2).

7. Durante el período entre reuniones, se celebraron las siguientes reuniones de los órganos subsidiarios de la AR III:

a) Reuniones del Grupo de Gestión:

- 10ª reunión, celebrada durante la 67ª reunión del Consejo Ejecutivo (Ginebra, Suiza, 17 de junio de 2015);
- 11ª reunión, celebrada durante la 68ª reunión del Consejo Ejecutivo (Ginebra, Suiza, 24 de junio de 2016);
- 12ª reunión, celebrada durante la Conferencia de Directores de los Servicios Meteorológicos e Hidrológicos Iberoamericanos (Antigua, Guatemala, 23 a 25 de noviembre de 2016);
RA III-17/INF. 2.1(1), p. 2

- 13ª reunión, celebrada durante la 69ª reunión del Consejo Ejecutivo (Ginebra, Suiza, 21 de mayo de 2017);

- 14ª reunión, celebrada durante la Conferencia de Directores de los Servicios Meteorológicos e Hidrológicos Iberoamericanos (Willemstad, Curasaó, 7 a 9 de marzo de 2018);

- 15ª reunión, celebrada durante la 70ª reunión del Consejo Ejecutivo (Ginebra, Suiza, 20 a 29 de junio de 2018).

b) Reunión conjunta del Grupo de Trabajo sobre el Clima, el Grupo de Trabajo sobre Infraestructura y Desarrollo Tecnológico y el Grupo de Trabajo sobre Hidrología y Recursos Hídricos (Asunción, Paraguay, 5 a 9 de octubre de 2015).

c) Reunión conjunta del Grupo de Trabajo sobre el Clima, el Grupo de Trabajo sobre Infraestructura y Desarrollo Tecnológico y el Grupo de Trabajo sobre Hidrología y Recursos Hídricos (Asunción, Paraguay, 4 a 6 de octubre de 2017).

**Actividades principales**

8. Durante el período entre reuniones, se llevaron a cabo las actividades siguientes:

a) Desde la decimosexta reunión de la AR III (celebrada en 2014):

- participación en la reunión de los presidentes de las AR y de las comisiones técnicas (CT) (Ginebra, Suiza, enero de 2015);

- conclusión del proyecto CLIMANDES I y puesta en marcha del proyecto CLIMANDES II (Lima, Perú, 18 a 21 de noviembre de 2015);

- XXXVIII Foro Regional de Perspectivas Climáticas para el Sur de América del Sur (Mar del Plata, Argentina, 27 y 28 de mayo de 2015);

- XXXIX Foro Regional de Perspectivas Climáticas para el Sur de América del Sur, con participación de hidrólogos de la cuenca del Plata (Porto Alegre, Brasil, 15 a 17 de diciembre de 2015);

- Conferencia de Directores de los Servicios Meteorológicos e Hidrológicos Iberoamericanos (Cartagena, Colombia, 4 a 6 de marzo de 2015);

- presentación de los resultados relativos al fortalecimiento de la capacidad institucional de la Dirección de Meteorología e Hidrología y la Dirección Nacional de Aeronáutica Civil del Paraguay (Asunción, Paraguay, 20 de marzo de 2015);

- participación en la Conferencia sobre Satélites de la Administración Nacional del Océano y de la Atmosfera (NOAA) (Greenbelt, Maryland, Estados Unidos de América, 27 de abril a 1 de mayo de 2015);

- Curso de Inundaciones Costeras (Cartagena de Indias, Colombia, 3 a 6 de noviembre de 2015).

b) Desde el Decimoseptimo Congreso Meteorológico Mundial (celebrado en junio de 2015):

- finalización y aprobación del Plan de Gestión de la AR III para 2016-2019 del Grupo de Gestión (Asunción, Paraguay, octubre de 2015);
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- participación en la reunión de los presidentes de las AR y de las CT (Ginebra, Suiza, enero de 2016);

- Centros Regionales Sobre el Clima (CRC):
  - conclusión de la fase de prueba del CRC para el Oeste de Sudamérica (CRC-OAS), situado en el Centro Internacional para la Investigación del Fenómeno de El Niño (CIIFEN), en Guayaquil (Ecuador), y puesta en marcha de la fase operativa;
  - entrada en servicio del CRC para el Sur de Sudamérica (CRC-SAS).

  c) Desde la 68ª reunión del Consejo Ejecutivo (celebrada en junio de 2016):
  
  - participación del presidente de la AR III en las reuniones de los presidentes de las AR y de las CT (Ginebra, Suiza, enero de 2017);
  
  - seguimiento de las actividades conjuntas del Grupo de Trabajo sobre Infraestructura y Desarrollo Tecnológico y el Grupo de Trabajo sobre Hidrología y Recursos Hídricos para elaborar sistemas y procedimientos de intercambio de datos hidrometeorológicos mediante el Sistema de Información Hidrológica (SIH) y el Sistema de Información de la OMM (SIO). Asimismo, el Grupo de Trabajo sobre el Clima y el Grupo de Trabajo sobre Hidrología y Recursos Hídricos trabajan codo a codo para definir las necesidades comunes para la elaboración de predicciones hidrológicas a largo plazo de la Región;
  
  - puesta en marcha de la fase de prueba del CRC-SAS;
  
  - LX Foro Regional de Perspectivas Climáticas para el Sur de América del Sur del CRC-SAS (Santiago, Chile), con la participación de expertos regionales en clima e hidrología. La presencia de hidrólogos durante el episodio de El Niño-Oscilación del Sur de 2015-2016 se basó en el mandato del Grupo de Trabajo sobre Hidrología y Recursos Hídricos;
  
  - XLI Foro Regional de Perspectivas Climáticas para Sur de América del Sur del CRC-SAS (Asunción, Paraguay, diciembre de 2016).

  d) Desde la 69ª reunión del Consejo Ejecutivo (celebrada en junio de 2017):
  
  - participación del señor Guillermo Navarro, Representante Permanente de Chile ante la OMM, como asesor del señor David Grimes, presidente interino de la AR III, en las reuniones de los presidentes de las AR y de los presidentes de las AR y de las CT (Ginebra, Suiza, enero de 2018);
  
  - participación en la Conferencia de Satélites de la NOAA (Nueva York, Estados Unidos de América, 17 a 20 de julio de 2017);
  
  - organización del Taller sobre Predicción Subestacional a Estacional (Asunción, Paraguay, agosto de 2017);
  
  - organización del Taller sobre Vigilancia y Predicción de Sequías y preparación de un Plan Estratégico para la Aplicación de un Sistema de Vigilancia y Predicción de Sequías para el Sureste de América del Sur (Buenos Aires, Argentina, agosto de 2017);
XLII Foro Regional de Perspectivas Climáticas para el Sur de América del Sur (foro regional sobre la evolución probable del clima) (Montevideo, Uruguay, septiembre de 2017);

- reunión conjunta del Grupo de Trabajo sobre el Clima, el Grupo de Trabajo sobre Infraestructura y Desarrollo Tecnológico y el Grupo de Trabajo sobre Hidrología y Recursos Hídricos (Asunción, Paraguay, 4 a 6 de octubre de 2017);

- participación en la reunión del Grupo de Trabajo del Consejo Ejecutivo sobre Planificación Estratégica y Operacional (Ginebra, Suiza, octubre de 2017);

- participación en calidad de presidente del Grupo de Trabajo del Consejo Ejecutivo sobre la Reducción de Riesgos de Desastre (Ginebra, Suiza, octubre de 2017);

- taller para la ejecución del Marco Mundial para los Servicios Climáticos en Colombia (Bogotá, Colombia, noviembre de 2017);

- elección del señor Guillermo Navarro como presidente de la AR III, tras la dimisión del señor Julián Báez en marzo de 2018;

- participación en la Conferencia de Directores de los Servicios Meteorológicos e Hidrológicos Iberoamericanos (Willemstad, Curasao, 7 a 9 de marzo de 2018).

e) Desde la 70ª reunión del Consejo Ejecutivo (celebrada en junio de 2018):

- participación en las reuniones del Grupo de Trabajo del Consejo Ejecutivo sobre la Reducción de Riesgos de Desastre y del Grupo de Trabajo del Consejo Ejecutivo sobre Planificación Estratégica y Operacional (Ginebra, Suiza, abril de 2018);

- reunión de trabajo con el director de la Oficina Regional de las Américas de la OMM (Asunción, Paraguay, mayo de 2018);

- participación en el 65º período de sesiones del Comité Mixto de Pensiones del Personal de las Naciones Unidas (Roma, Italia, 25 de julio a 3 de agosto de 2018);

- participación en la reunión del Equipo Especial para la Reforma de los Órganos Integrales del Consejo Ejecutivo de la OMM (Ginebra, Suiza, 6 a 8 de septiembre de 2018);

- participación en la sexta reunión de la Junta Intergubernamental sobre los Servicios Climáticos (Roma, Italia, 24 y 25 de octubre de 2018);

- participación en la reunión sobre cooperación internacional de la Agencia Estatal de Meteorología de España y clausura del segundo Curso Internacional de Formación de Meteorólogos basado en el paquete de instrucción básica para meteorólogos (Madrid, España, 29 y 30 de octubre de 2018).

Logros principales

9. Además de las actividades mencionadas anteriormente, cabe destacar los siguientes logros de la AR III:
a) Pleno funcionamiento de los dos CRC de la AR III de la OMM, el CRC-OAS (en el CIIFEN, sito en Guayaquil, Ecuador) y el CRC-SAS (red con función de CRC entre los Servicios Meteorológicos Nacionales de la Argentina y el Brasil).

b) Establecimiento y puesta en marcha del sitio web de la AR III (http://ar3omm.org) como un repositorio y canal de información de los grupos de trabajo y los Servicios Meteorológicos e Hidrológicos Nacionales (SMHN) de la AR III.

c) Ejecución del Proyecto del Sistema de Observación Hidrológica de la OMM del Sistema Mundial Integrado de Sistemas de Observación de la OMM en la Cuenca del Plata (WIGOS/WHOS-Plata), que consiste en una infraestructura de datos hidrológicos para los cinco países de la cuenca destinada a mejorar el flujo de datos básicos para la vigilancia y la predicción hidrológica. La infraestructura propuesta está formada por uno o más nodos que proveen datos en cada país y un nodo central instalado en el Instituto Nacional de Meteorología del Brasil, sito en Brasilia. Tres de los cinco países de la cuenca han comenzado a proporcionar información y los otros dos comenzarán a hacerlo a principios de 2019. El proyecto servirá de experiencia piloto y luego se ampliará a toda la AR III. Se basa en una norma sobre datos hidrológicos propuesta por la Comisión de Hidrología.

d) Aplicación del Sistema Guía para Crecidas Repentinas en el noroeste de América del Sur (Colombia, Ecuador y Perú) en el marco del proyecto Sistema Guía para Crecidas Repentinas para el Noroeste de América del Sur.

e) Aplicación del Sistema de Pronóstico y Alerta Temprana Hidrometeorológicos en la Cuenca del Plata (PROHSMAT-Plata). El sistema que se aplicará se inscribe en el marco del proyecto WIGOS/WHOS-Plata y se basa en las funcionalidades del Sistema Guía para Crecidas Repentinas.

Prioridades y desafíos

10. En el Plan de Funcionamiento para Mejorar los SMHN de la Región III de la OMM, los Miembros establecieron las cuatro prioridades fundamentales siguientes:

a) el WIGOS y el SIO;

b) las predicciones que tienen en cuenta los impactos y las alertas tempranas para la reducción de riesgos de desastre;

c) el desarrollo de capacidad de los SMHN; y

d) el Marco Mundial para los Servicios Climáticos.

La Asociación ha trabajado para alcanzar estos objetivos prioritarios, como puede apreciarse en el presente informe. Además, tiene previsto crear un tercer CRC para el noreste de Sudamérica a fin de lograr que los CRC puedan prestar servicios climáticos que respondan a los requisitos y las necesidades de los usuarios de la AR III y proporcionar a las instancias decisorias información delicada sobre fenómenos climáticos de gran importancia para la sociedad y la economía. Asimismo, habida cuenta de los requisitos, las calificaciones y las certificaciones, además de las certificaciones de calidad, que exige actualmente la Organización de Aviación Civil Internacional, se examinarán los servicios meteorológicos que se prestan a la aviación.
Agradecimientos

11. El presidente de la Asociación desea expresar su reconocimiento y agradecimiento a todas las personas que han contribuido a la labor de la Asociación. En particular, agradece a los presidentes y vicepresidentes de los Grupos de Trabajo de la AR III. El agradecimiento se hace extensivo a los Miembros de la Asociación que han acogido diversas reuniones, conferencias y actividades de formación durante el período entre reuniones.

12. El presidente desea dejar constancia de su profundo agradecimiento y reconocimiento al Secretario General de la OMM y a la Secretaría, en particular al personal de la Oficina Regional para las Américas, por el valioso apoyo y asesoramiento que han brindado a la labor de la Asociación.
REPORT ON THE ACTIVITIES OF RA III WORKING GROUPS

WORKING GROUP ON CLIMATE (WG-CL)

1. The Working Group on Climate of RA III (WG-CL), which includes the Subgroup on Agro-Meteorology, was established by Resolution 15 (AR III-16) at the sixteenth session of the Regional Association III (Asuncion, 2014) and fulfilled the work program for the period 2015-2018 in accordance with the RA III strategic and operational plans. The final report of the second meeting of the WG-CL (Asuncion, October 2017) contains detailed information on its activities related to the implementation of the Global Framework for Climate Services (GFCS) in the region, capacity building and projects at the regional level. The same work dynamic was maintained during the year 2018.

Activities in the intersessional period

2. Among the main activities developed by the WG-CL in the intersessional period, mention must be made of the following:

   (a) At the sixteenth meeting of the Commission on Basic Systems (CBS-16, China-2016) the Regional Climate Center for southern South America (SSA) received the official designation as a WMO RCC;

   (b) Through the RCC-WSA and RCC-SSA the permanent development of the Regional Climate Outlook Forums (RCOF) has been maintained, with at least one face-to-face COF per year and a virtual COF being developed each month;

   (c) Since 2017, the WG-CL is supporting the President of RA III in the evaluation and implementation of the mechanism for the contributions of the WMO to the GFCS, both at the regional and national levels;

   (d) The WG-CL together with the RCCs of the region, has actively participated in the development and presentation of regional projects financed by institutions such as the Adaptation Fund, Euroclima+ and the Inter-American Development Bank, in support of the National Meteorological and Hydrological Services (NMHSs) to increase their technical capacity to generate and disseminate better meteorological, climatic and hydrological services;

   (e) In 2018 were held the sessions of the Commission on Climatology (CCl) and the Commission on Agricultural Meteorology (CAgM). In both sessions the participation of the WG-CL representatives was very active. Ms Barbara Tapia, President of WG-CL, (Chile) and Mr Orivaldo Brunini (Brazil) were elected vice-chairs of their respective commissions, Commission of Climatology (CCL) and Commission of Agricultural Meteorology (CAgM).

Recommendations for the next period

3. The WG-CL agreed that the following tasks were highly recommended for the next period:

   (a) Priority for the implementation of the National Framework of Climate Services (NFCS) in the NMHSs of the region, as a basic mechanism of interface with users;
Support the activities of the RCCs in the region, and promote the work and exchange of good practices between the RCCs of RA III and those of RA IV;

Support the launch and implementation of regional projects with the active participation of the staff of WMO Regional Office for the Americas (RAM);

Maintain the support for the President of RA III on issues related to the GFCS and the contribution from WMO;

Support the development of the Climate Outlook Forums (COF) in the region, thus expanding its forecasts to the sectors of agriculture, energy, disaster risk reduction, health and water resources;

Align the development of education and training activities by WMO, AECID, RCCs and others, especially on sub-seasonal to seasonal forecast, climate scenarios, climate change and data rescue;

Support the implementation of early warning systems projects;

Maintain active participation in the next scheme of Technical Commissions of WMO (a structure based on 2 Technical Commissions, to be approved by the 18th WMO Congress in June 2019).

4. The members of WG-CL agreed that it was essential to continue with a regional working structure system that focuses on the 3 pillars of WMO - Weather, Climate and Water - with small WGs focused on creating effective task teams for specific issues, with clear terms of reference and deadlines for carrying out the assigned tasks.

5. The WG is required to be a direct contact between the RAM Office, the Technical Departments and the Technical Commissions to support the efficient implementation of initiatives and projects carried out in the region.

**Current composition of the RA III WG-CL**

<table>
<thead>
<tr>
<th>Person</th>
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**Working Group on Infrastructure and Technological Development (WG-ITD)**

6. The Working Group on Infrastructure and Technological Development of RA III (WG-ITD), was established by Resolution 14 (RA III-16) at the sixteenth session of RA III (Asuncion, 2014) and fulfilled the work program for the period 2015-2018 in accordance with the strategic and operational plans of the region. The final report of the last meeting of the WG-ITD (Asuncion, October 2017) contains detailed information on its activities related to the infrastructure of the Region and also a summary of its operational plan.

**Activities in the intersessional period**

7. Among the main activities developed by the WG-ITD in the intersessional period, mention must be made of the following:

   (a) Review and update of the WIGOS Regional Plan of RA III;
   (b) Achieve progress in the implementation of the WIGOS-SAS/CP Project (now WIGOS/WHOS-Plata);
   (c) Development of the concept and finalization of the proposal for the establishment of WIGOS Regional Centers, to be formally decided by the RA III-17 in November 2018;
   (d) Participation and technical contributions to the annual meetings of ICG-WIGOS on the development and implementation of WIGOS;
   (e) Increased awareness of the importance of the implementation of WIGOS and WIS;
   (f) A complete survey on the use of numerical models in the Region;
   (g) Training through workshops, and directly by experts, on some important matters, such as BUFR, AWS, OSCAR, etc.
   (h) Preparation of a concept document on the system of identification of stations according to the structure and guidelines on the WIGOS Identifiers, which was sent to all the countries of RA-III through RAM and published on the website of the WMO as an example for other countries;
   (i) Contribution for the increase of AMDAR observations in South America;
   (j) A complete survey of Internet access capabilities and IP-VPN communications network throughout the Region;
   (k) Update of the GT-RTD Operational Plan until the end of 2018, including matters such as the WIGOS Regional Centers and the Regional Basic Observations Network (RBON);
   (l) Increased awareness of the importance of radio frequencies for meteorological observations and telecommunications;
   (m) Update, with the support of the Regional Office for the Americas, of the lists of Focal Points for WIS, WIGOS, OSCAR and others;
   (n) Update of the WMO Weather Radar Database.

**Recommendations for the next period**

8. The WG-ITD agreed that the following tasks were highly recommended for the next period:

   (a) Prioritize the data assimilation activities and the verification of Numerical Weather Forecast models;
(b) Assist in the implementation of the WIGOS Regional Centres (WRCs);

(c) Assist the Members of the Region in the preparation of the WIGOS national plans together with the WRCs;

(d) Implementation of the WIGOS quality monitoring system;

(e) Update of the OSCAR/Surface database;

(f) Continuation of the WIGOS/WHOS-La Plata Basin (LPB) Project;

(g) Transition of the RBSN and RBCN networks for the RBON;

(h) Support the implementation of the new station identification system in all the countries of the Region;

(i) Study the feasibility of creating a regional weather forecast model (as a regional consortium);

(j) Accompany the development of the WIS 2.0 platform;

(k) Support to the Severe Weather Forecast Demonstration Project (SWFDP), if approved by the RA-III;

(l) Accompany the needs of the Members on the updating of reception and diffusion systems of products from new generation meteorological satellites;

(m) Generation and distribution of a regional Meteorological Radar Mosaic;

(n) Increase the regional data exchange of Automatic Weather Stations;

(o) Complete the migration to BUFR;

(p) Support the implementation of Early Warning Systems projects;

(q) Develop a training program in several infrastructure areas, including WIS, WIGOS, AMDAR and AWS;

(r) Participate in the next scheme of Technical Commissions of WMO (a structure based on 2 Technical Commissions, to be approved by the 18th WMO Congress in June 2019); and

(s) Improve the cooperation with RA IV, on infrastructure issues.

9. The members of WG-ITD agreed that it was essential to modify the current working structure with other scheme based on small WGs focused on creating effective task teams for specific issues, with clear terms of reference and deadlines for carrying out the assigned tasks.

10. During the joint meeting with the Working Groups on Hydrology and Climate, it was suggested to request RA III to change the name of the Working Group on Infrastructure and Technological Development, with another designation to make more explicit the forecast and weather in all their dimensions.
### Current composition of the RA III WG-ITD

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11. The WG-HWR was established by Resolution 14 (RA III-16) at the sixteenth session of RA III (Asunción, 2014) and fulfilled the work program for the period 2015-2018 in accordance with the strategic and operational plans of the region. The final report of the last WG-HWR meeting (Asunción, October 2017) contains detailed information on its activities, which are summarized below.

(a) Progress was made with the implementation of the WIGOS-SAS/CP Project (now WIGOS/WHOS-Plata) based on the proposal of the CHy vice-president. The funding was obtained for the start-up of the system at the end of 2019.

(b) The central server was installed in the GISC Brasilia and the IT staff of INMET jointly with a representative of the node in Argentina were trained. Consequently, computer training of the other four countries was conducted by the INMET staff trained initially.

(c) This activity, which allows the interoperability of meteorological and hydrological data for its application to operational hydrological models of real-time forecasting, is considered fundamental for the region.

(d) A consultation meeting was held in Brasilia to prepare a proposal for the development and application of a Hydro-meteorological Prediction and Early Warning System in the Plata Basin (PROHMSAT-Plata). This proposal, if supported by the Permanent Representatives of the countries involved, would be funded by USAID. More information can be obtained at: [http://www.wmo.int/pages/prog/hwrp/flood/ffi/plata-basin.php](http://www.wmo.int/pages/prog/hwrp/flood/ffi/plata-basin.php)

(e) Following the recommendations of the Initial Planning Workshop (Lima, 2016), the implementation of Flash Flood Guidance System project was initiated for NW South America, with of a Workshop in Bogota, Colombia, in February 2018. The funding is assured for the initial phase, which includes the basic modules. The participating countries (Colombia, Ecuador and Peru) designated focal points that will provide the necessary data for the development of the system. The first training activity is expected in early 2019.

(f) The experts of the WG-HWR participated actively in CHy activities, in the areas of hydrological forecasting, flood risk mapping, drought monitoring, seasonal hydrological predictions. Their contribution has been publicly acknowledged several times by the president of the CHy.

(g) The web page of the Group (mentioned above) has become the platform for the exchange of ideas between the members and several invited experts, as well as the archiving site for all the documents prepared by the Group or documents of general interest.

12. The WG-HWR agreed that the following tasks were highly recommended for the next period:

**Recommendations for the next period:**

(a) Priority must be given to data assimilation activities and their application to Operational Hydrology;

(b) Collaboration with Regional Climate Centres is necessary for the implementation of hydro-climatic products. For the drought issues, the collaboration with RCC of Southern South-America is essential;

(c) Continue to support the development and maintenance of the website; and

(d) Continue with the approach of holding joint meetings of the three RA III Working Groups.
## Current composition of the RA III WG-HWR

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INFORME SOBRE LAS ACTIVIDADES DE LOS GRUPOS DE TRABAJO DE LA AR III

GRUPO DE TRABAJO SOBRE EL CLIMA

1. El Grupo de Trabajo sobre el Clima de la Asociación Regional III (AR III), que comprende el Subgrupo de Agrometeorología, fue establecido en virtud de la Resolución 15 (AR III—16) aprobada en la decimosexta reunión de la AR III (Asunción, 2014) y llevó a la práctica el programa de trabajo para el período 2015-2018 de conformidad con el Plan Estratégico y el Plan Operativo de la AR III. En el informe final de la segunda reunión del Grupo de Trabajo sobre el Clima (Asunción, octubre de 2017) figura información detallada sobre sus actividades relacionadas con la ejecución del Marco Mundial para los Servicios Climáticos (MMSC) en la Región, la creación de capacidad y los proyectos realizados a escala regional. Durante el año 2018 se ha mantenido la misma dinámica de trabajo.

Actividades realizadas en el período entre reuniones

2. Entre las principales actividades desarrolladas por el Grupo de Trabajo sobre el Clima en el período entre reuniones cabe destacar lo siguiente:

   a) En la 16ª reunión de la Comisión de Sistemas Básicos (China, 2016), el Centro Regional del Clima para el Sur de América del Sur (CRC-SAS) obtuvo la designación oficial de Centro Regional sobre el Clima (CRC) de la Organización Meteorológica Mundial (OMM);

   b) Por conducto del Centro Regional del Clima para el Oeste de Sudamérica (CRC-OSA) y el CRC-SAS, se ha mantenido el desarrollo permanente de los Foros Regionales sobre la Evolución Probable del Clima (FREPC), con la celebración de al menos un foro presencial al año y un foro virtual al mes;

   c) Desde 2017 el Grupo de Trabajo sobre el Clima ha estado ayudando al presidente de la AR III a evaluar e implantar el mecanismo para promover las contribuciones de la OMM al MMSC, tanto a nivel regional como nacional;

   d) Junto con los CRC de la Región, el Grupo de Trabajo sobre el Clima ha participado activamente en el desarrollo y la presentación de proyectos regionales financiados por instituciones como el Fondo de Adaptación, Euroclima+ y el Banco Interamericano de Desarrollo cuya finalidad es ayudar a los Servicios Meteorológicos e Hidrológicos Nacionales (SMHN) a incrementar su capacidad técnica para generar y difundir mejores servicios meteorológicos, climáticos e hidrológicos;

   e) En 2018 tuvieron lugar las reuniones de la Comisión de Climatología (CCI) y la Comisión de Meteorología Agrícola (CMAg), que contaron con la participación muy activa de los representantes del Grupo de Trabajo sobre el Clima. La señora Bárbara Tapia (Chile), presidenta del Grupo de Trabajo sobre el Clima, y el señor Orivaldo Brunini (Brasil) fueron elegidos vicepresidentes de sus respectivas comisiones, la CCI y la CMAg.

Recomendaciones para el próximo período

3. El Grupo de Trabajo sobre el Clima convino en que era muy recomendable realizar en el próximo período las tareas siguientes:
a) conceder prioridad a la aplicación del Marco Nacional de Servicios Climáticos (MNSC) en los SMHN de la Región, como mecanismo básico de interfaz con los usuarios;

b) apoyar las actividades de los CRC de la Región y promover la labor y el intercambio de buenas prácticas entre los CRC de la AR III y los de la AR IV;

c) apoyar la puesta en marcha y la ejecución de proyectos regionales en los que participe activamente el personal de la Oficina Regional para las Américas (RAM) de la OMM;

d) seguir prestando apoyo al presidente de la AR III para cuestiones relativas al MMSC y la contribución de la OMM;

e) apoyar el desarrollo de los Foros sobre la Evolución Probable del Clima en la Región y, en ese sentido, ampliar sus predicciones a los sectores de la agricultura, la energía, la reducción de riesgos de desastre, la salud y los recursos hídricos;

f) armonizar el desarrollo de las actividades de enseñanza y formación de la OMM, la Agencia Española de Cooperación Internacional para el Desarrollo (AECID), los CRC y otros, especialmente en los ámbitos de la predicción subestacional a estacional, los escenarios climáticos, el cambio climático y el rescate de datos;

g) apoyar la ejecución de proyectos sobre los sistemas de alerta temprana;

h) seguir participando activamente en la próxima configuración de las comisiones técnicas de la OMM (estructura basada en dos comisiones técnicas que se someterá a la aprobación del Decimocuarto Congreso Meteorológico Mundial en junio de 2019).

4. Los miembros del Grupo de Trabajo sobre el Clima convinieron en que era fundamental mantener un sistema de estructura de trabajo regional que se centrara en los tres pilares de la OMM —el tiempo, el clima y el agua—, con grupos de trabajo pequeños centrados en la creación de equipos especiales eficaces para cuestiones específicas, con mandatos claros y plazos para la finalización de las tareas asignadas.

5. Es necesario que el Grupo de Trabajo sirva de contacto directo entre la RAM, los departamentos técnicos y las comisiones técnicas a fin de apoyar la ejecución eficiente de las iniciativas y los proyectos llevados a cabo en la Región.

**Composición actual del Grupo de Trabajo sobre el Clima de la AR III**

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Grupo de Trabajo sobre Infraestructura y Desarrollo Tecnológico


Actividades realizadas en el período entre reuniones

7. Entre las principales actividades desarrolladas por el Grupo de Trabajo sobre Infraestructura y Desarrollo Tecnológico en el período entre reuniones cabe destacar lo siguiente:

a) revisión y actualización del Plan Regional del Sistema Mundial Integrado de Sistemas de Observación de la OMM (WIGOS) de la AR III;

b) avances en la ejecución del Proyecto WIGOS-SAS/CP (actualmente WIGOS/WHOS-Plata);

c) desarrollo del concepto y finalización de la propuesta de establecimiento de los centros regionales del WIGOS, sujeta a la decisión oficial de la AR III en su decimoséptima reunión, que se celebrará en noviembre de 2018;

d) participación en las reuniones anuales del Grupo de Coordinación Intercomisiones sobre el WIGOS centradas en el desarrollo y la ejecución del WIGOS, y contribuciones técnicas a esas reuniones;

e) mayor concienciación sobre la importancia que reviste ejecutar el WIGOS y el Sistema de Información de la OMM (SIO);

f) un estudio completo sobre la utilización de modelos numéricos en la Región;

g) capacitación mediante talleres, e impartidos directamente por expertos, sobre algunas cuestiones importantes como la forma binaria universal de representación de datos meteorológicos (BUFR), la Estación Meteorológica Automática (EMA), la Herramienta de análisis y examen de la capacidad de los sistemas de observación (OSCAR), etc.;

h) preparación de un documento conceptual sobre el sistema de identificación de estaciones conforme a la estructura y las directrices de los identificadores del WIGOS, que se envió a todos los países de la AR III a través de la RAM y se publicó en el sitio web de la OMM como ejemplo para otros países;

i) contribución al aumento de observaciones de Retransmisión de Datos Meteorológicos de Aeronaves (AMDA) en América del Sur;

j) un estudio completo sobre las capacidades de acceso a Internet y la red de comunicaciones IP-VPN en toda la Región;

k) actualización del Plan Operacional del Grupo de Trabajo hasta finales de 2018, que comprende cuestiones como los centros regionales del WIGOS y la Red Regional de Observaciones Básicas (RROB);

l) mayor concienciación sobre la importancia de las radiofrecuencias para las observaciones y telecomunicaciones meteorológicas;
m) actualización, con el apoyo de la Oficina Regional para las Américas, de las listas de los coordinadores sobre el WIS, el WIGOS, OSCAR y otros;

n) actualización de la Base de Datos de Radares Meteorológicos de la OMM.

**Recomendaciones para el próximo período**

8. El Grupo de Trabajo sobre Infraestructura y Desarrollo Tecnológico convino en que era muy recomendable realizar en el próximo período las tareas siguientes:

a) conceder prioridad a las actividades de asimilación de datos y a la verificación de los modelos de predicción numérica del tiempo;

b) prestar asistencia para instaurar los centros regionales del WIGOS;

c) ayudar a los Miembros de la Región a preparar los planes nacionales del WIGOS junto con los centros regionales del WIGOS;

d) instaurar el sistema de control de la calidad del WIGOS;

e) actualizar la base de datos OSCAR/Surface;

f) continuar el Proyecto WIGOS/WHOS-Plata;

g) realizar la transición de la Red Sinóptica Básica Regional (RSBR) y la Red Climatológica Básica Regional (RCBR) a la RROB;

h) respaldar la implantación del nuevo sistema de identificación de estaciones en todos los países de la Región;

i) estudiar la viabilidad de crear un modelo de predicción meteorológica regional (como consorcio regional);

j) acompañar el desarrollo de la plataforma 2.0 del SIO;

k) prestar apoyo al Proyecto de demostración de las predicciones de fenómenos meteorológicos extremos en caso de que lo apruebe la AR III;

l) acompañar las necesidades de los Miembros en relación con la actualización de los sistemas de recepción y difusión de productos de satélites meteorológicos de nueva generación;

m) generar y distribuir un mosaico de radares meteorológicos regional;

n) intensificar el intercambio de datos de las estaciones meteorológicas automáticas a nivel regional;

o) completar la migración a BUFR;

p) respaldar la ejecución de proyectos sobre los sistemas de alerta temprana;

q) desarrollar un programa de capacitación en varias esferas de la infraestructura, incluidos el SIO, el WIGOS, la AMDAR y la EMA;
r) participar en la próxima configuración de las comisiones técnicas de la OMM (estructura basada en dos comisiones técnicas que se someterá a la aprobación del Decimoctavo Congreso Meteorológico Mundial en junio de 2019); y

s) mejorar la cooperación con la AR IV en cuestiones de infraestructura.

9. Los miembros del Grupo de Trabajo sobre Infraestructura y Desarrollo Tecnológico convinieron en que era fundamental cambiar la estructura de trabajo actual por otra configuración basada en pequeños grupos de trabajo centrados en la creación de equipos especiales eficaces para cuestiones específicas, con mandatos claros y plazos para la finalización de las tareas asignadas.

10. Durante la reunión conjunta celebrada con el Grupo de Trabajo sobre Hidrología y el Grupo de Trabajo sobre el Clima, se propuso pedir a la AR III que cambiara el nombre del Grupo de Trabajo sobre Infraestructura y Desarrollo Tecnológico por otra designación que hiciera más explícitos la predicción y el tiempo en todas sus dimensiones.

**Composición actual del Grupo de Trabajo sobre Infraestructura y Desarrollo Tecnológico de la AR III**

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Grupo de Trabajo sobre Hidrología y Recursos Hídricos

11. El Grupo de Trabajo sobre Hidrología y Recursos Hídricos fue establecido en virtud de la Resolución 14 (RA III-16) aprobada en la decimosexta reunión de la AR III (Asunción, 2014) y llevó a la práctica el programa de trabajo para el período 2015-2018 de conformidad con el Plan Estratégico y el Plan Operacional de la Región. En el informe final de la última reunión del Grupo de Trabajo sobre Hidrología y Recursos Hídricos (Asunción, octubre de 2017) figura información detallada sobre sus actividades, que se resumen a continuación.

a) Se lograron avances en la ejecución del Proyecto WIGOS-SAS/CP (actualmente WIGOS/WHOS-Plata) basado en la propuesta del vicepresidente de la Comisión de Hidrología (CHi). Se obtuvo financiación para poner en marcha el sistema a finales de 2019.

b) Se instaló el servidor central en el Centro Mundial del Sistema de Información (CMSI) de Brasilia y el personal informático del Instituto Nacional de Meteorología (INMET) recibió formación conjuntamente con un representante del nodo en la Argentina. Por consiguiente, la capacitación informática de los otros cuatro países fue impartida por el personal del INMET que había recibido formación inicialmente.

c) Esta actividad, que permite la interoperabilidad de los datos meteorológicos e hidrológicos para su aplicación a los modelos operativos hidrológicos de predicción en tiempo real, se considera fundamental para la región.

d) Se celebró una reunión de consulta en Brasilia con el fin de preparar una propuesta para el desarrollo y la aplicación de un Sistema de Pronóstico y Alerta Temprana Hidrometeorológicos en la Cuenca del Plata. Si esta propuesta obtiene el apoyo de los Representantes Permanentes de los países participantes, será financiada por la Agencia de los Estados Unidos para el Desarrollo Internacional (USAID). En el siguiente enlace encontrará información adicional:


e) Siguiendo las recomendaciones del Taller Inicial de Planificación (Lima, 2016), se inició la ejecución del proyecto de Sistema Guía para Crecidas Repentinlas en el noroeste de América del Sur con la celebración en febrero de 2018 de un taller en Bogotá (Colombia). La financiación está garantizada para la fase inicial, que comprende los módulos básicos. Los países participantes (Colombia, el Ecuador y el Perú) designaron coordinadores que aportarán los datos necesarios para desarrollar el sistema. La primera actividad de capacitación está prevista para principios de 2019.

f) Los expertos del Grupo de Trabajo sobre Hidrología y Recursos Hídricos participaron activamente en las actividades realizadas por la CHi en las esferas de predicción hidrológica, cartografía del riesgo de crecidas, control de la sequía y predicciones hidrológicas estacionales. El presidente de la CHi ha reconocido públicamente su contribución en varias ocasiones.

g) El sitio web del Grupo (mencionado más arriba) se ha convertido en la plataforma para el intercambio de ideas entre los miembros y varios expertos invitados, así como el espacio donde se almacenan todos los documentos preparados por el Grupo o documentos de interés general.

12. El Grupo de Trabajo sobre Hidrología y Recursos Hídricos convino en que era muy recomendable realizar las tareas siguientes en el próximo período:
Recomendaciones para el próximo período:

a) debe concederse prioridad a las actividades de asimilación de datos y a su aplicación en la hidrología operativa;

b) es necesario colaborar con los CRC para introducir productos hidroclimáticos. Para cuestiones relacionadas con la sequía es fundamental la colaboración con el CRC para el Sur de América del Sur;

c) seguir apoyando el desarrollo y el mantenimiento del sitio web; y

d) seguir celebrando reuniones de los tres grupos de trabajo de la AR III de forma conjunta.

Composición actual del Grupo de Trabajo sobre Hidrología y Recursos Hídricos de la AR III

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REPORT OF THE DIRECTOR OF WMO REGIONAL OFFICE FOR THE AMERICAS

1. Mr. Miguel Rabiolo served as Director of the Regional Office from the beginning of the intersessional period until December 2017. Mr. Julian Baez assumed the direction of the Office from January 2018 to date. Both directors have carried out the task of direction with eagerness, dedication and enthusiasm.

2. During the intersessional period, the Regional Office for the Americas staff fulfilled its functions and responsibilities as an integral part of the Development and Regional Activities Department (DRA) of the WMO Secretariat. In this context, the Office assisted the president, the vice president and the subsidiary bodies of the Association in the exercise of their responsibilities.

3. Since the last RA III session, the number of activities organized and/or coordinated by the Regional Office for the Americas has increased considerably. In addition to the support for the organization of meetings of the RA III Management Group and the respective meetings of each of the three Working Groups, the Regional Office has implemented the practice of extraordinary meetings via video conferences, which translates into an improvement and increase of coordination meetings and a decrease in cost.

4. Furthermore, the Regional Office has had an active participation in the implementation and management of projects, among which mention must be made of the following:

   (a) After the completion of Project CLIMANDES I in Peru, the Project CLIMANDES II is close to completion, the support of the Regional Office for the Americas to both CLIMANDES I and II was maintained during the intersessional period. The continuity of a project with similar characteristics is expected at a regional level;

   (b) The second extension of the Project Consolidation of Modelling and Numerical Weather Prediction in the National Institute of Meteorology (INMET), in Brazil, concluded successfully in May 2018 and a third extension of 24 months has been agreed, until 7 June 2020, for the successful completion of the project;

   (c) The continuation of the cooperation program with AEMET of Spain. Three Meetings of the Conference of Directors of Ibero-American Meteorological and Hydrological Services (CIMEHT) have been held, as well as workshops and courses to strengthen the capacities of the Meteorological and Hydrological Services staff in Ibero-American countries;

   (d) The support and guidance for the designation of the Regional Climate Center for Southern South America (RCC-SSA) and also for the joint activities of RCCs (RCC-SSA and RCC-OSA). Continuous support for the implementation of Regional Climatic Outlook Forums (RCOF), both in person and through video conference, was also maintained;

   (e) The collaboration with WMO Technical Departments and the RA III NMHSs for the preparation and design of regional projects, such as: PROHMSAT Plata, WIGOS/WHOS-Plata, ENANDES. The Regional Office for the Americas intends to improve this collaboration, with a greater participation of the staff of the Office in the management of the projects.
5. The Regional Office for the Americas was very active in providing advice to Members of RA III on queries and requests on technical or organizational matters. The Director of RAM Office conducted several fact-finding missions to Members and provided authorities and decision makers with reports and recommendations on best practices, improvements of institutional and technical matters and resolution of deficiencies. Many of these activities provided opportunities to verify with decision makers that a number of investment institutions have special interest in areas like disaster risk reduction, climate change mitigation and adaptation, as well as enhancement of climate services in the region.
INFORME DEL DIRECTOR DE LA OFICINA REGIONAL PARA LAS AMÉRICAS DE LA ORGANIZACIÓN METEOROLÓGICA MUNDIAL

1. El señor Miguel Rabiolo desempeñó el cargo de director de la Oficina Regional para las Américas desde el principio del período entre reuniones hasta diciembre de 2017. Desde enero de 2018, ocupa ese cargo el señor Julián Báez. Ambos han desempeñado las funciones de dirección con empeño, dedicación y entusiasmo.

2. Durante el período entre reuniones, el personal de la Oficina Regional para las Américas desempeñó sus funciones y responsabilidades como parte del Departamento de Desarrollo y de Actividades Regionales de la Secretaría de la Organización Meteorológica Mundial (OMM). En este contexto, la Oficina ayudó al presidente, al vicepresidente y a los órganos subsidiarios de la Asociación en el ejercicio de sus responsabilidades.

3. Desde la última reunión de la Asociación Regional III (AR III), el número de actividades organizadas o coordinadas por la Oficina Regional para las Américas ha aumentado considerablemente. Además del apoyo para la organización de reuniones del Grupo de Gestión de la AR III y las respectivas reuniones de cada uno de los tres Grupos de Trabajo, la Oficina Regional ha comenzado a celebrar reuniones extraordinarias por videoconferencia, lo cual se traduce en la mejora y el aumento de las reuniones de coordinación y la reducción de los costos.

4. Asimismo, la Oficina Regional ha participado activamente en la ejecución y la gestión de diversos proyectos. Cabe destacar:

a) el apoyo prestado durante el período entre reuniones al proyecto CLIMANDES, en el Perú, tanto a su primera fase (CLIMANDES I), que ya concluyó, como a su segunda fase (CLIMANDES II), que está por concluir. Está previsto que se siga ejecutando un proyecto con características similares a nivel regional;

b) la conclusión con éxito de la segunda prórroga de proyecto “Consolidación de la Modelización y la Predicción Numérica del Tiempo en el Instituto Nacional de Meteorología (INMET)”, en el Brasil, en mayo de 2018, y el acuerdo de una tercera prórroga de 24 meses, hasta el 7 de junio de 2020, para terminar de ejecutar adecuadamente el proyecto;

c) la continuación del programa de cooperación con la Agencia Estatal de Meteorología de España (AEMET). Se celebraron tres reuniones de la Conferencia de Directores de los Servicios Meteorológicos e Hidrológicos Iberoamericanos, así como talleres y cursos para reforzar las capacidades del personal de los Servicios Meteorológicos e Hidrológicos de los países iberoamericanos;

d) el apoyo y la orientación para la designación del Centro Regional del Clima para el Sur de Sudamérica y para las actividades conjuntas de este y el Centro Regional del Clima para el Oeste de Sudamérica. Asimismo, se siguió prestando apoyo para la celebración de los Foros Regionales sobre la Evolución Probable del Clima, tanto de forma presencial como por videoconferencia;

e) la colaboración con los departamentos técnicos de la OMM y los Servicios Meteorológicos e Hidrológicos Nacionales de la AR III para preparar y diseñar proyectos regionales, como el Sistema de Predicción Hidrometeorológica y Alerta
Temprana en la Cuenca del Plata (PROHMSAT-Plata), el programa del Sistema de Observación Hidrológica de la OMM del Sistema Mundial Integrado de Sistemas de Observación de la OMM en la cuenca del Plata (WIGOS/WHOS-Plata) y ENANDES. La Oficina Regional para las Américas tiene la intención de estrechar esta colaboración y aumentar la participación del personal de la Oficina en la gestión de esos proyectos.

5. La Oficina Regional para las Américas asesoró muy activamente a los Miembros de la AR III sobre las consultas y las peticiones relativas a cuestiones técnicas o de organización. El director de la Oficina Regional realizó varias misiones de investigación a los Miembros y proporcionó a las autoridades y las instancias decisorias informes y recomendaciones sobre las mejores prácticas, las mejoras en cuestiones institucionales y técnicas y la corrección de deficiencias. Muchas de estas actividades bridaron oportunidades para comprobar con las instancias decisorias que algunas instituciones de inversión tienen especial interés en esferas como la reducción de riesgos de desastre, la mitigación del cambio climático y la adaptación a él y la mejora de los servicios climáticos de la región.
REPORT FROM THE RA III REGIONAL CONFERENCE (RECO)  
(Santiago de Chile 19-20 November 2018)

SUMMARY OF RECOMMENDATIONS

The RA III Regional Conference (RECO) finished its work fulfilling the planned program. According to the objectives, the six sessions were carried out with a participatory dynamic, which made it possible to formulate the following recommendations for the seventeenth session of Regional Association III (RA III-17).

**Session 1: WIGOS in RA III**

The RECO was informed on the conceptual aspects of WIGOS and WIS by Mr. Antonio Divino Moura, from the Centre for Weather Prediction and Climate Studies (CPTEC), Brazil, who introduced the topic and set the scene for discussion. The audience discussed some of the associated issues and challenges, including data quality, regional agreements, regulatory framework and the need for greater coverage and resolution. The panelists, Mr. José Arimatéa de Sousa Brito (president of the Working Group on Infrastructure and Technological Development, Brazil), Mr. Gastón Torres (vice-president of the Working Group on Infrastructure and Technological Development, Chile) and Mr. Gualberto Carrasco (Permanent Representative of Bolivia), shared their individual experiences in implementing WIGOS/WIS in their respective National Meteorological and Hydrological Services (NMHS). The audience agreed that coverage and resolution can be greatly expanded by articulating with private sector and other partners.

**Session recommendations**

- In order to have a sustained implementation of WIGOS, it is recommended that NMHSs invest in human resources qualified in technical topics, at intermediate level.

- For the sustainability of investments from international projects, the focus should not be on buying equipment but more on training and operational activities, for example, making data available internationally, including support to partners.

- WIGOS/WHOS-SAS/CP is an important project for the Region as an example of WIGOS integration, integrating hydrology data.

- WIGOS and WIS are critical initiatives that should be promoted at a higher level to have global visibility, for example, including them in the Agenda 2030 Sustainable Development Goals and in the Sendai Framework, to facilitate discussion within governments.

- Include potential partners with networks that can help improve the coverage of the NMHS observing networks, especially in poor data areas.

- WIGOS is also about integrating other types of observations, such as marine data (via the JCOMM In Situ Observations Programme Support Centre (JCOMMOPS)), atmospheric chemistry, etc.

- Members need to implement WIGOS at national level, starting by:
  - their observations strategy and National WIGOS Plans;
improve quality data by working with the Regional WIGOS Centres (RWC) in terms of WIGOS Data Quality Monitoring System (WDQMS);
 working with partners making diagnostics of national networks, including private partners.

**Session 2: Disaster Risk Reduction and Impact Based Forecasting in RA III**

The key Speaker, Dr. Osvaldo Moraes from CEMADEN, Brazil, set the framework for discussion of main concepts related to Multi Hazard Early Warning Systems (MHEWS) and its implementation in Brazil, putting emphasis in the different roles each institution has in the overall chain of services. The panellists, Mr. José Olmedo (Permanent Representative of Ecuador) and Mr. Reinaldo Gutiérrez (National Meteorological Service, Chile), shared their experiences in their respective countries. Dr. Xu Tang, from WMO, informed about the Common Alerting Protocol (CAP), and its level of implementation worldwide. The audience discussed on how to articulate with other disciplines of the social sciences, and mechanisms like the Sendai Framework and the Global Framework for Climate Services (GFCS). It was recognized the necessity to incorporate climate information and services into disaster risk reduction (DRR).

**Session recommendations**

- Expand partnerships between WMO and other key stakeholders, like civil defence and civil protection.
- At national level, identify specific roles, capabilities and limitations for each institution within the DRR and impact-based forecasting processes.
- Implement the Common Alerting Platform at the regional level.
- Recognize relationships between hydro-meteorological events and impacts; how these processes develop in cascade.
- Include training programmes to improve the capability of Members to develop and provide impacts-based forecasts and warnings.
- Support ongoing projects, under implementation or preparation, such as the Flash Flood Guidance System in Northwest South America (FFGSNWSA), and the Hydrometeorological Forecasting and Early Warning System (PRHOMSAT) in the La Plata Basin.

**Session 3: Global Framework for Climate Services in RA III**

The keynote speaker, Mr. Johannes Cullmann (D/CLW-WMO), gave an overview on the operationalization of the Climate Services Information System on Regional Scales (CSIS-R), focused on RA III. He invited Brazil and the Guyanas to initiate the pilot of an RCC network in their countries and invited RA III to actively contribute to the integration of the CSIS with WIGOS/WIS as well as to define the regional characteristics needed to integrate the RCCs into the Global Data-processing and Forecasting System (GDFPS). The panellists, Ms. María de los Milagros Skansi (Regional Climate Centre for the Southern South American Region (RCC-SSA), Mr. Francisco de Assis Diniz (Permanent Representative of Brazil), Mr. Enrique Garrido (National Meteorological Service, Chile) and Rodney Martínez (International Research Centre on El Niño (CIIFEN) and Regional Climate Centre for Western South America (RCC-WSA)), reviewed the situation in the Region and highlighted main aspects.

The Permanent Representative of Brazil underlined that the RCCs are still not strong enough and require more support. He recalled that Argentina, Brazil and Uruguay in recent years faced
severe drought events that had a serious effect on the agricultural production and the economy, and stressed that the generation of energy, agriculture, the management of natural disasters and other related aspects depend on climate information.

Mr. Ken Takahashi (Permanent Representative of Peru), moderator of the session, mentioned that in his country ecosystems and forests are priorities for RCC-WSA. Panelist María Skansi (RCC-SSA) mentioned that this Centre already includes the academia and sectoral institutions. The improvement of the database is a permanent objective, including data recovery. The centennial stations (Argentina and Chile) are good in South America, but not enough. A plan for drought information has already been implemented and now the information is being adapted to different sectoral requirements.

For panellist Rodney Martínez, from CIIFEN, which houses the RCC-WSA, it is essential to address economies of scale, improving the image of NMHSs through better services and assessing interfaces to have a better impact with less investment. Regional climate forums are the potential nucleus for better future climate service provision, including other players and also political entities. The CIIFEN representative stressed that the excellent guides produced by WMO should be valued and promoted, as they are not well known.

For panellist Enrique Garrido (Chile), climate services must be user driven and integrated. Chile has experience in this field, with two strategic objectives: Early Warning System and Climate Services. This experience showed that it is essential to internalize the concept of climate services, and also the use of channels to interact with other services so that the product reaches the user. In Chile, the use of WMO methodology made the result successful and the agricultural sector benefited. A climate services portal was established that provides processed data to users, including seasonal, cross-sectional forecast, which can be used by several sectors. Young meteorologists have extended this concept and social networks bring this to users in an easy and friendly way.

Finally, the Permanent Representative of Peru, moderator of the session, put on the table the need to better integrate universities in this process, since improved seasonal outlooks are needed, particularly for droughts. The statistics are not enough to predict future scenarios. It is necessary to understand the cause-effect relationship. The use of models is fundamental.

**Session recommendations**

- In order to be sustainable, it is crucial that projects and other international initiatives to develop climate services in Member countries respond mainly to their needs, even when these are not perfectly aligned with global agendas. RCCs have a key role in supporting Members for this purpose at the regional level, but it should be emphasized that the implementation of climate services finally occurs at the national level.

- The main identified gap in climate services in RA III is the delivery, particularly the stage concerning the interface with the user. Although the NMHSs are responsible for generating climate forecasts, they are not the only actors in the provision of services. Consequently, an effective and sustainable service delivery at the national level will require the consolidation of alliances with the other institutions involved (interface with intermediate users). The PRs have the key role of promoting this action in their countries.

- Scientific research should be promoted in RA III, both in NMHSs and in universities. RA III must identify the priority research lines, which can be promoted by RA III through programs such as the WCRP and the WWRP. For example, one thematic may be the physical mechanisms associated with seasonal prediction, especially in those aspects not well simulated by global models, and the verification of these models. Another thematic may be the evaluation of climate impacts and socio-economic benefits of the various services in the different realities of our region.
Session 4: The gender dimension in NMHSs

The moderator of the session, Ms. Assia Alexieva (SPO/WMO), recalled that the Fifteenth Meteorological Congress, in 2015, requested Directors of NMHSs to take urgent and positive action to improve gender mainstreaming in their services. Since then, we have gone from the conceptual phase to concrete actions. In recent years, workshops on women leadership have been held in conjunction with Technical Commissions sessions, but this is the first time that gender is included in a meeting of a Regional Association.

The concept of the session 4 was based on a survey on the composition of NMS staff and the existence of gender policies, to better focus the issue in the region. The session was organized in three stages. The first was a presentation of the problem at a global level by the keynote speaker, Josy Gallagher, with interactive discussions of small groups formed among those attending the RECO, which allowed to identify prejudices and unconscious bias. The second was an open debate by the panellists, followed by questions of the attendees. The third was the common preparation of a regional action plan.

On the margins of the session, the keynote speaker made appointments with interested PRs to which she offered individual coaching so that they could improve inclusive leadership practices in their services.

The panellists Mr. Ken Takahashi (Permanent Representative of Peru), Ms. Madeleine Renom (Permanent Representative of Uruguay), Mr. José Olmedo (Permanent Representative of Ecuador) and Ms. Celeste Saulo (Permanent Representative of Argentina), agreed in the observation that the bias of men for hard sciences and women for social sciences was predominant in the past, nevertheless, that is changing as more and more women are doing technical and scientific studies, with excellent results.

Although gender stereotypes persist in the region and an important part of the societies in RA III still have a patriarchal traditionalist vision of the roles of women and men, the experiences narrated show that there are progressive changes, formally at the legislative level through state norms protecting and promoting gender equality, and informally in terms of new practices that seek to build an inclusive leadership culture.

After the deliberations of the panellists and the discussion groups formed among the attendees, it was agreed to make three recommendations to RA III-17.

Session recommendations

- Formulate policies that institutionalize a gender perspective in NMS structures, processes and activities as well as ensure equal opportunities for both women and men.

- Ensure that the Association and the NMS are inclusive and responsive by taking into account not only gender but also age, language, ethnicity, etc.

- Maintain and regularly review gender-disaggregated statistics on employment, participation in capacity building, research, etc.

- Implement the Action Plan for Advancing Gender Equality in RA III which was formulated during the session.

Session 5: Emerging issues in hydrology in RA III

Mr. Johannes Cullman, Director of WMO Climate and Water Department (CLW), gave a presentation on the main issues currently occupying WMO in the field of hydrology: the recent water conference (HydroConference), the extraordinary session of the Commission on Hydrology, the dialogue on water, and specific projects being developed at the subregional
level. He invited participants to include their view on how hydrology should be represented in future WMO governance in the form of recommendations to Congress.

The participants in the RA III RECO showed interest in ongoing regional projects and, in particular, in participating in them once they are scaled down. The panellists, Ms. Dora Goniadzky, president of the Working Group on Hydrology and Water Resources, Ms. Silvana Alcoz (DINAGUA, Uruguay), Mr. Ken Takahashi (Permanent Representative of Peru) and Mr. Garvin Cummings (Permanent Representative of Guyana), covered different aspects, from complementing the description of the sub-regional projects to a description of hydrology at the regional and local levels.

After the presentations, much of the discussion focused on aspects related to the reform process, and on how hydrology could be given more visibility within WMO on the one hand, and on how WMO could be given more visibility as a reference on water-related issues on the other hand, in particular measurements and operational hydrology.

The regional hydrological advisor reminded the participants that there has been broad support throughout RA III to work towards a dual country representation consisting of a meteorologist as well as a hydrologist in WMO governance.

The participants recognized that although several Meteorological Services in the Region do not provide hydrological services, at the regional level there is generally a coordinated work between the Meteorological and Hydrological Services; in this sense, Chile mentioned, for example, that in the framework of WIGOS, its NMS has been working jointly with the National Water Directorate in the identification of stations. A similar situation exists in Argentina and Brazil within the framework of the WIGOS/WHOS Plata project.

**Recommendations of the session**

- It was recommended that Permanent Representatives support the participation of the key national hydrological experts in the next extraordinary session of the Commission on Hydrology.

- In those countries where NMSs do not provide hydrological services, it was recommended to take steps to achieve greater coordination between Metrological and Hydrological Services, particularly taking into account the regional implementation of the WIGOS/WHOS, the MMSC and disaster risk reduction.

- It was recommended to maintain the current structure of the Working Group on Hydrology and Water Resources, but with greater interaction with the current Commission on Hydrology or with the structure resulting from the reform process.

- Expand the geographical scope, or seek replication, of ongoing sub-regional projects.

**Session 6: Development of partnerships – Relationship with Regional Institutions and Policy Makers in RA III.**

The moderator of the session, Mr. Reinaldo Gutiérrez (Chile), introduced the keynote speakers, Ms. Mary Power (WMO) and Mr. Vladimir Tsirkunov (WB/GFDRR). Ms. Mary Power presented on behalf of Mr. Markus Repnik (Development Partnership Office of WMO).

Both speakers focused on the increasing challenges and demands considering that some of the most pressing risks the world is confronted currently with are related to weather, climate, and water. While demands are increasing, hydrometeorological institutions in developing and least developed countries and SIDS are confronted with major performance challenges in terms of their capacity to meet the needs of their countries for basic services to protect life and property. RA III is no exception in this regard.
Ms Power outlined WMO approach to capacity development and development partnerships. She emphasized that while WMO is not a development agency per se, ensuring that all WMO members have capacity to deliver the basic essential services is a top priority. Closing the capacity gap through effective partnerships is goal of the draft WMO Strategic Plan 2020-2023: to close the capacity gap on weather, climate, and water services between developed and developing countries. Scaling up effective partnerships is therefore critical and desirable.

She explained that will be facilitated through the WMO Country Support Initiative, creating an enabling environment, the provision of WMO technical expertise, the implementation of a knowledge platform (CPDB) and the development of NMHSs-twinning arrangements. She recalled the current projects in RA III, in which WMO leads and / or participates: CLIMANDES 1 and 2 with Swiss cooperation; ENANDES, financed by the Adaptation Fund; the Iberoamerican CIMET support by AEMET and the Spanish Trust Fund in WMO; FFGS–USAID (La Plata), and CREWS.

Regarding the WMO Partners Advisory Service, she stressed the importance of bringing the climate rationale in the development agenda, valuing the expertise of NMHS for the design and in some cases the implementation of projects.

Mr. Tsirkunov described the increasing focus in the WB investment portfolio on enhancing hydrometeorological services for sustainable development. He drew attention to the fact that to serve ever more elaborate societal needs, in order to minimize increasing economic losses from hydromet disasters, and to better adapt to climate change and variability, the international support for the NMHSs modernization in developing countries should be scaled up and become more impactful as so far this support has been insufficient and not always effective. He explained that the Hydromet Program of the Global Facility for Disaster Reduction and Recovery (GFDRR) plays a role of “focal point and service center” to mobilize resources, as a guide and support for larger investments by the WB in hydromet modernization. He explained that this Program has three pillars: Capacity Building, Analytical Support and Knowledge Management and Technical Assistance. Given the technical and institutional challenges, the low capacity of countries to manage and absorb large investments, the promising option is to build more aggressively the partnerships with all actors, including the private sector. Recent joint efforts of the WMO and the WBG in strengthening partnerships, such as the Alliance for Hydromet Development and the Global Weather Enterprise, were specifically described.

The panellists from Switzerland, Spain and South America, shared their experiences. There has been Insufficient progress to date in the region and generally. In RA III as in other regions, with exponentially growing challenges, linear progress is not sufficient. Progress needs to be more exponential to meet the growing demand and tackle ongoing and emerging challenges.

They agreed on the need to pin efforts to the main global agendas: the 2030 Agenda for sustainable development, the Sendai Framework for disaster risk reduction and the Paris Agreement. All agreed on the need for a hydromet development coordination framework in the region. This pointed to the need for strategic alliances and an integrated approach.

Finally, after a round of comments and answers by the keynote speakers and the panellists, the participants of RECO agreed to present Recommendations to the RA III-17.

**Recommendations**

- **Alliances:** Strong Alliances are needed. Transboundary alliances and cooperation to address the transnational nature of weather and climate events and impacts; alliance between public sector institutions (NMHSs), private sector entities and research institutions is critical for further improvement of hydrometeorological services to all; alliances between service providers and users is critical to ensure that services meet the
needs of the community; alliances between development financing partners and development agents are also critical to avoid redundancy and duplication of effort.

The Alliance for Hydromet Development introduced by WMO, the WBG and the Green Climate Fund (GCF), the Global Weather Enterprise Forum and the Climate Risk Early Warning Initiative (CREWS) are good examples of this type of alliances, to name but a few.

- **Sustainability is a major challenge and needs to be based on** (i) Global public good: Country-level weather/climate observation infrastructure is providing benefits beyond the country boundaries, (ii) Integrated observation infrastructure: infrastructure needs to be fully integrated in the country’s weather/climate observation infrastructure (WIGOS). (iii) Multi-country: as there is a (sub) regional and global dimension to observations and weather and climate services, financing of country observation infrastructure needs to be seen from this broader perspective. (iv) Sustainability: Hydromet appears to be one of the most poorly performing sectors concerning infrastructure sustainability in developing countries. Projects and programmes need to take a longer perspective and consider 10 year + timeframes for capacity development in a more realistic framework for making major improvements.

- **Research to applications**: Partnerships between the research sector and the operational community of service providers to allow the establishment of a regional mechanism, preferably under the umbrella of WMO. Also, the need for a system of indicators in South America to monitor progress was discussed.

- **Better tapping knowledge and expertise of the WMO**: There is demand for scaled-up provision of technical expertise for Hydromet projects and an acknowledged role of WMO community - to provide this expertise. New arrangements are needed to better use the expertise of NHMSs to assist those who finance/develop/implement Hydromet projects.
INFORME DE LA CONFERENCIA REGIONAL DE LA ASOCIACIÓN REGIONAL III (Santiago de Chile, 19 a 20 de noviembre de 2018)

RESUMEN DE LAS RECOMENDACIONES

La Conferencia Regional (RECO) de la Asociación Regional III (AR III) finalizó sus trabajos y cumplió así el programa previsto. De conformidad con los objetivos establecidos, las seis sesiones celebradas fueron de tipo participativas, lo que dio lugar a que se formularan las recomendaciones siguientes para la decimoséptima reunión de la AR III.

Sesión 1: Sistema Mundial Integrado de Sistemas de Observación de la OMM (WIGOS) y Sistema de Información de la OMM (SIO) en la Asociación Regional III

El señor Antonio Divino Moura, del Centro de Previsión del Tiempo y Estudios Climáticos (CPTEC) del Brasil, presentó a los participantes en la RECO los aspectos conceptuales del Sistema Mundial Integrado de Sistemas de Observación de la OMM (WIGOS), introdujo así el tema de la sesión y sentó las bases para el debate ulterior. Los participantes debatieron algunos aspectos y desafíos conexos, entre otros, la calidad de los datos, los acuerdos regionales, el marco reglamentario y la necesidad de una mayor cobertura y resolución. Los panelistas, el señor José de Arimatea de Souza Brito (presidente del Grupo de Trabajo de Tecnología y Desarrollo Tecnológico, Brasil), el señor Gastón Torres (vicepresidente del Grupo de Trabajo de Tecnología y Desarrollo Tecnológico, Chile) y el señor Gualberto Carrasco (Representante Permanente de Bolivia), compartieron sus experiencias en materia de ejecución del WIGOS/SIO en sus respectivos Servicios Meteorológicos e Hidrológicos Nacionales (SMHN). Los participantes convinieron en que la cobertura y la resolución podían ampliarse notablemente gracias a la colaboración con el sector privado y otros asociados.

Recomendaciones de la sesión

- Se recomienda a los Servicios Meteorológicos e Hidrológicos Nacionales (SMHN) que inviertan en recursos humanos cualificados en temas técnicos, de nivel intermedio, para lograr una ejecución sostenida del WIGOS.

- Para la sostenibilidad de las inversiones que proceden de proyectos internacionales, no debería priorizarse la compra de equipos, sino la formación y las actividades operativas, por ejemplo, poniendo a disposición datos a nivel internacional y prestando ayuda a asociados.

- El WIGOS/WHOS-SAS/CP es un proyecto importante para la Región y es un ejemplo de la integración mediante el WIGOS, en particular de datos hidrológicos.

- El WIGOS y el Sistema de Información de la OMM (SIO) son iniciativas clave que deberían promoverse al más alto nivel para que tengan visibilidad mundial, por ejemplo, incluyéndolos en los Objetivos de Desarrollo Sostenible asociados a la Agenda 2030 para el Desarrollo Sostenible y en el Marco de Sendái, con objeto de facilitar el diálogo con los gobiernos.

- Es importante incorporar a asociados con redes que puedan ayudar a mejorar la cobertura de las redes de observación los SMHN, en particular en zonas con escasez de datos.
El WIGOS tiene por vocación integrar también otros tipos de observaciones, como las marinas (a través del Centro de Apoyo al Programa de Observaciones *in situ* de la CMOMM (JCOMMOPS)) y de química atmosférica, entre otras.

Es necesario que los Miembros lleven a cabo la ejecución del WIGOS a nivel nacional, comenzando por:

- elaborar su estrategia de observaciones y plan nacional del WIGOS;
- mejorar la calidad de los datos mediante la colaboración con los Centros Regionales del WIGOS en lo que respecta al Sistema de Control de Calidad de Datos del WIGOS;
- colaborar con asociados, incluidos los del sector privado, para hacer diagnósticos de las redes nacionales.

**Sesión 2: Reducción de riesgos de desastre y predicciones que tienen en cuenta los impactos en la Asociación Regional III**

El orador principal, señor Osvaldo Moraes, del Centro Nacional de Vigilancia y Alertas de Desastres Naturales (CEMADEN) del Brasil, sentó las bases para la discusión de los conceptos principales relativos a los Sistemas de Alerta Temprana Multirriesgos (MHEWS) y a la ejecución de ese Sistema en el Brasil, poniendo énfasis en los diferentes roles que cada institución tiene en toda la cadena de servicios. Los panelistas, el señor José Olmedo ( Representante Permanente del Ecuador) y el señor Reinaldo Gutiérrez (Dirección Meteorológica de Chile) compartieron sus experiencias nacionales respectivas. El señor Xu Tang, de la OMM, se refirió al Protocolo de Alerta Común (CAP) y al grado de implementación del Protocolo a nivel internacional. Los participantes debatieron sobre los vínculos con otras disciplinas de las ciencias sociales y con mecanismos como el Marco de Sendái y el Marco Mundial para los Servicios Climáticos. Se reconoció la necesidad de incorporar la información y los servicios climáticos en la reducción de riesgos de desastre.

**Recomendaciones de la sesión**

- Ampliar las asociaciones entre la OMM y otras partes interesadas clave, como defensa y proteccion civil
- A nivel nacional, determinar las funciones, capacidades y limitaciones específicas de cada institución en el marco de los procesos de reducción de riesgos de desastre y predicciones que tienen en cuenta los impactos
- Implementar el Protocolo de Alerta Común (CAP) a nivel regional
- Reconocer las relaciones entre los fenómenos hidrometeorológicos y sus impactos: cómo estos procesos evolucionan en cascada
- Establecer programas de formación a fin de mejorar la capacidad de los Miembros para elaborar avisos y predicciones que tienen en cuenta los impactos
- Prestar apoyo a los proyectos en curso, que ya sea se estén ejecutando o estén en proceso de elaboración, como el Sistema Guía para Crecidas Repentinas en el noroeste de América del Sur y el Sistema de Pronóstico y Alerta Temprana Hidrometeorológicos en la Cuenca del Plata (PROHMSAT-Plata)
Sesión 3: Servicios Climáticos en la Asociación Regional III

El orador principal, señor Johannes Cullmann, Director del Departamento del Clima y del Agua (CLW) de la Organización Meteorológica Mundial (OMM), presentó un panorama general de la ejecución a escala regional del Sistema de Información de Servicios Climáticos, centrándose en la Región III. Invitó al Brasil y a las Guyanas a que iniciaran una red piloto de Centros Regionales sobre el Clima (CRC) en sus países, e invitó a la AR III a que contribuyese activamente a la integración del Sistema de Información de Servicios Climáticos (CSIS) con el WIGOS/SIO y a que definiera las características regionales necesarias para integrar los CRC en el Sistema Mundial de Proceso de Datos y de Predicción. Los panelistas, la señora María de los Milagros Skansi (Centro Regional del Clima para el Sur de Sudamérica (CRC-SAS), Argentina), Francisco de Assis Diniz (Representante Permanente del Brasil), Enrique Garrido (Dirección Meteorológica de Chile) y Rodney Martínez (Centro Internacional para la Investigación del Fenómeno de El Niño (CIIFEN) y CRC-OSA) pasaron revista de la situación en la Región y destacaron aspectos principales.

El Representante del Brasil subrayó que los Centros Regionales sobre el Clima (CRC) no son aún lo suficientemente sólidos y necesitan recibir más asistencia. Asimismo, recordó que en años recientes la Argentina, el Brasil y el Uruguay habían debido hacer frente a eventos severos de sequía, que habían tenido graves consecuencias en la producción agrícola y en la economía, e hizo hincapié en que la producción de energía, la agricultura, la gestión de desastres naturales y otros aspectos conexos dependen de la información climática.

Por su parte, el moderador de la sesión, el señor Ken Takahashi (Representante Permanente del Perú) comentó que, en su país, los ecosistemas y los bosques representan prioridades para los CRC-OSA. La panelista María Skansi, del CRC-SAS, comentó que ese Centro trabaja con el sector académico e instituciones sectoriales. Tiene como objetivo permanente la mejora de la base de datos, incluida la recuperación de datos. Las estaciones centenarias (Argentina y Chile), funcionan bien en América del Sur, pero no es suficiente. Se ha implementado un plan en relación con la información sobre la sequía y actualmente la información se adapta a las necesidades de los distintos sectores.

Para el panelista Rodney Martínez, del CIIFEN, que alberga el Centro Regional del Clima para el Oeste de Sudamérica (CRC-OSA), es esencial beneficiarse de las economías de escala, mejorar la imagen de los Servicios Meteorológicos e Hidrológicos Nacionales (SMHN) mediante la prestación de mejores servicios y examinar las interfaces para lograr un mayor impacto con menos inversiones. Los foros climáticos regionales son el núcleo potencial para la prestación futura de mejores servicios climáticos, que debería incorporar a otros agentes y entidades políticas. El representante del CIIFEN hizo hincapié en que las excelentes guías elaboradas por la OMM deberían valorarse y promoverse ya que no son ampliamente conocidas.

Por su parte, el panelista Enrique Garrido (Chile) estima que los servicios climáticos deben estar integrados y orientados a los usuarios. Chile ha acumulado experiencia en este ámbito y tiene dos objetivos estratégicos: sistemas de alerta temprana y servicios climáticos. Esa experiencia les ha demostrado que es esencial interiorizar el concepto de servicios climáticos, así como utilizar los canales establecidos para interactuar con otros Servicios de forma tal que los productos lleguen a los usuarios. En Chile, la aplicación de la metodología de la OMM ha resultado muy exitosa y el sector agrícola ha cosechado beneficios. Se creó un portal de servicios climáticos, que proporciona datos procesados a los usuarios, entre otros, predicciones estacionales y sectoriales, que pueden ser utilizadas por diferentes sectores. Los jóvenes meteorólogos han ampliado este concepto y las redes sociales lo acercan a los usuarios de forma fácil y accesible.

Por último, el Representante Permanente del Perú expresó la necesidad de incorporar debidamente a las universidades en este proceso ya que se precisan mejores proyecciones estacionales, en particular para las crecidas. Las estadísticas no bastan para predecir...
escenarios futuros. Es necesario comprender la relación de causa efecto. El uso de modelos es fundamental.

Recomendaciones de la sesión

- Es fundamental que, para que sean sostenibles, los proyectos y otras iniciativas internacionales destinadas a crear servicios climáticos en los países Miembros respondan a sus necesidades prioritarias, incluso cuando estas no estén perfectamente en consonancia con los programas internacionales. Los Centros Regionales sobre el Clima (CRC) tienen que desempeñar un papel clave prestando apoyo a los Miembros a nivel regional, pero debe hacerse hincapié en que la implementación de servicios climáticos se lleva a cabo a nivel nacional.

- La deficiencia principal que se ha detectado en relación con los servicios climáticos en la AR III es la prestación, en particular la fase relativa a la interfaz con el usuario. Si bien los SMHN tienen la responsabilidad de generar predicciones climáticas, no son los únicos agentes en la prestación de servicios. En consecuencia, una prestación efectiva y sostenible a nivel nacional exigirá la consolidación de asociaciones con otras instituciones participantes (interfaz con usuarios intermediarios). Los Representantes Permanentes tienen que desempeñar una función clave en la promoción de esos medidas en sus países respectivos.

- Debería alentarse la investigación científica en la AR III, tanto en los SMHN como en las universidades. La AR III debe definir las líneas de investigación prioritarias, que podrá promover a través de programas como el Programa Mundial de Investigaciones Climáticas (PMIC) y el Programa Mundial de Investigación Meteorológica (PMIM). Un tema podría ser, por ejemplo, los mecanismos físicos asociados a la predicción estacional, en particular sobre los aspectos que los modelos mundiales no logran simular adecuadamente, y la verificación de esos modelos. Otro tema podría ser la evaluación de los impactos climáticos y los beneficios socioeconómicos de los diversos servicios para las distintas partes de la Región, con realidades diferentes.

Sesión 4: La dimensión de género en los Servicios Meteorológicos e Hidrológicos Nacionales

La moderadora de la sesión, señora Assia Alexieva, de la Oficina de Planificación Estratégica de la OMM, recordó que el Decimoquinto Congreso Meteorológico Mundial (2015) había solicitado a los Directores de los Servicios Meteorológicos e Hidrológicos Nacionales (SMHN) que tomasen con urgencia medidas efectivas para mejorar la incorporación de la perspectiva de género en sus Servicios. Desde entonces, hemos pasado de la fase conceptual a las acciones concretas. En los últimos años se han organizado, conjuntamente con las comisiones técnicas, talleres sobre el liderazgo de las mujeres, pero esta es la primera vez que las cuestiones de género se incluyen en una reunión de una Asociación Regional.

La sesión 4 se basó en una encuesta sobre la composición del personal de los Servicios Meteorológicos Nacionales (SMN) y la existencia de políticas de género para enmarcar mejor el tema en el contexto de la Región. La sesión se estructuró en tres secciones. La primera consistió en la presentación, a cargo de Josy Gallagher, oradora principal, de un problema a nivel mundial y en discusiones interactivas en pequeños grupos formados por los participantes en la RECO, con objeto de detectar prejuicios y sesgos inconscientes. La segunda sección fue un debate abierto, con panelistas invitados, al que siguieron preguntas de los participantes. Durante la tercera sección se elaboró, de forma conjunta, un plan de acción regional.

En paralelo a la sesión, la oradora principal se reunió de forma individual con los Representantes Permanentes interesados, a los que dio asesoramiento para que pudiesen mejorar las prácticas de liderazgo inclusivo en sus Servicios respectivos.
Los panelistas, el señor Ken Takahashi (Representante Permanente del Perú), la señora Madeleine Renom (Representante Permanente del Uruguay), el señor José Olmedo (Representante Permanente del Ecuador) y la señora Celeste Saulo (Representante Permanente de la Argentina) estuvieron de acuerdo en que si bien, tiempo atrás, predominaba la idea de que los hombres estaban hechos para las ciencias duras y las mujeres para las ciencias sociales, eso estaba cambiando a medida que más y más mujeres cursaban carreras técnicas o científicas, con excelentes resultados.

Si bien los estereotipos de género persisten en la Región y una gran parte de la sociedad de los países de la AR III todavía tienen una visión patriarcal tradicionalista de los roles de las mujeres y los hombres, las experiencias narradas por los panelistas demuestran que se están produciendo cambios graduales, formalmente a nivel legislativo a través de normas estatales que velan por la igualdad de género y la promueven, e informalmente mediante las nuevas prácticas que están orientadas a construir una cultura de liderazgo inclusivo.

Tras las exposiciones de los panelistas y los debates que tuvieron lugar en los grupos formados por los participantes, se acordó formular las recomendaciones siguientes a la AR III en su decimoséptima reunión.

Recomendaciones de la sesión

- Formular políticas que institucionalicen una perspectiva de género en las estructuras, procesos y actividades de los Servicios Meteorológicos Nacionales (SMN), así como velar por una igualdad de oportunidades para las mujeres y los hombres
- Velar por que la Asociación y los SMN adopten enfoques inclusivos y no sexistas, teniendo en cuenta no sólo el género, sino también la edad, el idioma y la etnicidad, entre otros
- Mantener y actualizar con regularidad estadísticas, desglosadas por género, sobre empleo, participación en la creación de capacidad y actividades de investigación, entre otras
- Aplicar el Plan de Acción para Promover la Igualdad de Género, que fue elaborado durante la sesión.

Sesión 5: Temas emergentes en hidrología en la Asociación Regional III

El señor Johannes Cullman, Director del Departamento del Clima y del Agua (CLW) de la OMM, realizó una presentación sobre los principales temas que ocupan actualmente a la OMM en el ámbito de la hidrología: la reciente conferencia sobre el agua (HidroConferencia), la reunión extraordinaria de la Comisión de Hidrología, el diálogo sobre el agua, y proyectos específicos que se vienen desarrollando en las subregiones. Invitó a los participantes a que dieran a conocer su visión de cómo la hidrología debía representarse en la gobernanza futura de la OMM formulando recomendaciones al Congreso.

Los participantes en la RECO de la AR III mostraron interés en los proyectos que estaban en curso en la Región y, en particular, en participar en ellos una vez que se lleven a escala. Los panelistas, la señora Dora Goniadzky (presidenta del Grupo de Trabajo sobre Hidrología y Recursos Hídricos), la señora Silvana Alcoz (Dirección Nacional de Aguas, DINAGUA, Uruguay), el señor Ken Takahashi (Representante Permanente del Perú) y el señor Garvin Cummings (Representante Permanente de Guyana), cubrieron diferentes aspectos, desde complementar la descripción de los proyectos subregionales hasta una descripción de la hidrología a nivel regional y local.

Luego de las presentaciones, gran parte del debate se centró en aspectos relacionados con el proceso de reforma de la OMM, y en cómo se podría dar más visibilidad, por un lado, a la hidrología dentro de la OMM y, por otro, a la OMM como un referente en temas relacionados con el agua, en particular las mediciones y la hidrología operativa.
El asesor hidrológico regional recordó a los participantes que se ha conseguido un amplio apoyo en la AR III para lograr una doble representación nacional, es decir, un meteorólogo y un hidrógrafo, en los procesos de gobernanza de la OMM.

Los participantes reconocieron que, si bien varios Servicios Meteorológicos de la Región no brindan servicios hidrológicos, a nivel regional existe en general un trabajo coordinado entre los Servicios Meteorológicos e Hidrológicos; en ese sentido, Chile mencionó, por ejemplo, que en el marco del WIGOS, su SMN viene trabajando conjuntamente con la Dirección Nacional de Aguas en la identificación de estaciones. Una situación similar se da tanto en la Argentina como en el Brasil en el marco del proyecto WIGOS/WHOS Plata.

**Recomendaciones de la sesión**

- Se recomendó que los Representantes Permanentes apoyen la participación de los expertos hidrológicos nacionales principales en la próxima reunión extraordinaria de la Comisión de Hidrología.

- En aquellos países donde los SMN no brindan servicios hidrológicos, se recomendó tomar medidas para lograr una mayor coordinación entre los Servicios Meteorológicos e Hidrológicos, particularmente teniendo en cuenta la ejecución regional del WIGOS/WHOS, el MMSC y la reducción de riesgos de desastres.

- Se recomendó mantener la actual estructura del Grupo de Trabajo sobre Hidrología y Recursos Hídricos, pero con una mayor interacción con la actual Comisión de Hidrología, o aquella que se establezca como resultado del proceso de reforma de la OMM.

- Expandir el alcance geográfico, o buscar la replicación, de los proyectos subregionales que están en curso.

**Sesión 6: Creación de asociaciones — Relación con instituciones regionales e instancias normativas en la Asociación Regional III**

El moderador de la sesión, el señor Reinaldo Gutiérrez (Chile), introdujo a los oradores principales, la señora Mary Power (OMM) y el señor Vladimir Tsirkunov (Banco Mundial/Fondo Mundial para la Reducción de los Desastres y la Recuperación). La señora Power presentó el tema en nombre del señor Markus Repnik (Oficina de Asociaciones para el Desarrollo de la OMM).

Ambos ponentes se centraron en los crecientes retos y necesidades habida cuenta de que algunos de los riesgos más acuciantes a los que se enfrenta actualmente el mundo están relacionados con el tiempo, el clima y el agua. A medida que crecen las necesidades, las instituciones hidrometeorológicas de los países en desarrollo, los países menos adelantados y los pequeños Estados insulares en desarrollo se enfrentan a importantes desafíos operativos en lo que respecta a su capacidad para satisfacer las necesidades de sus países en materia de servicios básicos para proteger la vida y los bienes. La Asociación Regional III no es una excepción a este respecto.

La señora Power describió el enfoque de la OMM en materia de desarrollo de capacidad y de asociaciones para el desarrollo. Subrayó que si bien la OMM es un organismo de desarrollo, el objetivo del proyecto de Plan Estratégico de la OMM para 2020-2023 es colmar la brecha de capacidad en materia de servicios meteorológicos, climáticos e hidrológicos entre los países desarrollados y los países en desarrollo mediante la concertación de asociaciones efectivas. Por lo tanto, es fundamental y deseable ampliar las asociaciones efectivas.
Explicó que se facilitará mediante la Iniciativa de apoyo a los países de la OMM, creando un entorno propicio, el suministro de conocimientos técnicos especializados de la OMM, la puesta en marcha de una plataforma de conocimientos (la base de datos de la OMM con los perfiles de los países (CPDB)) y la elaboración de acuerdos de hermanamiento entre los SMHN. Recordó los proyectos en curso en la AR III, que la OMM dirige o en los que participa: CLIMANDES 1 y 2 con la cooperación suiza; ENANDES, financiado por el Fondo de Adaptación; el apoyo de AEMET a la Conferencia de Directores de los Servicios Meteorológicos e Hidrológicos Iberoamericanos (CIMHET) y el fondo fiduciario español en la OMM; el Sistema Guía para Crecidas Repentinas (FFGS)/Agencia de los Estados Unidos para el Desarrollo Internacional (USAID) (La Plata) y CREWS.

En cuanto al servicio de asesoramiento a los asociados de la OMM, subrayó la importancia de incorporar los fundamentos climáticos en el programa de desarrollo, valorando los conocimientos especializados de los SMHN para el diseño y, en algunos casos, la ejecución de los proyectos.

El señor Tsirkunov hizo referencia a la creciente atención que se presta en la cartera de inversiones del Banco Mundial a la mejora de los servicios hidrometeorológicos para el desarrollo sostenible. Señaló a la atención de los participantes que para atender a necesidades cada vez más complejas de la sociedad a fin de reducir al mínimo las crecientes pérdidas económicas causadas por los desastres hidrometeorológicos y de adaptarse mejor al cambio climático y la variabilidad del clima, debería ampliarse el apoyo internacional para la modernización de los SMHN de forma que tenga más impacto ya que este apoyo, hasta la fecha, ha sido insuficiente y no siempre efectivo. Explicó que el Programa de Hidrometeorología del Fondo Mundial para la Reducción de los Desastres y la Recuperación (GFDRR) desempeña un papel de "coordinador y centro de servicio" para movilizar recursos, como una guía y apoyo para las inversiones mayores del Banco Mundial en la modernización de los servicios hidrometeorológicos. Explicó que este Programa tiene tres pilares: creación de capacidad, apoyo analítico y gestión de conocimientos, y asistencia técnica. Habida cuenta de los desafíos técnicos e institucionales, la poca capacidad de los países para gestionar y absorber grandes inversiones, una opción prometedora es conformar más activamente asociaciones con todos los agentes, incluido el sector privado. Se describieron específicamente iniciativas conjuntas recientes de la OMM y el Grupo Banco Mundial (GBM) destinadas a fortalecer asociaciones, como la Alianza para el Desarrollo de Hydromet y las entidades internacionales del ámbito de la meteorología.

Los panelistas de Suiza, España y América del Sur, compartieron sus experiencias. Hasta la fecha, los avances han sido insuficientes en la Región y en general. En la AR III, al igual que en otras regiones, donde los desafíos crecen exponencialmente, el progreso lineal no es suficiente. El progreso debe ser más exponencial para satisfacer la creciente demanda y hacer frente a los desafíos actuales y futuros.

Convinieron en la necesidad de realizar esfuerzos en relación con los principales programas mundiales: la Agenda 2030 para el Desarrollo Sostenible, el Marco de Sendái para la Reducción del Riesgo de Desastres y el Acuerdo de París. Todos estuvieron de acuerdo en la necesidad de un marco de coordinación para el desarrollo de la hidrometeorología en la Región. Para ello, es necesario forjar alianzas estratégicas y adoptar un enfoque integrado.

Finalmente, después de una ronda de comentarios y respuestas por parte de los oradores principales y los panelistas, los participantes en la RECO acordaron presentar las recomendaciones siguientes a la AR III en su decimoséptima reunión.

Recomendaciones de la sesión

- **Alianzas**: Se necesitan alianzas sólidas: las alianzas transfronterizas y la cooperación para abordar la naturaleza transnacional de los fenómenos meteorológicos y climáticos y sus impactos; las alianzas entre instituciones del sector público (SMHN), entidades del
sector privado e instituciones de investigación, que son decisivas para seguir mejorando los servicios hidrometeorológicos para todos; las alianzas entre los proveedores de servicios y los usuarios, que son decisivas para que los servicios respondan a las necesidades de la comunidad; las alianzas entre los asociados de la financiación para el desarrollo y los agentes de desarrollo, que son también decisivas para evitar redundancias y duplicación de esfuerzos.

La Alianza para el Desarrollo de los Servicios Hidrometeorológicos, establecida por la OMM, el Grupo Banco Mundial y el Fondo Verde para el Clima, el Foro de las entidades internacionales del ámbito de la meteorología y la iniciativa de Riesgo Climático y Sistemas de Alerta Temprana (CREWS) son buenos ejemplos de este tipo de alianzas, por nombrar solo unas pocas.

- La **sostenibilidad es un reto importante y debe basarse** en (i) el bien público mundial: la infraestructura de observación meteorológica y climática nacional está proporcionando beneficios más allá de las fronteras nacionales; ii) infraestructura de observación integrada: la infraestructura debe estar plenamente integrada en la infraestructura de observación meteorológica y climática del país (WIGOS); iii) múltiples países: dado que las observaciones y los servicios meteorológicos y climáticos tienen una dimensión (sub)regional y mundial, la financiación de la infraestructura de observación de los países debe considerarse desde esta perspectiva más amplia; iv) sostenibilidad: el sector hidrometeorológico parece ser uno de los sectores con peores resultados en lo que respecta a la sostenibilidad de las infraestructuras en los países en desarrollo. Los proyectos y programas deben adoptar una perspectiva más amplia y considerar plazos de 10 años o más para el desarrollo de la capacidad en un marco más realista para realizar mejoras importantes.

- **Investigación a aplicaciones**: Asociaciones entre el sector de la investigación y la comunidad operativa de proveedores de servicios para establecer un mecanismo regional, preferiblemente bajo los auspicios de la OMM. También se discutió la necesidad de un sistema de indicadores en América del Sur para supervisar el progreso.

- **Aprovechar más los conocimientos y la experiencia de la OMM**: Existe una demanda de un mayor suministro de conocimientos técnicos para los proyectos de hidrometeorología y del reconocimiento del rol de la comunidad de la OMM en el suministro de estos conocimientos. Se necesitan nuevas disposiciones para utilizar mejor los conocimientos técnicos de los SMHN para ayudar a quienes financian, desarrollan y ejecutan los proyectos de hidrometeorología.
IMPROVING SERVICE DELIVERY, DISASTER AND CLIMATE RESILIENCE THROUGH IMPACT-BASED DECISION SUPPORT SERVICES

ACTIVITY REPORT ON AGRICULTURAL METEOROLOGY AND DROUGHT

Introduction

The following meetings and training activities were organized, managed, or funded by WMO through regular or extra-budgetary sources. The goal of these activities was to support climate action and build drought-resilient communities by improving the capacity of agricultural meteorological services and increasing interaction and feedback between NMHSs and the agricultural community.

Regional Working Group on Agricultural Meteorology

Regional experts from the Commission for Agricultural Meteorology (CAgM) and members of the CAgM management group participated in the many Regional Association III working groups on agricultural meteorology to develop work plans and identify how best to meet the needs of the region as regards information on agrometeorology. Regional experts from various commissions in RA III held a meeting of the RA III working groups on infrastructure, hydrology, and climate including the subgroup on agricultural meteorology in Asuncion, Paraguay in October 2017. This meeting helped foster discussions and lay the framework to developing a regional drought project.

Roving Seminars Training Activities in Agricultural Meteorology

Three Roving Seminars were held in September 2016 in Santiago del Estero province, Argentina organized by the Argentinian meteorological service, supported by local institutions and funded by WMO. Participants came from extension services students, honey producers and goat herders. Roving seminars were used to improve relations with users and cooperating institutions and to have better service delivery in agriculture. As a result, a team comprising the NMHS Agricultural Meteorology division, the Ministry of Agriculture regional office and local experts gave three seminars in Santiago del Estero province, a thousand kilometres northwest of Buenos Aires. In coordination with experts from Santiago del Estero’s national university, three towns were selected. Nueva Esperanza, San Jose del Boquerón and Sachayoj.

The specific objectives of those activities were:

- to encourage knowledge sharing on climate and agriculture,
- to promote weather and climate products and reports, giving easy access to farmers, livestock producers, beekeepers and trainers,
- to identify other relevant aspects not covered by current products and bulletins,
- to develop new products and services, and
- to improve rainfall record-keeping in that region by providing simple plastic rain gauges and training on their use.
Training Activities in Agricultural Meteorology

During the intersessional period, there were requests from countries and regions to conduct training courses on various topics in agricultural meteorology. A training workshop on agricultural and hydrological drought monitoring and management was held in Santa Cruz de la Sierra, Plurinational State of Bolivia, from 5 to 9 June 2017 with the support of the Spanish Cooperation Agency (AECID), WMO and the Spanish State Meteorological Agency (AEMET). Participants came from sixteen Latin American NMHSs from WMO regions III and IV.

Regional Drought Activities

A Workshop on Developing a Drought Monitoring, Early Warning and Mitigation System for South America was held in Buenos Aires, Argentina from 8 to 10 August 2017. The purpose of this workshop was to further develop an initiative put forward by various countries in South America aimed at implementing an effective drought monitoring, forecasting and mitigation system that would allow a proactive management of drought-related risks. The workshop shared several presentations from previous successful experiences in developing drought monitoring and forecasting systems. There were 78 participants from 15 countries. Key outputs included a draft strategic plan that could subsequently be adapted to the different contexts and needs of the region. A regional project proposal was subsequently developed and several proposals to donors were made in early 2018 (see below).

Latin America and The Caribbean Regional Conference on Drought Management and Preparedness, Santa Cruz, Plurinational State of Bolivia from 14 to 16 August 2017. Co-organized by WMO, the Food and Agriculture Organization (FAO), the United Nations Convention to Combat Desertification (UNCCD) and the Bolivian Ministry of Environment and Water. The conference identified and analysed the drought-related challenges, needs and gaps of LAC countries in order to promote effective management strategies and propose potential solutions. Local and international experts also provided perspectives on various aspects of drought management in the region and beyond. The conference focused on the following thematic issues:

- key elements of national drought policy;
- greater collaboration at all levels to enhance local, national and regional observation networks;
- information delivery systems to improve public understanding of, and preparedness for drought,
- coordination of drought programmes and of a response in an effective, efficient and customer-oriented manner.

The conference concluded by adopting the Santa Cruz Declaration and then started internal discussions in each country on how to improve drought management.

Integrated Drought Management Programme (IDMP)

The Integrated Drought Management Programme (IDMP) was established by WMO and the Global Water Partnership (GWP) in 2013 and has over 30 partner organizations. The IDMP provides advice and guidelines to communities, countries and regions affected by drought through the Integrated Drought Management HelpDesk. The IDMP published the Handbook of Drought Indicators and Indices in 2016 and the National Drought Management Policy Guidelines in 2014. The Advisory and Management Committees of the IDMP meet every year. Representatives from CAgM, CCI, and CHy attend these meetings as well as drought experts from partner organizations. In September 2016, an IDMP expert group meeting on action and inaction on drought preparedness, costs and benefits was organized and the team approved the publication of Benefits of action and costs of inaction: Drought mitigation and preparedness – a literature review.
Relevant Regional Projects

Based on the strategic plan drawn up during the South American drought workshop held in August 2017, the Inter-American Development Bank approved US$ 550 000 for the establishment of a South American Drought Information System (SADIS). SADIS is a regional project that will provide state-of-the-art, authoritative, and relevant information about drought, expected impacts, and possible actions to mitigate those impacts. This information will allow institutions from the various South American countries to design preparedness and mitigation actions, issue early drought warnings, and initiate responses in specific regions and activities.

CLIMANDES is a twinning project between the national meteorological service of Switzerland, MeteoSwiss, and the Peruvian National Hydrological and Meteorological Service, SENAMHI, financed by the Swiss Agency for Development and Cooperation (SDC). The first phase of Climandes, initiated in 2012, was aimed at producing climate services to support decision-making in the Andean region. After the successful completion of the project in 2015, the second phase of Climandes, Climandes 2 was launched in November 2015 with the initiation of activities in January 2016. In addition to developing climate services and further strengthening the RTC, the second phase is putting a strong emphasis on the socio-economic benefits of climate services for farming communities in the Andean region.

In March 2018, the Adaptation Fund Board Project and Programme Review Committee (AFB/PPRC) approved the “Enhancing adaptive capacity of Andean communities through climate services” (ENANDES) project pre-concept note presented by WMO in coordination with the NMHSs from Chile, Colombia and Peru. The proposed project aims to reduce vulnerability and strengthen the resilience of Andean communities in those countries by increasing their ability to better manage water for more efficient cropping, irrigation and power generation. In October 2018, the AFB/PPRC endorsed the project concept note and a full project proposal is being developed.

Other Meetings

There was a meeting on agromet products and services for forestry, livestock, and fisheries held in Tiradentes, Brazil from 15 to 17 March 2017. This meeting brought together three CAgM expert teams from CAgM Focus Area 1 (operational agricultural meteorology). Based on this meeting, the following two expert team reports were developed: Handbook on Livestock Poultry Inland Fisheries-Draft from Expert Team 1.1 and a Draft Fire Danger Rating Handbook from Expert Team 1.3.
IMPROVING SERVICE DELIVERY - DISASTER AND CLIMATE RESILIENCE THROUGH IMPACT-BASED DECISION SUPPORT SERVICES

WEATHER SERVICES, SERVICE QUALITY AND DELIVERY

(1) RA III Working Group on Service Delivery

In view of the needs expressed by RA III-16 (2014), decisions of Congress (Cg-17, 2015) and the decisions and recommendations of EC-70 (2018), there is a need for a mechanism that would coordinate further advancement of service delivery in RA III, in form of a Working Group or any other mechanism that the RA III Session may prefer. The mechanism would be tasked with coordinating regional initiatives in the areas of weather, climate, water and particularly for:

- Enhancing the international exchange of forecasts and warnings including the development of an RA III hub, for the aggregation of alerts in support of the Global Multi-hazard Alert System (GMAS);
- Coordinating the impact-based forecast and warnings services development;
- Standard Interfaces for accessing data and services for Public Service Delivery;
- Delivery of urban services in RA III.

(2) Impact-based forecast and Warning Services (IBFWS)

The RA III Capacity Building Workshop on Impact-based Forecast and Warning Services and the Common Alerting Protocol (CAP) was held in Buenos Aires, Argentina from 10 to 14 September 2018. The outcomes of the workshop can be found in the Final Report.

(3) Standard Interfaces for Accessing Data and Services for Public Service Delivery

3.1. Decision EC-70/5.1/2 - The Executive Council:

(a) Thanked the Commission for Basic Systems (CBS) for the development of the Concept Paper on the development of Common Interfaces for Service Delivery (CISD);

(b) Acknowledged that, as new web-based services emerge from the implementation of WMO Integrated Global Observing System (WIGOS), WMO Information System (WIS) 2.0 and seamless Global Data-processing and Forecasting Systems (GDPFS), harmonization of these services to provide consistent interfaces will likely benefit the Global Weather Enterprise;

(c) Requested that the establishment of standard interfaces (e.g. protocols or APIs) for accessing data and services for public service delivery, as expressed in the CISD concept paper, and the gathering of the related user requirements be progressed by CBS as part of the seamless GDPFS implementation;

(d) Further requested Members to share best practices on the development and implementation of web-service interfaces for accessing weather and climate information;
Further requested CBS to collate feedback from Members and provide guidance, as well as requesting the Secretary-General to provide the resources necessary to support this activity.

(4) **Delivery of urban services in RA III**

4.1 Outline of Guidelines for the development of an integrated operational platform to meet Urban Service Delivery needs as approved by EC-70 (Decision 7).

4.1.1. Introduction

The main goal of the Guidelines will be to articulate operational and delivery aspects based on the Guide for Integrated Urban Weather, Environment, Marine Meteorological and Climate Services and provide WMO Members with advice on practical considerations for service delivery in order to address the needs of urban communities, including value-added services, as part of the work of the National Meteorological and Hydrological Services (NMHSs).

An integrated operational platform will need to draw on the advancements in technology available through WIGOS and WIS to ensure that it is fully compliant with the “smart cities” concept of high-density, high-resolution urban environmental information.

It will be important, when developing the guidelines, to coordinate with other WMO activities, in particular the Global Framework for Climate Services (GFCS), and relevant technical commissions (TCs) and regional associations (RAs). It is essential to realise that, at national level, there are many agencies, apart from NMHSs, engaged in urban services development and provisions, for instance for air quality, and the guidelines must reflect this multi-agency reality by being attractive to both NMHS and non-NMHS service providers. The guidelines should also be flexible enough to allow for the integration aspects articulated in the Guide for Integrated Urban Weather, Environment, Marine Meteorological and Climate Services. In regard to the provision of high-resolution, multi-scale predictions to support urban needs, this requirement will need to be addressed through the ongoing development of the seamless GDPFS.

While the climatological, hydrological, oceanographic and environmental aspects of the urban environment will be comprehensively covered in the Guide, the integrated operational platform should enable easy access to a climatology of impact-based indicators within cities, to facilitate effective risk management in urban areas during periods of high-impact weather, recognising the potential domino effect of infrastructural failure and its consequences.

4.1.2 Content

The guidelines currently include the following sections:

(a) Executive summary,
(b) Background,
(c) WMO Framework:
   (i) Constituent body decisions and recommendations,
   (ii) Role of NMHSs.
(d) Developing a strategy for urban services,
(e) Partnerships and user engagement,
(f) Urban services and products:

(i) General considerations,
(ii) Types of services and products to be provided.

(g) Water management (including flooding),

(h) Environmental services (including health),

(i) Land transport sector,

(j) Marine Meteorological and Ocean services (Sea Level rise, Storm Surges, Coastal inundation, etc.):

- Climate; Data.

(k) Operational aspects,

(l) Service delivery aspects including dissemination and communication,

(m) Pilot studies,

(n) Capacity development and training,

(o) Evaluation and assessments.

The guidelines are to be developed based upon best practices and case studies of Members. Best practices will be included in boxes as examples. Also the WMO Strategy for Service Delivery and Its Implementation Plan (WMO-No. 1129) and, amongst others, the WMO Guidelines on Multi-hazard Impact-based Forecast and Warning Services (WMO-No. 1150) will be considered.

4.1.3 Timeline

The final version of the guidelines is expected in January 2019 and will be presented to WMO at Cg-18 in 2019.

(5) Enhancing International Exchange of forecasts and Warnings

5.1 CAP training for RA III was conducted in Argentina in September 2018,

5.2 The Filtered Alert Hub:

The Filtered Alert Hub is the prototype for the WMO alert hub which is under development. You can get more information on it by clicking here.

5.3 WMO Widget for Live Feed of Alerts/Warnings:

This widget displays current CAP coded warnings aggregated from official warning authorities. It displays the type of warning, the issuing authority and the country. Clicking on a particular warning opens a page containing more details.

5.4 The global warnings map of the Severe Weather Information Centre (SWIC):

This map is currently under development by Hong Kong Observatory (HKO) on behalf of WMO, and is not yet available to the public. The beta version of the map is ready and may be viewed by clicking here.
5.5 The Annex to this information document shows the performance of RA III Members in contributing to the World Weather information Service (WWIS). It may be noted that these initiatives underpin the WMO Global Multi-hazard Alert System (GMAS), which is currently under development.

Annex: 1
### Annex

#### Statistics of forecast submission by WMO Members for the WWIS

<table>
<thead>
<tr>
<th>WMO Member</th>
<th>RA III</th>
<th>Forecast Range (no. of days)</th>
<th>Post 32 days ending at 16 Oct 2018</th>
<th>Monthly number of days with forecast submission Post 32 + 1 Month</th>
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<td>Argentina</td>
<td>0</td>
<td>9</td>
<td>[Data Table]</td>
<td>[Data Table]</td>
</tr>
<tr>
<td>Boliva, Plurinational State of</td>
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<td>9</td>
<td>[Data Table]</td>
<td>[Data Table]</td>
</tr>
<tr>
<td>Brazil</td>
<td>0</td>
<td>9</td>
<td>[Data Table]</td>
<td>[Data Table]</td>
</tr>
<tr>
<td>Chile</td>
<td>0</td>
<td>9</td>
<td>[Data Table]</td>
<td>[Data Table]</td>
</tr>
<tr>
<td>Colombia</td>
<td>0</td>
<td>9</td>
<td>[Data Table]</td>
<td>[Data Table]</td>
</tr>
<tr>
<td>Ecuador</td>
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<td>9</td>
<td>[Data Table]</td>
<td>[Data Table]</td>
</tr>
<tr>
<td>Finland</td>
<td>0</td>
<td>9</td>
<td>[Data Table]</td>
<td>[Data Table]</td>
</tr>
<tr>
<td>Guyanas</td>
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<td>9</td>
<td>[Data Table]</td>
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<td>9</td>
<td>[Data Table]</td>
<td>[Data Table]</td>
</tr>
<tr>
<td>Peru</td>
<td>0</td>
<td>9</td>
<td>[Data Table]</td>
<td>[Data Table]</td>
</tr>
<tr>
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<td>Uruguay</td>
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<td>[Data Table]</td>
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<tr>
<td>Venezuela, Bolivarian Republic of</td>
<td>0</td>
<td>9</td>
<td>[Data Table]</td>
<td>[Data Table]</td>
</tr>
</tbody>
</table>
COLLABORATION ON WMO GLOBAL MULTI HAZARD ALERT SYSTEM/
MULTI-HAZARD EARLY WARNING SYSTEMS IN RA III

1. Background

International and Regional Frameworks and Processes Pertaining to Disaster Risk
Reduction in RA III

1.1 At the 6th Regional Platform for Disaster Risk Reduction in the Americas and the
Caribbean\(^1\) (RP18) which took place from 20 to 22 June 2018 in Cartagena, Colombia,
Ministers responsible for disaster risk reduction (DRR) and the delegations, many of them
including representatives from National Meteorological and Hydrological Services (NMHSs),
recognized the importance of ensuring coherence when implementing global frameworks such
as the 2030 Agenda for Sustainable Development, the Paris Agreement on Climate Change,
the Sendai Framework for DRR 2015-2030, the Addis Ababa Action Agenda on Financing for
Development, the Agenda for Humanity, the New Urban Agenda, the Small Islands Developing
States (SIDS) Modalities of Action (S.A.M.O.A.) Pathway, and regional inter-governmental
processes and frameworks including the Regional Action Plan for the Implementation of the
Sendai Framework for DRR 2015-2030 in the Americas\(^2\).

1.2 The Cartagena Declaration\(^3\) of the Third High-level Meeting of Ministers and
Authorities on the Implementation of the Sendai Framework in the Americas and the Caribbean
during RP18 calls on all governments and stakeholders to translate these frameworks into
policy and practice to achieve resilience at national and local levels across all sectors, including
by strengthening governance arrangements and by providing practical guidance to ensure
effective and efficient management of disaster risk. Commitment to establish new and
strengthen existing regional, sub-regional, national, sub-national and local platforms on DRR,
with the active engagement of local and national stakeholders, in coordination with regional
and international partners and cooperation mechanisms is needed. Dialogue, increased
understanding of risk factors and knowledge-sharing among a broad range of national and
local stakeholders, including universities, the private sector, and science and technology
communities to enhance the availability of innovative technology and research, facilitate
capacity development, and contribute to decision-making for addressing local risks and the
needs of the most vulnerable to be promoted.

1.3 Ministers and Heads of Delegation highlighted the importance of strengthening
cooperative relationships and collaboration between Members and the need to continue
encouraging the participation of donors and international organizations to support DRR actions
and for every country to invest in keeping its infrastructure and early-warning systems
operational and sustainable in anticipation of, during and after disasters. They committed to
making progress on monitoring the Regional Action Plan in order to assess its effectiveness
and the response by the region’s countries to the planned initiatives and establish follow-up
arrangements, in line with the baselines to be assessed in the context of the 7th Regional
Platform for DRR in the Americas and the Caribbean to be held in 2020 in Jamaica.

\(^1\) http://eird.org/pr18/eng/
\(^3\) http://eird.org/pr18/docs/cartagena-declaration.pdf
1.4 It was also highlighted that people-centred, multi-hazard early warning systems (MHEWS) need to be scaled-up and sustained through partnerships among all actors involved in each aspect of the early warning chain, ensuring accountability and clear roles and responsibilities, adequate financing and regional cooperation especially in light of transboundary hazards. Early warnings need to be translated into early action, including for hard-to-reach populations and allowing for local solutions and decision-making as well as feedback mechanisms to improve the overall early warning and disaster management system. The development and dissemination of methodologies and science-based tools that facilitate the timely implementation of measures to prevent, prepare, identify and communicate the losses caused by disasters were also highlighted. This can be done through online monitoring platforms that are designed for this purpose and adopted for the monitoring of the Sendai Framework.

1.5 The RP18 Chair’s Summary also underlined the importance of strengthening capacities for analysis, modelling, forecasting and early warning and of the information generated by technical-scientific institutions as the basis for making informed decisions about risk in the Region. To achieve this there is a need to coordinate the work of statistical offices and other national agencies and to design financing mechanisms that promote public-private co-responsibility for the implementation of monitoring and alert/warning systems and support technical-scientific institutions. Legal frameworks are required in the Americas to facilitate the participation of the science and technology sectors in national DRR mechanisms and facilitate their active participation in the formulation of public policies for territorial advocacy. Lastly, the importance of planning for recovery was highlighted, taking into account long-term risks and the analysis of risk and capacities in order to inform response planning and to improve interventions.

1.6 During a RP18 side event, the outcomes of the project entitled Lessons Learnt on Early Warning Systems (EWS) Following the 2017 Hurricane Season funded by the Climate Risk and Early Warning Systems (CREWS) initiative were presented. In the Caribbean, CREWS aimed to assess the effectiveness of Caribbean EWS by identifying critical gaps during the 2017 hurricane season in the areas of meteorology and hydrology, disaster management, and gender, in order to reassess and validate priority investments for CREWS and other initiatives in the Region that concern both RA III and RA IV.

The WMO Disaster Risk Reduction Roadmap

1.7 After a drafting and consultation period between late 2014 and early 2017, the WMO DRR Roadmap was approved by the WMO President on behalf of the Executive Council (EC) in April 2017. This roadmap aligns the WMO DRR Programme with the Sendai Framework. The vision of the WMO DRR Roadmap is that WMO and the NMHSs of its Members are recognized as an authoritative and effective support mechanism within the national, regional and global DRR arenas with regard to weather-, water- and climate-related hazards. Such a NMHS – supported by WMO structures as a whole – is able to:

(a) Co-design, co-produce and co-deliver, together with other NMHSs and partners, user-driven services that support disaster risk management measures in multiple sectors and at various spatial and temporal scales;

(b) Fully link vulnerability and exposure data to standardized hazard information in data processing, production, and service delivery in order to contribute to and use impact-based forecasts and risk-informed warnings of multiple hazards within the framework of MHEWS;

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4 http://eird.org/pr18/eng/docs/Resumen_final_VI_PLA_REG_RRD_CARTAGENA_P18_ENG.pdf
6 http://www.library.wmo.int/index.php?lvl=notice_display&id=19866#.W7SUjUbT-vM
Advance and apply science (natural and social) and technology to support the
development and delivery of such products and services for disaster risk reduction;
and,

Sustain its core operations, also after having been affected by disasters themselves.

Accordingly, the WMO DRR Roadmap will work towards the following objectives:

(a) Provide a framework for WMO Members to assess, support and enhance their
NMHSs’ contributions to their national DRR efforts through strengthened capabilities
and cooperation at all levels and in a more cost-effective, systematic and
sustainable manner;

(b) Provide a mechanism to enhance WMO programmatic coordination and
cooperation with respect to DRR, especially through strengthening the regional
and global institutional infrastructure to create sustained capacities for country-
level implementation support;

(c) Reference and make accessible knowledge products (standards, guidelines, tools,
methods, good practices, Quality Management Frameworks (QMF), competencies,
etc.) to Members, the WMO operational and research networks, and the Secretariat
for their support to local, national, regional and global DRR activities; and,

(d) Identify both tactical and strategic opportunities for enhancing the role and visibility
of NMHSs and WMO in national, regional and global policy processes related to
disaster risk management through coordinated and focused engagement with
international stakeholders and service providers, e.g. the United Nations (UN)
system, regional and sub-regional intergovernmental organizations, the private
sector, charities and non-governmental organizations (NGOs).

2. **Decisions by the Seventieth WMO Executive Council Especially Relevant to
Disaster Risk Reduction in RA III**

**Further Implementation of the WMO Disaster Risk Reduction Roadmap**

2.1 Through Decision 3, EC-70 decided to further implement the WMO DRR Roadmap at
the national, regional and global level and monitor its further implementation in line with the
draft WMO Strategic Plan 2020-23\(^7\) (especially its Goal 1) and its Key Performance Indicators
(KPIs), including recurring reviews of requirements of Members, UN and humanitarian agencies
(HAs) and identifying how this implementation further contributes to achieving the relevant
goals and targets set in other aforementioned international frameworks, especially in view of a
seamless approach to reducing the risks from weather-, water-, and climate-related hazards and
the role NMHSs are playing in all components of disaster risk management (including for
reducing risks from non-hydrometeorological hazards) under national legislation.

2.2 EC-70 requested the technical commissions (TCs), regional associations (RAs) and
technical (including co-sponsored) programmes (TPs) such as the Tropical Cyclone Programme
(TCP), assisted by their DRR Focal Points (WMO DRR FP RA-TC-TP), to:

(a) Ensure that their work plans align with the DRR Roadmap;

(b) Map progress with relevant resolutions and decisions against the objectives of the
DRR Roadmap and monitor its implementation with the help of quantitative
indicators;

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\(^7\) Recommendation 20 (EC-70) for submission to the Eighteenth World Meteorological Congress (Cg-18).
Considerations to Develop a WMO Global Multi-Hazard Alert System (GMAS)

2.4 EC-70 also decided to further the concept of and gather additional user requirements on a Global Multi-Hazard Alert System GMAS to support Members (Decision 4). It requested the EC Working Group on DRR (EC WG/DRR)’s Expert Group on GMAS (EG-GMAS) to gather additional GMAS user requirements according to the Plan developed by the EC WG/DRR (which, in turn, is based on the drafts developed by the EG-GMAS at its meetings held in October 2017 and March 2018 with support from the Secretariat)\(^8\). This would allow for the development of options for the implementation of GMAS, including a full-featured option to meet all of the user requirements as well as a minimum viable product which delivers to a subset of prioritized requirements, for consideration by Cg-18. The Decision also called for the documentation of best practices in MHEWS of Members. Further needs and requirements are being gathered from Members and relevant agencies, and the Third Meeting\(^9\) of the EG-GMAS will take place from 28 to 29 November 2018 in Geneva.

2.5 GMAS is a proposed resource that would provide WMO Members and other potential users with standardized, authoritative warnings and alerts issued by NMHSs for multiple hazards related to high-impact weather, water, ocean and climate events as well as with related information generated by NMHSs and WMO Global and Regional Centres. Introduced through Decision 3 (EC-69), GMAS is being developed under the auspices of the WMO technical commissions and regional associations and will be aligned with the roles and functions of the centres that make up the WMO Global Data Processing and Forecasting System (GDPFS). It could be built on the alert hub technology, prototyped by the U.S. National Oceanic and Atmospheric Administration (NOAA) Big Data Project. It would also leverage the WMO

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Information System (WIS) to maintain a repository of authorized warnings, alerts and related information and to distribute this information to authorized users. Using WIS would ensure that there are no costs for NMHSs in implementing this module of GMAS. It should further leverage existing subregional and regional warning mechanisms, such as Meteoalarm of the European Meteorological Services Network (EUMETNET), Meteoalert of the Federal Service for Hydrometeorology and Environmental Monitoring of the Russian Federation (Roshydromet), the South-East European Multi-Hazard Early Warning Advisory System (SEE-MHEWS-A) and GMAS Asia (Figure 1).

2.6 The World Weather Information Service (WWIS)\(^{10}\) and the Severe Weather Information Centre (SWIC)\(^{11}\) are considered as initial core components of GMAS. They will be developed further to provide a web-based user interface with a map display, ensuring the attribution of information to WMO and NMHSs as authoritative sources of warnings and alerts. This module is being developed by the Hong Kong Observatory (HKO) as an in-kind contribution to the development of GMAS. Furthermore, the Worldwide Met-Ocean Information and Warning Service (WWMIWS) web portal, hosted by Météo-France and aimed at shipping users, already provides many of the functionalities included in the GMAS Concept in a simple, low cost but effective manner.

\[
\text{Concept}
\]

**Figure 1: Schematic of the proposed concept for a WMO Global Multi-Hazard Alert System (GMAS)**

**Status of the Development of Identifiers for Cataloguing High-Impact Weather, Water and Climate Events**

**Support to the United Nations and other humanitarian agencies**

2.7 Furthermore, Decision 5 (EC-70) called for the development of a coordination mechanism that enables easy access to authoritative information and provision of expert

\[10\] http://worldweather.wmo.int/en/home.html
\[11\] https://severe.worldweather.wmo.int/
advice to the United Nations (UN) and humanitarian agencies (HAs) to respond to their immediate requests in anticipation of, and during or after hydrometeorological hazard situations. GMAS is expected to be a key resource for such a WMO Coordination Mechanism (WCM) to support UN and other HAs.

2.8 Cg-17 in 2015 noted the need for a better understanding of disaster risk, including the characteristics of hydrometeorological hazards, expressed in the international policy frameworks mentioned above. Cg-17 adopted Resolution 9 (Cg-17) through which it decided to standardize information on weather, water, climate, space weather and other related environmental hazards and risks, and develop identifiers for cataloguing extreme and high-impact weather, water and climate events. When fully implemented, this would enable WMO to offer its Members and the international community a standardized, continuously updated and global dataset of hazard and extreme event occurrences including the attribution to climate change. Subsequently, EC-68 in 2016 (Decision 4) established the WMO Inter-Programme Task Team on Cataloguing Extreme Weather, Water and Climate Events (IPTT-CEWWCE) to support the implementation of Resolution 9 (Cg-17). In this regard, WMO organized an international workshop on cataloguing and managing information on high-impact and extreme events from 20 to 22 November 2017\(^\text{12}\). The workshop developed an innovative approach to cataloguing of such events which leverages international standards and is versatile and flexible enough to account for complex relationships among various event types.

2.9 The approach centres on identifying events uniquely without a prior attribution to other events at the national, regional and global levels. This would be accomplished by assigning a universally unique identifier (UUID)\(^\text{13}\) number to each event (Figure 2). The event UUID would contain several key parameters (Figure 3), such as event start and end times, spatial extent, event type. Other parameters provide context such as description, local identifier (e.g. local or regional names of storms), and links to other events (e.g. heavy rain to tropical cyclone) which enables the clustering of events (e.g. events linked to other events) to mirror larger scale (synoptic) phenomena. Each event and sub-event can have its own UUID, yet incorporating the UUIDs of associated events in any given event record allows the entire chain of events to be linked to each other, along with any associated data. Table 1 provides details on these attributes. Table 2 provides event types to be recorded in the parameter fields. Additional information about each event (relevant hydrometeorological parameters such as wind speeds, precipitation amounts, values of hydrometeorological indexes, etc.) can be stored in a separate database, also associated with the UUID. Importantly, authorities responsible for assessing and cataloguing information on loss and damage would be able to use the same UUID to associate this type of non-hydrometeorological information with the events.

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Figure 2: Assigning universally unique identifier (UUID) numbers to events

\(^{12}\) [http://www.wmo.int/pages/prog/wcp/wcdmp/meeting/international-workshop-extreme-events.html](http://www.wmo.int/pages/prog/wcp/wcdmp/meeting/international-workshop-extreme-events.html)

\(^{13}\) A universally unique identifier (UUID) is a 128-bit number used to identify information in computer systems. Adoption of UUIDs and GUIDs is widespread, with many computing platforms providing support for generating them, and for parsing their textual representation.
2.10 Event records at the national and regional levels would be stored in their respective standardized data centres. At the regional level though, a complete set of all event records at regional and national levels would be stored and a post analysis of events would be carried out through aggregation (or clustering). This is a necessary step for understanding the geographical and physical factors explaining the origin, life-time and scale of events with cascading features that usually extend beyond the national scales. Quality control in partnership with loss and damage data custodians and stakeholders would then be necessary to verify and finalize event information entries (e.g. spatial area).

2.11 At the seventeenth session of the Regional Association VI (Europe), RA-VI-17, in February 2018, the Association decided to test the proposed approach for cataloguing high-impact events, starting in 2018 and continuing over a sufficient period to deliver results and recommendations relevant for operationalization of the approach. The test phase was kicked off at a meeting at the Deutscher Wetterdienst (DWD) in Offenbach, Germany, in July 2018, and the initial proposal was modified to ensure synergy with the Common Alerting Protocol (CAP) 2.0 (under development). Through Recommendation 1, EC-70 recommended that the proposed approach, with the necessary refinement as per the conclusions and lessons learnt of the test phase, be submitted to Cg-18 in June 2019 for consideration and adoption.
Table 1: Event parameters (Fields with * are mandatory for recording)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Format</th>
<th>Description</th>
<th>Comments</th>
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</thead>
<tbody>
<tr>
<td>UUID*</td>
<td>Alphanumeric</td>
<td>UUID (32 character random sequence)</td>
<td>(e.g. 00112233-4455-6677-8899-aaabcdeedf)</td>
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<tr>
<td>Record Creation*</td>
<td>Date/Timestamp</td>
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<td></td>
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<tr>
<td>Identifier*</td>
<td>Text</td>
<td>Originator (Name of institution that is recording the event)</td>
<td>Institution that is recording the event</td>
</tr>
<tr>
<td>Start Time*</td>
<td>Date/Timestamp</td>
<td></td>
<td></td>
</tr>
<tr>
<td>End Time*</td>
<td>Date/Timestamp</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Event Type*</td>
<td>List (Controlled list – see table below)</td>
<td>System or primary</td>
<td>Source of event (e.g. tropical cyclone) or primary (list of primary events)</td>
</tr>
<tr>
<td>Area*</td>
<td>Recognized spatial datatype</td>
<td>Area of event</td>
<td></td>
</tr>
<tr>
<td>Headline</td>
<td>List (Controlled list, Table 2)</td>
<td>Text (e.g. hurricane, heatwave coastal flooding)</td>
<td>Highly recommended to enter</td>
</tr>
<tr>
<td>Description</td>
<td>Text (Up to 240 characters)</td>
<td>Open description text</td>
<td>Description of event such as max temp, highest wind speed, Category</td>
</tr>
<tr>
<td>Linkage</td>
<td>Alphanumeric</td>
<td>UUID reference link to source events</td>
<td>UUID of other events considered as source events (e.g. Tropical cyclone)</td>
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<tr>
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<tr>
<td>Post processing</td>
<td></td>
<td>Quality control, verification</td>
<td>Not started / Ongoing / Validated</td>
</tr>
</tbody>
</table>

Table 2: Event types (comprising both primary hazards and the weather systems that they originate from), as defined by the WMO Event Type List

<table>
<thead>
<tr>
<th>Primary</th>
<th>System</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rain Snow</td>
<td>Dust</td>
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<tr>
<td>Temperature</td>
<td>Sand</td>
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<tr>
<td>Hail</td>
<td>Lighting</td>
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<tr>
<td>Fog Wind Frost</td>
<td>Tornado</td>
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<tr>
<td></td>
<td>Drought</td>
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<td></td>
<td>Floods</td>
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<tr>
<td>Ice Haze</td>
<td>Marine Waves</td>
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<tr>
<td></td>
<td>Avalanche</td>
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<tr>
<td></td>
<td>Thunderstorms</td>
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<tr>
<td></td>
<td>Cyclonic (e.g. Tropical, Extra-tropical cyclone, mid-latitude cyclone)</td>
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<tr>
<td></td>
<td>Anti-cyclonic</td>
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<tr>
<td></td>
<td>Convective (thunderstorms)</td>
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<tr>
<td>Headline</td>
<td>Coastal flood</td>
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<tr>
<td></td>
<td>Estuarine flood</td>
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<td></td>
<td>Flash flood</td>
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<tr>
<td></td>
<td>Fluvial (riverine) flood</td>
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<tr>
<td></td>
<td>Ice and debris-jam flood</td>
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<tr>
<td></td>
<td>Pluvial flood</td>
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<tr>
<td></td>
<td>Ground water flood Snowmelt flood</td>
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<tr>
<td></td>
<td>Glacial lake outburst</td>
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<tr>
<td></td>
<td>Sand haze</td>
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<tr>
<td></td>
<td>Sand storm</td>
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<tr>
<td></td>
<td>Dust storm</td>
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<tr>
<td></td>
<td>Black carbon</td>
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<tr>
<td></td>
<td>Brown clouds</td>
</tr>
<tr>
<td></td>
<td>Polluted air</td>
</tr>
<tr>
<td></td>
<td>Blizzard</td>
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<tr>
<td></td>
<td>Dry Spell Wet Spell</td>
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<tr>
<td></td>
<td>Cold wave</td>
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<tr>
<td></td>
<td>Heatwave</td>
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<td></td>
<td>Landslide/Mudslide</td>
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<td></td>
<td>Mud flow</td>
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<td></td>
<td>Acid rain</td>
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<td></td>
<td>Storm surges</td>
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<td>Tsunami</td>
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<td></td>
<td>Avalanche</td>
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<tr>
<td></td>
<td>Downburst</td>
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Outcomes of the First Multi-Hazard Early Warning Conference (MHEWC-I) and Follow-up, including Preparations for the MHEWC-II in May 2019

2.12 The First Multi-Hazard Early Warning Conference (MHEWC-I)\textsuperscript{16} was held in Cancún, Mexico, from 22 to 23 May 2017 as a preparatory meeting to the 2017 Global Platform for DRR. Organized by the International Network for Multi-Hazard Early Systems (IN-MHEWS), the aim of the Conference was to demonstrate to countries how they can improve the availability of, and their communities’ access to, multi-hazard early warning and risk information/assessment.

\textsuperscript{14} Available at: http://www.wmo.int/pages/prog/wcp/cc/documents/ProposalforCataloguingHighImpactEvents.pdf.

\textsuperscript{15} Thunderstorm warnings will form part of the primary hazard list with an asterisk* denoting that in terms of recording the event a thunderstorm will be registered as a system not as a primary hazard. This will also apply to cyclonic systems, such as named tropical cyclones (Hurricanes, Typhoons, etc.)

\textsuperscript{16} http://www.wmo.int/earlywarnings2017/
(as expressed in Target g) of the Sendai Framework). It defined an approach to establish national baselines on EWS to be used by government agencies to report on advances in early warning efforts on a periodic basis. A main goal was therefore to take stock of current level single and multi-hazard EWS, i.e. their effectiveness, related actors and partnerships, coordination mechanisms and gaps.

2.13 The Conference also:

(a) Advocated and promoted the broadening of the scope of early warning, risk information and assessment to address multiple hazards and risks;

(b) Promoted best practices for warnings to reach people in need for timely action, including especially the Common Alerting Protocol (CAP) standard for all hazards alerting across all kinds of media;

(c) Leveraged progress in the development of observation and monitoring systems, the use of Big Data and the strengthening of capacities to use information and communication technology, particularly for Least Developed Countries (LDCs) and SIDS;

(d) Identified the requirements of MHEWS to comply with end-to-end systems and interoperability with local, national and regional scales through the development of an updated Checklist for MHEWS\(^\text{17}\); and,

(e) Examined trans-boundary and regional issues in developing and disseminating early warnings.

2.14 IN-MHEWS is planning to organize MHEWC-II\(^\text{18}\) from 13 to 14 May 2019 in Geneva hosted by WMO, during the preparatory days of the 2019 Global Platform for DRR\(^\text{19}\). The focus will be on collecting good practices and providing guidance to countries on implementing MHEWS and measuring progress with Target g) of the Sendai Framework – the target for which reporting is the weakest.

**Capacity Development Projects to Strengthen Early Warning and Disaster Risk Management in RA III**

2.15 Achieving Long-term Goal 1 of the draft WMO Strategic Plan 2020-2023, namely to “Better serve societal needs: delivering, authoritative, accessible, user-oriented and fit-for-purpose information and services” relies on progress with Earth system observations and predictions (Goal 2), targeted research (Goal 3), closing the capacity gap between NMHSs (Goal 4), and strategic realignment of WMO structures and programmes (Goal 5). Thus, capacity development for Members and their NMHSs – largely realized through extra-budgetary funded projects – is key.

2.16 Individual donor countries or multi-donor trust funds are funding a number of projects that target or involve the NMHSs in RA III. Many of them are implemented through the WMO Secretariat, but also by other international agencies, development banks and regional/national organizations. These projects support the implementation of core WMO programmes and their flagship projects, such as the Severe Weather Forecasting Demonstration Project (SWFDP), Flash Flood Guidance System (FFGS), Coastal Inundation Forecasting Demonstration Project (CIFDP), etc. in addition to the regular budget. Knowing which projects are being implemented, and the partners and NMHSs implementing them, allows WMO to prioritize investments and align with WMO development partners in order to

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\(^{17}\) [https://library.wmo.int/index.php?lvl=notice_display&id=20228#.W1ehREbT8XE](https://library.wmo.int/index.php?lvl=notice_display&id=20228#.W1ehREbT8XE)

\(^{18}\) [http://www.wmo.int/earlywarnings2019/](http://www.wmo.int/earlywarnings2019/)

\(^{19}\) [https://www.unisdr.org/conference/2019/globalplatform](https://www.unisdr.org/conference/2019/globalplatform)
have the highest impact and avoid duplication. These projects address capacity development and infrastructure needs and foster partnerships.

3. **Items for discussion**

3.1 RA III is invited to:

(a) Identify how to align its Operating Plan and other regional work plans with the international and regional frameworks relevant for DRR as well as with the draft WMO Strategic Plan 2020-2023 and the WMO DRR Roadmap;

(b) Strengthen its regional partnership, especially with respect to MHEWS, and continue to engage its Members’ NMHSs at the highest level of their national DRR and climate change adaptation mechanisms and include representatives of NMHSs in their national delegations to the Regional and Global Platforms for DRR and other key stakeholder fora;

(c) Revisit its working mechanisms for DRR and consider establishing a working group on DRR, possibly in combination with a Working Group on Service Delivery, to better address regional and national differences in capacities and region-specific hazards; and,

(d) Continue to nominate WMO DRR Focal Points of its Members (through their NMHSs) which will be recorded in the WMO Country Profile Database (CPDB), as requested by Decision 3 (EC-68), and who will assist with monitoring the implementation of the WMO DRR Roadmap.

3.2 The RA III Working Groups are invited to actively engage in the development and implementation of comprehensive and integrated capacity development projects to ensure that they really address the needs of Members. The development and delivery of services by the NMHSs targeted by DRR-related capacity development activities need to consider the uniqueness of national and local sociocultural conditions, including indigenous knowledge, gender aspects and increased participation of younger generations and persons with disabilities in order to sustain resilience levels. Members are also encouraged to make use of the WMO Country Profile Database (CPDB) to inform the Secretariat and other Members about on-going projects that their NMHS is involved in.

3.3 RA III Members are further invited to contribute to MHEWC-II through voluntary and/or in-kind contributions and participation of NMHS staff. Examples from Members’ experiences and practices and from CREWS, GFCS and other projects, could be presented.

3.4 RA III Members are further invited to test the methodology for the cataloguing of high-impact weather, water and climate events in RA III, as recommended by EC-70, and provide feedback on the outcomes to the EC WG/DRR, benefitting from the pilot phase conducted in RA VI (Europe).

3.5 RA III Working Groups and Members are also invited to support the further development of the concept for the GMAS as a driver and vehicle for capacity development activities at national and regional levels and for efficient outreach to and recognition from key regional and global users and stakeholders, especially humanitarian organizations and agencies. Gathering their requirements on a GMAS will be essential for its success.

3.6 Lastly, RA III Members and the WMO Regional Centres in RA III are invited to contribute to the development of, and participate in, a WMO Coordination Mechanism that enables easy access to authoritative information and the provision of expert advice to the UN and other HAs to respond to their immediate requests in anticipation of, and during or after hydro-meteorological hazardous situations.
BACKGROUND ON CURRENT ACTIVITIES
SUPPORTING MARINE AND COASTAL SERVICES

National Marine Services Focal Points

JCOMM-5 approved the establishment of National Marine Services Focal Points (in process now – one Focal Point per WMO Member). This Focal Point will provide a direct and focused contact point within each Member, for communication and dissemination of marine and coastal service delivery information. The global network will enable Members to share best practices and facilitate a community of practice on marine and coastal service delivery.

Assessment of marine service delivery capabilities to guide future priorities

In respect of the recommendation arising from the Marine Services Assessment Report to elevate the need for dedicated focus on improving marine and coastal services at WMO, and for WMO Members, a capability assessment is planned for marine and coastal service delivery. The outcome will enable WMO to prioritize and plan activities to enhance marine and coastal service capability in specific Regions.

Support and guidance for countries undergoing the IMO Member State Audit Scheme

WMO has developed a set of guidelines to assist the IMO Audit team when they are conducting audits in respect to SOLAS obligations. SOLAS Chapter V, Regulation V, outlines the meteorological and ice service responsibilities within each country. These are reflected in WMO Technical Regulations for marine meteorological services. Members are encouraged to liaise with their relevant national regulatory authority in relation to the IMO schedule of audits.

Members wishing to know more about the IMO Audit Scheme and WMO guidelines should contact the Marine Meteorological and Ocean Affairs Division via their email address, mmo@wmo.int.

Greater recognition of the METAREA Coordinator role in delivery of SOLAS services

JCOMM-5 recognized the delivery of the IMO/WMO Worldwide Met-Ocean Information and Warning Service (WWMIWS) and the formation of a Committee comprising all METAREA Coordinators to coordinate and improve the service delivery in accordance with International Maritime Organization (IMO)/WMO service regulations. JCOMM-5 endorsed updates to the roles and responsibilities of the METAREA Coordinator, which will be included in an update in 2019, of the IMO Assembly Resolution, A.1051, governing the IMO/WMO Worldwide Met-Ocean Information and Warning Service.

Marine safety in polar waters

Marine service provision in Antarctica waters are regulated by the IMO/WMO WWMIWS and the new IMO Polar Code (implemented in 2017). The WWMIWS METAREA responsibility in RA III polar water is provided by Argentina and Chile, who also provide ice products. Ice products are available from the JCOMM Ice Logistics Portal.
JCOMM has established liaison mechanisms with the International Association of Antarctic Tour Operators (IAATO) for tour operators in polar waters, and the UN Food and Agricultural Organization (FAO) with respect to fishing. JCOMM continues to maintain a strong relationship with the IMO for safe shipping in Antarctic waters.

**Marine-related Global Data-Processing and Forecasting System (GDPFS) Regional Specialized Meteorological Center’s (RMSCs)**

To provide a common foundation for all Members to provide marine meteorological services from, a framework of marine-related RMSCs was established including modelling for wave, ocean, and marine environment emergency response, to complement existing RMSC’s for tropical cyclones and atmospheric modelling.

Nominations are currently open for the wave and ocean modelling RMSC’s. Interested Members should contact the Marine Meteorological and Ocean Affairs Division via their email address, mmo@wmo.int.

**Marine Competency implementation**

JCOMM-5 endorsed a renewed commitment to roll out the marine competencies in line with the Quality Management Framework development and publication of the (new) Guide to Competency (WMO-No. 1205). A JCOMM Task Team will form to develop specific guidance in the context of implementing competencies for marine forecasting.

**Key marine service documentation updated**

WMO-No. 558 - *Manual on Marine Meteorological Services* has been updated with refreshed mandatory and recommended procedures in accordance with WMO guidelines for technical regulations.

WMO-No. 471 - *Guide to Marine Meteorological Services* has been re-written with specific focus on documenting user requirements and providing guidance to Members looking to establish or enhance their marine meteorological services.

**Coastal Inundation activities:**

JCOMM-5 endorsed a new Expert Team on Disaster Risk Reduction which will include focus on coastal multi-hazard early warning systems and associated capacity development to improve understanding and awareness of early warnings.
2017 WMO Aeronautical Meteorology Scientific Conference

A WMO Aeronautical Meteorology Scientific Conference (AeroMetSci-2017) was held at the Centre International de Conférences of Météo-France in Toulouse, France from 6 to 10 November 2017. The conference was attended by more than 200 participants from all six WMO Regions.

The conference involved the Commission for Aeronautical Meteorology (CAeM), Commission for Atmospheric Sciences (CAS) and Commission for Basic Systems (CBS) and was in response to Decision 44 (EC-68).

The objective of the conference was to provide a forum for representatives of the scientific research community (including research institutes, universities and other academia), aeronautical meteorological service providers (public and private sector), aviation users and industry to discuss the need for and strategic direction of meteorological scientific and technological advancement in support of current and future air transport needs. This was the first such international conference convened by WMO dedicated to aeronautical meteorology science and technology since March 1968.

The 2017 conference provided an overview on the current state-of-the-art and the foreseen advances in meteorological science and technology, and the expectations for faster transfer of these advances into operations in the form of fit-for-purpose services for aviation end-users. The conference was a blend of keynote presentations, oral and poster technical presentations and panel discussions addressing the following leading topics:

(a) Science underpinning meteorological observations, forecasts, advisories and warnings comprising ice crystal icing and airframe icing research, turbulence research, significant convection research, wake vortex detection and prediction research, fog and low visibility research, space weather research, atmospheric aerosols and volcanic ash research as well as advances in observing methods and the use of observations, seamless nowcast and numerical weather prediction, probabilistic forecast and statistical methods;

(b) Integration, use cases, fitness for purpose and service delivery comprising in-cockpit and on-board meteorological capabilities, terminal area and impact-based forecast, collaborative decision-making, air traffic flow management, network management, trajectory-based operations, flight planning and user-preferred routing;

(c) Impacts of climate change and variability on aviation operations and associated science requirements comprising jet stream position, intensity and related phenomena, extreme weather events at airports and changes to established scenarios, and the re-evaluation of airframe/avionics resilience standards and certification.

Proceedings of the 2017 conference, in the form of a WMO publication, are available as AeM SERIES No. 2 (English only). The conference proceedings include the addresses given during the opening of the conference, the summaries of panel discussions, the recommendations and statement of the conference, copies of all the keynote presentations, technical oral presentations and technical poster presentations and other relevant information. In addition, the WMO Aeronautical Meteorology Programme (AeMP) website (available here) provides all materials associated with the conference.
At the conclusion of the Conference, the following recommendations and statement were formulated to better inform the planning of meteorological scientific research activities over the next 15 years consistent with aviation users’ needs and expectations:

**Recommendation 1**

In the context of **science underpinning aeronautical meteorological (MET) observations, forecasts, advisories and warnings**, the conference recommended that:

(a) Research activities demand improved access to data, especially aircraft-based observations to support validation, verification and calibration as part of a continuous improvement drive;

(b) Research efforts should be conducted in collaboration with users to ensure their needs are addressed;

(c) The transition from research to operations following validation should be accelerated and well communicated;

(d) Conveying uncertainty is required to inform risk management, but remains a challenge that needs further research and guidance; and

(e) MET hazards and their impacts on aviation should be more clearly defined and articulated.

**Recommendation 2**

In the context of **integration, use cases, fitness for purpose and service delivery**, the conference recommended that:

(a) Close collaboration within and across MET and air traffic management (ATM) communities should be actively encouraged as a prerequisite of impact assessment and an enabler to future global interoperability and harmonization;

(b) Establishing ATM users’ requirements should be a prerequisite for tailored, fit-for-purpose MET solutions;

(c) MET information must be translatable into ATM impacts to enable full integration in the strategic planning, pre-tactical and tactical decision-making phases;

(d) Probabilistic methodologies with proper verification and calibration should be applied to better convey to users where and to what extent inherent forecast uncertainties exist;

(e) Blending MET parameters through ensemble approaches that yield a higher quality, more usable forecast should be further pursued but with an acknowledgement of the potential masking of extremes;

(f) Machine-learning such as artificial intelligence could be pursued to optimize MET support to ATM in the era of ‘Big Data’;

(g) Design of systems for delivering harmonized MET information to pilots and other stakeholders should further consider the need for standardization and collaborative decision-making (CDM);

(h) An increasingly automated ATM operating environment will require supporting MET educational programmes for end-users; and

(i) The research-to-operations process for prioritized MET products and services reaching maturity should be expedited.
**Recommendation 3**

In the context of **climate change and variability on aviation and associated science requirements**, the conference **recommended** that:

(a) The potential impacts of climate change and variability on aviation operations on the ground and in the air downscaled to the local level must be well researched and communicated;

(b) The mitigation of extreme weather events and the adaptation to a changing climate demands a multidisciplinary effort involving both the physical and the social sciences. Furthermore, all stakeholders in meteorology and aviation must work together, including through WMO and ICAO, to build consensus on robust, sustainable global solutions;

(c) Responding to climate variability will require a high degree of flexibility on the aviation users’ side. While the incidence of high-impact extreme weather events are expected to increase, they will be infrequent relative to the norm. The foreseen continued growth of aviation worldwide in a changing climate scenario may present new challenges as demand for airspace capacity increases;

(d) Improved availability of and access to high-quality in-situ observations of meteorological parameters, including water vapour, is a key enabler to improving climate prediction model capabilities. The preservation of such data is essential for validating and calibrating climate predictions; and

(e) A changing climate scenario may render some of today’s aerodrome, airspace and airframe design and operation standards inadequate in the years or decades to come. Using past climatological records alone as an indicator of future climate at an airport, say, may be insufficient given the (current) rate at which the world’s climate is changing (warming).

**Statement**

The conference **stated** that:

(a) There is a tremendous amount of ongoing cross-disciplinary research in the field of aeronautical meteorology (MET). This collaborative scientific excellence should be leveraged to enable the future global air traffic management (ATM) system;

(b) The role of MET as a key enabler to aviation’s vision for a globally interoperable, harmonized ATM system of the future that is safer, more efficient and more environmentally responsible will only be realized through the accelerated transition of scientific research and technological advancement into operations based on aviation users’ needs, new and improved community partnerships, trust, transparency and openness; and

(c) As the potential impacts of climate change and variability on aviation operations become better understood, the research community should continue to advance relevant science and communicate in a style that is well understood by the user.
A global survey of aeronautical meteorological service provision was conducted by the Commission for Aeronautical Meteorology (CAeM) between November 2016 and February 2017.

The primary objective of the survey was to establish a comprehensive, consolidated global view on the existing institutional arrangements for the provision of meteorological services to international air navigation, particularly at a national level, taking into account the supporting ICAO and WMO regulatory frameworks.

More than 90% of WMO Members responded to the CAeM survey. The outcomes of the survey were collated on a global and regional basis and comprised more than 50 questions.

A full, detailed final report on the outcomes of the 2016-2017 CAeM Global Survey on Aeronautical Meteorological Service Provision was published by WMO in November 2017 as AeM SERIES No. 1 (English only).

The following provides an overview of the main findings arising from the global survey:

**MWO, AMO and AMS functions**

One of the main focuses of the survey was on the ICAO/WMO service provision functions of meteorological watch office (MWO), aerodrome meteorological office (AMO) and aeronautical meteorological station (AMS).

Globally, there are approximately 230 MWOs and at least 600 AMOs and 1,250 AMSs serving international civil aviation. In addition, aeronautical meteorological services are being provided to approximately 2,500 domestic airports worldwide.

There is a large variety of arrangements and conditions within and between States and Territories, as well as across regions, for the provision of aeronautical meteorological service. The maturity of aeronautical meteorological service providers (AMSP) varies significantly across the WMO Members.

In a majority (approximately 60%) of States and Territories, the MWO, AMO and AMS functions are provided by national meteorological and hydrological services (NMHS). Air traffic services (ATS) organizations are the second largest provider (between 15 and 25%) with 25% performing the MWO function, while military entities, airport authorities and commercial meteorological service providers complete the portfolio of AMSPs. The largest variety of entities providing ICAO/WMO functions is noticed for AMS service provision. In 20% of States and Territories, the AMS service provision is made up of a combination of these entities.

Twenty-five percent of Members have no responsibility to maintain a continuous meteorological watch over a flight information region and, therefore, do not have an MWO. Of those Members with the responsibility to maintain a continuous meteorological watch over a flight information region (or regions), 64% of Members are responsible for one MWO, and 5% of Members for two MWOs.

In total, over 80% of States and Territories have less than five AMOs. There are three States however with more than fifty AMOs, and in total there are approximately 600 AMOs in place.

While precise data on number of AMOs existing in the past is not readily available, it is considered that the number of AMOs existing today has reduced over the years as more and

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1 The numbers for AMO and AMS do not include the offices and stations of the 18 Members that did not respond.
more AMO functions are performed from a regional or centralized location. In other words, AMO are no longer always physically located at an aerodrome.

Three quarters of Members have between one and five AMSs while 12% have between six and ten AMSs. The remainder varies between 21 and 50 AMSs. It is worthwhile to note that three Members respectively have responsibility for providing 67, 71 and 153 AMSs.

Almost 50% of Members indicated that there are plans to migrate to fully automated aerodrome observations, which is already the case for 3% of Members. Almost 40% of Members indicated that there are no plans to migrate to fully automated aerodrome observations. The differences in this regard between regional associations are significant.

The reasons for not migrating fully to automated aerodrome observations vary significantly between States and Territories and across regions and includes quality issues, lack of funding or negative business cases as well as States and Territories that opt for a hybrid approach.

In a majority (70%) of States and Territories, the meteorological observational data of the AMS is made available free of charge to the NMHS. In 6% of cases a charge is involved for the NMHS and in 5% of States and Territories, the observation data is not being made available to the NMHS at all. Seventeen Members (9%) indicated that there are issues regarding the sharing and provision of the meteorological observation data in their State or Territory.

**Regulatory frameworks**

The ICAO and WMO regulatory provisions are strongly reflected in the national legal/regulatory frameworks of States and Territories. In almost 80% of Members, the MWO, AMO and AMS functions are assigned through a formal designation to service providers.

The notion of ‘meteorological authority’ is not applied uniformly by all responding States and Territories. Many AMSPs no longer perform the role of regulator, which was a common case in the past for many NMHSs serving as AMSPs. In more than 70% of Members functional separation between regulation, service provision and oversight already exists.

Twenty-five percent of Members were of the opinion that the entity providing oversight does not possess adequate expertise in aeronautical meteorology. Several Members identified oversight deficiencies ranging from having no oversight at all to a need for more guidance and assistance.

**Quality management systems (QMS) implementation**

In a majority of States and Territories, the AMSPs have fully (68%) or partially (14%) implemented QMS. This is a significant improvement compared to previous years. However, at the same time, more than 30% of Members face a regulatory risk because of lack of a QMS or only a partially implemented QMS. The main reasons for such non-compliance have been stated as lack of funding and/or human resources, or low priority given by the government.

Of the AMSPs that have fully implemented a QMS, only one in every eight is certified to the ISO 9001:2015 QMS standard. Recognizing a need to transition from ISO 9001:2008 to ISO 9001:2015 by September 2018, and in view of the lack of implementation of QMS in a number of States and Territories, it is concluded that a considerable effort is still required from Members to implement QMS and/or transition to the ISO 9001:2015 standard.
**Competency and qualification of aeronautical meteorological personnel**

WMO introduced standards for competency assessment of aeronautical meteorological personnel (applicable since 1 December 2013) and qualification standards for aeronautical meteorological forecasters (applicable on 1 December 2016). Almost 70% of States and Territories have established a national competency programme for aeronautical meteorological personnel. The frequency of the competency (re)assessment ranges typically between one and five years.

In approximately 50% of States and Territories, the AMSPs fully comply with WMO requirements for the competency assessment for aeronautical meteorological observers and forecasters as well as the qualification standards for aeronautical meteorological forecasters. Thirty percent of Members indicate that this is in progress, 10% have not started and for 10% the situation is not known due to non-response. As such, many Members face a regulatory risk because of non-compliance with the competency assessment and qualification standards.

**Funding mechanisms including cost recovery**

In approximately 40% of States and Territories the aeronautical meteorological service provision is wholly funded by the government budget, and in 20% the service provision is fully funded via cost recovery mechanisms. For 30% of States and Territories, the funding mechanism is made up of combinations of government funding, cost recovery and commercial revenues. Cost recovery for aeronautical meteorological service provision is applied in half of the States and Territories.

Cost allocation and cost recovery for the provision of aeronautical meteorological service is an issue for a number of Members. Best practices are identified as Members having a cost allocation system and a cost recovery mechanism in place. The aeronautical meteorological service provision is fully funded from either government budget or cost recovered via en route and terminal charges. If required, a fair share of the core infrastructure costs can be allocated to the costs of the aeronautical meteorological service provision via the core cost mechanism.

**Technical capacity/capability**

Almost 90% of MWO AMSPs provide WS SIGMET in combination with or without other SIGMET types or AIRMET. For 11% of Members, this is unknown, or the Members do not have an MWO responsibility, and therefore, do not issue SIGMETs. Regional differences exist as for example some regions do not provide AIRMET, and in other regions, tropical cyclones do not occur and as such WC SIGMETs are not provided. One third of Members conduct cross-border coordination for SIGMET production with MWOs in neighbouring FIRs.

Almost 80% of AMO AMSPs utilize NWP output and nowcasting products (fully or to some extent) in the forecasting process, including warnings, while a minority of approximately 10% of AMSPs do not.

Almost two-thirds of Members conduct forecast verification for either TAF, AIRMET, SIGMET or aerodrome warnings, and based on the response to the survey, this figure is expected to go up to 80% by 2019.

At the time of the survey only around one-third of Members use aircraft based observations from AMDAR, ADS and or SSR Mode S in the aeronautical meteorological forecast production process.
Challenges in service provision

New or emerging challenges amongst Members include meeting emerging technological standards such as IWXXM and to fulfil ATM user needs for improved meteorological data and services.

The top 10 priority challenges indicated by Members were: migration to XML, qualification of AMF, QMS implementation/maintenance, maintenance and calibration of observing equipment, automation of aerodrome observation, meeting demands for advanced products and services, cost-recovery implementation, competency assessment, SIGMET quality, and advanced MET information and services for terminal area.

Several Members identified other challenges such as competition from other providers (private sector, commercial providers or regionalization) on aeronautical meteorological service provision. Especially in Europe, there is the challenge to comply with the cost reduction targets of the Single European Sky, and at the same time comply with regulations and to contribute to increased safety and capacity by improving meteorological services for air traffic management.
SEVERE WEATHER FORECASTING DEMONSTRATION PROJECT IN RA-III

LETTER OF ENDORSEMENT, BY 9 PRs, OF THE RECOMMENDATIONS OF THE MEETING ON FFGS (LIMA, PERU, 16-19 AUGUST 2016)

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Case postale N° 2300
CH-1211
Geneva, Switzerland

Subject: Flash Flood Guidance Project for South America

Dear Dr Taalas:

We, the undersigned, Permanent Representatives of our respective countries to WMO, have the pleasure to inform you about the Initial Planning Meeting on the Establishment of a Flash Flood Guidance Project for South America, which was held in Lima, Peru, from the 16th to the 19 August 2016. It was organized by the World Meteorological Organization (WMO) in cooperation with the National Meteorological Service of the National Oceanic and Atmospheric Administration of the United States of America (US NWS), and the Hydrologic Research Center (HRC). The National Meteorological and Hydrological Service (SENASAH) of Peru served as co-organizer and host, with funds provided by the United States Agency for International Development / Office of U.S. Federal Disaster Assistance (USAID / OFDA).

We hereby express our approval of the conclusions and recommendations of this meeting, which are attached, and express the commitment of our Countries to participate in all activities related to the Project on flash floods that lead to the achievement of their objectives for the benefit of South America.

In this regard, we request the WMO Secretariat to take appropriate action to mobilize the necessary financial resources to implement the project according to the modalities mentioned in the annex.

I would like to thank WMO, US NMS and HRC for their work to date, as well as USAID / OFDA for their generous financial support.

Let me assure you that the WMO Secretariat and project partners will have our full support and cooperation for the successful implementation of this project.

Sincerely,

Permanent Representative of Argentina to WMO
Permanent Representative of Brazil to WMO
... Chile, Colombia, Guyana, Paraguay and President of RA III to WMO, Peru, Suriname, Ecuador
Conclusions and Recommendations from the Initial Planning Meeting

[Note that the Conclusions and Recommendations were drafted and agreed upon in Spanish. The Spanish version, which is available on the WMO website, should be used as the definite text.]

Participants of the Initial Planning Meeting for the Establishment of a Flash Flood Guidance System (FFGS) for South America, which had representatives from 12 countries of RA III as experts in meteorological and hydrological forecasting, after having examined the technical characteristics of the system and discussed the various aspects of its application in the region, agreed to make the following recommendations to the Permanent Representatives of RA III:

- It is of interest to the region to implement the Flash Flood Guidance System (FFGS) in South America in order to reduce the loss of human life and economic damages. In addition, after being informed of the objectives of the Severe Weather Forecasting Demonstration Project (SWFDP), it is considered equally important to implement it concurrently with the FFGS, including the co-location of the regional centres, where possible. It also requested that WMO conduct an introductory workshop on the SWFDP in RA III as soon as possible.

- For FFGS, in view of the extent and diversity of meteorological and hydrological phenomena and geophysical characteristics of the region, the South America should be divided into four sub-regions. The sub-regions suggested cover a) the Northwest part, b) the three Guianas, and c) and d) two regions whose final composition would be determined later.

- Based on the technical, economic and human resources capacities, regional centres should be located in some of the following countries: Argentina, Brazil, Chile, Colombia, and Peru; the latter two having also expressed interest in hosting a Regional Centre. It should be noted that the sub-region b) should be supported by an external Regional Centre, as this has been successfully undertaken in regional projects in other parts of the world.

- The functionalities of each sub-regional system must be developed to reflect the needs of the participating countries. In addition to providing tools for hydrological and meteorological forecasters to develop timely and site-specific alerts for flash floods, the system should include optional items to help forecasters in developing alerts for: areas that have available high resolution Radar information, urban areas of selected cities experiencing false flooding, landslides and riverine floods.

- To consider starting implementation of the system in sub-region a).

In view of the above, to request WMO, through communication from the President of RA III to the Secretary-General, to take the necessary steps to mobilize the necessary resources to carry out the detailed actions herein described above.
Asunto: Proyecto de guía para crecidas repentina para América del Sur

Estimado Profesor Taalas:

Los abajo firmantes, Representantes Permanentes de nuestros respectivos Países ante la OMM, tenemos el placer de dirigirnos a Usted para referirnos a la reunión de planificación inicial del Proyecto de guía para crecidas repentina para América del Sur, celebrada en Lima, Perú, del 16 al 19 de agosto de 2016, y organizada por la Organización Meteorológica Mundial (OMM) en cooperación con el Servicio Meteorológico Nacional (SMN) de la Administración Nacional del Océano y de la Atmosfera de Estados Unidos de América (NOAA), el Centro de investigación hidrológica (CIH), en la que el Servicio Nacional de Meteorología e Hidrología (SENAHMI) de Perú ejerció de coororganizador y anfitrión, con fondos aportados por la Oficina de Asistencia para Desastres en el Extranjero de la Agencia de los Estados Unidos para el Desarrollo Internacional (USAID/OFDA).

A través de la presente queremos manifestarle nuestra aprobación de las conclusiones y recomendaciones de dicha reunión, anexas, y expresar el compromiso de nuestros Países de participar en todas las actividades relacionadas con el Proyecto de guía de crecidas repentina que conduzcan al logro de sus objetivos en beneficio de América del Sur.

En este sentido, le solicitamos sus buenos oficios para que la Secretaría de la OMM emprenda las acciones pertinentes para movilizar los recursos financieros necesarios para implementar el proyecto según las modalidades mencionadas en el anexo.

Quisiéramos expresarle nuestro agradecimiento a la OMM, al SMN de la NOAA y al CIH por la labor que han realizado hasta la fecha, así como a USAID/OFDA por su generoso apoyo financiero.

Permitamos asegurarle que la Secretaría de la OMM y los asociados en el proyecto contarán con nuestro apoyo y cooperación plenos para la ejecución satisfactoria de este proyecto.

Atentamente,

Prof. Andrea Celeste Saulo
Representante Permanente de Argentina ante la OMM

Mr. Francisco de Assis Diniz
Representante Permanente de Brasil ante la OMM
Dr. Guillermo E. NAVARRO
Representante Permanente de Chile ante la OMM

Dr. Omar FRANCO TORRES
Representante Permanente de Colombia ante la OMM

Mr. Garvin CUMMINGS
Representante Permanente de Guyana ante la OMM

Lic. Julian BAEZ
Representante Permanente de Paraguay y Presidente de la AR III ante la OMM

Ing. Amelia Ysabel DIAZ PABLO
Representante Permanente de Peru ante la OMM

Mr. Cornelis R. BECKER
Representante Permanente de Suriname ante la OMM

Sr. Jose OLMEDO
Representante Permanente de Ecuador ante la OMM
IMPLEMENTATION AND COORDINATION OF REGIONAL CLIMATE CENTRE OPERATIONS IN RA III

Regional Climate Centre implementation

(1) Since its Sixteenth Session, Regional Association III has been progressing in the implementation of Regional Climate Centres (RCCs). In accordance with Resolution 5 (RA III-16, September 2014), the RCC implementation in RA III comprises RCC Western South America (RCC-WSA), RCC-Network Southern South America and RCC-Network Northern South America.

RCC Western South America

(2) RCC Western South America (RCC-WSA) hosted by the Centro Internacional para la Investigación del Fenómeno de El Niño (CIIFEN), after the successful completion of its demonstration phase, was formally designated by Cg-17 as a WMO RCC serving the countries in western South America, namely Bolivia, Chile, Colombia, Ecuador, Peru and Venezuela.

(3) A flagship activity of RCC-WSA is the Western Coast of South America Climate Outlook Forum (WCSACOF) with sessions being organized on an annual basis, generally at the end of the year, and with the rotation principle applied to host WCSACOF sessions.

RCC-Network Southern South America

(4) RCC-Network Southern South America (RCC-Network-SSA) co-led by Argentina and Brazil, upon completion of its demonstration phase, was formally designated by EC-69 as a WMO RCC-Network. RCC-Network-SSA comprises two nodes with seamlessly distributed responsibilities, namely (i) Buenos Aires Node led by Servicio Meteorológico Nacional de Argentina (SMN) and (ii) Brasilia Node led by Instituto Nacional de Meteorologia (INMET), Brazil. The NMHSs of Paraguay and Uruguay serve as participant members, and the NMHSs of Bolivia and Chile are associate members contributing to the RCC-Network, with a number of other institutions serving as collaborating partners.

(5) RCC-Network-SSA coordinates the operation of the Southern South America Climate Outlook Forum (SSACOF), which was launched in 1997 and has been held regularly since then, once a year during the fourth quarter, by rotation among the participant countries.

Implementation of the Climate Services Information System

(6) Significant progress has been achieved in the implementation of the Climate Services Information System (CSIS) on a global and regional scale under the auspices of the Implementation Coordination Team for CSIS (ICT-CSIS) of the Commission for Climatology (CCI). Two important events were conducted, Developers Meeting on the GFCS-Relevant Climate Data, Products, and Tools (December 2016, Geneva, Switzerland) and WMO International Workshop on Climate Services Information System Operations and Coordination (March 2017, Nanjing, China), with important outcomes: a tangible action plan was developed for climate service delivery through CSIS operations, with a special focus on CSIS implementation at the national level. A prototype of the Climate Services Toolkit (CST) – a
suite of guidance, data, software tools and training resources – was also developed as an enabling component for CSIS implementation at regional and national levels.

(7) Acknowledging the CSIS progress, the Executive Council has requested through Decision 15 (EC-69), *inter alia:*

- the presidents of CCI and CBS, in consultation with presidents of other technical commissions, to provide guidance to the regional associations on how to implement the CSIS within their regions, building on lessons learned from all regions;

- the regional associations to promote the implementation of the CSIS at regional level, and to provide guidance to NMHSs in optimally utilizing global and regional CSIS products to strengthen climate services on a national scale.

(8) On the occasion of the completion of two decades of Regional Climate Outlook Forum (RCOF) operations around the world, WMO organized an *International Workshop on Global Review of Regional Climate Outlook Forums (5-7 September 2017, Guayaquil, Ecuador).* Its overarching outcomes were the recommendations to work towards the next generation RCOF process, including the mainstreaming of objective seasonal climate forecasting underpinning RCOF products, expanding product portfolio, based on standardized operational practices identified during the workshop, the integration of seasonal outlooks in decision-making processes at country level, an improved partnership and user engagement in the RCOF process.

(9) Through its Decision 9 (EC-70) on Promoting the Use and Interpretation of Climate Change Projections on Regional and National Scales, the Executive Council has encouraged regional collaboration. This collaboration includes adapting the RCOF format as a means of disseminating expert consensus and facilitating discussion among sub-regional groupings of Members sharing common climate characteristics on consistent approaches in interpreting and using regional climate change projections.

**CSIS Regional Approach**

(10) The first three objectives of the country-focused results-based framework (RBF) for WMO contributions to the GFCS, approved in Decision 16 (EC-68), focus on country-level implementation, supported with guidance materials and capacity development assistance as well as by an institutional architecture comprising regional and global centres. The combination of these ingredients is intended to be sufficient in principle to enable any WMO Member to complete the full climate services value chain to address high-priority national-level needs and requirements, exemplified by the CSIS Regional Approach depicted in the schematic below:
An extraordinary meeting of Presidents of Regional Associations and Presidents of Technical Commissions (PRA-PTC) was held on 19 June 2018 in Geneva, Switzerland ([http://www.wmo.int/pages/prog/wcp/meetings/wmo-gfcs2018.html](http://www.wmo.int/pages/prog/wcp/meetings/wmo-gfcs2018.html)). This meeting considered the CSIS regional approach with RCCs playing a central role as an integral part and enabling factor of strengthening the global-regional-national operations of the CSIS. A draft summary report is provided as an Annex to this INF.

**Seventeenth session of the Commission for Climatology**

The Commission for Climatology (CCI) held its seventeenth session (CCI-17) in Geneva on 10 and 13 April 2018 and re-elected Ms Barbara Tapia of Chile as its Vice-President.

A new working structure was adopted by CCI-17, which will address the effective implementation of CSIS across the whole value chain at global, regional and national levels. It comprises four focus areas, namely (i) Climate Monitoring, Data and Assessment, (ii) Climate Services Information System (CSIS) Operations, (iii) Climate Services for Societal Benefits and (iv) Capacity Development for Climate Services, and an Implementation Coordination Team for the Climate Services Information System (ICT-CSIS).

**Status of the Provision and Exchange of Selected Climate Dataset**


Annex: 1
ANNEX

WORLD METEOROLOGICAL ORGANIZATION

Extraordinary Meeting of
Presidents of Regional Associations and
Presidents of Technical Commissions

Mechanism for WMO contributions to the
GFCS, with participation by representatives of
WMO and co-sponsored programmes

GENEVA, 19 JUNE 2018

DRAFT SUMMARY REPORT

This report summarizes the outcomes of the June 2018 Extraordinary Meeting of presidents of regional associations, presidents of technical commissions, and representatives of WMO and co-sponsored programmes, chaired by the President of WMO, designated by Decision 16 (EC-68) as the mechanism for WMO contributions to the Global Framework for Climate Services (GFCS). The meeting reviewed follow-up actions from the previous meeting, in January 2018, and identified next steps. All data, presentations and other materials related to the meeting are available at http://www.wmo.int/pages/prog/wcp/meetings/wmo-gfcs2018.html.

The meeting reviewed presentations on the status of climate services implementation in each regional association based on checklists completed by 109 Members. The presentations identified priority needs within each region, how such needs can be addressed, and areas for further support from the technical commissions and co-sponsored programmes. Relevant information in this regard was provided via a presentation by the Copernicus Climate Change Service (C3S) as well as by presidents and representatives of WMO technical commissions.

Main findings

Areas of need across regions

Frequently-cited needs across regions include:

(a) A relatively low number of completed checklists received from some regions, despite intensive efforts made by the regional associations to date, and a continued need for completed checklists from all Members,

(b) Bringing the climate services capacity to more even levels both within and across regions, especially in climate-sensitive sub-regions where capacity is still low in relation to demand,

(c) Strengthening the user interface at the country level, with more emphasis on identifying precisely who the users/stakeholders are, their specific needs and how to meet them, and documenting the socio-economic benefits of climate services,

(d) Improved and more diverse tailored products to support specific services, including strengthening specific service areas that need further development, such as ocean and marine services,
(e) Strengthening the global-regional-national operational climate services information system, including:
   (i) Reinforced data management and exchange processes with the registration of data and products in WIS,
   (ii) Support in acquiring and using outputs from the Global Producing Centres of Long-Range Forecasts (GPCLRFs) and C3S.

(f) Systematic efforts to address frequently-occurring needs, such as WIS and WIGOS implementation; data rescue; data management; constructing and accessing gridded datasets on the Essential Climate Variables; accessing and using GPCLRF outputs; Regional and National Climate Outlook Forum strengthening and enhancement; National Frameworks for Climate Services (NFCSs); national plans for climate services; tailored products and services for high-demand areas such as for DRR, agriculture, water, health and energy; and documenting associated socio-economic benefits.

Additional and region-specific needs are identified in the presentations accessible through the link provided above.

Climate-water synergies

Many similarities were noted between climate needs and those in hydrology. Needs in hydrology revolve around the same basic issues: data management and exchange, service delivery, and capacity development. CHy is currently updating guidelines on managing National Hydrological Services addressing these areas. The hydrological community has also established facilities, such as the Global Hydrometry Support Facility, to address such needs. Although there are currently no regional water centres, experimentation is underway with some national services to potentially play this role. Regional climate centres could also conceivably take on a wider range of water-related functions. Another approach involving joint climate/hydrological services could therefore be of value.

Recommended resources and measures

In general, two complementary strategies were identified in order to address the needs emanating from the regional association analyses. One of these is to address frequently-occurring functional weak points, such as those concerning data rescue, or the implementation of methodologies for documenting socio-economic benefits in a more comprehensive and systematic way in each region. The other is to address specific needs as they arise in the course of enhancing global-regional-national operational systems and in the country-level delivery of specific associated services. The latter strategy involves a targeted “problem solving” approach, where capacities are developed in specific areas in order to enable the delivery of a specific, high-impact/high-demand, service on a case-by-case basis.

(1) Measures to address the first category of frequently-occurring, cross-cutting, functional needs, include:
   (a) The completion and regular updating of climate services checklists, accompanied by periodic capacity audits of the climate services of regional centres and NMHSs, similar to those carried out by IATA on aviation (CCI ISO quality management guidelines for climate services, currently in the process of being published, could be useful in this regard),
   (b) A more systematic documentation of the capacity development resources available to meet common functional need areas, and making those resources available through the WMO Global Campus, including through an e-library and calendar of events, so that all regions are not doing it independently (see learn.wmo.int), while targeting region-specific needs,
Making commission capacity development and technical resource materials more easily available, through training programmes, the climate services toolkit, and twinning between Members,

A more extensive translation of relevant WMO capacity development and technical resources into more WMO languages,

A greater use of the Regional Climate Forums as planning, organizing and integrating mechanisms for engaging regional centres and NMHSs, regional association working groups, technical commission experts, researchers, and representatives from WMO global centres, in order to strengthen the operational systems needed to support country-level service delivery more systematically,

Incorporating climatological and hydrological data and products, and the exchange thereof, into the design and implementation of the future seamless GDPFS:

(i) ECMWF is already a partner; the C3S Climate Data Store could become a platform for the distribution of data and products, and more digital data platforms (C3S and other WMO centres) should begin to interact operationally,

(ii) Scale-up of existing sound data management approaches (e.g. those of NOAA),

(iii) Greater emphasis could be put on RCCs as operational centres within the GDPFS in support of NMHS service delivery, and as a source of knowledge exchange and capacity development within regions. Furthermore, the use of any findings resulting from the upcoming CCl-led review of the RCCs’ mandatory and recommended functions could be an opportunity to introduce more flexibility into how RCCs operate and support NMHSs, including potentially with respect to their operational role in hydrology.

Measures to identify and address specific needs in the second category, for strengthening full value-chain operational systems with country-level service delivery, include:

(a) Identification of high-priority/high-impact services in high demand across countries in each region, e.g. as reflected in Nationally Determined Contributions to the Paris Agreement, National Adaptation Plans, and other national policies and plans,

(b) Identification of measures, processes and resources for systematically strengthening operational systems (i.e. involving routine operational exchange of climate/water data and products among NMHSs, regional and global centres) and the country-level provision of high-priority associated services, and for documenting the benefits of such services,

(c) Establishment of a joint plan on climate services identifying the measures to be taken at national and regional levels (RCCs/NMHSs/end users), including the establishment of NFCSs where necessary,

(d) Regional and global upscaling of existing demonstrations of tailored products and associated services which have already been shown to deliver societal benefits.

Next steps

The draft WMO Strategic Plan 2020-2023, and the need to prepare an update and plan for the Eighteenth Congress on WMO contributions to the GFCS as part of the implementation of the Strategic Plan, are further reasons why the preparation of action plans incorporating the above-mentioned elements is now needed. Such plans should include intended outcomes to be achieved by the end of 2023 and the critical path and core actions necessary for achieving them.
As outlined above, there are two main lines of action:

- The first is to address frequently-occurring cross-cutting needs in a more systematic manner,

- The second is to promote and strengthen integrated national-regional-global full value-chain operational systems and the country-level delivery of associated high-priority/high-impact services and documentation of the results and benefits.

These two lines of intervention entail both regional- and global-level actions.
Regional plans

Presidents of regional associations are requested to prepare a five-year plan for each region, irrespective of resources. These should be ready for discussion during the next PRA-PTC meeting in January 2019. These plans should identify:

(a) A set of high-impact/high-priority services in specific countries within each region and the measures needed to establish or strengthen such services with regional and global support,

(b) The highest-priority cross-cutting functional needs in the region, relevant capacity development and technical resources available for addressing those needs, and how to make such resources readily accessible to Members.

The Secretariat is requested to work with regional associations and members to seek to mobilize extra-budgetary resources in order to implement regional plans. Regional Climate Forums, regional association sessions and meetings, and project meetings can be used as planning and implementation vehicles and Secretariat facilitation in this regard is also requested.

Global plans

The presidents of CBS, CCI and CHy are requested to prepare a plan aimed at providing core resources for the implementation of the national-regional-global operational systems needed to support country-level service delivery as part of the overall plan related to the implementation of the future seamless GDPFS, with linkages to C3S as appropriate. This global plan will subsequently be adapted to fit regional circumstances, through the Regional Climate Forums, the RCC functional review, and other mechanisms.

The presidents of technical commissions are also requested to reflect on some of the needs identified above that could be addressed in their areas, and any relevant technical resources and mechanisms for their delivery which could be drawn upon, bearing in mind that services are generically defined at this point and that particular support for the implementation of specific services addressing health, disasters, water resources, agriculture, energy and other national priorities will be identified through the regional planning process.

The Secretariat is requested to provide consolidated support on access to training and other capacity development resources. The Secretariat, specifically the GFCSO, is further requested to facilitate access to and engagement with partner organizations. A particular area that requires further attention, and for which such engagement could be beneficial, is the strengthening of Members’ capacity to document socio-economic benefits. Finally, the Secretariat is requested to facilitate the ongoing monitoring of the results of these efforts through the climate services checklist and the presentation of the status of climate services, together with the above-mentioned plans, highlighting any necessary decisions that need to be made, for the Eighteenth World Meteorological Congress.

Strengthening the information base for planning and results monitoring

Members who have not done so already are requested to complete the climate services checklist. Regional associations are requested to continue their efforts to encourage Members to provide this information, and to continue their analysis thereof, with continued support from the Secretariat.

___________
WMO SECRETARIAT LETTER ON MAPPING OF CENTRES
ONTO NEW TYPES OF CENTRES

Our ref.: 11430/2018/DPPS/New Manual/GDPFS-2018

Annexes: 2 (available in English only)

Subject: Publication of the revised Manual on the Global Data-processing and Forecasting System (GDPFS) (WMO-No. 485)

Action required: To confirm the mapping of WMC and/or RSMC currently hosted by your Service onto the new types of centres (taking into account their functions described in the revised Manual on the GDPFS) at your earliest convenience.

Dear Sir/Madam,

In reference to the WMO letter dated 15 June 2016, ref: 8384-16/WDS-DPFS/New Manual on GDPFS-2016 (see Annex I), I am pleased to inform you that the new Manual on the Global Data-processing and Forecasting System (GDPFS) (WMO-No. 485), as approved by the WMO Executive Council, through Resolution 18 (EC-69), has been published on 16 February 2018 and available on the WMO website at the following link:

https://library.wmo.int/opac/doc_num.php?explnum_id=4246

WMO Members hosting a World Meteorological Centre (WMC) and/or a Regional Specialized Meteorological Centre (RSMC) are requested to confirm the mapping of WMC and/or RSMC (see Annex I) in their respective country, onto the corresponding new types of centres in line with the functions described in the revised Manual on the GDPFS. Several Members have already confirmed mapping (see Annex II). Please verify also whether your inputs were appropriately included.

Please note that the Centres with confirmed mapping are required to demonstrate their capabilities by the Eighteenth session of the World Meteorological Congress (Cg-18), in June 2019, in order to retain the new designation beyond Cg-18. Members currently hosting RSMCs with geographical specialization are reminded to ensure mapping of their centre onto the new types of centres, considering that RSMCs with geographical specialization will cease to exist after Cg-18.

In this regard, I wish to bring to your attention that as a part of the transitional arrangements recommended by CBS-Ext.(2014), Cg-17 (2015) agreed that the existing WMCs and RSMCs will retain their current status until the Cg-18 in 2019. To retain the status beyond Cg-18, they need to demonstrate full compliance with the designation criteria.

To: Permanent Representatives (or Directors of Meteorological or Hydrometeorological Services) of Members of WMO (limited distribution)
(Africa, Argentina, Armenia, Australia, Austria, Brazil, Canada, China, Egypt, Fiji, France, Germany, Hungary, India, Italy, Japan, Kenya, Korea (Republic of), Netherlands, New Zealand, Norway, Russian Federation, Saudi Arabia, Senegal, Serbia, South Africa, Spain, Sweden, Tunisia, Turkey, UK, USA, Uzbekistan)
Director General of ECMWF
I would like to take this opportunity to express my sincere thanks to you and your Service for your continued support to the WMO Global Data-processing and Forecasting System (GDPS).

Yours faithfully,

(W. Zhang)
for the Secretary-General
RA III-17/INF. 3.3(3), p. 3

ANNEX I

Our ref.: 8384-16/WDS-DPFS/New Manual on GDPFS-2016

GENEVA, 15 June 2016

Annexes: 2 (available in English only)

Subject: Revision of the Manual on the Global Data-processing and Forecasting System (GDPFS) (WMO-No. 485)

Action required: To confirm the mapping of the WMC and/or RSMC currently hosted by your Service onto the new designations (taking into account their functions described in the revised Manual on the GDPFS) at your earliest convenience but not later than 15 August 2016.

Dear Sir/Madam,

The Manual on the Global Data-processing and Forecasting System (GDPFS) (WMO-No. 485) is the single source of technical regulations for all operational data-processing and forecasting systems of WMO Members, including their designated meteorological centres. Following the request by the Commission for Basic Systems, at its fourteenth session (CBS-XIV, 2009), progress has been made with the revision of the Manual on the GDPFS, including the development of an outline for a new Manual, which was adopted by the Sixteenth World Meteorological Congress (Cg-XVI, 2011) through Resolution 6 (Cg-XVI). Noting that the new Manual introduces a number of changes to the current procedures, the Commission for Basic Systems, at its 2014 extraordinary session (CBS-Ext.(2014)), considered the comprehensive summary of changes of functions and procedures that would ensure a smooth transition to the new Manual. Acknowledging that the new Manual is being developed in accordance with quality management principles, which ensure its sustainability as part of the WMO Quality Management Framework (QMF), and would facilitate the review of compliance of GDPFS Centres against the designation criteria, CBS-Ext.(2014) recommended a roadmap for the completion of the new Manual (which will replace the current version), including transition arrangements for its implementation to manage the technical changes and the initial designation of the GDPFS Centres as defined in the new Manual, including World Meteorological Centres (WMCs) and Regional Specialized Meteorological Centres (RSMCs), which were approved by the Seventeenth World Meteorological Congress (Cg-17, 2015) in Resolution 12 (Cg-17).

I wish to bring to your attention that the new Manual introduces a clear definition for a WMC, for which a WMC shall be appointed if fulfilling the following functions:

- RSMC for global deterministic numerical weather prediction;
- RSMC for global ensemble numerical weather prediction; and
- RSMC for global numerical long-range prediction (known as Global Producing Centre for Long-range Forecasts).

To: Permanent Representatives of Members of Algeria, Argentina, Armenia, Australia, Austria, Brazil, Canada, China, Egypt, Fiji, France, Germany, Hungary, India, Italy, Japan, Kenya, Korea (Republic of), Netherlands, New Zealand, Norway, Russian Federation, Saudi Arabia, Senegal, Serbia, South Africa, Spain, Sweden, Tunisia, Turkey, UK, USA and Uzbekistan.

Director General of ECMWF
In addition, as per the summary of changes of functions and procedures, RSMCs with geographical specialization would become RSMCs with specialization in one (or more) of the following activities:

- RSMC for regional severe weather forecasting;
- RSMC for global deterministic numerical weather prediction;
- RSMC for limited-area deterministic weather prediction;
- RSMC for global ensemble numerical weather prediction; and
- RSMC for limited-area ensemble numerical weather prediction.

RSMCs with other activity specialization are redefined in the new Manual for clarity in the description of functions, not altering the designation criteria.

As part of the above-mentioned roadmap, WMO Members hosting a WMC and/or an RSMC are invited to confirm the mapping of the WMC and/or RSMC currently hosted by your Service (as per Appendix I-1 of the current version of the Manual on the GDPFS, Annex I) onto the corresponding designations (taking into account their functions described in the revised Manual on the GDPFS) at your earliest convenience but not later than 15 August 2016. Also for your easy reference, I wish to inform you that the draft version of the revised Manual (table of contents given in Annex II) is available on the WMO website at:


This version takes into account comments received by WMO Members following the request to review its content in the WMO circular letter ref. WDS-DPFS/New Manual on GDPFS-2015, dated 11 May 2015.

I wish to recall that as part of the transitional arrangements recommended by CBS-Ext.(2014), Cg-17 agreed that the existing WMCs and RSMCs will retain their status until the Eighteenth session of the World Meteorological Congress (Cg-18) in 2019; and to retain status after Cg-18, they need to demonstrate compliance by Cg-18.

I would like to take this opportunity to express my personal gratitude to you and your Service for your continued support in making meteorological products of the WMO’s Global Data-processing and Forecasting System (GDPFS), including Emergency Response Activities (ERA), increasingly more relevant in the world.

Yours faithfully,

[Signature]

(E. Manaenkova) for the Secretary-General
ANNEX I

Confirmation form for mapping of the WMC and/or RSMC hosted by your Centre

WMO MEMBER: ___________________________  E-mail address: ___________________________

Focal Point: ___________________________

O1. World Meteorological Centre (WMC)

The new Manual introduces a clear definition for a WMC, which WMC shall be appointed if
fulfilling the following functions:

- RSMC for global deterministic numerical weather prediction;
- RSMC for global ensemble numerical weather prediction; and
- RSMC for global numerical long-range prediction (known as GPC).

If you currently host a WMC, please answer YES or NO to confirm your will to map its functions
onto a new designation of WMC:

<table>
<thead>
<tr>
<th>Designated Centre</th>
<th>Mapping confirmation (Yes/No)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Melbourne (Southern hemisphere only)</td>
<td></td>
</tr>
<tr>
<td>Moscow</td>
<td></td>
</tr>
<tr>
<td>Washington</td>
<td></td>
</tr>
</tbody>
</table>

O2. Regional Specialized Meteorological Centre (RSMC) with geographical specialization

RSMCs with geographical specialization would become RSMCs for one (or more) of the
following activities:

(1) RSMC for regional severe weather forecasting;
(2) RSMC for global deterministic numerical weather prediction;
(3) RSMC for limited-area deterministic weather prediction;
(4) RSMC for global ensemble numerical weather prediction; and
(5) RSMC for limited-area ensemble numerical weather prediction.

If you currently host an RSMC with geographical specialization, please answer YES if you
confirm your will to map its functions onto a new designation(s) of one (or more) of RSMC(s).

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<th>(2) RSMC for global deterministic numerical weather prediction</th>
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### Q3. Regional Specialized Meteorological Centre (RSMC) with activity specialization

If you currently host an RSMC with activity specialization, please answer YES or NO to confirm your will to map its functions onto a new designation of its corresponding RSMC.

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<td><strong>European Centre for Medium-range Weather Forecasts (ECMWF)</strong></td>
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If you currently host an RSMC with activity specialization for Region VI (Europe), please answer YES or NO to confirm your will to map its functions onto a new designation and indicate the corresponding RSMC:

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<th>Mapping confirmation (Yes/No), if yes, please indicate the corresponding RSMC</th>
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<td>RSMC for the Provision of Ultraviolet-index forecasts for Region VI (Europe)</td>
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<td>Offenbach</td>
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</table>
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1. World Meteorological Centres (WMCs)
The new Manual introduces a clear definition for a WMC, which WMC shall be appointed if fulfilling the following functions:
- RSMC for global deterministic NWP;
- RSMC for global ensemble NWP; and
- RSMC for global numerical long-range prediction (known as GPC).

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<td>Washington</td>
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<tr>
<td><strong>New WMCs designated by EC-69 (2017)</strong></td>
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<td>UK (Exeter)</td>
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<td>Japan (Tokyo)</td>
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<td>China (Beijing)</td>
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<tr>
<td>ECMWF (Reading)</td>
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<tr>
<td><strong>Designation of new WMC (to designated by EC-70 in June 2018)</strong></td>
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<tr>
<td>Germany (Offenbach)</td>
<td>In consideration</td>
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2. Regional Specialized Meteorological Centre (RSMC) with geographical specialization
The Members who are currently hosting RSMCs with geographical specialization are especially required to map themselves against any of new types of centres considering that RSMCs with geographical specialization will cease to exist after Congress-18 in 2019. Such RSMCs may become RSMCs for one (or more) of the following activities depending upon their functions and capacities:
(1) RSMC for regional severe weather forecasting;
(2) RSMC for global deterministic NWP;
(3) RSMC for limited-area deterministic NWP;
RA III-17/INF. 3.3(3), p. 12

(4) RSNC for global ensemble NWP; and
(5) RSNC for limited-area ensemble NWP.

Therefore, Members hosting RSNCs with geographical specialization, are requested to please answer YES if they confirm their Centre(s) will to map its functions onto a new designation(s) of one (or more) of following RSNC(s).

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### 3. Regional Specialized Meteorological Centre (RSMC) with activity specialization

If you currently host an RSMC with activity specialization, please answer YES or NO to confirm your will to map its functions onto a new designation of its corresponding RSMC.

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<th>Mapping confirmation received at WMO (Yes/No)</th>
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CARTA DE LA SECRETARÍA DE LA OMM SOBRE LA CLASIFICACIÓN DE CENTROS SEGÚN LOS NUEVOS TIPOS DE CENTROS

Estimado Señor/Estimada Señora:

En relación con la carta de la Organización Meteorológica Mundial (OMM), de referencia 8384-16/WDS-DPFS/New Manual on GDPFS-2016 (véase el apéndice I), con fecha 15 de junio de 2015, me complace informarle de que la nueva versión del Manual del Sistema Mundial de Proceso de Datos y de Predicción (OMM-N° 465), aprobada por el Consejo Ejecutivo de la OMM en virtud de la Resolución 18 (EC-69), ha sido publicada el día 16 de febrero de 2018 y se encuentra disponible en el sitio web de la Organización en la siguiente dirección:

https://library.wmo.int/opac/doc_num.php?explnum_id=4246

Se ruega a los Miembros de la OMM que acogen un Centro Meteorológico Mundial (CMM) y/o un Centro Meteorológico Regional Especializado (CMRE) que confirmen la clasificación de dichos centros en sus países (véase el anexo I) respecto de las nuevas designaciones con arreglo a las funciones descritas en la versión revisada del Manual del Sistema Mundial de Proceso de Datos y de Predicción. Se ruega a los Miembros que ya han confirmado dicha clasificación (véase el apéndice II) que comprueben que la información que han aportado ha sido introducida correctamente.

Sirvase tomar nota de que los centros cuya clasificación ha sido confirmada deberán demostrar que tienen capacidad para operar según sus nuevas funciones antes del Decimoctavo Congreso Meteorológico Mundial, que tendrá lugar en junio de 2019, a fin de poder conservar la nueva designación con posterioridad a este. Se recuerda a los Miembros que actualmente acogen CMRE con especialización geográfica que deben asegurarse de clasificar sus centros respecto de las nuevas designaciones, tomando en consideración que los CMRE con especialización geográfica cesarán sus actividades con posterioridad al Decimoctavo Congreso Meteorológico Mundial.

A los Representantes Permanentes (o Directores de los Servicios Meteorológicos o Hidrometeorológicos) de los Miembros de la OMM (distribución limitada)

(Argelia, Argentina, Armenia, Australia, Austria, Brasil, Canadá, China, Egipto, Fiji, Francia, Alemania, Hungría, India, Italia, Japón, Kenia, Corea (República de), Países Bajos, Nueva Zelanda, Noruega, Federación de Rusia, Arabia Saudita, Senegal, Serbia, Sudáfrica, España, Suecia, Túnez, Turquía, Reino Unido, Estados Unidos de América y Uzbekistán)

Director General del Centro europeo de predicción meteorológica a medio plazo
A este respecto, quisiera señalar a su atención que como parte de las disposiciones de transición, que recomendó la Comisión de Sistemas Básicos (CSB) en su reunión extraordinaria de 2014, el Decimoseptimo Congreso Meteorológico Mundial, en 2015, acordó que la condición actual de los CMM y los CMRE existentes se mantendría hasta el Decimoctavo Congreso Meteorológico Mundial que tendrá lugar en 2019. Para mantener dicha condición con posterioridad al Decimoctavo Congreso Meteorológico Mundial, estos centros deberán demostrar que cumplen plenamente con los criterios de designación.

Quisiera aprovechar la oportunidad para expresarle mi agradecimiento a usted y a su Servicio por su constante apoyo al Sistema Mundial de Proceso de Datos y de Predicción de la OMM.

Le saluda atentamente.

(W. Zhang)
por el Secretario General
Our ref.: 8384-16/WDS-DPFS/New Manual on GDPFS-2016

Annexes: 2 (available in English only)

Subject: Revision of the Manual on the Global Data-processing and Forecasting System (GDPFS) (WMO-No. 485)

Action required: To confirm the mapping of the WMC and/or RSMC currently hosted by your Service onto the new designations (taking into account their functions described in the revised Manual on the GDPFS) at your earliest convenience but not later than 15 August 2016

Dear Sir/Madam,

The Manual on the Global Data-processing and Forecasting System (GDPFS) (WMO-No. 485) is the single source of technical regulations for all operational data-processing and forecasting systems of WHO Members, including their designated meteorological centres. Following the request by the Commission for Basic Systems, at its fourteenth session (CBS-XIV, 2009), progress has been made with the revision of the Manual on the GDPFS, including the development of an outline for a new Manual, which was adopted by the Sixteenth World Meteorological Congress (Cg-XVI, 2011) through Resolution 6 (Cg-XVI). Noting that the new Manual introduces a number of changes to the current procedures, the Commission for Basic Systems, at its 2014 extraordinary session (CBS-Ext.(2014)), considered the comprehensive summary of changes of functions and procedures that would ensure a smooth transition to the new Manual. Acknowledging that the new Manual is being developed in accordance with quality management principles, which ensure its sustainability as part of the WMO Quality Management Framework (QMF), and would facilitate the review of compliance of GDPFS Centres against the designation criteria, CBS-Ext.(2014) recommended a roadmap for the completion of the new Manual (which will replace the current version), including transition arrangements for its implementation to manage the technical changes and the initial designation of the GDPFS Centres as defined in the new Manual, including World Meteorological Centres (WMCs) and Regional Specialized Meteorological Centres (RSMCs), which were approved by the Seventeenth World Meteorological Congress (Cg-17, 2015) in Resolution 12 (Cg-17).

I wish to bring to your attention that the new Manual introduces a clear definition for a WMC, for which a WMC shall be appointed if fulfilling the following functions:

- RSMC for global deterministic numerical weather prediction;
- RSMC for global ensemble numerical weather prediction; and
- RSMC for global numerical long-range prediction (known as Global Producing Centre for Long-range Forecasts).

To: Permanent Representatives of Members of Algeria, Argentina, Armenia, Australia, Austria, Brazil, Canada, China, Egypt, Fiji, France, Germany, Hungary, India, Italy, Japan, Kenya, Korea (Republic of), Netherlands, New Zealand, Norway, Russian Federation, Saudi Arabia, Senegal, Serbia, South Africa, Spain, Sweden, Tunisia, Turkey, UK, USA and Uzbekistan

Director General of ECMWF
In addition, as per the summary of changes of functions and procedures, RSMCs with geographical specialization would become RSMCs with specialization in one (or more) of the following activities:

- RSMC for regional severe weather forecasting;
- RSMC for global deterministic numerical weather prediction;
- RSMC for limited-area deterministic weather prediction;
- RSMC for global ensemble numerical weather prediction; and
- RSMC for limited-area ensemble numerical weather prediction.

RSMCs with other activity specialization are redefined in the new Manual for clarity in the description of functions, not altering the designation criteria.

As part of the above-mentioned roadmap, WMO Members hosting a WMC and/or an RSMC are invited to confirm the mapping of the WMC and/or RSMC currently hosted by your Service (as per Appendix I-1. of the current version of the Manual on the GDPS, Annex I) onto the corresponding designations (taking into account their functions described in the revised Manual on the GDPS) at your earliest convenience but not later than 15 August 2016. Also for your easy reference, I wish to inform you that the draft version of the revised Manual (table of contents given in Annex II) is available on the WMO website at:


This version takes into account comments received by WMO Members following the request to review its content in the WMO circular letter ref. WDS-DPFS/New Manual on GDPS-2015, dated 11 May 2015.

I wish to recall that as part of the transitional arrangements recommended by CBS-Ext. (2014), Cg-17 agreed that the existing WMCs and RSMCs will retain their status until the Eighteenth session of the World Meteorological Congress (Cg-18) in 2019; and to retain status after Cg-18, they need to demonstrate compliance by Cg-18.

I would like to take this opportunity to express my personal gratitude to you and your Service for your continued support in making meteorological products of the WMO’s Global Data-processing and Forecasting System (GDPS), including Emergency Response Activities (ERA), increasingly more relevant in the world.

Yours faithfully,

[E. Manaenkova]
for the Secretary-General
ANNEX I

Confirmation form for mapping of the WMC and/or RSMC hosted by your Centre

WMO MEMBER:
Focal Point: E-mail address:

Q1. World Meteorological Centre (WMC)

The new Manual introduces a clear definition for a WMC, which WMC shall be appointed if fulfilling the following functions:

- RSMC for global deterministic numerical weather prediction;
- RSMC for global ensemble numerical weather prediction; and
- RSMC for global numerical long-range prediction (known as SPC).

If you currently host a WMC, please answer YES or NO to confirm your will to map its functions onto a new designation of WMC.

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<thead>
<tr>
<th>Designated Centre</th>
<th>Mapping confirmation (Yes/No)</th>
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<td>Melbourne (Southern hemisphere only)</td>
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<td>Washington</td>
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Q2. Regional Specialized Meteorological Centre (RSMC) with geographical specialization

RSMCs with geographical specialization would become RSMCs for one (or more) of the following activities:

(1) RSMC for regional severe weather forecasting;
(2) RSMC for global deterministic numerical weather prediction;
(3) RSMC for limited-area deterministic weather prediction;
(4) RSMC for global ensemble numerical weather prediction; and
(5) RSMC for limited-area ensemble numerical weather prediction.

If you currently host an RSMC with geographical specialization, please answer YES if you confirm your will to map its functions onto a new designation(s) of one (or more) of RSMC(s).

<table>
<thead>
<tr>
<th>Designated Centre</th>
<th>(1) RSMC for regional severe weather forecasting</th>
<th>(2) RSMC for global deterministic numerical weather prediction</th>
<th>(3) RSMC for limited-area deterministic weather prediction</th>
<th>(4) RSMC for global ensemble numerical weather prediction</th>
<th>(5) RSMC for limited-area ensemble numerical weather prediction</th>
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</table>
### Q3. Regional Specialized Meteorological Centre (RSMC) with activity specialization

If you currently host an RSMC with activity specialization, please answer YES or NO to confirm your will to map its functions onto a new designation of its corresponding RSMC.

<table>
<thead>
<tr>
<th>Designated Centre</th>
<th>Mapping confirmation (Yes/No)</th>
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<tbody>
<tr>
<td>Global Producing Centre for Long-range Forecasts (GPC)</td>
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<td>CPMTEC (Brazil)</td>
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<td>Washington</td>
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<tr>
<td>European Centre for Medium-range Weather Forecasts (ECMWF)</td>
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<td>Tropical Cyclone Centre / Hurricane Centre / Typhoon Centre</td>
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<td>New Delhi - Tropical Cyclone Centre</td>
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<td>Miami - Hurricane Centre</td>
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<td>Tokyo - Typhoon Centre</td>
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<td>La Reunion - Tropical Cyclone Centre</td>
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<tr>
<td>Honolulu - Hurricane Centre</td>
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<tr>
<td>RSMC for Atmospheric Sand and Dust storm Forecasts</td>
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<td>Barcelona</td>
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<tr>
<td>RSMC for Nuclear Environmental Emergency Response and/or Backtracking</td>
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<td>Beijing</td>
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<td>Exeter</td>
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<td>Melbourne</td>
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<td>Montreal</td>
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<td>Obninsk</td>
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<tr>
<td>Offenbach (backtracking only)</td>
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<td>Tokyo</td>
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<td>Toulouse</td>
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<td>Vienna (backtracking only)</td>
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<td>Washington</td>
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<tr>
<td>Regional Climate Centre</td>
<td>Africa hosted by the African Centre of Meteorological Applications for Development (ACMAD) (RA I)</td>
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<td>Beijing (RA II)</td>
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<td>Moscow (RA II)</td>
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<td>Western South America hosted by the International Research Centre on El Niño (RA III)</td>
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<tr>
<td>Network</td>
<td>De Bilt (Climate Data Service)</td>
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<td>(RA VI)</td>
<td>Offenbach (Climate Monitoring)</td>
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<td></td>
<td>Toulouse (Long-range Forecasts)</td>
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<tr>
<td></td>
<td>Moscow (Long-range Forecasts)</td>
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</tbody>
</table>

If you currently host an RSMC with activity specialization for Region VI (Europe), please answer **YES** or **No** to confirm your will to map its functions onto a new designation and indicate the corresponding RSMC.

<table>
<thead>
<tr>
<th>Designated Centre</th>
<th>Mapping confirmation (Yes/No), if yes, please indicate the corresponding RSMC</th>
</tr>
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<tbody>
<tr>
<td>RSMC for Medium-Range Weather Forecasts for Region VI (Europe)</td>
<td></td>
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<tr>
<td>ECMWF</td>
<td></td>
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<tr>
<td>RSMC for the Provision of Ultraviolet-index forecasts for Region VI (Europe)</td>
<td></td>
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<tr>
<td>Offenbach</td>
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</tbody>
</table>
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1. **World Meteorological Centres (WMCs)**
   The new Manual introduces a clear definition for a WMC, which WMC shall be appointed if fulfilling the following functions:
   - RSMC for global deterministic NWP;
   - RSMC for global ensemble NWP; and
   - RSMC for global numerical long-range prediction (known as GPC).

<table>
<thead>
<tr>
<th>Designated Centre</th>
<th>Mapping confirmation received at WMO (Yes/No)</th>
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<tr>
<td>Melbourne (southern hemisphere only)</td>
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<tr>
<td>Moscow</td>
<td>Yes</td>
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<tr>
<td>Washington</td>
<td>Yes</td>
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<tr>
<td><strong>New WMCs designated by EC-69 (2017)</strong></td>
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<tr>
<td>Canada (Montreal)</td>
<td>Yes</td>
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<tr>
<td>UK (Exeter)</td>
<td>Yes</td>
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<tr>
<td>Japan (Tokyo)</td>
<td>Yes</td>
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<tr>
<td>China (Beijing)</td>
<td>Yes</td>
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<tr>
<td>ECMWF (Reading)</td>
<td>Yes</td>
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<td><strong>Designation of new WMC to designated by EC-70 (in June 2018)</strong></td>
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<tr>
<td>Germany (Offenbach)</td>
<td>In consideration</td>
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2. **Regional Specialized Meteorological Centre (RSMC) with geographical specialization**
   The Members who are currently hosting RSMCs with geographical specialization are especially required to map themselves against any of new types of centres considering that RSMCs with geographical specialization will cease to exist after Congress-18 in 2019. Such RSMCs may become RSMCs for one (or more) of the following activities depending upon their functions and capacities:
   (1) RSMC for regional severe weather forecasting;
   (2) RSMC for global deterministic NWP;
   (3) RSMC for limited-area deterministic NWP;
(4) RSMC for global ensemble NWP; and
(3) RSMC for limited-area ensemble NWP.

Therefore, Members hosting RSMCs with geographical specialization, are requested to please answer YES if they confirm their Centre(s) will to map its functions onto a new designation(s) of one (or more) of following RSMC(s).

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<thead>
<tr>
<th>Designated Centre</th>
<th>(1) RSMC for regional severe weather forecasting</th>
<th>(2) RSMC for global deterministic NWP</th>
<th>(3) RSMC for limited-area deterministic NWP</th>
<th>(4) RSMC for global ensemble NWP</th>
<th>(5) RSMC for limited-area ensemble NWP</th>
<th>Mapping confirmation received at WMO (Yes/No)</th>
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3. Regional Specialized Meteorological Centre (RSMC) with activity specialization

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**Regional Climate Centre**

| Africa hosted by the African Centre of Meteorological Applications for Development (ACMAD) (RA I) | Yes |
| Beijing (RA II) | Yes |
| Tokyo (RA II)   | Yes |
| Moscow (RA II)  | Yes |

**New Centres designated by EC-59 (2017)**

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**Network (RA VI)**

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**4. Lead Centres**

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IATA-WMO COLLABORATIVE

AMDAR PROGRAMME

Purpose and Principles

Version D1, 7 September 2018

Purpose of Collaboration

Acknowledging the benefits of the data collected and processed within the scope of the existing AMDAR Programme (the “Programme”) for both the meteorological community and for the aviation industry, and recognizing the significant resource investment of National Meteorological and Hydrological Services (NMHS) Members of WMO in the existing AMDAR observing system and in its operations, IATA and WMO, pursuant to their Working Arrangement dated July 7th, 2017, wish to collaborate in order to establish an extension of the Programme in a more formal and identifiable framework: IATA-WMO Collaborative AMDAR Programme (“IWCAP”).

IWCAP Principles

The IWCAP will:

i. Promote, encourage and facilitate participation of all airlines in the Programme, with a priority focus on expanding the programme and improving AMDAR coverage over currently data-sparse areas with the highest impact and benefits to the meteorological and aviation communities and other data users.

ii. Comply with all principles of WMO’s Legal Framework, including Resolutions and Regulations applicable to AMDAR data.

iii. Encourage and coordinate the enhancement of the Programme through wider implementation of turbulence monitoring and water vapour measurement;

iv. Work with and promote the Programme within the aviation industry, including equipment manufacturers, to encourage greater efficiencies in the development and deployment of AMDAR avionics, applications and related infrastructure and service costs;

v. Discuss and negotiate directly with aviation data service providers to derive efficiencies and more equitable arrangements for Programme communications costs; and

vi. Collaborate with Hydrological and Meteorological Equipment Industry (“HMEI”) member companies active in the WMO Aircraft Based Observations Programme to maximize effectiveness through utilization of existing commercial infrastructures.
IWCAP Governance Structure

The management of the IWCAP will be performed by its Governing Body ("GB"), a group of technical and administrative representatives from both IATA and WMO.

The GB will foresee the Implementation of the IWCAP Principles of Collaboration detailed herein (the "Principles"), based on separate documents: the IWCAP “Concept of Operations” and the IWCAP “Implementation Plan”.

The GB will meet annually, or more often, as required to fulfill its role, by any means it deems appropriate.

Each of IATA and WMO will appoint a representative Co-chair to coordinate relations under the IWCAP who shall keep the Head of his or her organization informed in accordance with the Working Arrangement.

The GB will be comprised of a minimal and equal number of representatives of each organization necessary to fulfill the role and duties of the GB.

WMO and IATA will jointly and equitably fund the operations of the GB.

The GB will establish and maintain an Oversight, Planning and Coordination team (OPCT) to oversee and assist in the developmental and operational processes of the IWCAP. The GB and the OPCT will be jointly supported and resourced as agreed and as necessary by IATA and WMO.

IWCAP Operational Structure

The IWCAP will not initially replace the existing national and regional AMDAR programmes, but it is expected that these programmes will be offered the opportunity to migrate to the IWCAP, based on a decision, process and timeline that is convenient to the operators.

The IWCAP operations will be performed by WMO Member agencies ("IWCAP Operators") based on a regional structure of WMO Integrated Global Observing System (WIGOS) Centres, overseen and managed by WMO and its Regional Associations.

IWCAP Operators and WIGOS Centres will be resourced by the IWCAP to support their agreed operational functions, based primarily on the finances provided by participating regional WMO Members so as to perform the operations necessary to meet national requirements for AMDAR data from the IWCAP.

The GB will establish the IWCAP Regional Data Processing Centres (RDPCs) as WMO Regional WIGOS Centres operated by a WMO Member under delegated authority from its respective Regional Association (RA).

The responsibilities of the IWCAP Operators and of the RDPCs will be to establish the contractual relationships with individual airlines, receive, control the quality of, and securely manage, the AMDAR data received. The DPCs will ensure the timely provision of the AMDAR processed data on the WMO Information System (WIS).
IWCAP Financial Structure

The GB will manage the following financial aspects of the IWCAP:

i. Develop and establish the framework for a funding and cost structure to support the IWCAP operations and to reimburse airlines for their costs of participating in the programme, ensuring an equitable cost-sharing between participating NMHSs.

ii. Establish two types of funding mechanisms, an AMDAR Programme Operating Fund (“APOF”) and an AMDAR Programme Expansion Fund (“APEF”) to facilitate cost and resource-sharing initiatives and to extend the implementation of new national and regional AMDAR Programmes.

iii. The AMDAR Programme Operating Fund (APOF) will provide resources for the ongoing operations of the IWCAP. The AMDAR Programme Expansion Fund (APEF) will provide for the Programme’s development, expansion and enhancement.

Under the IWCAP, IWCAP Operators will raise/receive the required funds in the APOF to support:

i. The ongoing air-to-ground and ground-to-ground communications costs relating to the collection of AMDAR data at IWCAP RDPCs, and its subsequent provision on the WMO Information System (WIS).

ii. The infrastructure costs associated with the operation of IWCAP Regional and/or Global Centres and Systems.

iii. Any additional costs, which become necessary for the ongoing operation of the Regional AMDAR Programme.

Under the IWCAP, IWCAP Operators will raise/receive the required funds in the APEF to support:

i. The equipping of participating airline aircraft with AMDAR on-board software and other infrastructure required to support the operation of the IWCAP and most efficiently meet the requirements for AMDAR data.

ii. Research, analysis and other related activities to support improvements to the efficiency and utility of the IWCAP.

The GB will oversee the management by the IWCAP Operators of the funds of the APOF and APEF so as to meet the incremental costs only of the operation of the IWCAP. Any funds surplus to such requirements will be either transferred to or retained in the APEF, or else, based on the discretion and adjudication of the GB, returned to the participating NMHSs or donors in a fair and equitable dispersion.

Funds for the APOF and APEF will be provided by NMHSs under their agreement with the IWCAP Operator for participating in the IWCAP, and based on the cost structure developed by the GB for meeting national, regional and global requirements for AMDAR data. These funds may be supplemented from other sources, including:

i. The provision of funds to meet requirements for AMDAR data by other data users, including other (non-meteorological) government agencies, private entities, capacity development and aid agencies, specifically approved by the GB in advance;

ii. Revenue(s) raised by IATA through commercialization of AMDAR data; and

iii. Other sources as may be agreed upon by the GB as required.
IATA will sell or license the selling of AMDAR data to third parties.

IATA will retain an agreed upon percentage of the revenues from the sale of AMDAR data and transfer the remaining proceeds thereafter to the APOF or APEF, as decided by the GB.

**IWCAP Data Policy**

The GB will define AMDAR Data Policy to achieve the purposes of the IWCAP and in accordance with the applicable WMO Legal Framework.

An authorization policy for data transfer and its associated form templates, including AMDAR Data definition, will be developed by IATA with the agreement of the GB. The authorization policy will allow for the release and transfer of data to third-parties, including to non-participating airlines, and to IATA, giving IATA the right to further release it to third-parties. The terms of the data policy will be annexed to the contracts between each IWCAP Operator and/or DPCs and each participating airline.

All WMO Members will be licensed and retain full rights to use all AMDAR data produced under the IWCAP and provided on the GTS in compliance with all Principles of the IWCAP and in compliance with WMO’s Resolutions and Regulations applicable to AMDAR data.

The ownership of AMDAR data, as defined by the GB in the AMDAR Data Policy, will be retained by participating airlines.

WMO Members will have and retain full ownership of any meteorological products and services derived from the use of AMDAR data.

Access to the AMDAR data via the Global Data Centre will be in accordance with all Principles developed by the IWCAP and in compliance with WMO’s Legal Framework and enforced through a validation processes to be developed and established by the GB.

The GB will:

i. Develop and establish the Data Policy associated with the AMDAR data derived from the IWCAP and will ensure its adherence through the establishment of collaborative agreements between the IWCAP partner and operational entities.

ii. Develop the definitions, management, treatment, use, and access to AMDAR data provided by the airlines participating in the IWCAP and collected by the AMDAR RDPCs.

iii. Develop the protection of the intellectual property rights of both Organizations and their respective Members.

iv. Develop the IWCAP principles for secure data ownership and licensing policy, specifying the ownership by the airlines of AMDAR data and the ownership by the NMHSs of products and services derived from the use of AMDAR data.

v. Develop, in accordance with WMO’s Resolutions and Regulations applicable to AMDAR data, improved and secured access to AMDAR data for WMO Members and affiliated and validated data users, enabling adherence to agreements with commercial airline partners that license the provision and use of their data.
IWCAP Collaborative Agreement Framework

IATA and WMO will enter into a collaborative agreement to establish the IWCAP under the agreed Principles of the IWCAP and in accordance with its Concept of Operations and Implementation Plan.

The GB will oversee the development and establishment of the following agreements:

i. Standardised agreements between IWCAP Operators, RDPCs and participating airlines to support reception, processing and provision of AMDAR data through the IWCAP Operational Structure and the IWCAP Data Policy and for use of the data by WMO Members and its Operators, and by IATA.

ii. Agreements between WMO and IWCAP Operators to ensure reception, processing, provision and management of AMDAR data in compliance with the Principles of the IWCAP Data Policy.

iii. Standardised agreements between IWCAP Operators and participating NMHSs to support the provision of required funds in accordance with the IWCAP Financial Structure.

All contractual undertakings and standardized agreements between WMO, IATA, IWCAP Operators and their respective members, regarding AMDAR Data, whether provided by the airlines or by the DPCs and due to the nature of this data, will be on a “best effort” basis.

IWCAP Roles

IATA will:

i. Contribute the required and agreed upon resources to the Governing Board.

ii. Contribute to the coordination and oversight of the operation of the IWCAP through the commitment of the required and agreed resources to the OPCT.

iii. Lead the promotion of the Programme to its member airlines and other affiliated airlines, as the case may be, including the promotion of global benefits of providing aircraft observations using AMDAR in direct response to evolving meteorological requirements;

iv. Promote the Programme to the industry at large, so that the Programme is more widely recognized and integrated within the aviation industry;

v. Assist WMO in identifying the airlines that would best meet the requirements for the program expansion based on the route network analysis;

vi. Working directly with participating and candidate airlines in the Programme to:
   a. Educate them on AMDAR software usage;
   b. Foster airline engagement with local MET authorities;
   c. Promote and facilitate the utilization of AMDAR data by the airline community;

vii. Facilitate the communication between WMO and third party providers/OEMs;

viii. Educate various aviation stakeholders on the benefits of the program and conduct workshops and webinars to encourage airlines to join the program and implement water vapour measurement;

ix. On behalf of the IWCAP and subject to both the agreed terms of the GB /IWCAP (including all principle(s) of WMO’s Resolution(s) and Regulations applicable to AMDAR data of the
WMO Resolution 40 (Cg-XII)) and of the participating airlines’ agreement, IATA will, where feasible, pursue commercial opportunities related to the AMDAR data for sourcing funds to assist the Programme’s operation and expansion.

WMO will:

i. Contribute the required and agreed resources to the Governing Board.

ii. Contribute to the coordination and oversight of the operation of the IWCAP through the commitment of the required and agreed resources to the OPCT.

iii. Contribute to the coordination and oversight of the IWCAP financial framework.

iv. Contribute to the implementation and oversight of the IWCAP Data Policy through its maintenance as required within relevant WMO Technical regulations, and regulatory and guidance materials.

v. Coordinate/oversee the establishment of the requirements for AMDAR data of the meteorological community through both the WMO Regional Review of Requirements (RRR) process at the global level and through WMO Regional Associations (RAs) at the regional level.

vi. Oversee the agreements with each RDPC and each WIGOS Centre to reinforce IWCAP at regional levels through the APOF and APEF.

vii. Oversee the agreements with each IWCAP Operator for the commitment of funds to support the operation of the Programme under the IWCAP Financial Structure.
IATA-WMO Collaboration on the AMDAR Programme

Proposed Concept of Operations

Draft – Version 9: 7 September 2018
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6. Business Processes
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      i. Data Costs and Procurement
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Annex I – Acronyms and Abbreviations
EXECUTIVE SUMMARY

This document provides a “Concept of Operations” that describes the principles and operational framework under which the International Air Transport Association (IATA) and the World Meteorological Organization (WMO) will collaborate together on the future operation of the WMO Aircraft Meteorological Data Relay (AMDAR) Programme as a contribution to the WMO Integrated Global Observing System (WIGOS).

The World Meteorological Organization (WMO) Aircraft Meteorological Data Relay (AMDAR) Programme is based on the automated measurement and transmission of meteorological (MET) data from an aircraft platform. Observational meteorological data collected by the National Meteorological and Hydrological Services (NMHSs) from the airlines through the AMDAR Programme is of high value to the global meteorological community for its ability to increase forecasting accuracy for all users of weather forecasts, including aviation.

While the programme has been successfully growing and functioning in Europe, North America, Asia and Oceania, some other areas such as Northern and Central Africa, Eastern Europe, Western and Central Asia, the Southwest Pacific and the Middle East remain data-sparse. One of the reasons for this, among others, is limited funding available in these regions for programme expansion.

Acknowledging the benefits of AMDAR data to the meteorological community, and consequently the aviation industry, through improved meteorological forecast accuracy, IATA and WMO propose to jointly work on expanding the programme to new geographical areas whilst introducing new measures to give participating airlines better control over, and access to the data they provide to the programme. The IATA-WMO Collaborative AMDAR Programme (IWCAP) will develop and establish the cooperation intended to achieve these objectives.

The collaboration would license all WMO Members to use all AMDAR data produced under the IWCAP and provided on the GTS in compliance with the IWCAP data policy and with WMO Resolutions and Regulations applicable to AMDAR data.

By creating a formal partnership between the airlines (represented by IATA) and the WMO (representing its member NMHSs), the IWCAP will seek to improve AMDAR Programme management and the overall efficiency of the observing system. This includes the formation of a Governing Board and a more streamlined IATA-led process for promoting the global benefit of providing aircraft observations and recruiting airlines to do so under the IWCAP, in response to evolving meteorological requirements.

Additionally, a more robust funding and cost structure will be developed that reimburses airlines for their costs and provides a more uniform cost burden across NMHSs globally. In each WMO Region, an AMDAR Programme Operating Fund (APOF) will be created to provide real-time operating resources as well as an AMDAR Programme Expansion Fund (APEF) to provide for Programme development and enhancement. These funds will be managed and accounted regionally by IWCAP Operators oversighted by WMO and the IWCAP Governing Board.

The IWCAP will put in place a more formalized WMO-led process for establishing and maintaining requirements for AMDAR data through both the WMO Regional Review of Requirements (RRR) process at the global level, and also through a coordinated process through WMO Regional Associations on an annual basis, as a component of the Regional Basic Observing Network (RBON), resulting in regional operational and development plans for each of WMO’s six regional AMDAR Programmes. Based on established regional requirements and plans, an IWCAP Oversight,
Planning & Coordination Team (OPCT) would consolidate global plans for annual IWCAP operations and development, taking into account additional global and international requirements identified through the RRR and the WMO Global Basic Observing Network (GBON).

The operational aspects of the AMDAR programme would be consolidated through a number of WMO designated regional and global WIGOS centres, which would be responsible for the operation and maintenance of IWCAP systems. Such centres would include Regional Data Processing Centres (RDPC), Global and/or Regional Monitoring Centres, a Lead Centre for Aircraft-Based Observations and a Global Data Centre for Aircraft-Based Observations (GDC-ABO). Operational roles would, in most cases, be undertaken by designated WMO Members, funded where necessary through the IWCAP funds.

The IWCAP will establish the principles underlying a secure data ownership and data release policy that will clearly establish the original data ownership by the airlines, while ensuring that products derived from the use of AMDAR data would be owned by the NMHSs, in accordance with their national policies and regulations.

The IWCAP will improve the efficiency and security of data management of the AMDAR programme through the role and functions of the RDPCs and the GDC-ABO, which would be responsible for secure management and quality control of AMDAR data, thereby ensuring its timely provision on the WMO Information System (WIS).

To improve efficiencies in airline recruitment, the IWCAP will take advantage of IATA’s position and prominence in the aviation industry to ensure that the programme is more widely recognized and integrated within the aviation industry. This will ensure that solutions for AMDAR software functionality are optimized and implemented on the most appropriate avionics systems; that operational costs such as data communications services and AMDAR software development are minimized; and that aircraft manufacturers provide either optimal AMDAR data solutions available with new aircraft delivery or that can be readily retrofitted. The benefits of this will be a positive impact on airline operations, less need of in-house resources in joining the programme and a more streamlined and efficient process for doing so.

Through its established governance and operational framework, the IWCAP will expand and enhance AMDAR Programme spatial coverage, concentrating efforts in those data-sparse regions that will deliver the most impact and benefit to data users and the meteorological and aviation communities. Generally, the IWCAP will seek to find efficient and optimal ways to enhance the Programme, particularly focusing on efforts to extend water vapour and turbulence measurements reported globally.
1. **INTRODUCTION**

This document describes the key concepts and elements for the operation of the Aircraft Meteorological Data Relay (AMDAR) Programme under a proposed collaboration between the International Air Transport Association (IATA) and the World Meteorological Organization (WMO). This IATA-WMO Collaboration on AMDAR Programme (IWCAP) has a scope and aims as described below.

AMDAR observations are measurements of meteorological parameters made from an aircraft platform, which meet specific temporal, spatial and quality requirements, as defined by WMO and its NMHSs. AMDAR observations are derived from the WMO AMDAR observing system, which is defined and maintained as a component of the WMO Integrated Global Observing System. AMDAR observations are also the dominant source of the general class of Aircraft-Based Observations (ABOs). Other ABO types, such as those meteorological observations derived from ICAO Aircraft Reports (AIREPs), “Pilot Reports” (PIREPS) and Automatic Dependent Surveillance-Contract (ADS-C) observations, which may have associated meteorological data, are programmatically and managerially distinct from AMDAR data. The anticipated IWCAP impacts AMDAR data only, and does not impact any of these other types, which are governed by other international requirements, regulations or agreements.

**A. Scope**

The IWCAP will aim to improve, extend and enhance the existing WMO AMDAR Programme, chiefly through the recruiting of new airlines to the programme and the extension of some aspects of the programme, including the wider measurement of water vapour and turbulence. In developing this framework to support the extension and enhancement of the programme, the IWCAP will offer a collaborative operational framework under which the existing AMDAR Programmes could in the future be migrated; however, this would not be mandatory or enforced and would be at the discretion of the national programme operator in collaboration with the relevant WMO Regional Association.

The IWCAP does not aim, or intend to establish mandatory or enforced obligations on either the meteorological or the aviation communities, but seeks to extend and enhance an existing Public Private Partnership between the two communities so as to broaden and improve the well-documented benefits and positive impacts derived from the current AMDAR Programme.

The IWCAP will not incorporate requirements for aircraft-based observations derived from other sources of aircraft reports that are regulated by other bodies or organizations. This includes, in particular, those aircraft reports that are defined and regulated by the International Civil Aviation Organization (ICAO). However, the IWCAP will, where possible and agreed, take into account the availability of other sources of aircraft-based observations and the systems that produce such observations, when developing requirements for observations, plans and solutions for their provision from the AMDAR observing system.

The IWCAP will be limited to activities associated with the establishment of a framework that supports meeting the aims outlined below.
B. Aims

The IWCAP has the following aims:

1) an expanded and enhanced global aircraft-based observations data coverage that will contribute to meeting the national, regional and global requirements for upper-air observations under the WMO Rolling Review of Requirements;
2) implementation of a more efficient and simplified process for airlines to join and contribute to the Programme;
3) an improved process for the establishment and provision of requirements for AMDAR data by NMHSs and data users, based primarily on the WMO Rolling Review of Requirements and as a component system contributing to the WMO Integrated Global Observing System (WIGOS);
4) implementation of a sustainable funding mechanism to support AMDAR operations and expansion that will also facilitate participation by least developed countries (LDCs) and small island developing states (SIDS);
5) introduction of a simplified, equitable and centralized costing and remuneration system for AMDAR operations and development, based on more efficient and economic solutions for infrastructure and operational services;
6) establishing a more efficient business relationship between AMDAR programme operators (NMHSs), data users, data providers and other stakeholders;
7) more secure and better defined AMDAR data ownership and management practices;
8) a more efficient and optimized AMDAR programme derived from improved recognition and better integration of AMDAR with the aviation industry; and
9) a more extensive and improved use of AMDAR data in support of both meteorology, aviation and the wider community.

In Chapter 2, the current status of the AMDAR Programme is reviewed and critiqued in light of the above aims. Chapter 3 summarizes elements of the future IWCAP. The IWCAP governance and organizational structure are presented in Chapter 4, noting the reliance on existing and highly functional organizational elements and processes within both IATA and WMO. A summary of the IWCAP operation, development and budget cycle is given in Chapter 5, and a summary of business processes for the future IWCAP is presented in Chapter 6.
2. CURRENT AMDAR PROGRAMME OPERATION AND STRUCTURE

A. AMDAR Programme Description

The global AMDAR programme was initiated by WMO and its Members, in cooperation with aviation partners and has led to the development of the AMDAR observing system. The AMDAR observing system is a sub-system of the WMO Integrated Global Observing System and the Global Observing System, which is defined and maintained under the WMO World Weather Watch Programme.

The AMDAR system utilizes predominantly existing aircraft on-board sensors, computers and communications systems to collect, process, format and transmit meteorological data to ground stations via satellite or radio links. Once on the ground, the data is relayed to NMHSs, where it is processed, quality controlled and transmitted on the WMO Global Telecommunications System (GTS) of the WIS.

The data collected are used for a range of meteorological applications, including, meteorological Numerical Weather Prediction (NWP), public weather forecasting, climate monitoring and prediction, early warning systems for weather hazards and, importantly, weather monitoring and prediction in support of the aviation industry.

The global AMDAR observing system is comprised of the operational AMDAR observing systems maintained by National & Regional AMDAR Programmes in collaboration with their partner airlines.

WMO maintains the international regulatory material and standards for operation of the AMDAR observing system and, through its Technical Commissions, oversees the maintenance and development of the AMDAR observing system and the work programme on aircraft-based observations through the coordination of Technical Commission expert teams.

WMO Members continue to develop and expand the AMDAR observing system in line with the Actions of the Commission for Basic Systems (CBS) Implementation Plan for the Evolution of the Global Observing System.

Resource material related to national and regional AMDAR programme development can be found in the WMO AMDAR Resources/AMDAR Programme Development area.

B. Current Operational Framework

Currently, the AMDAR programme has two distinct operational models. The first model is fundamentally national in operation, in which a country NMHS or Civil Aviation Authority (CAA) partners with one or more of its national airlines to develop and implement a national AMDAR programme.

The operation of the national programme is based on both the national and international (WMO) requirements for aircraft-based observations. Agreements are made between the AMDAR programme national partners, which generally license the national NMHS to use the AMDAR data within applications for the provision of forecast products and services. These agreements also allow the data to be exchanged on the WIS and for their subsequent use by WMO member countries and NMHS under, and in accordance with WMO, Resolution 40.
The other model is based on a regional approach, in which several NMHSs agree to cooperate on the operation of an AMDAR programme, sharing resources and costs and defining the requirements for its operation and output based on mutual agreement. The EUMETNET/E-AMDAR programme is an example of such a programme, which has flourished under a small, centralized management structure contracted to a NMHS to coordinate and operate the programme on behalf of EUMETNET and its members. Some operational aspects of this regional model will form the basis of the approach that IATA and WMO would seek to establish in each WMO region to support the operational and developmental framework for the proposed collaboration on AMDAR.

C. Status of the Current AMDAR Programme

The current Global AMDAR Programme consists of 12 national and regional AMDAR programmes involving more than 30 countries in collaboration with 40 partner national airlines and a combined global fleet of more than 5000 aircraft.

Over the past 5 years, the global AMDAR Programme has been very successful in increasing the number of reports transmitted to the NMHSs in support of weather forecasting (Figure 1). Growth was rapid from 2011-2015, primarily due to increased airline participation globally derived from concerted efforts by WMO and the leading national and regional AMDAR programmes to assist other countries in developing new AMDAR capabilities. For example, the USA has been instrumental in the development of new programmes in Central and South America and EUMETNET has undertaken similar leadership in Europe and nearby regions such as Northern Africa and Eastern Europe. Since 2015, however, the number of observations has plateaued at around 750,000 observations per day. WMO activities have continued to focus on further development and expansion of the AMDAR programme including the critical development and expansion of water vapour and turbulence monitoring.

Efforts have also been made to enhance and expand the wider WMO ABO Programme to include increased derivation of ABO data from Air Traffic Management (ATM) navigation and Air Traffic Control (ATC) aircraft reports such as ADS-C, Automatic Dependent Surveillance-Broadcast (ADS-B) and Secondary Surveillance Radar (Mode S). While currently smaller in number, it is expected that these reports will greatly increase in the future as a complement to AMDAR observations.
Figure 1. Averaged daily number of aircraft-based observations transmitted on the WMO Global Telecommunications System over 2007 to September 2017. Different coloured lines indicate data volumes derived from different sources: all aircraft and all systems (black); AMDAR only (blue), from the AMDAR Programme with reports submitted in binary format (BUFR, red); and from the AMDAR Programme with reports submitted in text format (FM42, green); and, from ICAO data sources (AIREP and ADS, magenta).

D. Issues with the Current Operational AMDAR Programme Model

While the programme has been successfully growing and functioning in Europe, North America, Asia and Oceania, some other areas such as Northern and Central Africa, Eastern Europe, Western and Central Asia, the Southwest Pacific and the Middle East remain data-sparse, often due to limited funding and technical capability to support programme expansion in these regions. Figure 2 provides a depiction of the current global coverage of aircraft-based observations over a 24-hour period.
Figure 2 (Courtesy of the USA National Oceanic and Atmospheric Administration (NOAA), Earth System Research Laboratory (ESRL) Global Systems Division (GSD), AMDAR Data Display). Representative coverage of aircraft-based observations available on the WMO Global Telecommunications System over a 24 hour period on 30 September 2017. Colours, ranging from red through light blue, indicate the altitude of the observation indicated by dot points. Only a limited number of observations are shown due to the limited image resolution – in this case, around 22,000 of more than 715,000 observations are plotted.

The AMDAR Programme has successfully incorporated reliable and timely data streams of observed winds and temperature from a wide variety of airframes and international airlines, together with descriptive metadata needed for use by the operational meteorological community. While WMO and its Members have made great progress in working with aviation industry organizations to standardize AMDAR reporting within aviation communications protocols and primary avionics systems, there is still more progress to be made to achieve greater efficiency and ease of implementation. Moreover, data ownership and management standards and practices are insufficiently uniform, robust and secure for an operational system serving both the aviation and meteorological sectors.

Incorporation of water vapour measurements has lagged in many regions of the world and is seen as a critical priority for the programme moving forward. In addition to these moisture measurements being an increasingly important input to global, regional and higher-resolution NWP, they will also meet meteorological requirements for the calculation of atmospheric stability indices required for severe weather forecasting, as well as contribute to meeting aviation requirements for knowledge and forecasting of icing potential. Additionally, wider monitoring and reporting of turbulence is required by both the aviation and meteorological communities, despite the technical difficulties of sampling aircraft motion and its response to atmospheric turbulence. A first step is the gathering of turbulence data and associated metadata, which are used for aviation operations and in meteorology for forecast applications and their verification.
Costs for data communications, software development and implementation and other business practices differ by State, region and from programme to programme as NMHSs have made their contractual arrangements with partner airlines or data integrators independently of other global partners, even though supporting requirements are very similar.

The current Programme would benefit from a more cooperative and structured approach to development and operation at both the regional and global levels, including a more robust funding framework that is acceptable to both the NMHSs and the airlines.

In summary, the key issues that the IWCAP would aim to improve or resolve are:

- lack of a simple and more homogeneous data cost structure and other business practices for the AMDAR Programme;
- difficulties with convincing airline of the benefits for participation in the programme and the requirements and process for doing so,
- lack of efficient and effective processes for integrating AMDAR data into airline operations;
- lack of sustainable, improved funding mechanisms and coordination to support AMDAR development in data-sparse areas and in developing and least developed countries;
- lack of coordination of requirements for the provision of AMDAR data by NMHSs;
- lack of understanding and implementation of data policy arrangements, and data management and security procedures;
- lack of knowledge of AMDAR and its requirements for operation among IATA partners, suppliers and applications developers; and
- unmet requirements for wider implementation of water vapour and turbulence monitoring.

Meeting the IWCAP aims will address these issues.
3. OVERVIEW OF IWCAP CONCEPT OF OPERATION TO ACHIEVE AIDS

This section briefly describes and summarises the key concepts and operating elements of the proposed IWCAP that will be developed and implemented in order to meet the aims of the programme, which are listed in in section 1.B. Each section, A to I, addresses the corresponding numbered aim.

A. Aim 1 - Expanded and Enhanced Global Data Coverage

The aim to expand and enhance the global coverage of AMDAR so as to better meet WMO requirements for upper-air meteorological observations in support of improved weather forecasting and services is the primary aim of the collaboration and will be achieved through addressing and meeting the all of the aims below.

AMDAR data are produced from operational national AMDAR programmes by participating aircraft in two primary modes of observing and reporting of meteorological variables: 1) As “vertical profiles” when the aircraft is on ascent or descent at terminal national and international airports, and 2) As “en route” data, whilst aircraft are travelling between airports in the upper troposphere at altitudes of more than 30,000 feet. This leads to a data coverage for the programme that is limited and has gaps as described in section 2.D. The IWCAP will focus primarily on introducing new airlines to the programme so as to optimally fill these gaps in data coverage from aircraft-based observations. The provision of valuable observations from areas where current observing density is low will provide the largest positive impact to meteorological Numerical Weather Prediction (NWP) models and forecasting services and products, resulting in improved, timely meteorological and weather related information for aviation, which ultimately will lead to safer and more efficient flight operations.

While the impact of temperature and wind measurements to provide meteorological information is critical for flight operations, there are compelling reasons for adding water vapour (moisture) and turbulence measurements. Moisture measurements are important for diagnosis of clouds, fog formation/dissipation, icing and potential severe weather, all of which impact flight operations. Moisture measurements are also important meteorologically to capture real-time atmospheric stability, and cloud and precipitation evolution. Likewise, there are meteorological requirements for global atmospheric turbulence estimates both en route and near airports due to needs for modelling and verification of forecasts for turbulent transport of moisture, temperature and momentum. Furthermore, turbulence greatly impacts aviation business, especially flight planning to maximize safety.

Through the governance and operational framework established and based on high-level coordination, oversight and assistance from IATA and WMO, the IWCAP will expand and enhance the AMDAR programme coverage concentrating efforts to do so in those data-sparse regions which will deliver the most impact and benefit to data users and the meteorological and aviation communities. The collaboration will seek to find efficient and optimal ways to enhance the programme, particularly focusing on efforts to extend measurement of moisture and turbulence globally.

B. Aim 2 - Increasing Airline Participation

Based on the better-defined business relationships developed under the IWCAP, the processes for airlines to join and contribute to the IWCAP will be better defined and able to be adopted more readily and uniformly throughout the aviation industry.
The process for IATA airlines joining the programme under the IWCAP will be streamlined, based on and harmonized with the improved process for establishing the requirements for AMDAR data by WMO Members. Through IATA-led promotion and education, airlines and other industry partners will better understand the benefits of participating in the programme and the technical requirements for establishing the necessary infrastructure and processes for contributing to the programme under pre-established and agreed terms and conditions that protect their data ownership. WMO and IATA will together facilitate contact and dialogue between airlines, NMHSs and IWCAP operators to ensure efficient and smooth planning and implementation of new programme partnerships. Airlines will be assisted by the programme’s Oversight, Planning & Coordination Team (OPCT) and other organizational technical bodies and task teams to establish their programmes and will be reimbursed for incurred developmental and operational costs directly from the programme funds.

C. Aim 3 – Improved Process for Establishment and Maintenance of Meteorological Requirements for AMDAR Data

The IWCAP will put in place a more formalized WMO-led process for establishing and maintaining national, regional and global requirements for aircraft-based observations and AMDAR data based on a formalised, annual process harmonized with the operation of the WMO Regional Basic Observing Network. Global requirements would be established in collaboration with the WMO technical commission responsible for observational data and infrastructure, based on consolidated regional requirements and taking into account data user requirements maintained through the WMO Rolling Review of Requirements process. Regional requirements would be managed and maintained by WMO Regional Associations, through a process in which WMO member countries would be requested to provide their ongoing and future national requirements for aircraft-based observations to a regional working group, which would then incorporate and consolidate those requirements into a regional development and operational plan for each of WMO’s six regional AMDAR Programmes. Requirements of developing countries as well as those for disaster risk reduction will be given special attention, including the establishment and utilization of other funding mechanisms to support programme development and operational costs.

Based on the established regional requirements and plans, the IWCAP Oversight, Planning & Coordination Team (OPCT) would develop global plans for the development and ongoing operation of the IWCAP. The plans would then be implemented through the established developmental and operational procedures and resourced from the operational and development funds.

Requirements for AMDAR data will be maintained under continuous review to assure programme outputs are fit-for-purpose and optimized with other sources of observations (e.g. other sources of aircraft-based observations, satellites, radio-sonde, operational weather radars, surface-based GNSS data, etc.) in supporting WMO Application Areas.

D. Aim 4 – Sustained Funding of Operations and Development

The IWCAP would incorporate a more robust, well defined and simplified funding and cost structure for both the operational and developmental components of the AMDAR Programme.

The Governing Board would oversee the establishment and operation of both the AMDAR Programme Operating Fund (APOF) and the AMDAR Programme Expansion Fund (APEF). These funds would be contributed through several means, primarily consisting of the contributions of WMO Members to support their requirements for AMDAR observations and the development and operation of the infrastructure required to support their provision.
E. Aim 5 - Simplified Costing and Procurement

AMDAR data communications and other operational costs currently differ widely across the globe, mostly due to the individual development of programmes in different regions and varying financial capacities. A simpler and more equitable cost structure, acceptable to both NMHS and airline partners and taking advantage of improved and more efficient arrangements with service providers, will result in a more economic programme with fair and equitable reimbursement for airline participation.

Operating and data provision fee structure(s) would be as simple as possible and aimed at a relatively uniform global, or at least regional cost per observation that would take into account a minimum of relevant or necessary factors, for example, varying national or regional communications costs, or the requirement for sensor installation for water vapour measurement if required. A collaborative approach to the operation and funding of the Programme would potentially allow all nations to participate in the programme, with the cost structure taking into account the varying national capability to both utilize and meet the costs of their provision. These funds collected as part of IWCAP, would also allow for contribution from other sources and donors that have an interest in supporting the programme’s development and operation, particularly within least developed countries and over data-sparse areas.

Under the IWCAP framework, each NMHS would be responsible for meeting the operational costs for the required AMDAR profile data produced within their country or region and would contribute toward meeting the costs of global and regional en route data. However, data reception and processing would be undertaken on a regional basis, creating efficiencies and saving costs through the collaborative funding and sharing of resources and infrastructure.

Mechanisms and funding strategies for capacity development and operational support will also be put in place to ensure that Least Developed Countries (LDC) and Small Island Developing States (SIDS) could readily contribute to and benefit from the programme.

Commercialisation of AMDAR data to private entities would be undertaken by IATA. The revenue from this would be used to offset the costs to NMHSs of the operation of the programme and to remunerate participating airlines and offset some of the cost associated with Programme implementation and data provision. IATA will retain an agreed upon percentage of the revenues from the sale of AMDAR data to offset any costs associated with commercializing the data to third parties.

F. Aim 6 - Well Defined Business Relationships between Programme Partners

Within the current AMDAR Programme, business relationships between NMHSs and airlines, have evolved historically and differently based on the varying ways that national programmes have been developed and implemented and usually focused primarily on national requirements. This has resulted in heterogeneous business relationships and data policies across the globe. A more uniform approach to business relationships in the operation of the programme would result in an improved and more efficient programme development and operation, a greater willingness for airlines to participate and a greater willingness and capacity for NMHSs to support the development of new partnerships with airlines.

It is proposed to create and maintain a formal partnership between the airlines (represented by IATA) and the NMHSs (represented by the WMO). Based on this partnership, IATA and WMO will together establish a governance and agreement framework, wherein each partner will have well-defined, complementary roles and will work with the other partner on common processes and programme issues.
Under the IWCAP, both IATA and WMO will contribute to the membership of the Governing Board and the Oversight, Planning & Coordination Team (OPCT). These entities would define and oversee the functions and roles of resourced Operators, which would be primarily responsible for the programme's execution. Additionally both organizations would contribute to the establishment of ad hoc tasks teams to undertake well defined activities and tasks in support of the programme and continue to provide leadership and expertise to the programme through and from within their respective existing organizational bodies and supporting technical programmes.

G. Aim 7 – Improved Data Ownership, Management and Security

Data ownership, management and security are critical issues for the IWCAP due to the requirement to ensure the security of AMDAR data as the property of the participating airlines. The collaboration will establish the principles underlying a more uniform data policy, together with other practices, strategy and processes for data management and security.

The agreements will clearly establish the original data ownership of the airlines, while ensuring that products derived from AMDAR data would be owned by the NMHSs. Likewise, products derived from AMDAR data by third Parties in which IATA enters a commercial relationship shall be owned by those third Parties.

Data management would be made more efficient through the establishment of a number of regional data processing and other required regional centres under the wider WIGOS framework. These Regional WIGOS Centres would be responsible for secure management and quality control of AMDAR data, ensuring its timely provision on the WIS. WMO Members would access the data from the WIS and make use of them as they do now and in accordance with the relevant WMO regulatory framework and the IATA-WMO data policy.

Non-real-time AMDAR Data would be licensed by IATA for archival in the AMDAR Global Data Centre for Aircraft-Based Observations (GDC-ABO) from which it will be accessible and used by WMO Member NMHS and research agencies, non-commercial entities and others through a formalized validation process.

H. Aim 8 - Increased Efficiencies and Wider Integration of AMDAR in the Aviation Industry

The collaboration will take advantage of IATA’s position and prominence in the aviation industry to ensure that the programme is more widely recognized and integrated within the aviation industry. While WMO has developed functional and operational standards for AMDAR on-board software and for the management of the data by NMHSs, the programme would be advantaged and made more efficient by improved coordination with aircraft manufacturers, avionics vendors, applications developers and other related service providers, giving them a better understanding of the operation of the programme and seeking their contribution to its development through more formalized and centralized planning and implementation processes.

The wider integration of AMDAR will be realized through measures such as:

- Ensuring that solutions for AMDAR software functionality are optimized and implemented on the most appropriate avionics systems;
- Coordinating the development of solutions for meeting requirements for provision of AMDAR data with airlines and aviation experts;
Putting in place wider competitive tendering processes for services so as to minimize operational costs and optimize some aspects of the programme, such as data communications services and AMDAR software development; and

Working with aircraft manufacturers to ensure that AMDAR solutions are optimally provided and available with new aircraft delivery or readily retrofitted.

Efficiencies and reduced costs associated with the development and operation of the Programme would be derived through:

- Reduced costs of AMDAR onboard software provision and implementation as a result of standardization and industry cooperation, ensuring availability of solutions for retrofit;
- Regional collaboration on data management based on standardization of data representation, alleviating the requirement for redundant and costly development of national data processing centres;
- Centralized and direct negotiation of lower data communications costs with service providers, based on wider implementation and realization of programme expansion; and
- Other costs reductions based on efficiencies derived from a collaborative approach to programme operation, including reduction in resources required for data quality monitoring and systems fault rectification.

These measures will be implemented through both ongoing and ad hoc (as-required) procedures, processes and activities put in place by the IWCAP, overseen and managed by the governance and operational framework.

I. Aim 9 - Wider Availability and Improved Use of AMDAR

While use of AMDAR data is well established in the meteorological community and the benefits well documented, particularly in weather forecast applications, in other areas it is not being used to its full potential.

WMO will continue to promote and ensure the use of AMDAR data in meteorological, climate and other applications areas and that it is used particularly to improve and enhance weather services and products for aviation operations.

IATA will also promote AMDAR programme participation and the benefits of the data to the aviation community while at the same time analysing and implementing operational procedures that can facilitate its wider and more active use for applications such as flight operations and flight management.

IATA will also seek to promote the use of AMDAR data by other data users, ensuring that the programme and the participating partners benefit from resources derived from any related commercial revenues.

As the AMDAR programme is enhanced globally with wider provision of water vapour and turbulence information, it is expected that the benefits and impact of its use for the relevant application areas will be correspondingly improved and acknowledged, leading to further expansion of the programme over the longer term.
4. IWCAP OPERATIONAL AND PROGRAMMATIC STRUCTURE

A. Overview

This section describes the entities, systems and processes that would form the new IWCAP and support its developmental, implementation and operational elements.

The initial IWCAP operations will largely be based technically on the current WMO AMDAR Programme that is currently executing reliably to deliver data to users. However, to realise the efficiencies and economic advantages of a regional and collaborative approach, the IWCAP will take a more centralized (regional or global) approach to the following key areas of the programme:

- Airline recruitment and agreement making.
- Establishment of requirements for observations.
- Planning, development and implementation.
- Data management and provision.
- Avionics requirements and development.
- Funding, accounting, and disbursement of costs.

Over time, it would be expected that most existing national and regional programmes would be migrated to the IWCAP framework with little change at the national level except the integration into the regional approach and the transfer of the resourcing arrangements to the IWCAP. Under the IWCAP, it would be expected that currently existing operational programmes would become more cost efficient, better optimized and provide improved coverage. Currently existing programmes would be expected to continue to operate under the current model so as to honour existing contractual obligations and/or until such time as it is convenient or more cost efficient for them to be migrated.

Additionally, it is expected that the transition to the global IWCAP operations would be undertaken with an iterative approach on a region by region basis as each WMO Regional Association confirms a decision by its member NMHSs to participate and collaboratively gather and define its requirements for participation under the model described in section 5.B and as a component of the maintenance of the Regional Basic Observations Network. This process would be coordinated by the IWCAP Oversight, Planning & Coordination Team (OPCT) in cooperation with the relevant WMO Regional Associations and its relevant work groups.

In some cases, the regional operational programmes could be initially established from new or existing national programmes that are adapted or developed and combined within each WMO Region in conformity with the new IWCAP operational framework and structure that is depicted in Figure 3 and described below.

In this way and possibly commencing with WMO Region VI with the support and participation of the EUMETNET/E-AMDA programme, the IWCAP would be expected to commence operations at the start of 2020 after an initial development period over 2019.

B. Operational Structure

A depiction of the proposed operational structure (right hand panel) showing the various key entities and operational and developmental (left hand panel) processes, is provided in Figure 3. This structure is applicable to each of the 6 WMO Regions.
Figure 3. Overview of IWCAP operations.

Figure 4 below provides more detail regarding data flow under the IWCAP, including the systems and centres that make up the WIGOS Data Quality Monitoring System for Aircraft-Based Observations and the Global Data Centre for Aircraft-Based Observations.

The systems and centres that will form the operations of the IWCAP are described below.
Figure 4. Overview of IWCAP operations.

i. Airlines and Aircraft

The IWCAP Operators (see section 4.C) will establish collaborative agreements with each participating airline that will be based on the over-arching agreement between WMO and IATA for operation and development of the AMDAR programme.

Their introduction to the Programme and the process for their integration into the program will be assisted by IATA and coordinated by the IWCAP OPCT.
ii. Data Service Provision

Through collaboration and strong business relationships with aviation Data Service Providers (DSPs), observations taken on-board operating aircraft of participating airlines are downlinked in near-real-time via a land and satellite-based communications network to designated Regional Data Processing Centres (RDPC).

iii. Regional Data Processing Centres

Regional Data Processing Centres (RDPCs) will be established by WMO and its Regional Associations under the WIGOS framework. These centres would be operated by WMO Members and authorized and resourced to receive, decode and process downlinked, incoming AMDAR data and, after specified quality control, format them for distribution on the WMO Information System by secured networks to NMHSs for operational use in meteorological and other applications, in accordance with the agreed data policy under the IWCAP.

iv. Global AMDAR Data Optimization System

The Global AMDAR Data Optimization System (G-ADOS) will be established and operated under the IWCAP to support the efficient and economic meeting of national, regional and global requirements for provision of AMDAR observations. The G-ADOS is a ground-based system that will support two-way communications with AMDAR on-board software so as to optimize the reporting of the global AMDAR fleet by reconfiguring the reporting status of participating aircraft to optimally meet requirements for data, while eliminating unnecessary redundant data that might otherwise be produced and needlessly increase the costs of the operation of the programme. The system also provides a means for efficiently and quickly catering for the changing and evolving requirements for data-by-data users, allowing an increase or a reduction in data resolution to be implemented at very little cost. Such reprogramming can even catering for seasonal or even shorter time-scale modifications in programme output to cater for varying climate and weather forecasting applications. The costing, financing and accounting framework would need to cater to such shorter-term change requests.

v. WIGOS Data Quality Monitoring System for Aircraft-Based Observations

The WIGOS Data Quality Monitoring System is comprised of several Regional WIGOS Centres that would provide data quality and incident management functions to the Programme to monitor data quality and coordinate processes to manage data quality issues and rectify associated incidents.

Lead Centre for Aircraft-Based Observations

The WMO designated global Lead Centre for Aircraft-Based Observations under WIGOS will be responsible for the quality evaluation and incident management processes associated with AMDAR data quality management under the WIGOS Data Quality Monitoring System.

Regional Associations will be responsible for establishing Regional WIGOS Centres for handling regional incident management processes.

Monitoring Centres for Aircraft-Based Observations

The WMO designated Monitoring Centres for Aircraft-Based Observations will be responsible for undertaking quality monitoring processes to support AMDAR data quality management under the
WIGOS Data Quality Monitoring System. Monitoring centres would be established under the WIGOS framework at either the global or the regional level as required.

vi. **Global Data Centre for Aircraft-Based Observations**

The WMO GDC-ABO is the international repository for aircraft-based observations and will provide access to AMDAR data in non-real time to researchers and other non-profit institutions as well as other approved or licensed data users (third parties).

vii. **IATA Flight Operations**

In addition to supporting real-time and other meteorological applications the AMDAR data derived from the programme would also support the operational activities of participating airlines and the aviation industry through the coordination and support of IATA. IWCAP RDPCs would transmit the AMDAR data to the IATA MET Data Platform where they would be integrated into operational systems for provision to airline partners. Within the agreed arrangements with airlines and WMO, IATA would also provide the data to third parties in support of aviation operations or under commercial arrangements. A percentage of the revenue from commercial sale of data by IATA should flow back into the programme to support airline participation and programme development and expansion.

C. **IWCAP Programmatic Structure**

IATA and WMO are proposing a collaboration to govern, operate and develop the global AMDAR Programme, with a view to optimally meeting the aims established and briefly described in Section 3 and the operational structure defined above. To sustain the management, development and operation of the AMDAR programme, the IWCAP will establish a programmatic structure to support the additional required management and coordination processes and technical working relationships between the partners. The major elements of this programmatic structure are indicated in green and orange in Figure 5:

1) Governing Board,
2) Oversight, Planning and Coordination Team (OPCT),
3) Operators, and
4) Ad Hoc Task Teams (ATTs).

These programmatic elements would be supported by the existing entities from both organizations, indicated in yellow (IATA, left side) and blue (WMO, right side). The entities in green would have only an coordinating, assisting and/or overseeing role in the programme and would have no role or function in the its day-to-day operation.
Figure 5. Overview of the IWCAP programmatic structure.

i. **IWCAP Governing Board**

The Governing Board will interact at functionally high levels within the IATA and WMO organizational structures to monitor and oversee the achievement of Programme aims and ensure that Programme participation is authorized, balanced, mutually beneficial and sustainable. The Governing Board led by two co-chairs, with one appointed from each organization and would have authority over, and oversight of all IWCAP functions. It would have responsibilities to:

- develop and formalize the operating relationships between IATA and WMO under the IWCAP;
- oversee the establishment and maintenance of the IWCAP under terms established in the collaborative agreement between IATA and WMO;
- develop the terms of reference of, and establish, the IWCAP Oversight Planning and Coordination Team (OPCT);
- coordinate and promote the IWCAP within the two organizations and among members and relevant constituent and subsidiary bodies;
- develop and approve high-level policies, definitions and required agreements relating to the programme and its operation;
- receive and approve routine reports, budget documents and high-level (global) plans in relation to the programme operation, development and implementation;
resolve any critical issues affecting the viability and sustainability of the programme; and
ensure integration and coordination of the operational activities of the programme within
the respective organizations.

IATA and WMO would designate, as necessary, staff and airline member representative experts to
the Governing Board and contribute the agreed and required resources to support its operations.
These details would be based on and subject to the agreement between WMO and IATA, which
would also define mechanisms and processes through which the Governing Board would make its
decisions and settle any disputes – see Section 6.A.i.

ii. IWCAP Oversight Planning and Coordination Team

IWCAP developmental and operational functions would be overseen by the OPCT. The OPCT would
not be involved the day-to-day operations of the programme, which would be executed by the
IWCAP Operators, assisted by IATA and WMO organizational entities through participation in
various Ad hoc Tasks Teams (ATTs) that provide specialized technical and programmatic support.

The OPCT would be comprised of at least one designated officer from each of IATA and WMO. It
would also provide both a meteorological and technical coordination support function according to
the needs of the programme and resourced either directly by IATA and WMO or by the IWCAP.
The OPCT would be expected to undertake the following functions and activities:

- assist Regional Associations to coordinate the establishment of the IWCAP and oversee its
  operation;
- assist Regional Associations to coordinate the establishment and maintenance of the
  necessary and approved Operators, activities, processes, systems and infrastructure of the
  IWCAP;
- at the direction and approval of the Governing Board, oversee the establishment and
  coordination of IWCAP Ad hoc Task Teams (ATTs);
- manage and coordinate the processes and procedures for the establishment and
  maintenance of the national, regional and global requirements for AMDAR data;
- manage and coordinate the planning and development activities for the IWCAP with IATA
  and WMO Operators;
- coordinate the compilation of required reports, budgets and documents and their provision
  to the Governing Board as necessary;
- develop, review and maintain necessary agreements and/or regulations with partner
  airlines, and WMO Members to ensure they support and comply with IWCAP policies and
  agreements;
- collaborate with relevant IATA and WMO bodies, work groups and other entities as
  necessary to support the IWCAP;
- monitor and report on the quality of IWCAP outputs and associated Key Performance
  Indicators; and
- escalate critical operational issues and decisions to the Governing Board.

iii. IWCAP Operators

IWCAP Operators will be responsible for the operation of the centres and systems depicted in
Figures 3 and 4 and described in section 4.B. Operators will be designated by WMO and Regional
Associations to undertake the operational aspects of the program related to data management. It
is expected that WMO Member NMHSs will generally undertake these roles, resourced by the
IWCAP and supported to establish and maintain their designated operations by other IWCAP
entities. In some cases, Operator functions could be fulfilled by third parties contracted by the
Operators or by WMO directly.
iv. **Ad Hoc Task Teams**

Ad hoc Task Teams (ATTs) would be formed by the OPCT at the direction of the Governing Board to fulfill well-defined, temporary or ongoing programmatic activities in support of IWCAP operation, development and/or implementation. ATTs would be comprised of designated, voluntary or funded experts or consultants from either the meteorological and/or aviation areas and would be derived chiefly from IATA and WMO entities and subsidiary bodies, such as secretariat staff, technical commissions, expert teams or other working groups.

ATTs would be responsible, among others, for one or more of the following envisaged roles and activities:

- resolving programme operational or developmental issues or problems;
- overseeing the implementation of a particular developmental aspect of the programme;
- developing specifications or requirements;
- interacting or engaging with third-party entities on programme-related matters or objectives; or
- undertaking promotional, educational or outreach activities in support of the programme.

In most cases, the lead or a member of an ATT would report directly and provide deliverables to the OPCT in support of the development or operation of the Programme.

v. **IATA Organizational Entity Roles**

The IWCAP would be expected to be strongly supported by existing IATA and WMO organizational entities for both programme-related operational and developmental activities and provision of expertise.

The following IATA organizational entities will contribute to the IWCAP.

- **IATA Safety and Flight Operations (SFO) and Marketing and Commercial Services (MACS) Divisions** would provide oversight and administration for aviation industry.
- **IATA Operations Committee (OPC)** would:
  - set priorities and oversees the SFO activities;
  - establish Working Groups and Regional Coordinating Groups to provide technical advice and support for campaigns and issues; and
  - act as advisor to the Governing Board and other relevant IATA bodies on all matters that relate to the improvement of safety, security and efficiency of civil air transport.
- **IATA Working Groups**
  - **Flight Operations Group (FOG)** would:
    - provide expertise and work on mandates related to flight operations and global air traffic management; and
    - report to the OPC
  - **Flight Operations Support Task Force (FOSTF)** would:
    - support the FOG; and
    - assist in all matters relating to aviation meteorology, makes recommendations related thereto, and indicates how its recommendations may be implemented in a rational, coordinated and cost-effective manner.
vi. **WMO Organizational Entities**

The following WMO organizational entities would be expected to contribute to the IWCAP in the following ways:

- **WMO technical commission responsible for observing networks and information systems**:  
  - review and maintain global requirements for observations and advise on observing system design and evolution;  
  - through the coordinated activities of member experts, develop and maintain international and regional operational procedures, standards and guidance for member NMHSs and component systems for a range of operational aspects of the programme including: data processing management, quality control and communications;  
  - contribute to the coordination, membership and work programs of IWCAP ATTs; and  
  - assist in the establishment and maintenance of operational component systems, such as the Lead Centre for Aircraft-Based Observations and Monitoring Centres.

- **WMO Regional Associations** would:  
  - develop and maintain regional-level annual and medium-term planning processes and procedures for the establishment and maintenance of national and regional requirements for aircraft-based observations and AMDAR data;  
  - in accordance with the IWCAP cost structure and funding framework (see section 6.C) and in collaboration with WMO and the OPCT, establish and coordinate a process to fund the operation of the regional AMDAR programme by IWCAP Operators and associated Regional WIGOS Centres;  
  - on an annual basis, ensure necessary planning and budgetary documents are developed and made available to the IWCAP;  
  - oversee the regional operations and outputs of the IWCAP Operators;  
  - under the coordination of the OPCT and operation of IWCAP Operators, interface with operational airlines and DSPs for generating and obtaining data and ensuring optimal data communications and data coverage;  
  - Under the Regional WIGOS Centre framework, either establish, operate and maintain or else participate in, an incident management system associated with the WIGOS Data Quality Monitoring System for aircraft-based observations to facilitate a regional and national response to resolve data quality issues;  
  - monitor regional AMDAR systems performance and observations quality; and  
  - establish regional work groups on Aircraft-Based Observations (WG-ABO) to:  
    - coordinate the development and maintenance of regional plans, requirements and budgets for AMDAR observations and regional AMDAR programme operations in accordance with the IWCAP and in the context of the Regional Basic Observations Network;  
    - assist in the establishment of regional AMDAR data processing and monitoring centres as required, and providing technical support for their maintenance and operation; and  
    - oversee the operation of associated Regional WIGOS Centres and the regional component of the AMDAR Data Quality Management System (DQMS).

- **National Meteorological and Hydrological Services** would:  
  - determine and provide their requirements for AMDAR ABO in accordance with Regional Association processes and procedures;  
  - ensure timely payment of fees and other agreed-upon expenses for data and transmission services to support the regional AMDAR programme and national requirements for ABO through the processes established under the IWCAP;
o comply with agreed data policy provisions and requirements established under the IWCAP;
o provide resources to the Regional Association to support the expert membership and activities of regional WG-ABOs;
o facilitate optimal use of AMDAR data for real-time aviation forecast services for positive impact on airline operations; and
o promote the Programme at the national level with the aviation industry and national Civil Aviation Authorities to ensure an understanding of the benefits and the business case for participation in it.
5. **IWCAP PROGRAMMATIC PROCESSES**

A. **Annual Cycle of Developmental and Implementation Processes**

The IWCAP will have three fundamental components:

1) Operational;
2) Implementation; and
3) Developmental.

Each component will have well-defined roles, activities and processes to ensure that requirements are established and plans are made within the developmental component.

The operational component will consist of those processes and activities required to maintain the IWCAP as described in section 4.

The developmental and implementation components will ensure the establishment of requirements for, and the transition of, newly developed technology and increased system capabilities into operations under the coordination and management of the IWCAP Oversight, Planning & Coordination Team (OPCT) in collaboration with the IWCAP Operators.

The IWCAP annual cycle of developmental, implementation and operational processes, as depicted in Figure 6 below, will be established by the IWCAP to support the ongoing development, expansion and enhancement of the programme based on the established and maintained requirements for aircraft-based observations.
The key processes of the IWCAP Operations, Development and Implementation are:

1) The establishment and ongoing maintenance of requirements for aircraft-based observations and AMDAR data at the national, regional and global levels;
2) The development and ongoing maintenance of annual and short to medium term regional and global plans for AMDAR programme operations, implementation and development;
3) Review and approval of developmental and operational plans and budgets;
4) Appropriation of funds and resources;
5) Implementation of plans on an annual basis; and
6) Monitoring, review and reporting of operational performance.

**B. Developmental Processes**

**i. Establishing Requirements for AMDAR Observations**

The process for establishing meteorological requirements will be based on the initial specification of national requirements which are then integrated into a harmonized and consolidated regional set of regional and global requirements in collaboration with WMO Regional Associations and Technical Commissions for provision of AMDAR data from the IWCAP.

This fundamental process in the IWCAP ultimately facilitates the establishment and maintenance of global requirements for AMDAR data based on an annual review and update cycle undertaken within each of the six WMO Regional Associations. This process results in 6 sets of regional requirements and associated regional operational and developmental plans which in turn are derived from the individual national requirements for AMDAR data of WMO Regional Association national members (Figure 7).

![IWCAP Requirements and Planning Process](image)

**Figure 7. The IATA-WMO Requirements and Planning Process.**

The regional requirements would, as much as possible, take into account capacities within the region, taking advantage of opportunities to optimize and economise through international and regional planning and infrastructure sharing. Regional resource allocation and budgeting would be based on the established requirements and on regionally and globally agreed costs for development and operation established under the IWCAP. The regional plans and budgets for resource allocation derived from national member contributions would support both the development and ongoing operation of the programme, including both regional and global infrastructure and systems, charges for observational data transmission and processing and management functions. The funds for development and operations would be managed as described in section 4.C.
The requirements cover, but are not limited to, measurements of aviation and meteorologically relevant observed parameters, global areal and temporal data coverage, and observed density for both horizontal (en route) and vertical (soundings) data. Programme and systems development will be focused on expanding global data coverage for en route and vertical profile data, improving data quality, processing and security throughout the system, and extending the programme to include or extend coverage of observations measurements, such as water vapour and possibly turbulence, to meet established requirements.

The requirements process has a one-year update cycle and includes planning for the coming 5 year period. It may likely include an extended outlook that would enable harmonization with both partners’ short to longer-term plans and operations. It will have the following elements:

- National Focal Points (NFPs) in each WMO Region will gather and update requirements for AMDAR observations annually and provide them to the regional Working Groups for Aircraft-Based Observations (WG-ABOs), organized by WMO Regional Associations.
- The WG-ABOs will annually validate and consolidate national requirements into Regional Requirements (RRs) and oversee a formal planning and implementation cycle for their Regional Association, taking into account the wider requirements for upper-air observations of the Regional Basic Observations Network.
- Through each WG-ABO, the Regional Association will develop and maintains a 5-year development plan (DP) and an operational plan (OP) that includes the means to support a sustained annual level of both human effort and funding for regional operational execution and planned development and expansion of the AMDAR Programme.

Regional and global requirements for AMDAR observations will essentially be formulated independently of the operational system of reporting airlines that is, or might be required to meet the requirements. For the most part, it will be up to the OPCT, the Operators and related ATTs to determine the most efficient and cost-effective solution for the provision of the required observations. This will be determined, planned and budgeted through the IWCAP global planning and budgeting process as described below.

### ii. Planning and Budgeting Processes

The IWCAP will incorporate processes to consolidate regional requirements into plans and budgets for meeting those requirements operationally. The costs of implementing new requirements, procedures, technologies, etc. will be calculated based on costs estimated and agreed under the IWCAP or provided/estimated by IWCAP Operators in consultation with IATA and participating airlines.

It will be the role of the OPCT and the Operators to develop and maintain both the developmental and operational plans for the IWCAP, which will be based on a process of consolidating the regional and global requirements for AMDAR into plans and budgets. In summary:

- Regional requirements, OPs and DPs and funding commitments would be consolidated into a Regional Operational Plan (ROP), a Regional Developmental Plan (RDP) including budgets.
- The ROP and RDP would incorporate and harmonize additional aspects of requirements for AMDAR Data including:
  - Meeting the requirements for AMDAR data of global data users defined under the WMO Global Basic Observing Network (GBON) and/or those users outside the national and regional requirements gathering and maintenance processes;
Consideration of requirements against other sources of upper-air observations and aircraft-based observations – for example, upper-air observations from radiosondes, wind profilers and derived from ICAO aircraft reports.

Incorporating requirements and financial support for provision of data in data-sparse areas and data for Least Developed Countries (LDCs) and Small Island Developing States (SIDS) – see below also; and

The use of internationally operating aircraft fleets to meet requirements for data in data-sparse areas and to improve the programme’s efficiency within and between regions.

- The ROP and RDP and associated budgets would be reviewed and approved by the Governing Board.
- This process would be conducted annually, with requirements, plans and budgets reviewed and updated for implementation over the next calendar year.

The planning and budgeting processes will also take into account special and specific considerations for aspects of the programme’s development including:

- Facilitating participation of least developed countries (LDCs) and small island developing states (SIDS) to allow them to benefit nationally and regionally from AMDAR data.
- Automatic and immediate delivery of AMDAR data during critical situations such as high impact weather for disaster risk reduction purposes.

### iii. Meeting Global Requirements

At the global level, meteorological requirements will be defined and maintained by the WMO Technical Commission in charge of observing network design and evolution through the WMO Rolling Review of Requirements, which maintains technology free and quantitative observational user requirements for all WMO Application Areas. The RRR identifies the gaps in every Application Area, and guides WMO Members in evolving their observing systems to address the gaps, taking into account cost-effectiveness of observing systems and the priorities of WMO members. WMO observing networks contributing to the WMO Integrated Global Observing System (WIGOS) also follow the Observing Network Design principles which are provided in WMO No. 1160, Manual to the WIGOS.

Ongoing operation of the IWCAP will be planned and supported based on the continuing requirements of WMO members and other data users for provision of these data as derived from the requirements making process described above and as specified in the regional operating and development plans. These requirements and plans will be consolidated by the OPCT taking into account those additional global requirements identified through the WMO RRR and under the WMO Global Basic Observing Network.

The plans will incorporate and include requirements to operationally support those new aspects of the programme that are implemented through the developmental process in addition to planning for the ongoing maintenance and operation of the system as described below.

### iv. Processes and plans for meeting requirements for expanding global AMDAR

The developmental planning process and the implementation activities will be done in close collaboration with IATA and the airline industry.

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1 For further information, see: [http://oscar.wmo.int](http://oscar.wmo.int)
Based on the requirements for AMDAR observations of WMO members and, in some cases, requirements from other entities that may be received by the IWCAP, the plans for expanding global AMDAR data will be maintained within the IWCAP Global Development Plan (GDP).

The GDP will describe the developmental activities, tasks and new infrastructure required to be developed and implemented in order to meet new requirements for observations or to improve the performance of the operational system. This would be accompanied by the budget required to undertake the implementation processes.

Within the planning and budgeting cycle, an analysis of the capabilities of the current AMDAR system to be able to meet new requirements for AMDAR observations would be routinely made. This will include an assessment of whether new airlines were required to be recruited to the program. In some cases, based on the ability of the existing system to provide observations through reconfiguration of the reporting regime, possibly through the functionality of the Global AMDAR Data Optimization System (G-ADOS), it might not be necessary to recruit new airlines to meet new requirements.

When required, the OPCT and/or ATTs will work with prospective targeted airlines to assess their technical capability and infrastructure and recommend an appropriate technical solution for enabling AMDAR reporting capability on their aircraft, including communications requirements to support the delivery of data to the RDPCs.

New airlines would be recruited under the established terms of the IWCAP and through a standardised agreement established with the participating partner airlines.

In addition to requirements for the recruitment of new airlines to the programme, the GDP would also take into account:

- Requirements for maintenance, improvements and upgrades to regional data processing and monitoring infrastructure;
- Expected operational data volumes and their associated costs;
- Requirements for development of AMDAR on-board software and other aircraft-related infrastructure;
- Schedules for AMDAR software installation, testing and ongoing maintenance;
- Documentation and distribution of procedures for system maintenance and operation and personnel training; and
- Engagement with and contracting of DSP(s).

IATA will have a lead role within the development and implementation process, through assistance in the establishment of appropriate ATTs and through the undertaking of related tasks within relevant IATA working groups. IATA will also promote the programme and its benefits within the aviation industry and among its member airlines to facilitate the establishment of partnerships and participation in the programme.

v. Meeting requirements for water vapour observations

Given meteorological requirements for water vapour observations as established in the WMO Rolling Review of Requirements, the potential availability of such a measurement from the AMDAR programme and the benefits that can be derived from its wider availability (see Section 7), IATA, in conjunction with the IWCAP, will work with the aviation industry to promote the derivation of solutions to cost-effectively meet such requirements, while minimizing the impact on airline operations.
Initially the focus for the IWCAP will be to determine medium to long-term requirements, including both the meteorological and aviation requirements for these observations and make assessment of the best strategies for meeting them, based on a supporting business case. It is clear already that the focus on integration of the measurement capability from the factory floor as an option for new aircraft will be key to those strategies, assuming that the business case supports this.

The meteorological community would very likely need to accept that such data would incur a higher cost than other AMDAR observations and that the cost structure and operational budgets would reflect this, however an aim of the IWCAP should be to minimize these costs and reduce them over time.

Meeting requirements for water vapour observations would also focus on:

- Analysing, assessing and developing the business case across the industry for airline capabilities and readiness to report these data;
- Facilitating the option for delivery of new aircraft with water vapour measurement capability;
- Development of cost-effective solutions for retrofit of aircraft to support water vapour measurement;
- Requirements for testing and certification of sensors;
- Requirements for updating of AMDAR onboard software to support water vapour provision; and
- Development of a cost and pricing structure for the data, acceptable to the airlines and WMO, that would allow a simplified planning and budgeting process by WMO Regional Associations, while also supporting further development.

vi. Meeting requirements for turbulence reporting

The AMDAR observing system supports reporting of turbulence parameters in conjunction with AMDAR functionality as described in the AMDAR Onboard Software Functional Requirements Specification (AOSFRS) – see 6.F. Turbulence reporting with AMDAR is facilitated through the installation and configuration of an avionics application to which the AMDAR application interfaces to obtain the turbulence related information for reporting via the AMDAR downlink messaging functions. While the integration of the two applications in this way may well be efficient in terms of communications functionality in a programme where the output from the two applications (AMDAR and turbulence) are required, they can also be managed separately, given their modularity.

Currently, IATA is working towards an independent solution for turbulence reporting by airlines to support its aims to operationalize provision of turbulence information to the aviation industry in support of safety and efficiency of flight operations.

Under the IWCAP, it is expected that IATA and WMO will agree to share turbulence information to support the operational requirements of both the aviation and meteorological communities. These arrangements will be defined within the IATA-WMO collaboration agreement – see 6.A.
C. Implementation Processes

i. Initial Development and Implementation of the IWCAP Operational System

It is expected that the current WMO AMDAR Programme will over time be evolved into the IWCAP operations. In doing so, the IWCAP organizational (managerial and operating) structures must be implemented jointly between IATA and WMO and functional IATA and WMO activities must be either migrated into the new operations or developed and implemented. An IWCAP Implementation Plan will be developed to provide guidelines and milestones for such initial implementation activities.

In the event that currently existing programmes are migrated to the new IWCAP framework, the integration process would be required to take into account ownership and value of existing infrastructure and associated property and rights. This could be done, for example, by ensuring under relevant agreements, that such infrastructure, property and rights were retained by the original owner, or else that the ownership was transferred with agreed remuneration or recompense paid by the new owner or the IWCAP.

ii. Ongoing Development and Implementation

Following the compilation of the GDP and associated budget each year, the funds would be transferred to the APEF to support implementation into operations, with the aim to undertake the implementation over the 12 to 18 month period subsequent to the developmental plans being finalized. The aim would be to then bring the new developments into the operational programme at the start of the next calendar year following the development and implementation period.

The following roles, processes and activities are envisaged to be undertaken by the Operators supported by the OPCT and relevant ATTs:

- Agreements between relevant partners would be established;
- Contracts would be established to support required AMDAR software development;
- Plans would be made with each airline to schedule and resource the implementation process, including installation of required AMDAR onboard software and sensors;
- Requirements for changes to RDPCs and monitoring systems would be undertaken and funded as necessary;
- Contracts for data communications provision would be established with DSPs based on a competitive tendering process where possible;
- Required changes to the G-ADOS would be planned and made; and
- Appropriate testing and documentation of systems performance and data quality would be undertaken.

D. Operational Processes and Procedures

i. Data Processing and Data Management

Under the IWCAP, RDPCs would be established and maintained at the WMO regional level as required to support the Regional AMDAR Programmes through a WMO-led designation process with agreed terms of reference and standard processes and procedures for operation. The operations and resources of the RDPCs would be managed through the regional and global requirements and planning process, with WMO Members supporting their operation through contribution to the IWCAP funds.
Regional and global plans for AMDAR operation and development will take into account requirements for data optimization and costs associated with redundant data.

It is envisaged that the E-AMDAR Data Optimization System (E-ADOS) would be reestablished as, or extended to become the Global AMDAR Data Optimization System (G-ADOS), based on successful negotiation with the current owners and operators.

a. **IATA Flight Operations Support and Provision of Data to Third Parties**

The IWCAP would establish a platform for participating airlines to provide and control access to their data and also to additional operational information based on data derived from the programme.

In accordance and agreement with the IWCAP and at the behest of airline partners, IATA would establish a commercialization mechanism for AMDAR data, for which the revenue raised would be used, in part, to supplement support to the IWCAP funds and also reduce the costs of the programme. Based on an agreed division of such funds, they could also be used to provide an incentive for airlines to participate through offsetting and reducing their own resource allocation to the programme.

Commercial third party access to AMDAR data may be facilitated either via the GDC-ABO or, if necessary, through an alternative platform established by IATA.

b. **Global Data Centre for ABO (GDC-ABO)**

The GDC-ABO will provide a centralized source of quality assured AMDAR data from which WMO Members and partners in the aviation industry can securely access non-real-time data in support of non-commercial meteorology, aviation forecasting, climate, research and other applications. Such access would be available through a secure and validated interface that would support and implement the IWCAP data policy and any variations as necessary, while also providing WMO Member NMHS with access to AMDAR data in accordance with the IWCAP and relevant WMO technical regulations.

The IWCAP will define access requirements and protocols for the GDC-ABO, which is expected to be operated by the USA in accordance with currently agreed terms of reference.

The IWCAP would provide some resourcing to the GDC-ABO in order to support required improvements to functionality and ongoing maintenance.

c. **Data Management and Data Quality Assurance**

*Data Quality Control*

The first and initial stage of data quality management is its quality control (DQC), which would be undertaken predominantly in two places. Firstly, limited but important and standardized DQC is undertaken by the AMDAR onboard software as observations are made on the aircraft platform. Secondly, the RDPCs would undertake more comprehensive automated and real-time DQC in the context of their ground-based processing carried out before distribution on the WIS.

In addition to the value-adding that DQC provides to AMDAR data, such processes undertaken by RDPCs will also incorporate procedures to notify airlines of implications for aircraft sensor error or mal-function, thereby contributing directly to flight operations and aircraft performance improvement for participating airlines.
National, Regional and International Data Quality Monitoring and Fault Management

The second stage of data quality management is associated with the ongoing process of monitoring and undertaking quality assessment of AMDAR data, based on both its routine use in operational meteorological applications, and also through data monitoring and assessment applications that are established for such a purpose. Such applications and systems are established and operated at the national, regional and global level. WMO and its Regional Associations will formally establish a WIGOS Data Quality Monitoring System (DQMS) for the programme that will take advantage of and coordinate the quality monitoring and assessment processes and results to provide a framework for assuring the quality of AMDAR data. This will be facilitated through the establishment and operation of regional monitoring and lead centres for aircraft-based observations that will oversee the DQMS and will include the operation of a fault management system to report, manage and ensure the timely rectification of data quality faults and issues.

RDPCs will have the functionality to remove errant data from the operational data stream in the event that it is detected by either the DQC or the DQMS and to notify airlines of aircraft sensor error or malfunction.

Data quality issues will be flagged and documented within the GDC-ABO.

Data Security

Data security in operations is a critical issue for IATA and airline partners. Agreed measures and procedures will be implemented in accordance with data policy in order to ensure and maintain data security and good working relationships between data users and providers.

WMO will ensure that NMHSs and all associated national data users comply with IWCAP data policy agreements and ensure their implementation through procedures and processes established as a part of the data management system of the IWCAP. This will include managing and monitoring access to data and validating the credentials and entitlement of those entities that request access to it.

In practice, data will be operationally secured through the design and functionality of the operational data processing systems, including RDPCs and the GDC-ABO.

ii. Operational Infrastructure Maintenance and Improvement

The OPCT and Operators will be responsible for coordinating the activities and processes associated with maintaining the operational standards and integrity of the IWCAP. Plans for infrastructure and systems maintenance will be incorporated within the GOP, with funding resources to be included in the APOF based on appropriate and agreed contributions from NMHS programme partners.

Plans and processes for infrastructure maintenance and improvement would likely or possibly include:

- AMDAR onboard software upgrades to support new required functionality or technology developments and changes;
- Data management and processing systems maintenance and upgrades; and
- Sensor calibration and maintenance.
6. BUSINESS PROCESSES

A. Agreements and Contracts

Under the IWCAP, a centralized agreement/contract framework will be implemented.

i. IATA-WMO Agreement for Collaboration on the Operation of the AMDAR Programme

In July 2017, IATA and WMO entered into a Working Arrangement (WA) on the Operation of the AMDAR Programme to determine a potential collaboration on the operation, enhancement and expansion the AMDAR programme. Under this WA, the organizations have proposed a Concept of Operations (the current document) to describe the practical aspects and the Terms of Reference of the collaboration. When both IATA and WMO agree on these, the scope of the WA will be extended [/a new WA will be made] to encompass the formal terms and conditions of the collaboration.

It is expected that such an agreement would cover the following:

- The precise scope of the collaboration, including a definition of any programme outputs and derivatives;
- The role that each organization agrees to undertake in the collaboration, including in data delivery and continuous operational and developmental management of the programme;
- The resources each Organization accepts to commit to the programme;
- Data pricing and agreed processes for the management of funds, including the mechanism of cost-recovery for the airlines to generate data on one hand and, on the other, the mechanism to recover the costs incurred by the NMHSs to process data and generate value-added products based on the data received;
- Definitions of policies, including data and software ownership, data licensing and data management, and the roles of both parties; and
- Specific arrangements and/or assumptions related to the roles of each organization’s members and affiliated entities;

The collaboration seeks to establish a uniform and more efficient approach to AMDAR operation, implementation and development, the WA and the operation of the IWCAP is not intended to create any exclusive arrangements for the availability and processing of AMDAR or other ABO data. For example, the IATA-WMO collaboration could include and accept the integration and sharing of ABO data from other sources beyond IATA Member airlines. Similarly, the IATA-WMO collaboration does not aim at, and will not, preclude the establishment of new arrangements, nor the continuation of the existing ones covering provision or sharing of ABO and/or AMDAR data between any other airlines and/or parties.

The collaboration and its associated arrangements will be fully transparent to the members of both organizations and, wherever possible, to the public at large.

ii. Agreements with WMO Members Agencies

WMO and/or its Regional Associations will enter into standardized agreements with WMO Members to establish the agreed terms and conditions for the provision of participating Member resources to support the establishment, development and operation of the IWCAP.
 iii. Agreements with IWCAP Operators

WMO and/or its Regional Associations will establish agreements with WMO Member or third party Operators to facilitate the operational components of the IWCAP. These agreements will clearly define the roles and functional requirements to be undertaken by the operator and the terms and conditions associated with the resourcing to support operational systems and centres. Operators will be responsible for the operations of IWCAP systems and WIGOS centres including:

- Regional Data Processing Centres
- AMDAR Data Optimization Systems
- Monitoring Centres
- Global Data Centres

iv. Agreements with Airlines for Participation in the IWCAP

Under the IWCAP, each airline will enter into an agreement with [each of the Regional Data Processing Centres/ with the Regional Data Processing Centre of its corporate residence country] defining its role and obligations to meeting the requirements for provision of AMDAR data to the programme, the protection of their property rights and other interests, and their payment/cost-recovery for participating in the programme.

v. Contracts with Vendors and Suppliers for Provision of Products and Services

IWCAP Operators, in accordance with their IWCAP agreements and with their internal processes, will contract with relevant vendors/equipment suppliers to purchase the necessary products, infrastructure and services for the operation of the programme.

vi. Establishment of AMDAR Data Policy with WMO Members

A general/common Data Policy covering the usage and the licensing of AMDAR Data received by the Regional Data Centres from the Airlines will be developed by WMO and IATA in accordance with the WA.

To ensure the implementation and maintenance of the Data Policy by WMO Members, WMO will develop guidance/guidelines within its Technical Regulations and applicable Manuals.

The Data policy will cover the following aspects.

B. Data Ownership and Policy

Data ownership and policy are critical aspects for the IWCAP due to the requirement to ensure the security of AMDAR data and maintain it as the property of the participating airlines.

The IWCAP will establish the guiding principles underlying a more uniform data ownership and licensing policy as follows:

- AMDAR Data will be formally defined under the IWCAP;
- AMDAR Data provided by an Airline will remain the property of that Airline
- NMHS products derived from or with AMDAR Data, e.g. Numerical Weather Prediction (NWP) output products, will be formally defined;
• NMHS products derived from or with AMDAR Data will remain the property of the respective/producing NMHS(s);
• IATA and WMO will establish an agreement to formalize the distribution of AMDAR Data on the WIS and its use by WMO Members;
• A data cost structure will be established to fairly and equitably compensate airlines for providing the AMDAR data and to support the development and operation of the IWCAP;
• WMO will seek to ensure WMO Members compliance with data policy and licensing agreements for usage of AMDAR data as described in 6.A.vi;
• AMDAR Data will be licensed by IATA and participating airlines for storage in the GDC-ABO and for use by WMO Member NMHS and research agencies, non-commercial entities, third party organizations and others subject to the license agreement agreed to by IATA and WMO and as approved through a accepted validation process; and
• In accordance with and subject to agreement and data policy arrangements under the collaboration, only IATA or entities authorized by IATA would be able to commercialize AMDAR Data.

C. Cost Structure and Funding

To ensure support for the continuous and stable growth and operation of the AMDAR programme, financial management and operational mechanisms will be adopted and revised as necessary for data pricing, procurement of new capabilities, and operational billing and funding reimbursement.

i. Data Costs and Procurement

A simplified cost structure for the provision of AMDAR data, that covers operational costs for both the airlines and global users, that supports sustained administration of these operational funds, and allows for planned and budgeted expansion of the programme over time from available funds, should result in a more equitable cost burden within the NMHSs and additional motivation for airline participation. Additionally, the establishment of sound mechanisms (see section 6.C.iv) to allow for donors supporting capacity development and other data users to contribute to the development and operation of the IWCAP will enable expansion and enhancement of the programme in Least Developed Countries (LDCs) and Small Island Developing States (SIDS).

Principles under which the IWCAP costing and funding structure are expected to be implemented are:

• Costs incurred by NMHSs will be limited to incremental costs of developing, implementing and maintaining the IWCAP for the provision of required AMDAR data;
• The total costs associated with meeting the requirements above and beyond the meteorological requirements for AMDAR data would be met by the entity making the requirements and attributed and accounted under the IWCAP;
• While made as simple as possible, the agreed cost structure to support AMDAR programme execution will also reflect/include the varying costs associated with producing the data such as communications methods and requirements for additional/special infrastructure e.g. sensor installation for water vapour measurement;
• The cost structure will recognize “value-added” made in the derivation of AMDAR data, such as the improvement of data quality by NMHSs and other entities in undertaking data quality management;
• The cost structure will reflect the dual nature of AMDAR Data as consisting of both en route and vertical profile data;
• Costs attributable to participating NMHS, will be primarily based on the AMDAR data volume generated to meet national requirements for vertical profile AMDAR data and will
include a contribution to the costs of meeting national, regional and global requirements for en route data;

- The developmental costs of the IWCAP attributable to participating NMHSs will be the costs associated with the development and implementation of AMDAR Onboard Software on participating aircraft and for the development and implementation of IWCAP operational centres and systems;
- The operational costs attributable to participating NMHSs for operation of the IWCAP will be the incremental costs associated with the transmission of required AMDAR Data from the aircraft to ground, its processing by RDPCs for provision on the WIS and for the operational costs of IWCAP operational centres and systems; and
- Where possible, the IWCAP will endeavour to establish regional or global arrangements for the direct provision of services in support of air to ground data communications.

### ii. Funding of the Programme

The IWCAP financial relationships are expected to operate under the model shown in Figure 8 and as described below.

![Figure 8. The IWCAP financial administration framework.](image)

It is proposed that the IWCAP will oversee the establishment and operation of two AMDAR programme funds in each WMO Regional Association, which will facilitate the planned and accounted management of funds to support the ongoing development and operation of the IWCAP.

The following processes and financial entities would be expected to be established and maintained under this financial framework:

- In consultation and agreement with WMO and IATA, the IWCAP will establish a data pricing and procurement framework as describe above in section 6.C.i.
- WMO and the Governing Board will establish and oversee the operation of in each Region of an AMDAR Programme Operating Fund (APOF) and an AMDAR Programme Expansion Fund (APEF), which will be accounted on a regional basis.
• The WMO Regional Associations will produce annually regional developmental and operational plans, which will outline national and regional requirements for AMDAR data, based on committed and available regional funding in the APOF and APEF.
• The WMO Regional Associations will be responsible for securing the funds for AMDAR programme operation and development on an annual basis, which will be transferred to the IWCAP funds to provide payment for AMDAR development and operating costs, based on the national and regional requirements for AMDAR data and the plans and budgets made within the Global Operating Plan and Global Development Plan.
• The fees charged for AMDAR programme operation, to be paid into the APOF, will be the agreed annual running costs of producing this data, including:
  o payment to airlines for the ongoing costs associated with the provision of the data;
  o payment to the IWCAP Operators for the operational costs associated with the operation of IWCAP centres and systems, such as the RDPCs and the Global AMDAR Data Optimization System; and
  o payment to external/private contracted service providers, including data service and communications.
• At the end of each year, any amounts which remain unused in the APOF will be transferred to the APEF to support regional AMDAR programme development.
• Any additional excess/ redundant data produced in addition to the requirements of the region/ country will be paid from the APOF.
• Both the APOF and APEF will be supplemented by an agreed percentage of revenue generated from the sale of AMDAR data by IATA.
• Both the APOF and APEF may be supplemented by contributions from external funding agencies and stakeholders to support least developed and developing country programme participation and development and/or additional data production.
• Both the APOF and APEF may be supplemented by contributions from global and other data users outside the regional requirements maintenance process. This would be based on their provision or requirements to the IWCAP and their provision of agreed funds to support the provision of such data. For example, a global NWP centre might support the provision of data over a particular data-sparse area through the IWCAP planning process and financial framework.

Should existing programmes be migrated to the IWCAP framework, their integration process will take into account the ownership and the value of existing infrastructure, associated property and rights that might be used by, or transferred to, the IWCAP. This may be achieved by ensuring in the relevant agreements, that such infrastructure, property and rights are either retained by the original owner, or that the ownership is transferred to the new owner, or to the IWCAP with agreed compensation.

iii. Funding IWCAP Development and Improvement

Funding for IWCAP development and improvement will be resourced and managed as follows:
• AMDAR Programme development and improvement to support meteorological requirements, as specified in the IWCAP Global Development Plan, will be planned and implemented on a regional basis under the management of the IWCAP OPCT and relevant ATTs.
• The GDP will outline regional requirements and the budget for AMDAR programme expansion and enhancement, including equipping new airline fleets with AMDAR Onboard Software and the development of turbulence monitoring and water vapour measurement.
• Additional contributors to the APEF for regional programme development may be:
  o Grants and contributions from external funding agencies and stakeholders; and
  o An agreed percentage of funding derived from the commercialization of AMDAR data by IATA.
iv. Funding AMDAR Programme and Capacity Development in Least Developed Countries

A key element of the IWCAP will be capacity development and the dedication of funding to support AMDAR programme implementation and improvement to NMHS operations in Least Developed Countries (LDC) and Small Island Developing States (SIDS). This will be achieved under the programme through the following mechanisms:

- securing grant funding and directing it into the APEF to support strategic and planned development in LDC and SIDS;
- Possible implementation of a development levy with the IWCAP funding framework to support planned AMDAR programme development in LDC and SIDS; and
- Facilitating provision and injection of other funding from data users and other stakeholders into the APEF to support meeting international and global requirements for AMDAR data over LDS, SIDS and data-sparse areas.

D. Commercial Requirements for AMDAR data

IATA will undertake to receive and manage any specific requirements for AMDAR data from third party commercial entities and for those additional requirements which lie outside the collaborative arrangement with WMO.

WMO Members who are licensed to obtain and use AMDAR data under the IWCAP will ensure that the data is managed securely and will not distribute or sell AMDAR data to third parties.

IATA will, in consultation with WMO, determine appropriate costs associated with the commercialization of AMDAR data and will manage the resulting revenue to ensure that it is used to fairly compensate the airline partners to offset their costs, to expand and enhance the IWCAP through the operational and development funds and to cover IATA costs associated with AMDAR data commercialization.
7. JUSTIFICATION AND BUSINESS CASE

[Under development...]

A. Differences Between Existing and Proposed AMDAR Programmes

B. Justification for IWCAP

C. Business Case for IWCAP
ANNEX I – ACRONYMS AND ABBREVIATIONS

[Under development...]

AMDAR  Aircraft Meteorological Data Relay

GDC-ABO  Global Data Centre for Aircraft-Based Observations
ENHANCING EARTH SYSTEM OBSERVATIONS AND DATA EXCHANGE

Polar and High Mountain Regions - Global Cryosphere Watch, Antarctic Polar RCC-Network, and Polar Space Task Group aspects

(1) Background information in support of draft Decision 3.4(5)/1, Items 1 and 3 (RA III-17)

1.1 Global Cryosphere Watch Implementation and Preoperational Phase

1.1.1 Overview

Resolution 43 (Cg-17) Global Cryosphere Watch (GCW) decided to mainstream and implement GCW in WMO programmes as a cross-cutting activity. It also decided that the implementation activities were to be undertaken during the seventeenth financial period as one of the major efforts of the Organization, with the goal that GCW should become operational.

During the seventeenth financial period, GCW made substantial progress in key areas, as defined in the Implementation Plan approved by Cg-17. GCW contributes to the role of the WMO in delivering on the targets of the UN Sustainable Development Goals, related to climate, water and natural hazards, as well as those of the Sendai Framework for Disaster Risk Reduction 2015-2030 (e.g. Priority 1: Understanding disaster risk, etc.).

GCW Implementation: Preoperational Road Map

During the seventeenth financial period, GCW made significant progress on:

(a) establishing the observing component of GCW, and its regulatory aspects, within the WIGOS framework;
(b) establishing the GCW Data Portal;
(c) developing and brokering cryosphere-related products;
(d) information dissemination and outreach, via the GCW website;
(e) developing partnerships with research and operational communities, at country level;
(f) regional engagements (e.g. by establishing a South America Regional Group).

The implementation of the GCW framework is approaching maturity and GCW is now enabling the deployment of its observing component as an integral part of WIGOS, Resolution 29 (EC-70), and of the implementation of its cross-cutting, end-to-end contribution to the WMO strategic goals - Recommendation 17 (EC-70).

With the key initial building blocks of the GCW framework in place in time for Cg-18, the prerequisites will be available for a Preoperational Phase of GCW, during the eighteenth financial period. This will ensure that GCW delivers to Members the full benefits of an end-to-end programme, by positioning cryosphere contributions and impacts in the WMO information value chain.
GCW is uniquely positioned to be the bridge between the scientific and the operational communities, acting as an agent of change in strengthening these relationships, and addressing climate, water, and weather priorities, as well as reflecting cryosphere contributions and impacts.

As the GCW Surface Observing Network was established within the WMO framework, by Resolution 29 (EC-70), Members are requested to take all necessary steps towards the integration of cryosphere observations within their respective national WIGOS framework.

Figure 1: GCW Surface Observing Network (draft Resolution EC-70)

There are 152 stations, of which 105 are CryoNet stations (Figure 1), (https://globalcryospherewatch.org/cryonet/sites.php) which are included in the GCW Surface Observing Network, being operated by 41 different organizations, in 26 countries, in five regions and Antarctica. They belong to NMHSs, universities and to other governmental and independent research organizations. Currently, of these stations, only 20% have WMO/WIGOS IDs and are partially registered in WMO OSCAR Surface.
Figure 2: GCW Surface Observing Network, by Regional Association

1.1.2 GCW priorities for the Preoperational Phase

During the preoperational phase, GCW will focus on the following goals:

i. Supporting Members in developing national cryosphere end-to-end monitoring and service partnership frameworks (WMO strategic goals, Items 2 and 3);

ii. Developing and publishing value-added cryosphere products, relevant to water resources and ecosystems’ management, safety (transportation), understanding natural hazards and risks, energy production, etc., in collaboration with relevant partners (WMO strategic goals, Items 1 and 4);

iii. Improving access to, and quality management of, current and past cryosphere data and products (WMO strategic goals, Items 2 and 3);

iv. Developing and publishing GCW regulatory and guidance material, including capacity development support material (WMO strategic goals, Items 1, 2 and 4).

To achieve these goals, GCW will work with Members in all regions, giving priority to:

(a) Improving the global coverage of the GCW Surface Observing Network, within the framework of WIGOS, to include at least 80% of countries where a cryosphere is present, and ensure access to their data;

(b) Establishing the GCW Data Portal as a Data Collection and Production Centre, and provide data quality monitoring, within the WIGOS Data Quality Monitoring System;

(c) Finalizing and publishing the GCW relevant regulatory and guidance materials (e.g. cryosphere observing and data exchange best practices, metadata for cryosphere variables, etc.);

(d) Developing regular statements on the state of the cryosphere, aligned with the respective Regional Climate Outlook Forums and with the Regional Climate Centres;

(e) Developing and conducting a minimum of one pilot per region, for a framework for national partnerships with a focus on the cryosphere (e.g. snow, glaciers, sea ice), and linked to national WIGOS plans, e.g. through coordinated workshops together with CHy and other partners (UNESCO International Hydrological Programme, IHP);
Advancing the availability of real-time cryosphere information, supporting targeted operational services.

GCW will continue working with Members, as the full operationalization of the surface observing component of GCW requires that Members register the GCW stations operating to WMO standards within their territories, in the WMO OSCAR Surface database, by providing unique station identifiers (WIGOS ID), by documenting the station metadata, including for those stations operated by non-NMHS partners.

At the same time, Members need to make their observations available in real time, where available (e.g. snow depth). Additionally, the Permanent Representatives with WMO are expected to endorse GCW stations operating within their territory, and stations operated by their national organizations located elsewhere.


1.1.3 Partnerships

The regulatory framework of WMO provides a great incentive for operational and scientific communities to engage with WMO within the framework of GCW, as it provides the mechanism for standardization and consistency.

GCW plays a leadership role in securing access to third-party (non-NMHS) cryosphere observations, which are critical for enhanced services (Earth system model, water resource management, disaster risk reduction, building climate resilience). Most of the cryosphere-related national activities are conducted outside of NMHSs, and are governed by different mechanisms. GCW will continue to broker partnerships with organizations with cryosphere activities (e.g. IACS, IAHS, ICIMOD, SCAR, WCRP/CliC and GEWEX, Arctic Data Committee, UNESCO IHP, etc.), with the goal of making an effective contribution to meeting the WMO strategic long-term goals.

(2) Background information in support of draft Decision 3.4(5)/1, Item 4 (RA III-17)

2.1 Concept Note for the HIGH MOUNTAIN SUMMIT:
with the goal of developing a framework of end-to-end high mountain hydro-meteorological and climate services to address water and hazard risk management, which will take place from 25 to 27 February 2019, at the World Meteorological Organization headquarters in Geneva, Switzerland.

2.1.1 Motivation

There is increasing recognition of the fundamental role played by the mountain cryosphere (glaciers, snow, and permafrost) and high-altitude ecosystems (such as the páramo systems in the tropics) in providing and regulating freshwater resources. In addition to sustaining life, they also cause hazards which have cascading and often devastating effects on populations, economic activities, infrastructure and ecosystems in mountain regions, downstream, and in lowland areas.

Changes in high mountain climate and ecosystems impact about half of the world’s population, including those living in densely populated lowland areas such as the Ganges-Brahmaputra Delta. In many places, threats from mountain hazards exacerbate existing vulnerabilities caused by poverty, food insecurity, insufficient infrastructure, environmental degradation and limited resources.
Reliable, sustainable and up-to-date climate and hydro-meteorological services are important instruments to strengthen climate resilience and adaptation in support of sustainable development. Science-based services, reflecting the advanced understanding of changes in high mountain snow, ice, and environments, can help optimize the allocation and utilization of resources by informing decision-making on risk management and sectoral planning. Agriculture, tourism, the energy sector, land development, health, infrastructure, education and transportation in all regions are affected by changes in high mountain regions.

The World Meteorological Organization (WMO) is therefore making a concerted worldwide effort with its partners to address emerging needs precipitated by these changes, and foster robust and sustainable services. Once available and accessible, these services will provide people in mountain, downstream, and lowland regions with adequate information for decision-making regarding water, weather, climate, and hazard management.

WMO, as the UN system’s authoritative voice on weather, climate and water, will co-host a High Mountain Summit on 25 through 27 February 2019, in Geneva, Switzerland. The WMO Executive Council has defined high mountain regions, as “mountain areas where a seasonal or perennial cryosphere is present and poses potential and serious risks to society related to water scarcity and disaster resilience.”

This Summit will build on the momentum created by major international initiatives. These include the Sendai Framework for Disaster Risk Reduction 2015-2030, the Paris Agreement on climate change, and the 2030 Agenda for Sustainable Development embracing the Sustainable Development Goals (SDGs), as well as an associated Framework for Action for implementing the 2030 Agenda for Mountains approved in December 2017 by the Mountain Partnership which comprises 330 members including 72 governments. It takes place ahead of the publication of the 2019 Special Report on the Ocean and Cryosphere in a Changing Climate (SROCC) of the International Panel on Climate Change (IPCC), which includes a dedicated chapter on High Mountain areas, as well as a cross-chapter paper on 'Mountains' to feature in the IPCC’s sixth assessment report (AR6) Working Group II report on Impacts, Adaptation and Vulnerability, scheduled for publication in 2021.

The Summit is being co-organized with the World Bank Group (WBG) – Global Facility for Disaster Reduction and Recovery (GFDRR), the Food and Agriculture Organization of the United Nations (FAO) and the Mountain Partnership Secretariat, the United Nations Educational, Scientific and Cultural Organization (UNESCO) – International Hydrological Programme (IHP), the Mountain Research Initiative (MRI), the International Association of Cryosphere Sciences (IACS), the International Association of Hydrological Sciences (IAHS), the Third Pole Environment program (TPE) of the Chinese Academy of Sciences (CAS), and with the strong support of Switzerland, Austria, Canada, France, Spain, Italy, and other WMO Members.

### 2.1.2 SUMMIT OBJECTIVE

The High Mountain Summit will seek to address the need for accessible, reliable, and policy-relevant information on water resources, natural hazard management, addressing accelerated changes in high mountain cryosphere and ecosystems, with the objective to inform, and therefore, promote sustainable mountain development.

It aims to create a platform for enhanced multi-sectoral inter-agency collaboration at national, regional and international levels, across sectors, scales, and actors, by leveraging existing and planned initiatives for providing integrated and comprehensive climate services along the production and utility value chain. It will identify education and capacity building needs to address mountain challenges.
The Summit seeks to align the efforts of WMO and its partners in increasing accurate and accessible climate and hydro-meteorological knowledge in support of the international agenda on sustainable development, disaster risk reduction and climate change.

2.1.3 EXPECTED OUTCOMES
The Summit seeks to achieve the following outcomes:

(1) Mobilize public and private sector leaders to leverage funding in support of relevant initiatives;

(2) Promote collaboration for new and ongoing initiatives, by developing a roadmap for strengthening the provision of hydro-meteorological, climate, and prediction services for mountain regions, for optimizing and enhancing cryosphere and high mountain observations, and advancing the scientific research agenda to address emerging gaps;

(3) Leverage the knowledge and influence of relevant stakeholders in order to coordinate and upscale end-to-end services and increase inter-agency engagement, including identifying barriers and proposing enabling actions;

(4) Ensure that existing funding mechanisms such as The World Bank, the Green Climate Fund, the Global Environmental facility, the Adaptation Fund, and others, identify high mountains as priority areas for investments and projects.

The Summit will conclude with:

(1) A statement and call for action, reflecting the Summit outcomes, in line with the 2030 Agenda;

(2) High level mapping of user needs and gaps in observations, predictions, scientific knowledge, and services, which should be addressed through coordinated activities, at international, regional and national level;

(3) Launch a limited number of projects and long-term plans for high mountain observations, predictions, research and services, targeting 2-3 regions and focus areas.

The outcomes of the Summit will contribute to:

(1) Identifying key specifications and research areas for user-relevant design and implementation of climate services in mountain regions, responding to investment knowledge needs, for instance by national institutions and development partners, with a focus on developing countries;

(2) Fostering a high-level dialogue, leading to addressing high mountains in the WMO strategic objectives for the 2020-2023 financial period, for consideration at the Eighteenth World Meteorological Congress, as well as in the programmes of all co-hosting organizations;

(3) Leveraging governance, providing input to policy development, and promoting internationally funded initiatives, to support the goals of the 2030 Agenda, and of sustainable mountain development;

(4) Promoting closer links between science and policy.

2.1.4 PARTICIPANTS:
The Summit will engage relevant stakeholders, practitioners, research communities, and decision-makers from national, regional, and international institutions, representing all
regions of the world affected by changes in the high mountain climate and ecosystems, in recognition of the regional diversity of impacts, and the need for regional solutions.

The co-organizers are expecting up to 250 participants, representing:

- Relevant national governments/governmental agencies
- National meteorological and hydrological services
- Environmental, land use and urban planning agencies
- Mountain organizations and institutions
- Disaster and emergency management agencies
- Water resource management agencies
- Avalanche forecasting/transportation agencies
- Energy (hydropower) authorities
- Other funding agencies
- Relevant UN agencies
- Regional and international organizations with a mountain focus
- Research institutions and academia from different countries and regions
- The World Climate Research Programme (WCRP)
- The private sector
- Indigenous representation

For more information, please visit the Summit’s Website at:
http://highmountainsummit.wmo.int/

CONTACT: highmountainsummit@wmo.int

(3) Background information in support of draft Decision 3.4(5)/1, Item 5 (RA III-17)

The EC-PHORS Services Task Team has agreed that Dr Scott Carpentier will lead a sub-task team with a broader representation of interests in the Antarctic, to identify the actions and next steps to initiate a PRCC concept for the Antarctic, including an associated RCOF. On the occasion of the EC-PHORS-8, following consultations within the Services Task Team and the Antarctic Task Team, it was agreed that a new and customized survey would be conducted to determine the needs and capacities of members having interests in the Antarctic for an RCC arrangement, followed by a scoping workshop to agree on a suitable structure for the AntRCC-Network. EC-PHORS-8 has endorsed this approach. EC-70 has endorsed these initiatives.

The seventeenth session of CCI held in Geneva on 10 and 13 April 2018, noting that the functions and criteria defined for designation of RCCs have remained largely unchanged over the past decade, adopted Resolution 3 (CCI-17) deciding to revisit these functions, products and criteria, in order to propose suitable updates and revisions.

See also RA III-17/INF. 3.3(1) RCC-CSIS_en.docx for additional information on the current status of RCC implementation in RA III, and the associated aspects of the Climate Services Information System (CSIS).

Information on the Antarctic Observing Network

The Antarctic Observing Network (AntON) was established by Congress through Resolution 55 (Cg-16) to better meet the requirements of Members, including those of the research community as expressed by the Scientific Committee on Antarctic Research (SCAR), for surface and upper-air observations through further integration of Antarctic observing systems.
Indeed, Congress considered that the density of the current Antarctic Observing Network of surface and upper-air stations was much less than what would be considered desirable to properly characterize Antarctic weather and climate and, in order to provide a good representation of climate for Antarctica, there is no need to distinguish between a synoptic and climate network. Manned stations in Antarctica also contribute vital ozone and other observations to the Global Atmosphere Watch (GAW).

The name “Antarctic Observing Network (AntON)” is to be used for a description of the Antarctic network composed of surface and upper-air stations and including all Global Climate Observing System (GCOS) Surface Network (GSN) and Upper-Air Network (GUAN) and GAW stations. Decision 46 (EC-70) approved three new stations as AntON stations (Chile and Argentina).

**Background information in support of draft Decision 3.4(5)/1, Item 6 (RA III-17)**

The mandate of the Polar Space Task Group (PSTG) is to provide coordination across space agencies to facilitate acquisition and distribution of fundamental satellite datasets, and to contribute to or support the development of specific derived products for cryospheric, polar, and high-mountain scientific research and applications, and it operates within the framework of the Executive Council Panel of Experts on Polar and High Mountain Observations, Research and Services. Its membership includes 15 space agencies, including Comisión Nacional de Actividades Espaciales (Argentina) and Instituto Nacional de Pesquisas Espaciais (Brazil). [http://www.wmo.int/pages/prog/sat/pstg_en.php](http://www.wmo.int/pages/prog/sat/pstg_en.php)

In the inter-sessional period, satellite agencies, as members of the PSTG, advanced the systematic collection of satellite data over priority areas of Greenland, Antarctica, the Canadian and Russian Arctic, and permafrost “cold spots”. At its 7th meeting in December 2017, the PSTG discussed its engagement with the GCW on developing best practices for measuring snow and sea ice variables using surface- and space-based measurements. The agencies, as members of the PSTG, are engaged with scientific activities organized as part of the Year of Polar Prediction (YOPP), and relevant operational and additional satellite data acquisitions are being identified. To ensure close, continuous interaction of the PSTG with the Southern Ocean Observing System (SOOS) community, a focal point will be identified.

The 8th session of the PSTG is planned for 16-18 October 2018, hosted by WMO, in Geneva, Switzerland.


The workshop:

- reviewed current snow products, including gaps and insufficiencies,
- identified priority science questions and required products (with a focus on terrestrial snow mass and snow water equivalent),
- reviewed the maturity of requirements and technical readiness levels of satellite snow mission concepts,
- identified field campaign and modelling studies to support and advance snow-water equivalent retrieval techniques,
- assessed the state of readiness of operational data assimilation systems to use snow variables.
CAPACITY DEVELOPMENT

Report on the WMO Regional Training Centres (RTCs) of RA III and Training Activities and Fellowships Delivered to the Region

1. WMO RTC in Argentina

The RTC in Argentina is one of the very first RTCs recognized by EC-17 in 1965. The RTC had two components; the University of Buenos Aires (UBA), National Meteorological Service (SMN), and recently with Resolution-31 of EC-70, the Faculty of Engineering and Water Sciences (FICH) of the National University of the Litoral (UNL) was designated as the third component of the RTC in Argentina.


(a) Servicio Meteorológico Nacional (SMN)

The Center is specifically focused on operational meteorology and runs courses in online, face-to-face, and blended formats. It has its own Moodle platform installed to support online and blended courses. Topics range from: Modality / Geomagnetism and Solar Earth Relations, Solar Radiation Evaluation Workshop, Geomagnetism and Space Climatology, Operational Hydrological Balance for Agro, Observation Techniques in Geomagnetism, Processing and Interpretation of Satellite Images for Meteorology and Environment, Calibration of Meteorological Instruments, Surface Meteorological Observer, Training of Trainers, Training of Observation Practices Tutors, Surface Meteorological Observation Practices Course, METAR/SPECI, and Volcanic Ashes.

<table>
<thead>
<tr>
<th>SMN</th>
<th>Long-term Courses</th>
<th>Short-term Courses</th>
<th>Distance Learning Courses</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. of Courses</td>
<td>International Participants</td>
<td>No. of Courses</td>
</tr>
<tr>
<td></td>
<td>TOTAL Female</td>
<td>Male</td>
<td>TOTAL Female</td>
</tr>
<tr>
<td>2016</td>
<td>0 0 0</td>
<td>0</td>
<td>5 18 9</td>
</tr>
<tr>
<td>2017</td>
<td>0 0 0</td>
<td>0</td>
<td>1 0 0</td>
</tr>
</tbody>
</table>

The center is also good in cooperation and collaboration with WMO and hosted several WMO training activities for the region, e.g. WMO Training of Trainers Seminar for RA III in 2016, and WMO RA III Capacity Building Workshop on Impact-based forecast and Warning Services (IBFWS) and on the Common Alerting Protocol (CAP) in September 2018. Experts of the center have also been very active in development and translation of resources in Spanish language, and contributed the new cloud atlas.
(b) **Universidad de Buenos Aires (UBA)**

The Department of Atmospheric and Ocean Sciences of the University of Buenos Aires offers long-term and short-term courses in the form of face-to-face and online. The long-term courses are in “Licenciatura en Ciencias de la Atmósfera”, “Bachillerato en Ciencias de la Atmósfera”, and “Doctorado de la Universidad de Buenos Aires (área Ciencias de la Atmósfera y los Océanos)”. It also offers short courses on Climate Models, Satellite oceanography, Marine Optic and Remote Sensing, and Characterization of Droughts and their spatio-temporal Variability.

<table>
<thead>
<tr>
<th>UBA</th>
<th>Long-term Courses</th>
<th>Short-term Courses</th>
<th>Distance Learning Courses</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. of Courses</td>
<td>No. of Courses</td>
<td>No. of Courses</td>
</tr>
<tr>
<td></td>
<td>TOTAL Female Male</td>
<td>TOTAL Female Male</td>
<td>TOTAL Female Male</td>
</tr>
<tr>
<td>2016</td>
<td>3 12 4 8</td>
<td>2 23 5 15</td>
<td>2 1 0 1</td>
</tr>
<tr>
<td>2017</td>
<td>3 8 5 3</td>
<td>4 4 1 3</td>
<td>2 1 1 0</td>
</tr>
</tbody>
</table>

(c) **Facultad de Ingeniería y Ciencias Hídricas (FICH)**

The FICH evolved in 1985 from the Department of General and Applied Hydrology, created in 1970 by the UNL, a University located in Santa Fe, capital of the Province of the same name in the Northeast of Argentina. The programmes offered by FICH of main interest to WMO are; at grade level: Water Resources Engineering (IRH), at post grade level: Master in Water Resources Engineering (MIRH) and Master in Integrated Water Resources Management (MGIRH). As the new component of the RTC, the FICH will start reporting next year with the report for 2018 activities.

2. **WMO RTC in Brazil**

The RTC in Brazil was recognized by Cg-7 in 1975, reconfirmed by EC-34 in 1982 and by EC-61 in 2009. The UFPA in Belem was the single until its withdrawal of designation as RTC by EC-65 in 2013. The new RTC is a network of a number of universities creating a virtual RTC, “Centro Virtual de Ensino e Treinamento em Meteorologia (CVEM)”, which was designated by EC-65 in 2015. The participant institutions collectively offer undergraduate courses, which are available at (http://portal.mec.gov.br/index.php?Itemid=530) and post-graduate courses at (http://www.capes.gov.br/cooperacao-internacional/multinacional/pec-pg) in several technical levels and for professional training in Portuguese. The CVEM has 13 universities and institutions in its network, INPE, UFAL, UFGG, UFP, UFRG, UFSC, UF, UFRN, UEA, UNESP, UNIFEI, and USP. They train around 90 international students every year. Below is the table presenting the information obtained for 2016. No report is available for 2017.

<table>
<thead>
<tr>
<th>COURSE/INSTITUTION</th>
<th>INPE</th>
<th>UFAL</th>
<th>UFGG</th>
<th>UFPA</th>
<th>UFP</th>
<th>UFRG</th>
<th>UFSC</th>
<th>UF</th>
<th>UFRN</th>
<th>UEA</th>
<th>UNESP</th>
<th>UNIFEI</th>
<th>USP</th>
</tr>
</thead>
<tbody>
<tr>
<td>GRADUATION</td>
<td></td>
<td>10</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>=</td>
<td>1</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>8</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>MASTER</td>
<td>5</td>
<td>5</td>
<td>1</td>
<td>9</td>
<td>4</td>
<td>=</td>
<td>*</td>
<td>4</td>
<td>0</td>
<td>1</td>
<td>*</td>
<td></td>
<td>14</td>
</tr>
<tr>
<td>DOCTORATE</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>=</td>
<td>*</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>*</td>
<td></td>
<td>10</td>
</tr>
</tbody>
</table>

*Total number of international students = 87*
3. **WMO RTC in Peru**

The RTC in Peru was designated by Cg-16 in 2011. The “Universidad Nacional Agraria La Molina (UNALM)” was the only component until designation of the “Servicio Nacional de Meteorología e Hidrología (SENAMHI)” as a component of the WMO RTC by EC-70 in 2018.

(a) **Universidad Nacional Agraria La Molina (UNALM)**

The National Agricultural University La Molina (UNALM) dates back to 1901, when the Government of Peru planned and established the National School of Agriculture and Veterinary Authority (ENAV) based on studies of a Belgian Mission in July of that year. In 1960, the school was upgraded to the rank of a university and named “Universidad Nacional Agraria La Molina” (UNALM). Currently the UNALM is the only university in Peru that trains professionals in meteorology, with sound knowledge on physical sciences and mathematics. The UNALM has a strong collaboration with the National Meteorological and Hydrological Service of Peru (SENAMHI), which is also a well-organized institution that was established since 1969 and became an RTC component in 2018.

Training in meteorology was introduced in 1973 under the Faculty of Science which is composed of the Department of Environmental Engineering, Physics and Meteorology; Departments of Mathematics, Biology and Chemistry. In 1996, admission was suspended due to administrative reasons until 2007 when a resolution was approved for UNALM to recommence admitting students for studies in meteorology. UNALM is funded by the Government of Peru and students’ registration fees.

<table>
<thead>
<tr>
<th>UNALM</th>
<th>Long-term Courses</th>
<th>Short-term Courses</th>
<th>Distance Learning Courses</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. of Courses</td>
<td>No. of Courses</td>
<td>No. of Courses</td>
</tr>
<tr>
<td></td>
<td>International</td>
<td>International</td>
<td>International</td>
</tr>
<tr>
<td></td>
<td>Participants</td>
<td>Participants</td>
<td>Participants</td>
</tr>
<tr>
<td></td>
<td>TOTAL Female</td>
<td>TOTAL Female</td>
<td>TOTAL Female</td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td>Male</td>
<td>Male</td>
</tr>
<tr>
<td>2016</td>
<td>1 4 0 4</td>
<td>0 0 0 0</td>
<td>0 0 0 0</td>
</tr>
<tr>
<td>2017</td>
<td>1 3 0 3</td>
<td>1 9 4 5</td>
<td>0 0 0 0</td>
</tr>
</tbody>
</table>

(b) **Servicio Nacional de Meteorología e Hidrología (SENAMHI)**

The National Meteorological and Hydrological Service of Peru (SENAMHI) is a well-organized institution that was established in 1969, and provides public services, consulting, studies and scientific research in the areas of Meteorology, Hydrology, Agrometeorology and Environmental Affairs. The SENAMHI has, in its central office in Lima, facilities for communication, computing, forecasting, numerical weather prediction, satellite imagery, climate prediction and research. These facilities are also used for practical training sessions and on-the-job training. It has extensive partnership locally and internationally and is currently implementing several donor funded projects. The SENAMHI hosted several training activities related to these projects like CLIMANDES, and trained many staff of the NMHSs from the Andean region. They also hosted the WMO Human Resources Development Workshop in 2010. The SENAMHI has installed a distance learning platform in Moodle, which supports its online and blended learning activities. As the new component of the RTC, the SENAMHI will start reporting next year with the report for 2018.
4. WMO RTC in the Bolivarian Republic of Venezuela

The “Universidad Central de Venezuela (UCV)” in Caracas was designated by EC-27 in 1975, which provides BSc in Meteorology and Hydrology, Postgraduate Courses in Hydrology, and other specialized courses are offered online. The RTC was externally reviewed in March 2005 and reconfirmed as RTC by EC-58 in 2006. There was no review for the past 12 years, as the PR of Venezuela requested postponement of the review. The RTC has not submitted any annual report for the past four years.

5. Short-term Training Support Provided by WMO ETRP

In addition to the supports given by the Technical Departments (TDs) of WMO, the Education and Training Programme organized a number of training events and provided support to participants from RA III to attend. Also a number of participants were co-sponsored in the events organized by the RTCs and the education and training partners. The below two tables indicate the Member, training event, and number of participants supported. The number with "*" indicates the online training events.

<table>
<thead>
<tr>
<th>Member</th>
<th>Institute, Training Event Title</th>
<th>2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>Argentina</td>
<td>Hong Kong China-HKO, Use and Interpretation of Mesoscale Numerical Weather Prediction</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>WMO-ETR, Online Course for Trainers of RA III and RA IV*</td>
<td>22</td>
</tr>
<tr>
<td>Brazil</td>
<td>WMO-ETR, Online Course for Trainers of RA III and RA IV*</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>WMO-ETR, Training Development Workshop for Regional Training Institutions in RA III and IV</td>
<td>2</td>
</tr>
<tr>
<td>Chile</td>
<td>WMO-ETR, Online Course for Trainers of RA III and RA IV*</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>WMO-ETR, Training Development Workshop for Regional Training Institutions in RA III and IV</td>
<td>1</td>
</tr>
<tr>
<td>Colombia</td>
<td>WMO-ETR, Online Course for Trainers of RA III and RA IV*</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>WMO-ETR, Training Development Workshop for Regional Training Institutions in RA III and IV</td>
<td>1</td>
</tr>
<tr>
<td>Ecuador</td>
<td>WMO-ETR, Online Course for Trainers of RA III and RA IV*</td>
<td>2</td>
</tr>
<tr>
<td>El Salvador</td>
<td>WMO-ETR, Training Development Workshop for Regional Training Institutions in RA III and IV</td>
<td>1</td>
</tr>
<tr>
<td>Peru</td>
<td>WMO-ETR, Online Course for Trainers of RA III and RA IV*</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>WMO-ETR, Training Development Workshop for Regional Training Institutions in RA III and IV</td>
<td>5</td>
</tr>
<tr>
<td>Uruguay</td>
<td>WMO-ETR, Online Course for Trainers of RA III and RA IV*</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>WMO-ETR, Training Development Workshop for Regional Training Institutions in RA III and IV</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>45</td>
</tr>
</tbody>
</table>

In the past four years from 2014 to 2017, there were 83 fellowship requests from RA III for short and long term study ranging from one month service delivery course to five years degree study, 54 were awarded. The annual average of awarded against request is 14 and 21 with the award rate of 64%, 14% higher than the global average award rate of 47%.

<table>
<thead>
<tr>
<th>Member, Institute, Training Event Title</th>
<th>2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Argentina, WMO-ETR, Symposium on Education and Training and Meeting for RTC Directors</td>
<td>2</td>
</tr>
<tr>
<td>Brazil, WMO-ETR, Symposium on Education and Training and Meeting for RTC Directors</td>
<td>1</td>
</tr>
<tr>
<td>Ecuador, WMO-ETR, Symposium on Education and Training and Meeting for RTC Directors</td>
<td>1</td>
</tr>
<tr>
<td>Peru, WMO-ETR, Symposium on Education and Training and Meeting for RTC Directors</td>
<td>1</td>
</tr>
<tr>
<td>Venezuela, Bolivarian Republic of, China-NUIST, International Training Course on &quot;Numerical Weather Prediction&quot;</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>6</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year</th>
<th>Request by region</th>
<th>Total awarded by Region</th>
<th>Total awarded/request in each region%</th>
<th>Female request by region</th>
<th>Female request in region%</th>
<th>Total female awarded by Region</th>
<th>Female awarded by female request in each region%</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td>11</td>
<td>6</td>
<td>55%</td>
<td>3</td>
<td>27%</td>
<td>1</td>
<td>33%</td>
</tr>
<tr>
<td>2015</td>
<td>20</td>
<td>14</td>
<td>70%</td>
<td>7</td>
<td>35%</td>
<td>5</td>
<td>71%</td>
</tr>
<tr>
<td>2016</td>
<td>26</td>
<td>19</td>
<td>73%</td>
<td>4</td>
<td>15%</td>
<td>2</td>
<td>50%</td>
</tr>
<tr>
<td>2017</td>
<td>26</td>
<td>15</td>
<td>58%</td>
<td>6</td>
<td>23%</td>
<td>5</td>
<td>83%</td>
</tr>
<tr>
<td>annual average</td>
<td>21</td>
<td>14</td>
<td>64%</td>
<td>5</td>
<td>25%</td>
<td>3</td>
<td>60%</td>
</tr>
<tr>
<td>total</td>
<td>83</td>
<td>54</td>
<td></td>
<td>20</td>
<td>13</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**RA III fellowship overview 2014-2017**
There were 13 female awards against 20 requests in the past four years. Female annual average requests is only five with three awarded, which is lower than the overall requested and awarded of 24 and 14. The overall awarded rate in the past four years was 64% in RA III, although the female requests rate was low in the region with a four-year average of 25% against the overall requests. In the fellowship programme, much weight is put on awarding female candidates, to reflect WMO gender mainstream policy. However, a low female request rate is key in the low female award rate in RA III. Therefore, the NMSs are urged to raise the opportunities for female candidates in the requests for fellowship and capacity building.

7. Summary of the Outcomes of the Meeting of Heads of Regional Training Centres (RTC) Barbados, 2 November 2017

The meeting reflected on a number of issues and came up with the following recommendations/observations:

1. The Management Development Training resource material being developed by the WMO ETR Office be published as a WMO Information Note in the first quarter of 2018 and shared with RTCs and other training institutions;

2. When a review of the BIP-M and BIP-MT is undertaken, consider including learning outcomes related to management development;

3. RTCs to consider running management development courses;

4. The RTCs create a list and regularly update it of national/regional institutional specialities in all WMO priority areas. This list to contain contact addresses and advise whether the institutions are willing to share resources;

5. Strongly recommended that RTCs and other training institutions share resources and strive to develop relationships to advance training and capacity development in their respective regions and beyond where possible;

6. Concluded that RTCs must take into account the rapid changes in technology and user-orientated services whilst developing and revising their education and training programmes;
7. Strongly recommended that operationalization of the WMO Global Campus is fast tracked and that WMO consider seeking regional consultation in the development;

8. RTCs must align their programmes to support the WMO competency and qualification frameworks and provide participant documentation that could be used in their home services to show what sections of the various competency frameworks had been addressed in the training intervention;

9. RTCs actively participate in raising resources for fellowships and other education and training activities;

10. Noted that due to low bandwidth it could be difficult to use complex web and other online interfaces and thus the meeting recommended that participants use their influence to request software interfaces that included an option suitable for low bandwidth connections;

11. Encouraged RTCs to follow the rapid evolution in technology and changes in services wherever possible and where this was not possible to strategize on how to overcome capacity issues;

12. Encouraged the RTCs to collect research results of institutions cooperating with the RTCs and make them available to their students and other RTCs where appropriate. The meeting requested RTCs to encourage research institutions to develop new services and products;

13. Encouraged RTCs to share their documents/information with the ETR Office who will consider them for global circulation.

________________
CAPACITY DEVELOPMENT - NARROWING THE PERFORMANCE GAP OF NATIONAL METEOROLOGICAL AND HYDROLOGICAL SERVICES IN RA III

MAJOR DEVELOPMENT PROJECTS IN RA III

WMO Voluntary Cooperation Programme (VCP) in the Region 2014-2018

1. Expert service – Develop a proposal on new institutional structure for the NMHS
   - Beneficiary Member: Paraguay
   - Period: 2014
   - Purpose: to provide the AEMET (Agencia Estatal de Meteorología) international consultant with support information at national level, the current structure of DMH (Dirección de Meteorología e Hidrología), its budget, legislative and regulatory framework and current link with DINAC (Dirección Nacional de Aeronáutica Civil)
   - Funding source: VCP
   - Status: completed

2. Expert service – Feasibility study to establish the new legal structure for meteorological services
   - Beneficiary Member: Paraguay
   - Period: 2015
   - Purpose: Follow-up to the above-mentioned project
   - Funding source: DRA/RAM
   - Status: completed

3. Expert services – Update strategic Plan for the Hydrometeorological Service
   - Beneficiary Member: Guyana
   - Period: 2018
   - Purpose: to revise and update the strategic plan 2014-2018 which was requested in 2013 and developed in 2014
   - Funding source: VCP
   - Status: ongoing

Extra-budgetary Projects

1. Flash Flood Guidance System II
   - Beneficiary Members: Colombia, Ecuador, Peru
   - Period: 2011-2019
   - Purpose: Development and implementation of regional flash flood guidance and early warning systems. The approach will entail development of regional technology, training, protocols and procedures to address the issues of mitigating the impacts of flash floods and the application of such a system allowing the provision of critical and timely information by the NMHSs of the participating countries.
   - Funding source: United States Agency for International Development (USAID)/Office of Foreign Disaster Assistance (OFDA)
   - Status: ongoing
2. Numerical weather forecast at the National Institute of Meteorology (INMET)
   - Beneficiary Member: Brazil
   - Period: 2012-2020
   - Purpose: Development of systems that support numerical weather prediction activities, the integration and assimilation of data derived from the national monitoring network, as well as data from meteorological and environmental satellites aimed at increasing the accuracy of weather and climate forecasts in line with international standards. It will also promote the technical and scientific development of personnel so that INMET’s responsibilities are in line with the demands for meteorological information of Brazilian society.
   - Funding source: Brazil
   - Status: ongoing

3. CLIMANDES-2
   - Beneficiary Member: Peru
   - Period: 2016-2018
   - Purpose: Strengthen Servicio Nacional de Meteorología e Hidrología del Perú (SENAMHI)’s capacities to develop effective climate services to improve the socioeconomic benefits (SEB) at the regional, national, and local levels.
   - Funding source: Swiss Agency for Development and Cooperation (SDC)
   - Status: ongoing

Workshops and training events funded by extra-budgetary resources

2015
- XXXVIII Forum on Climate perspectives for the southern part of South America (Mar del Plata, Argentina, May 2015)
- XXXIX Forum on Climate perspectives for the southern part of South America, with participation of hydrologists of the Plata Basin (Porto Alegre, Brazil, December 2015)
- Workshop-Course on Coastal Floods (Cartagena de Indias, Colombia, November 2015)

2016
- LX Forum on Regional Climate Perspectives of the Regional Climate Center for the Southern South American region (RCC-SSA) (Santiago, Chile, May 2016)
- LXI Forum on Regional Climate Perspectives of RCC-SSA (Asuncion, Paraguay, December 2016)

2017
- Workshop on sub-seasonal to seasonal prediction (Asuncion, Paraguay, August 2017)
- Drought Monitoring and Forecasting Workshop (Buenos Aires, Argentina, August 2017)
- LXII Forum on Climate perspectives for the southern part of South America (RCOF) (Montevideo, Uruguay, September 2017)
- Workshop for the implementation of GFCS in Colombia (Bogota, Colombia, November 2017)

2018
- Implementation meeting of WIGOS-FFGS in the Plata Basin (Brasilia, Brazil, May 2018)
- Regional Association III Capacity Building Workshop on Impact-Based Forecast and Warning services and the Common Alerting Protocol (CAP) (Buenos Aires, Argentina, September 2018)
PARTNERSHIPS AND COOPERATION

WMO POLICY FRAMEWORK ON PUBLIC-PRIVATE ENGAGEMENT

For the past four years there has been an intensive dialogue between the stakeholders of the so-called “global weather enterprise (GWE)” and the related subject of “public-private partnership (PPP)” or “public-private engagement (PPE)”. This discussion can be traced through the following major WMO events:

a. **WMO World Weather Open Science Conference (WWOSC-2014), Montreal, Canada, 16-21 August 2014.** During this event, a two-day special session, co-sponsored by the American Meteorological Society (AMS) and the Canadian Meteorological and Oceanographic Society (CMOS), focused on enhancing collaboration across the weather enterprise to benefit societies worldwide. The three panel discussions involving experts from the five sectors of the weather enterprise (public, private, academic, NGO and meteorological societies) resulted in collecting a wealth of ideas from the different perspectives of the panellists. Given the scope of the challenges and opportunities within the weather enterprise, the WMO was encouraged to engage in the analysis of the suggestions contained in the report of the session and come up with a prioritized list of recommendations and time frames required to move forward effectively. (For more information please see: [https://public.wmo.int/en/resources/bulletin/future-of-weather-enterprise-1](https://public.wmo.int/en/resources/bulletin/future-of-weather-enterprise-1))

b. **17th WMO Congress, Geneva, 25 May–12 June 2015.** Congress discussed the *Future role of the private sector in meteorology* (agenda item 9.6). Congress highlighted the different, and at times, complementary roles and responsibilities of NMHSs, academic institutions, research and technological agencies, and the private sector. Congress agreed that closer interactions between the public and private sectors could stimulate innovation and facilitate cross-fertilization, ultimately benefitting the achievement of the WMO Strategic Plan and expected results. Congress noted that WMO has a unique opportunity to initiate this interaction and emphasized that inaction may limit the benefits to be derived for the users. In its Resolution 67 (Cg-17) Congress specifically requested “the regional associations and the technical commissions to investigate the opportunities and challenges related to partnerships with the private sector, developing guidance and advice which includes identifying opportunities for dialogue with the private sector in their work plans, documenting positive and constructive examples of partnership, identifying existing relevant WMO principles, policies, guidelines and standards that require consideration and advise the Executive Council accordingly, to help both the public and private sectors to avoid conflicts and encourage cooperation”. Congress also requested “the Executive Council to guide the development and monitor guidance material and advice to support effective engagement between the National Meteorological and Hydrological Services and the private sector and report on the implementation of the present resolution at regular sessions of the World Meteorological Congress”. (For more information please see: [Cg-17, pp. 216 - 217](https://public.wmo.int/en/resources/bulletin/future-of-weather-enterprise-1))

c. **68th Session of the Executive Council, Geneva, 15–24 June 2016.** During EC-68 a *Special Dialogue on the Complementary and Cooperative Contributions of Public and*
Private Sector Institutions to Meteorology and Hydrology was conducted. The dialogue session included speakers and panellists from both public and private sector stakeholders (see the dialogue summary in the attachment to this INF document). EC formulated a set of 18 key issues to be addressed in developing policies and principles for engagement. The results of the special dialogue and guidance for its continuation were summarized in Decision 73 (EC-68). (For more information please see: EC-68, pp. 232 - 237)

d. **69th Session of the Executive Council, Geneva, 10–17 May 2017.** Following the directions given by Cg-17 and EC-68, the EC-69 session continued the discussions on public-private engagement and adopted Decision 61 (EC-69) Public–private engagement: A road map to the Eighteenth World Meteorological Congress. EC reinstated that the PPE was of high importance for the Members and that “WMO can provide a neutral platform for fostering constructive dialogues among all the parties, taking into consideration the differences amongst its Members”. EC discussed the approach to be undertaken in furthering the dialogue with the private sector and agreed:

(1) That there is some urgency to better equip NMHSs, through WMO, to engage actively and positively with private sector organizations, not least to ensure that essential national mandates, including the importance of a single authoritative voice in relation to the safety of life and property are sustained;

(2) That in accordance with the aims and purposes of the Convention of WMO, a policy framework on public-private engagement would be beneficial to the Organization and should be prepared for consideration and approval at the next World Meteorological Congress (Cg-18);

(3) That early engagement between WMO and key representatives of the private sector, such as the HMEI, as well as other relevant stakeholders, including academia, to explore areas for collaboration and to obtain feedback on the evolving policy framework would be beneficial and would assist its further development and implementation for net public benefit;

EC-69 endorsed a draft Policy Framework for Public-Private Engagement which was annexed to Decision 61, and requested its completion by EC-70. WMO president and the presidents of the regional associations were requested to play an active role in this action. In addition, EC-69 endorsed a work programme on the subject of PPE and IWE until Congress-18 in June 2018 with the understanding that Congress will consider an appropriate policy act thereof. (For more information please see: EC-69, pp. 283 - 292)

e. **70th Session of the Executive Council, Geneva, 20–29 June 2018.** The Executive Council adopted Resolution 33 (EC-70), public-private engagement, and endorsed the policy framework for PPE (provided in the Attachment to this INF). The Council acknowledges the establishment of a Global Weather Enterprise Forum (GWEF) supported by WMO, the GFDRR, and the HMEI, as a consultative platform among various stakeholders in the public, private and academic sectors, to steer the dialogue between the sectors, consider necessary coordinated actions to address the growth of GWE, and derive recommendations for consideration by relevant bodies, including WMO. EC also agreed that there was an urgent need for thorough preparation of a high-level policy on GWE and PPE for consideration by the Eighteenth World Meteorological Congress, in order to update existing policy and guidance documents, including the Geneva Declaration of the Thirteenth World Meteorological Congress (1999) and Annexes 2 and 3 to Resolution 40 (Cg-XII). (For more information in English please see: EC-70, pp. 102-115 / For more information in Spanish please see: EC-70 pp. 112-128).
PARTNERSHIPS AND COOPERATION

ENHANCING WEATHER, CLIMATE AND HYDROLOGICAL SERVICE DELIVERY CAPACITY OF DEVELOPING COUNTRIES THROUGH EFFECTIVE PARTNERSHIPS: BEYOND BUSINESS AS USUAL

The upcoming WMO Strategic Plan 2020-2023 sets an ambitious goal – to close the capacity gap on weather, climate and water services between developed and developing countries. Scaling up effective partnerships is one of the Strategic Objectives to achieve this Goal. Delivering on this objective requires moving beyond business as usual and stepping up efforts for scaled-up, coordinated, sustained, and increased impact of support to developing countries through strategic partnerships fostered by the WMO Secretariat and its new Office of Development Partnerships.

1. What is at stake?

While demand for information and services provision is increasing exponentially, many NMHSs in developing countries are confronted with major performance challenges. According to the World Economic Forum 2018 Global Risk Report, four of the five most pressing risks that the world is confronted with are related to weather, climate and water. With exponentially growing demand, linear progress in delivering hydromet services is not sufficient. Closing this capacity gap requires scaling-up collaboration and leveraging WMO expertise and knowledge through strategic partnerships that generate an increased impact.

The United Nations’ reform agenda makes a call to join up efforts to better serve countries, and it creates a sense of urgency for country level action. The ambitious course of action proposed by the 2030 Agenda, the Sendai Framework and the Paris Agreement necessitates mobilizing an increasing amount of investments, the effectiveness of which is highly dependent on the quality of the underpinning weather, climate and hydrological information.

The growing flow of resources for hydromet services - including from the Green Climate Fund (GCF), Multilateral Development Banks, and bilateral partners - requires a more systematic and complementary approach for sustainable investments. Efforts need to focus not only on “more” but also “better” investments to increase capacity and relevance of NMHSs as key players for a country’s sustainable development. Several mechanisms aiming at fostering programmatic approaches have already been developed, including the Global Framework for Climate Services (GFCS). There is an opportunity to increase their operational relevance and to scale up their impact.

Going beyond business as usual also requires going beyond traditional finance. There is an increasing role of the private sector in providing weather, climate and water services. The growing community of the Global Weather Enterprise (GWE), which brings together the public and private sectors and academia, is working to foster innovative hydro-meteorological services business models.
2. **Why do we need partnerships and what is the role of the WMO Development Partnerships Office?**

The Second Development Partners Conference “Strengthening and Sustaining National Meteorological and Hydrological Services, going beyond business as usual” convened by WMO, the World Bank and the Global Facility for Disaster Reduction and Recovery (GFDRR) in March 2018. Participants agreed that closing the capacity gap on weather, climate and hydrological services will require a collective effort and a commitment to work under common principles of effectiveness and “better” targeted action. Effective partnerships will play a critical role in achieving the common goal of scaled-up, coordinated, sustained, and more impactful hydromet action.

The objective of the WMO Secretariat is to substantially scale up its support to developing countries in implementing the WMO 2020-2023 Strategic Plan. This objective will be achieved by working in collaboration with the main development partners. The partnership value proposition is to jointly achieve more than the WMO Secretariat could achieve on its own. To achieve increased impact, there is a need to leverage human, technical, and financial resources.

Building on lessons learned from the implementation of the 2016 - 2019 Resource Mobilization Strategy, the WMO Secretariat and its Office of Development Partnerships will act as a:

(a) **Catalyst** – for more and better investments aiming at closing the capacity gap of hydromet services in developing countries;

(b) **Expert advisor** – tapping and providing the combined expertise of the WMO institutional network and its partners in support of developing countries;

(c) **Innovator** – fostering new ways and mechanisms to increase impact of hydromet investments in developing countries.

Given the importance of development partnerships in the context of the upcoming Strategic Plan, the Development Partnerships Office has been repositioned and strengthened. The office works now under the direct guidance of the Secretary-General and has been integrated into the Cabinet and External Affairs Department.

3. **How to scale up support through Development Partnerships?**

To effectively play its roles as catalyst, expert advisor, and innovator, the Development Partnerships Office is focusing on three priority areas:

(a) **Mobilizing development partners for scaled-up and more effective support**

Building on the outcomes of the 2018 Development Partners Conference, the WMO Secretariat aims at rallying development partners for scaled-up, coordinated, sustained, and impactful investments in hydromet services. The WMO Secretariat will work with major providers of development and climate finance, including Multilateral Development Banks, the GCF, and bilateral development agencies, to connect the dots between increasing but largely scattered resources and investments in hydromet services.

(b) **Developing the WMO Advisory Services Mechanism**

WMO is the authoritative voice of the United Nations on weather, climate and water. As such, it is incumbent on WMO to ensure that best available science, evidence and expertise is provided in a tailored manner to developing countries and their partners. To this end, through the WMO Advisory Services Mechanism, the WMO Secretariat will mobilize technical expertise from the WMO community – including
technical commissions, programmes and national, regional and global centres and from other affiliated entities – in support of weather, climate and hydrological evidence-based decision-making and related hydromet projects.

For the provision of this technical expertise, the WMO Secretariat has created a mechanism that allows countries and their development partners to draw on the knowledge amassed by the vast WMO institutional network and programmes. WMO expert services provided to international development partners will be financed through a cost-recovery mechanism. Expert services provided directly to developing countries and their NMHSs will be delivered through the Country Support Initiative (see section (c) below).

The World Bank and WMO signed a framework agreement on 12 October 2018 that provides in the context of the WMO Advisory Services Mechanism, for WMO to be contracted by World Bank borrowers to provide technical assistance in the areas of weather, climate and hydrology. Ongoing WMO Advisory Services include the crafting of the GCF climate rationale policy that lays out the climate science basis for GCF investments and National Adaptation Plans (NAPs).

(c) **Establishing a Country Support Initiative**

The WMO Country Support Initiative seeks to increase development effectiveness of hydromet investments in developing countries. For this purpose, the Initiative will mobilize financing from bilateral partners and tap science, evidence and expertise made available through WMO Advisory Service Mechanism to provide technical support beyond projects and foster innovation to address financing needs for observations and sustained operational systems. The Country Support Initiative will provide demand-driven, complementary and rapid response support. This support will be provided when no other funding source is available. More specifically, the Initiative will support developing country NMHSs and their international development partners in:

- Creating an enabling environment for sustainable hydromet investments, including supporting NMHSs in coordinating international partners’ support;

- Providing WMO technical support for review of project proposals promoted by countries and international development partners. WMO will review how the planned projects systemically strengthen operational systems, service delivery and NMHS capacity. Several partners, including Green Climate Fund and UNDP have requested such support.

- Connecting the capacity development dots by providing short-term capacity gap-filling support, longer-term mentoring, and creating the knowledge platform of the Alliance for Hydromet Development with the Country Profile Database providing its foundation.

- Exploring country-tailored public-private engagement opportunities in support of translating into practice the WMO Policy Framework on Public-Private Engagement, adopted by EC-70 in June 2018,

- Exploring innovative and sustainable financing options for observations and operational systems.
4. What are examples of evolving successful development partnerships?

(a) Climate Risk and Early Warning Systems (CREWS) Initiative

The CREWS partnership was established between WMO, the World Bank, the GFDRR, the United Nations Office for Disaster Risk Reduction (UNISDR) and multiple bilateral partners. The World Bank serves as the trustee. While still in its early stages, CREWS has already increased the impact of hydromet interventions in Least Developed Countries (LDC) and Small Islands Development States (SIDS) by leveraging investments in these countries through a programmatic approach. CREWS aligns the technical expertise of its implementing partners, offers scaled-up technical support tailored to each specific country context, and aims at leveraging substantial amounts of additional financial resources. For example, in Mali, a CREWS grant of US$ 3.3 million to strengthen meteorological, hydrological, food security and civil protection services has leveraged a US$ 22.75 million grant from the GCF and an additional US$ 8.25 million from the World Bank fund for the poorest countries – International Development Association – World Bank (IDA).

WMO contribution to CREWS focuses on strengthening hydro-meteorological systems and service delivery. This is largely done through NMHS-to-NMHS partnering.

(b) Green Climate Fund

The WMO Secretariat through its Development Partnerships Office and in collaboration with WMO technical departments has stepped up its engagement with the GCF and in September 2018 signed a contract for the provision of WMO advisory services to support GCF Secretariat in enhancing the climate science basis of the climate rationale in all GCF funded activities. This repositioning of the partnership with the GCF also includes the provision of direct support to developing countries NHMSs, strengthening capacity and increasing their relevance as providers of evidence for climate finance decision making.

(c) The World Bank Group

Based on a Memorandum of Understanding signed in 2017, the collaboration between the WMO Secretariat and the World Bank Group is rapidly evolving. For example, the 2018 Hydromet Development Partners Conference was co-organized and follow-up to the conference is undertaken in a joint manner. In September 2018, the South Asia HydroMet Forum was successfully co-hosted and cemented the foundation for increased regional collaboration efforts. The World Bank and WMO are already jointly exploring how to support the region in implementing the proposed areas of action. Collaboration is also progressing on the Global Weather Enterprise (GWE) initiative, which is exploring innovative business models to catalyse opportunities of collaborative work between private, public sector and academia.

As the World Bank is scaling up its financing for hydromet projects – financing tripled over the past few years with today about US$ 800 million being invested and further growth expected – the WMO Secretariat is advancing arrangements to deliver WMO advisory services to the World Bank for design and implementation support of World Bank financed projects under the WMO Advisory Services Mechanism (see section 3(b)). By working closely with the World Bank and other Multilateral Development Banks, WMO has a significant opportunity to enhance its impact as a catalyst, expert advisor, and innovator.
RA III INPUTS TO THE WMO STRATEGIC AND OPERATING PLANS 2020-2023

Recommendation 20 (EC-70)

WMO STRATEGIC PLAN

THE EXECUTIVE COUNCIL,

Recalling:

(1) Decision 65 (EC-69) – Preparation of the WMO Strategic Plan 2020–2023,

(2) The recommendations of the Working Group on Strategic and Operating Planning,

Confirms that the final version of the draft WMO Strategic Plan has been prepared in accordance with the above-mentioned decision of the Executive Council and the recommendations of the Working Group;

Recommends to the Eighteenth World Meteorological Congress draft Resolution XX (Cg-18) – WMO Strategic Plan, as laid out in the annex to the present recommendation.

Annex to Recommendation 20 (EC-70)

Draft Resolution XX (Cg-18)

WMO Strategic Plan

THE CONGRESS,

Noting:

(1) Resolution 69 (Cg-17) – WMO Strategic Plan (2016–2019),

(2) Resolution 71 (Cg-17) – Preparation of the Strategic and Operating Plans 2020–2023,

(3) Decision 65 (EC-69) – Preparation of the WMO Strategic Plan 2020–2023,

(4) Recommendation 20 (EC-70) – WMO Strategic Plan,

Noting further that the WMO strategic planning process for the period 2020–2023 and beyond is based on and comprises three interlinked key components, namely:
(1) The WMO Strategic Plan, which provides a high-level vision and overarching priorities of the future direction of WMO, articulated in long-term goals and strategic objectives with focused implementation areas for the financial period 2020–2023 and related monitoring indicators,

(2) The WMO Operating Plan, which presents outcomes in the form of benefits to Members, outputs, activities and related performance indicators to address the global societal needs and achieve the strategic objectives,

(3) The WMO Results-based Budget, which identifies resources for implementing the Strategic Plan, including functioning of constituent bodies, the Secretariat and activities,

Approves, under the provision of Article 8 (a), (b) and (c) of the Convention of the World Meteorological Organization, the WMO Strategic Plan, as contained in the annex to the present resolution;

Urges Members to take the WMO Strategic Plan into account in developing and carrying out their national development, disaster risk reduction, climate services and other relevant strategies on programmes in meteorology, hydrology and related disciplines, as well as in their participation in the programme activities of the Organization;

Requests the Executive Council, the regional associations, the technical commissions and the Secretary-General to adhere to the vision, overarching priorities, long-term goals and strategic objectives set forth in the Strategic Plan and to organize programme activities so as to achieve the expected outcomes;

Requests the Executive Council to use the Strategic Plan, complemented by the WMO Operating Plan, as a benchmark to monitor progress and performance in achieving the expected outcomes by implementing programmes and activities of the Organization and to submit a report to the Nineteenth World Meteorological Congress;

Requests the Secretary-General to arrange for the publication of the Strategic Plan, for its distribution to all Members and constituent bodies of WMO, to United Nations system and other partner organizations, as appropriate.

Note: This resolution replaces Resolution 69 (Cg-17), which is no longer in force.
Annex to draft Resolution XX/1 (Cg-18)

WMO Strategic Plan

World Meteorological Organization

STRATEGIC PLAN

Draft

Foreword (will be added at the stage of publishing)
Executive summary (will be a separate publication for external communication)
Our Vision

By 2030, we see a world where all nations, especially the most vulnerable, are more resilient to the socioeconomic consequences of extreme weather, climate, water and other environmental events; and underpin their sustainable development through the best possible services, whether over land, at sea or in the air.

Our Mission

Our Mission is outlined under Article 2 of WMO Convention as to facilitate worldwide cooperation on monitoring and predicting changes in weather, climate, water and other environmental conditions through the exchange of information and services, standardization, application, research and training.

(WMO is a specialized agency and an authoritative voice of the United Nations)

WMO Member States and Territories own and operate the scientific infrastructure required for providing the weather, climate, water and related environmental services, and primarily delivered through their national meteorological and hydrological organizations.

WMO enables the performance of its Member States and Territories in the provision of their monitoring, forecasting and warning services, leads and informs the global agenda where it best serves their interest through provision of credible information, reports and assessment at global, regional scales, channels their scientific expertise to address emerging issues such as climate change, and fosters effective and strategic partnerships.

For more than a century, WMO has been providing the essential worldwide leadership and coordination in support of nations’ responsibilities to provide weather, climate, water and related environmental services that protect lives, property and livelihoods. The cross-border nature of the weather, water and climate phenomena requires close coordination among all WMO Members States and Territories in building highly standardized systems for their monitoring, analysis and prediction. WMO, through its various bodies and programmes, has established and facilitated an unprecedented global scientific and operational cooperation, encompassing Members’ National Meteorological and Hydrological Services (NMHSs), academic and research institutions, business partners, communities and individuals.

The role of WMO will remain to support the activities of its Member States in understanding the past, monitoring the present and predicting the future state and interactions of the atmosphere, the hydrosphere and other vital elements of our planet, enabling adequate and effective preparedness, adaptation and response to related natural extremes. This will require further enhancement of coordinated and interoperable networks and systems for data collection and processing, improvement of predictive skill through advanced science and computational technologies, and finally highly innovative approaches of service delivery that will ensure that accurate, fit-for-purpose information will reach its users on time for making their weather-, water- and climate-informed decisions.

1 In the context of this Strategic Plan, the term “weather” refers to short-term variations in the state of the atmosphere and their phenomena or effects, including wind, cloud, rain, snow, fog, cold spells, heat waves, drought, sand and dust storms and atmospheric composition, as well as tropical and extratropical cyclones, storms, gales, the state of the sea (e.g. wind-generated waves), sea ice, coastal storm surges etc. “Climate” refers to longer-term aspects of the atmosphere-ocean-land surface systems. “Water” includes freshwater above and below the land surfaces of the Earth, their occurrence, circulation and distribution, both in time and space. Related “environmental” issues refer to surrounding conditions affecting human beings and living resources, for example the quality of air, soil and water, as well as “space weather” - the physical and phenomenological state of the natural space environment, including the Sun and the interplanetary and planetary environments.
Our Core Values

The WMO recognizes, above all, in fulfilling its mandate, the principles of striving to ensure that “no Member State or Territory should be left behind”, and to sustain the public trust and confidence in the science underpinnings and the authoritative voice of the Organization and its Members. As WMO works to translate its vision into results, the Organization will be guided by the following values:

(1) **Accountability for results and transparency.** To serve as an authoritative voice and a global leader in its field of work, WMO decisions and actions must be characterized by adherence to the highest scientific and technical standards, integrity, professionalism, capacity to perform and effectiveness. WMO sets clearly defined objectives and assumes responsibility for delivering high-quality results. In so doing, the WMO remains mindful of the need for quality management and cost-effectiveness;

(2) **Collaboration and partnership.** Collaboration lies at the foundation of WMO mandate. WMO recognizes the importance of partnerships among Members, multilateral and bilateral development partners and other relevant actors, including the private sector, academia and other non-state players, to leverage investment, enhance capability and performance of National Meteorological and Hydrological Services, and deliver improved outcomes for society. WMO would expect that any such partners uphold the highest standards of ethical behaviour;

(3) **Inclusiveness and diversity.** WMO is committed to support all Members and narrow the capacity gaps among them in the delivery of services by sustaining government support, international cooperation, catalyzing investment and targeted assistance. Based on the priorities identified by its regional bodies, WMO will ensure the coordination and implementation of its programmes, strategies and activities and facilitate the transfer of knowledge within and across regions to better serve the needs of its Members. WMO will also pursue gender equality and effective participation of women and men in governance, scientific cooperation and decision-making in implementation of Sustainable Development Goal 5, the WMO Gender Equality Policy, and UN criteria.

The WMO Core Values also guide the behaviour of Secretariat staff. As custodians of the Organization’s image and reputation, they are expected to uphold a commitment to the highest standards of ethical behaviour as expressed in the WMO Code of Ethics and the Standards of Conduct for the International Civil Service.
Key Drivers

Global agenda creating unprecedented demand for actionable, accessible and authoritative science-based information

The 2030 Agenda for Sustainable Development, the Paris Agreement on climate change, and the Sendai Framework for Disaster Risk Reduction serve as the centrepieces for national and international policymaking and action. And as a consequence, their implementation will increasingly demand actionable, accessible and authoritative information and services on the changing states of the entire Earth System.²

As governments, organizations and international bodies align their development activities within these frameworks, WMO and NMHSs in particular, have enormous roles to play in supporting implementation. The concomitant decisions at all levels will continue to be contingent upon a better understanding of the changing threat levels from natural hazards, weather, water and climate extremes and climate change. The measurements and reports of the WMO community in these areas currently serve as the backbone of Earth System monitoring and prediction services. Global Earth System observations will provide a basis for meeting the demand for increasing seamless prediction capability from weather to climate scales based on a unified modeling approach.

As new forms of measurements emerge, and new uses for these measurements become more sophisticated, the reliance on WMO through its Members for this authoritative information will only increase. Furthermore, advancing the global observation and numerical modeling system will provide a foundation for addressing the increasing requirements for impact decisions related to a wide range of applications from public safety, to agriculture, energy, health, and water resource management and relevance to climate change.

This means that the quality of these decisions will depend to a greater extent on the WMO ability to properly measure and report on changes in the climate, to assess and communicate weather, climate, water-related and air quality risks and to provide effective multi-hazard, extended range forecasts and early warnings. Governments, organizations, and international bodies will increasingly rely on information from WMO and NMHSs as they pursue their sustainable development goals on land, at sea and in the air.

The provision of climate services at global, regional and national levels for economic sectors in support of energy, water, health, and food production among others will be vital in building a low-carbon and climate-resilient economy. The Global Framework for Climate Services (GFCS) provides a basis to support international policies and actions, National Adaptation Plans and progress towards achieving Nationally Determined Contributions.

To address these growing demands for actionable scientific information, Members’ NMHSs will need targeted investments, scientific and technical development and strategic partnerships.

² In this context, the Earth is being considered as an integrated system of atmosphere, ocean, cryosphere, hydrosphere, biosphere and geosphere, which informs policies and decisions based on a deeper understanding of the physical, chemical, biological and human interactions that determine the past, current and future states of the Earth.
Increasing threats of extreme weather and climate urge action for resilience, mitigation and adaptation

High-impact weather, water and climate extremes have devastating consequences for the safety of people, national economies, urban and rural environments, and food and water security. Extreme hydrometeorological events currently account for more than 80% of the world’s natural disasters. According to the Intergovernmental Panel on Climate Change, these extremes are expected to occur with greater frequency and intensity as greenhouse gas concentrations continue to rise. Sea levels rise, also linked to climate change, will further increase the threat to more than half of the world’s population who are living in coastal regions.

Society’s exposure and vulnerabilities to these hazards will be further exacerbated due to: population growth, reaching more than 9 billion by 2050; the development of human settlements, further urbanization and growth of mega cities worldwide, particularly in flood plains and coastal zones; significant expansion of built environments and critical infrastructures to service human needs; and the relocation of vulnerable populations. To affect smart mitigation and adaptation policy development and decision-making by governments at all levels, international institutions, economic decision-makers and citizens, demand for increasingly useful, accessible, and authoritative meteorological and hydrological information and services is growing.

To support national agendas for disaster risk reduction and climate adaptation, WMO fosters the production and delivery of accessible and authoritative meteorological and hydrological information and services. This information is critical to strengthening resilience to the impacts of high impact weather, climate and water extremes. It provides an essential underpinning to support the development and implementation of National Adaptation Plans under the Paris Agreement and UN system needs on humanitarian and crisis management.

Growing capacity gap threatens global infrastructure and services

All WMO Member States collectively contribute to the global meteorological and hydrological infrastructure and facilities. While this collective global system is a public good that benefits all, the contribution and service performance among the Members continues to be uneven. Many NMHSs are facing substantial development needs and capability gaps in providing the weather, climate, water and related environmental information and services to meet national, regional and global requirements. The typical challenges center around maintaining sustainable infrastructure, human resources, and the ability to benefit from the advances in science and technology.

Such deficiencies are often present in those countries that are particularly vulnerable to natural disasters. These could jeopardize effective protection of life and property and slow down socioeconomic recovery. Moreover, globalization and the interdependence of critical infrastructure may further contribute to widening capacity gaps among NMHSs and related agencies. Narrowing the capacity gaps by sustaining government support, international cooperation, catalyzing investment and targeted assistance is more important than ever in view of the increasing frequency and intensity of weather-, climate- and water-related extremes.

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3 Hydrometeorological hazards are of atmospheric, hydrological or oceanographic origin.
Rapid advancements in science and technology and changing landscape of data and service delivery urge for innovative partnerships

Rapid progress in science and technology provides the opportunity to greatly improve services and to make them more accessible. Advanced weather, climate and hydrological services contribute to timely and effective planning and decision-making, resulting in greater socioeconomic benefits. The contribution of science and technology is further enhanced by accelerating the research-to-operations cycle in all fields.

This poses challenges to WMO since the 21st century systems for monitoring, prediction and service delivery are of the highest complexity handling increasingly large datasets and sophisticated numerical models. Therefore, WMO plays a major role in the transfer of modern knowledge and technology from developed to developing countries to enable them to benefit from the new information era.

The increasing demand for more and more diverse services from increasingly sophisticated and capable users changes rapidly the service delivery and business models in many parts of the world. Trends like “big data”, “crowd sourcing” and “open system”, the appearance of commercial observing networks, data and service providers, the affordability of digital technology, the introduction of artificial intelligence and cognitive computing to rapidly extract useful information from “big data”, all are game changers. The private sector, as well as academia and other players, contribute by accelerating the uptake of technological innovations, and assisting Member States in offering more efficient, attractive and accessible services in support of their sustainable development goals. There are many opportunities for optimization and efficiency through integration of networks, computing power and service delivery through use of social media.

Member States must support their NMHSs to better and readily adapt to this dynamic changing environment, while WMO must elaborate the means to strengthen cooperation, mutual reinforcement and complementarity among state and non-state actors. It is important to advocate for the essential role of NMHSs in providing the critical infrastructure, competence and authoritative services for serving their governments’ fundamental public good function for protecting life and property.

Overarching Priorities

The Strategic Plan sets out long-term goals for 2030 horizon and strategic objectives, focused on addressing the most pressing developments and needs during the 2020-2023 planning cycle of the Organization. The Plan articulates expected outcomes expressing clear benefits to Members. As we translate these goals and objectives into detailed plans we will focus our resources in accordance with three overarching priorities:

(1) Enhancing preparedness and reducing losses of life and property from hydrometeorological extremes;
(2) Supporting climate-smart decision making to build resilience and adaptation to climate risk;
(3) Enhancing socioeconomic value of weather, climate, hydrological and related environmental services.

Reflecting on these key priorities, there will be a need to involve a broad set of stakeholders and multidisciplinary expertise to address the current and future challenges facing society as a consequence of changing weather, climate and water patterns worldwide. To be effective, WMO fosters collaborative mechanisms to better align interests, build community and engage stakeholders and experts under weather, climate and water.
Long-term Goals and Strategic Objectives

Goal 1  Better serve societal needs: delivering, authoritative, accessible, user-oriented and fit-for-purpose information and services

**Long-term outcome:** Enhanced capability of Member States to develop, access and utilize accurate, reliable and fit-for-purpose weather, climate, water and related environmental impact-based services to best support the policy-making and actions that implement sustainable development and mitigate weather, climate and water-related risks.

### Objective 1.1  Strengthen national multi-hazard early warning/alert systems and extend reach to better enable effective response to the associated risks

*Warnings on weather, climate, water and other environmental extreme events are essential for the safety of lives and livelihoods, recognized under UN Global Agenda and foundational to all governments’ NMHSs’ mandates. In many countries capacities to deliver warnings are lacking and will be addressed, particularly through focused action in the most vulnerable least developed countries.*

**Focus in 2020-2023:**

- Enhance impact- and risk-based extended forecast and warning products and services to enable better preparedness and response to hydrological and meteorological events.
- Strengthen national capacity in multi-hazard early warnings.
- Enhance access to official national meteorological and hydrological forecasts and warnings globally in support of regional and global requirements.

### Objective 1.2  Broaden the provision of policy- and decision-supporting climate information and services

*The Global Framework for Climate Services (GFCS) provides a unique platform for guiding and supporting activities across the value chain for climate services, which contribute to adaptation, mitigation and reduction of loss and damage. Availability and access to these products will be expanded and broadened to benefit all Members.*

**Focus in 2020-2023:**

- Advance a climate service information system enabling all Members to access, and add value to, the best available global and regional climate information products and methodologies through improved processing, exchange and enhancement of information on past, present and future climate.
- Support Members’ production and delivery of authoritative national climate information products and services in GFCS priority areas to adapt and respond to climate variability and change, including through participation in National Adaptation Plans, and to avert loss or damage as well as to optimize benefits from climate-related opportunities.
- Refine WMO products containing key climate indicators, seasonal outlooks, and improved characterization of extremes and associated impact information recognized as key inputs for international climate-related policy implementation and UN system action.
Objective 1.3  Further develop services in support of sustainable water management

To mitigate related risks and subsequent losses, improved access to reliable global and regional information on the current status and future conditions of water resources is critical, but stakeholders do not have a central source for this information. WMO will establish a system to enable easy access to essential water resources information to support informed decisions based on current and expected hydrological conditions.

Focus in 2020-2023:

- Enable better access to improved hydrological services, forecasts and warnings for water resources, drought and flood risk management and planning.
- Facilitate exchange of transboundary data and products through the Global Hydrological Status and Outlook System to enhance understanding of current and future water resources.
- Regular reporting on the state of global water resources.

Objective 1.4  Enhance the value and innovate the provision of decision-supporting weather information and services

Weather-informed decision-making for all modes of transport (aviation, marine, land), energy, agriculture, health, tourism, urban and other sectors will be raised to new levels, resulting in substantial productivity gains and positive environmental impacts. Service delivery approaches will be innovated to build Members’ capacity to provide modern, fit for purpose and high quality services.

Focus in 2020-2023:

- Enhance and increase weather services by uptake of modern technology in service delivery and quality management principles.
- Design and implement new weather and water prediction services for the specific needs of megacities and other urban areas.
- Provide NMHSs with further guidance and assistance in the assessment and enhancement of socioeconomic benefits of their services.
- Establish principles and guidance for successful public-private engagement, and facilitate a continuous dialogue between players and stakeholders based on collaboration and mutual reinforcement.
- Develop and adopt international standards, quality control mechanisms and recommended practices in a holistic manner for all service areas based on best national practices.
Goal 2 Enhance Earth system observations and predictions:

**Strengthening the technical foundation for the future**

*Long-term outcome:* An integrated Earth system observational network increasingly automated and optimized to ensure effective global coverage. High quality fit-for-purpose measurements feeding a continuous global data exchange underpinned by data management and data processing mechanisms.

**Objective 2.1 Optimize the acquisition of Earth system observation data through the WMO Integrated Global Observing System (WIGOS)**

All in-situ and space-based observing programmes of WMO are being consolidated in a single integrated system, the WIGOS, which will be operational in 2020. Worldwide implementation of WMO standards, principles and tools will enable Members to optimize their observing networks. It will allow Members to leverage observing systems operated by all relevant government agencies, research entities, non-profit organizations and private companies, including also non-traditional data acquisition vehicles such as crowd-sourcing and the Internet of Things.

**Focus in 2020-2023:**

- Advance the implementation of WIGOS rapidly through coordinated global and regional plans, in particular further development and operational implementation of Global Basic Observing Network (GBON), electronic metadata inventories for all observing platforms, along with quantitative tools to monitor their data delivery and data quality.
- Increase compliance with regulations and standards, and identify critical gaps in observational data coverage and address that through the integrated design of observing networks.
- Develop additional regulatory and guidance material developed to facilitate integration of externally-sourced observations under the WIGOS umbrella.

**Objective 2.2 Improve and increase access to, exchange and management of current and past Earth system observation data and derived products through the WMO Information System**

The useful shelf life for observations accessed through the WIS is unlimited. Atmospheric composition, climate, hydrological and oceanographic observations from all times will need to be continuously available and accessible for research, climate monitoring, re-analysis and other applications. Therefore, WMO will streamline and coordinate all WMO data management systems.

**Focus in 2020-2023:**

- Foster the continuous growth and evolution of WIS to accommodate and exploit the different technical capabilities of the Members and provide continued access to all observations acquired under WIGOS and all data generated under the Global Data Processing and Forecasting System for all Members.
- Further develop regulatory and guidance material governing international exchange of data, along with strengthened monitoring of compliance.
- Consolidate and further develop WMO data management systems and practices through WIS to help ensure that all observational data and key products are properly archived.
Objective 2.3  Enable access and use of numerical analysis and Earth system prediction products at all temporal and spatial scales from the WMO seamless Global Data Processing and Forecasting System

Major weather patterns are routinely predicted more than a week ahead, tropical cyclone landfalls are predicted accurately several days ahead, and even small-scale severe weather with high local impact is often forecasted with enough lead-time to mitigate its impact. WMO will further promote the development of Earth system Prediction, facilitate the use of cascading seamless system of numerical models° operated by centres around the world and coordinated through WMO to enhance national forecasting capabilities of all Members.

Focus in 2020-2023:

- Advance the GDPFS to accommodate increased emphasis on probabilistic forecasting and coupled Earth system modelling to improve predictions over time scales ranging from long-term climate variability to seasonal/sub-seasonal to short-term weather events.
- Further develop regulatory and guidance material governing the functioning of the GDPFS.
- Enhance the GDPFS to enable all Members to develop and/or improve their own national predictive capabilities benefiting from advances in quantitative model- and impact-based forecasting products.

Goal 3  Advance targeted research: Leveraging leadership in science to improve understanding of the Earth system for enhanced services

Long-term outcome: Leveraged global research community resulting in fundamental advances in the understanding of the Earth system, leading to improved policy-relevant advice and predictive skill at all time scales in a seamless context. This will result in the strengthened forecast and warning performance of all Members as research and operations coalesce to apply the best science to all components of the service value chain.

Objective 3.1  Advance scientific knowledge of the Earth system

WMO is uniquely placed to step up to the challenges and opportunities associated with fundamental Earth system science questions and will lead a global research effort that draws on the best expertise within NMHSs, academia and research institutes.

Focus in 2020-2023:

- Address overarching challenges in Earth system scientific research, modelling, analysis and observations, on topics such as atmospheric composition, the ocean/atmosphere/land coupling, cryosphere, clouds and circulation, water availability and flooding, regional sea level and coastal impacts, high-impact weather, and climate variability and change.

° "In the context of WMO, seamless prediction considers not only all compartments of the Earth system, but also all disciplines of the weather–climate–water–environment value chain (monitoring and observation, models, forecasting, dissemination and communication, perception and interpretation, decision-making, end-user products) to deliver tailor-made weather, climate, water and environmental information covering minutes to centuries and local to global scales" (WMO/WWRP, Catalysing Innovation in Weather Science: WWRP Implementation Plan 2016-2023, 2016).
- Prioritize research implementation plans and mobilize broad scientific community to help leverage global research potential to generate enhanced knowledge and understanding of the Earth system and related weather, water and climate linkages.
- Support advancement of WMO-coordinated priority scientific assessments and services.

**Objective 3.2 Enhance the science-for-service value chain ensuring scientific and technological advances improve predictive capabilities**

WMO demonstrates the value of translating science into enhanced operational service delivery with societal benefits. Considering the exponential growth in the expectations of users and stakeholders in improved predictive capabilities and socioeconomic relevance, WMO will work to ensure an effective science-for-service transition by accelerated research to operations applications.

**Focus in 2020-2023:**
- Improve predictive capabilities in high-impact weather forecasting, seasonal to sub-seasonal to decadal prediction, polar prediction, urban and environment prediction and water cycle prediction.
- Enhance relevance and utility of products and services through broader engagement of social science expertise and closer collaboration between physical and social scientific groups.

**Objective 3.3 Advance policy-relevant science**

In the next decade science is expected to provide tools and solutions for suitable use in the implementation of national and international policies and actions. WMO key research initiatives, working closely with its partners, will advance scientific assessments and climate projections, authoritative global reports on greenhouse gases and other atmospheric constituencies, and new technologies to better quantify the carbon, energy and water cycles.

**Focus in 2020-2023:**
- Implement an integrated global greenhouse gas information system to enable Members to improve the quality and confidence in national greenhouse gas emission inventories.
- Enhance the body of scientific knowledge assessed by IPCC and other global scientific reports.
- Improve the basis of understanding for water resource management decisions drawing upon improved capabilities, especially in sub-seasonal to seasonal range.

**Goal 4 Close the capacity gap on weather, climate, hydrological and related environmental services: Enhancing service delivery capacity of developing countries to ensure availability of essential information and services needed by governments, economic sectors and citizens**

**Long-term outcome:** Improved access to regional and global monitoring and prediction systems and utilization of weather, climate and water information and services bringing tangible benefits to developing Members, in particular least developed countries, small-island developing states and Member island territories. This will be achieved through strategic investments, technology transfer, knowledge and experience sharing, and by taking due account of social inclusion and gender factors.
Objective 4.1  Address the needs of developing countries to enable them to provide and utilize essential weather, climate, hydrological and related environmental services

The increasing vulnerability of many societies and economies to natural hazards and extreme weather events and the gaps in the capabilities of NMHSs to deliver adequate services – particularly those of developing countries, least developed countries and small island developing States and Member island territories – require WMO to strengthen its capacity development efforts, building upon existing capacities in NMHSs, taking advantage of the capacity of developed country NMHSs in twinning and other arrangements, and leveraging the investments of the UN system and other development partners towards this goal.

Focus in 2020-2023:

• Improve understanding of the specific capacity needs of each developing country with respect to technical, institutional and human resources, to enable them to provide adequate weather, climate, hydrological and related environmental services, in particular for protection of life, property and economic productivity.

• Mobilize strategic resources involving development partners and national governments and assisting NMHSs to develop long-term strategies and operational plans to address the identified capacity needs.

• Increase visibility and sustainability of NMHSs in LDCs and SIDS by demonstrating, promoting and communicating the societal-economic value of their weather, climate, water and related environmental observations, research and services.

Objective 4.2  Develop and sustain core competencies and expertise

There is a growing deficit in the capability and numbers of adequately educated and trained staff needed to provide weather, climate, hydrological and related environmental services in many countries and territories. Additionally, rapid advances in scientific innovation and technological developments require corresponding and continuous training of NMHS personnel. WMO will increase its training and long-term education activities to help Members to obtain and maintain needed competencies.

Focus in 2020-2023:

• Support Members to acquire the qualification and competencies required for effective service delivery through appropriate education and training programmes focused on WMO standards and recommendations.

• Support cooperation between developing and developed Members and full utilization of the WMO Regional Training Centres.

Objective 4.3  Scale-up effective partnerships for investment in sustainable and cost-efficient infrastructure and service delivery

Enhance the full spectrum of the weather, climate and hydrological services delivery to support the protection of life, property and the environment and the security of food production, energy and water resources. Scale up partnership investments to minimize cost and maximize the opportunity for the networks to be sustainable long beyond the lifetime of donor funded projects.

Focus in 2020-2023:

• Strengthen partnerships and alliances among all Members to share knowledge, technology and expertise with particular emphasis on the use of twinning arrangements.
Enter into strategic, functional and mutually beneficial development partnerships and alliances with the key relevant UN, intergovernmental and nongovernmental organizations, the private sector, and academia.

Provide leadership in promoting the principles on which global meteorology is built, emphasizing authoritative voice, common standards, data and product sharing.

**Goal 5  Strategic realignment of WMO structure and programmes for effective policy- and decision-making and implementation**

**Long-term outcome:** Improved relevance, effectiveness and efficiency of the constituent bodies and implementation of this Strategic Plan through closer alignment of structures and processes with the strategic goals of the Organization.

**Objective 5.1  Optimize WMO constituent body structure for more effective decision-making**

Ensure the effective and efficient use of resources, including those of Members, through a more strategic focus of the WMO action, and constituent body constructs, structures and processes adapted to implement the Strategic Plan.

**Focus in 2020-2023:**

- Implement the decisions of Congress on optimized constructs, processes and duties of WMO constituent bodies and organs to enhance the efficiency and effectiveness of the Organization and good governance.

**Objective 5.2  Streamline WMO programmes**

*WMO scientific and technical programmes need to be periodically reviewed by the Congress to ensure their relevance to the Strategic Plan of the Organization as well as their effectiveness and efficiency of delivery. This will be done based on the principles of quality management, cost-effectiveness, and optimal support by contributing experts and the Secretariat.*

**Focus in 2020-2023:**

- Streamline WMO scientific, technical and service programmes to enable the Organization to better achieve the goals and objectives set in the Strategic Plan, ensuring coherence and consistency between the strategic, programmatic and financial frameworks.

**Objective 5.3  Advance equal, effective and inclusive participation in governance, scientific cooperation and decision-making**

*Organizations that respect diversity and value gender equality demonstrate better governance, improved performance and higher levels of creativity. Gender equality and the empowerment of women are further key to scientific excellence and essential to meeting the challenges of climate change, disaster risk reduction and sustainable development, particularly Sustainable Development Goal 5.*

**Focus in 2020-2023:**

- Advance gender equality across the Organization, especially in governance and decision-making, in implementation of SDG5 and the WMO Gender Equality Policy.
- Provide equitable access to, interpretation of and use of information and services to both women and men.
- Attract more women and girls to science and employment in NMHS through showcasing role models and investing in human capital.

**Implementation of the Strategic Plan**

This Strategic Plan will guide the decisions and activities of WMO in helping to realize its 2030 vision, and will serve as the focus for the upcoming financial period 2020–2023, bringing the greatest benefits to Members.

The Strategic Plan takes into account strategic, operational, financial, compliance and reputational risks for the Organization and its Members as outlined in key drivers.

The integrated WMO Operating Plan 2020-2023 presents time-bound programme activities and projects, result-oriented budgets and success indicators (see Annex for a series of illustrative indicators). The Operating Plan forms the basis for resource allocation, and defines the risks and performance matrices against which to assess progress to achieve expected outcomes through the WMO Monitoring and Evaluation System.
## Annex

### Monitoring indicators

<table>
<thead>
<tr>
<th>Strategic objective</th>
<th>Monitoring indicators</th>
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<tbody>
<tr>
<td>1.1 Strengthen national multi-hazard early warning/alert systems to extend reach and better enable effective decision response to the associated risks</td>
<td>1.1.1 Number of Members participating in a global alert system&lt;br&gt;1.1.2 Number of Members with a MHEWS integrated in a national DRR management system&lt;br&gt;(TBD) Number of countries cataloguing high impact weather, weather and climate events using WMO standard unique identifiers</td>
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<tr>
<td>1.2 Broaden the provision of policy- and decision-supporting climate information and services at all levels</td>
<td>1.2.1 Number of Members with basic system for climate services&lt;br&gt;1.2.2 Number of Members with enhanced CSIS capacity&lt;br&gt;1.2.3 Number of Members offering tailored products within GFCS priority areas&lt;br&gt;1.2.4 Number of Members making use of RCCs and/or RCOFs&lt;br&gt;1.2.5 User/stakeholder assessment of the relevance, usefulness and timeliness of WMO flagship products (e.g. Statement of the Global Climate, El Niño Outlook, etc.)</td>
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<tr>
<td>1.3 Further develop services in support of sustainable water management</td>
<td>1.3.1 Number of Members participating in WMO status and outlook system&lt;br&gt;1.3.2 Number of Members with operational flood forecasting&lt;br&gt;1.3.3 Number of Members with operational drought warning system</td>
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<td>1.4 Enhance the value and innovate the provision of decision-supporting weather information and services</td>
<td>1.4.1 Number of Members with QMS for selected services (aviation, marine, EWS)&lt;br&gt;1.4.2 Number of Members with socioeconomic benefit analysis conducted in the past X years&lt;br&gt;1.4.3 Number of Members with signed agreements between NMHSs and private sector/academia actors on (a) service delivery and (b) maintenance of networks&lt;br&gt;1.4.4 Number of Members using (a) web applications and (b) social media in service delivery</td>
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<td>2.1 Optimize the acquisition of Earth system observation data through the WMO Integrated Global Observing System (WIGOS)</td>
<td>2.1.1 Percentage of the Earth system covered by observations (especially hydrosphere, cryosphere, developing and LDCs, SIDs)&lt;br&gt;2.1.2 Number of Members complying with WMO observation standards&lt;br&gt;2.1.3 Number of Members implementing national observing system WIGOS</td>
</tr>
<tr>
<td>2.2 Improve and increase access to, exchange and management of current and past Earth system observation data and derived products through the WMO Information System</td>
<td>2.2.1 Number of Members with national network monitoring and data management systems established&lt;br&gt;2.2.2 Number of Members implementing data exchange policies, as per Resolutions 40, 25 and 60</td>
</tr>
<tr>
<td>2.3 Enable access and use of numerical analysis and Earth system prediction products at all temporal and spatial scales from the WMO seamless Global Data Processing and Forecasting System</td>
<td>2.3.1 Number of Members (a) accessing and (b) using quantitative numerical model fields in support of national product generation and service delivery&lt;br&gt;2.3.2 Number of Members providing verification data to the producing centres</td>
</tr>
<tr>
<td>3.1 Advance scientific knowledge of the Earth system</td>
<td>3.1.1 Assessed value of WMO-led research to Members and the global UN agenda (measured in terms of excellence, relevance and impact)</td>
</tr>
<tr>
<td>Strategic objective</td>
<td>Monitoring indicators</td>
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<tr>
<td>3.2 Enhance the science-for-service value chain ensuring scientific and technological advances improve predictive capabilities</td>
<td>3.2.1 Number of downloads of Sub-seasonal to Seasonal Prediction (S2S) database in Terabytes</td>
</tr>
</tbody>
</table>
| 3.3 Advance policy-relevant science                                                | 3.3.1 Number of Members with national greenhouse gas monitoring systems supporting climate action  
3.3.2 Number of Members with capability for decadal predictions                        |
| 4.1 Address the needs of developing countries to enable them to provide and utilize essential weather, climate, hydrological and related environmental services | 4.1.1 Number of NMHSs with strategic plans and legal basis for their operation  
4.1.2 Number of NMHSs with documented inputs to (a) NAPs and (b) NDCs  
4.1.3 Number of NMHSs with enhanced capacity to provide a range of services (based on CPDB self-assessment) |
| 4.2 Develop and sustain core competencies and expertise                             | 4.2.1 Number of NMHS staff trained at WMO training centres and/or fellowships  
4.2.2 Number of NMHSs whose staff have adequate (to be defined) level of core competencies to meet national mandate |
| 4.3 Scale up effective partnerships for investment in sustainable and cost-efficient infrastructure and service delivery | 4.3.1 Number of NMHSs receiving international capacity development assistance through WMO technical advisory role and/or partnerships  
4.3.2 Number of Members benefiting from WMO-catalyzed development projects  
4.3.3 Volume of development projects catalyzed through WMO (in CHF)  
4.3.4 Number of Members with legal basis for public-private partnerships |
| 5.1 Optimize WMO constituent body structure for more effective decision-making     | 5.1.1 Members perceptions based on Stakeholder Survey (e.g. on structure, effectiveness and mode of operation of WMO Constituent Bodies) – see Section 3 of 2016 Survey                                                                 |
| 5.2 Align WMO programmes                                                            | 5.2.1 Members perceptions based on Stakeholder Survey (e.g. value of WMO programmes to operational services provided by Members) – see Section 4 of 2016 Survey                                                                 |
| 5.3 Advance equal, effective and inclusive participation in governance, scientific cooperation and decision-making | 5.3.1 Proportion of female and male delegates to WMO constituent body meetings  
5.3.2 Proportion of male and female members of constituent body working structures (working groups, expert teams) |

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COUNTRY PROFILE DATABASE AND MONITORING AND EVALUATION

Integration of Monitoring and Evaluation in the Country Profile Database Version 2.5

1. Version 2.5 of the Country Profile Database (CPDB) was launched in November 2017, integrating Monitoring and Evaluation (M&E) and relevant survey data into a single information repository. The latter replaced the Survey on Impacts of Achieved Results on Members and other surveys previously used to collect monitoring data.

2. The purpose was to reduce duplication, streamline the data collection process, and ensure access to institutional information and monitoring data. Once completed by all, CPDB would contain comprehensive information on the whole WMO membership, which would be retrievable ahead of constituent body sessions and as needed.

3. Existing data in Members’ profiles was migrated to the new CPDB version. Information on NMS staffing and capacity development was updated with the most recent data available from Members’ responses to the WMO Survey on Human Resources Status of NMHS (2017). Relevant data was also imported accordingly from the latest Survey on Impacts of Achieved Results on Members conducted in 2015.

Mid-Term Performance Assessment 2016-2017

4. The collection of monitoring data for the first biennium of the 2016-2019 financial period took place between November 2017 and February 2018. At roughly 33%, the response rate from Region III was among the lowest among the WMO regions. Only 4 Members fully provided the M&E data requested by updating their respective CPDB profiles, 1 provided partial data, and 7 Members did not provide any monitoring data. Eight Members from Region III have a designated M&E focal point.

5. Based on the data collected, a **Mid-Term Performance Assessment Report 2016-2017** was developed, assessing progress in implementation of the Expected Results and Key Outcomes of the WMO Strategic Plan 2016-2019. A **Summary** of the Mid-Term Report was also prepared, highlighting capacity gaps (marked in red) and areas with notable progress (marked in blue). The lack of representative data from Region III made the drawing of regional trends and the identification of regional deficiencies difficult.

Country Profile Database Version 3.0

6. Work on the next version of CPDB is ongoing. Significant improvements are envisioned in terms of access, data collection and management, data visualization and storage. Dashboards, maps and other interactive features will be developed to improve performance reporting. Members’ nominated focal points will have access to tools that will allow NMHS to update and report on their own profile, as well as the ability to compare their profile against regional and global profiles.
7. The ultimate objective is to turn CPDB into a single repository of information accessible to and used by all Members. The existence of such a knowledge hub is expected to facilitate decision-making and inform strategic planning nationally as well as for WMO as a whole. It will further help in the identification of priorities and capacity gaps as well as assist in resource mobilization for WMO and for our development partners.

**Baselines and Targets for 2020-2023**

8. Monitoring indicators have been designed and included in the draft 2020-2023 Operating Plan. They are closely aligned to the Strategic Objectives formulated in the draft 2020-2023 Strategic Plan. Preliminary data will be collected through CPDB to establish baselines and set targets together with the scheduled update of Member profiles in late 2018-early 2019.
PROPOSED CONSTITUENT BODY REFORM

Resolution 35 (EC-70)

WMO EXECUTIVE COUNCIL STRUCTURES

THE EXECUTIVE COUNCIL,

Recalling:

(1) Decision 84 (EC-68) – Governance review,
(2) Decision 68 (EC-69) – WMO constituent body reform,

Having considered the recommendations of the Executive Council Working Group on Strategic and Operational Planning concerning the WMO constituent body reform,

Emphasizing the essential role of the Executive Council as the executive body of the Organization, responsible for the coordination of programmes of the Organization and for the utilization of its budgetary resources in accordance with the decisions of the World Meteorological Congress,

Recalling the primary functions of the Executive Council set out in Article 14 of the Convention of the World Meteorological Organization,

Considering that the discharge of such primary functions requires the Executive Council, inter alia:

(1) To lead the development of the WMO Strategic Plan and provide recommendations to Congress on overall policy aspects, including the establishment of partnerships,
(2) To support and supervise regional associations and technical commissions in the implementation of their decisions and resolutions and in the preparation of their operating plans,
(3) To provide advice to Congress on scientific and technical matters and emerging issues, including those that entail the engagement of expert communities beyond the WMO mandate,
(4) To provide recommendations to Congress concerning programme and budget estimates, financial matters and compliance with the legal framework of the Organization,

Decides:

(1) To establish the following standing bodies reporting to the Executive Council, with the terms of reference as given in the annex to the present resolution:
   (a) Policy Advisory Committee (PAC);
   (b) Technical Coordination Committee (TCC);
(2) To confirm the following bodies reporting to the Executive Council:

(a) WMO Staff Pension Committee, established by Resolution 30 (EC-XXI), as amended by Resolution 21 (EC-XXXV);

(b) WMO Audit Committee, with the terms of reference provided by Resolution 8 (EC-LXIII);

(c) Financial Advisory Committee, with the terms of reference provided by Resolution 39 (Cg-XV), reporting to Congress and the Executive Council;

(3) To recommend to Congress the establishment of the Science Advisory Panel, reporting to Congress and the Executive Council, with the terms of reference as formulated in Recommendation 25 (EC-70) Annex 4;

(4) That the need for, and the functions of, other bodies reporting to the Executive Council shall be reconsidered in light of the establishment of PAC and TCC;

(5) To continue consideration of the matter of the number and distribution of seats of the Executive Council, referred to the Council by Congress, in the next financial period 2020–2023;

(6) To defer the implementation of point (1) in this decision regarding the PAC and the TCC to the Executive Council at its seventy-first session.

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Annex to Resolution 35 (EC-70)

**Policy, scientific and technical advisory bodies reporting to the Executive Council**

**A. Policy Advisory Committee**

**Mandate**

The Policy Advisory Committee (PAC) shall advise the Executive Council on any matters concerning the strategy and policy of the Organization submitted to it by the Executive Council, with a particular focus on:

(1) Maintaining awareness of global trends and external drivers that affect Members and the long-term vision-setting of the Organization,

(2) Improving and aligning the Organization-wide strategic, operational and budget planning process, including monitoring of implementation of the Strategic Plan,

(3) Keeping under review WMO policies and practices for the exchange of meteorological, hydrological and climatological and related data and products,

(4) Optimizing WMO governance and programme structures, processes and practices to ensure the effective and efficient use of resources through a more strategic focus and within a quality management framework,

(5) Addressing and keeping under review the evolution of the role and operation of National Meteorological and Hydrological Services,

(6) Streamlining WMO scientific and technical programmes to ensure their relevance to the Strategic and Operating Plans and effectiveness,
Guiding the engagement of the Organization in partnerships with other UN and international organizations, the academia and the private sector,

Mainstreaming and advancing gender equality across the Organization, especially in governance and decision-making.

Membership

The Committee shall be composed of:

(a) The presidents of the regional associations,

(b) Eight Members of the Executive Council appointed by the Council upon proposal by the President noting the need for the expertise in the focus areas of the mandate of the Committee and taking into consideration regional representation and gender equality factors,

(c) The chairs of the Scientific Advisory Panel and the Technical Coordination Committee as ex officio members.

Working procedures

The Committee shall be chaired by the WMO President or one of the Vice-Presidents.

The Committee shall normally meet once per year prior to a session of Executive Council.

The chair of the Committee may invite experts and/or representatives from partner organizations to attend meetings of the Committee as observers.

At meetings of the Committee, the members may be assisted by advisors.

The Committee may establish time-bound substructures as needed for the discharge of specific tasks during an intersessional period.

B. Technical Coordination Committee

Mandate

The Technical Coordination Committee (TCC) shall act as a two-way interface between the Executive Council and the technical bodies of the Organizations: technical commissions, the Research Board, and other relevant bodies. It shall ensure the coordination between these bodies and shall provide the necessary analytical information to inform EC decisions on and the regional associations to ensure that the technical work of the Organization is properly guided by the needs and priorities identified by Members.

The committee shall report to the Executive Council on the following issues:

(1) Progress in developing further the WMO technical regulatory framework in a consistent manner by all technical bodies involved;

(2) Status of compliance with technical regulations of the WMO Members, including advice on identified barriers to compliance and ways to address them to resolve deficiencies;

(3) Impact and risk assessment of new standards and technology on the systems operated by Members, including financial and human resources impact;
Evolving user needs for information and services and alignment of the plans of the WMO technical bodies to meet those needs;

Collaboration and coordination between the technical bodies and regional associations to ensure that regional priorities and requirements are considered into the technical bodies’ planning;

Collaboration among the technical commissions, the Research Board and any other bodies established by Congress or Executive Council required to facilitate the transition of research to operations through co-design, operational testing and feedback from operational community;

Issues of common concerns of regional associations, technical commissions, the Research Board and any other bodies established by Congress or Executive Council affecting the progress of implementation of the Strategic and Operating Plans;

Coordination with other bodies, such as SAP and PAC and any other issues that might be referred to by the Executive Council.

Membership

The Committee shall be composed of:

(a) The presidents and vice-presidents of the technical commissions,

(b) The presidents of regional associations,

(c) The chair and vice-chair of the Research Board,

(d) The chairs of any other bodies established by Congress or Executive Council,

(e) The chairs of other WMO-sponsored and co-sponsored technical bodies identified by the President.

Working procedures

The Committee shall be chaired by a WMO Vice-President.

The Committee shall meet in principle once per year prior to a session of Executive Council.

The chair of the Committee may invite experts and/or representatives from other partner organizations to attend meetings of the Committee as observers.

At meetings of the Committee, the members may be assisted by advisors.

The Committee may establish time-bound substructures for the discharge of specific tasks during an intersessional period. Such temporary substructures shall be discontinued at the end of every intersessional period.
Recommenda­tion 25 (EC-70)

WMO technical commissions and other bodies

THE EXECUTIVE COUNCIL,

Recalling:

(1) That the Seventeenth World Meteorological Congress had requested the Executive Council to provide recommendations to the Eighteenth Congress on constituent body constructs,

(2) Decision 84 (EC-68) – Governance review,

(3) Decision 68 (EC-69) – WMO constituent body reform,

Having considered:

(1) The functions of technical commissions as defined by Article 19 of the WMO Convention and WMO General Regulations 180 to 196,

(2) The recommendations of the first 2018 session of the Working Group on Strategic and Operational Planning concerning the construct of technical commissions (see EC-70/INF. 16),

(3) The concept of a revised system of technical commissions, as provided in Annex 1 to the present recommendation,

(4) The importance of having effective mechanisms to strengthen scientific development for the provision of better weather, climate and related environmental services,

(5) The importance for the Organization of benefitting from independent, high-level scientific advice on global societal trends and challenges,

Having further considered:

(1) The alternative proposal by the fourteenth meeting of the Conference of Directors of the Ibero-American Meteorological and Hydrological Services (CIMHET), advocating three commissions for services and applications,

(2) The success of the Open Science Conferences,

(3) The outcomes of the Global Conference: Prosperity through Hydrological Services, held in Geneva from 7 to 9 May 2018, and of the Executive Council Special Dialogue on Water, held on 25 June 2018, which encouraged WMO to take on a stronger role in the evolving global water agenda in order to realize opportunities and benefits for Members,

(4) That the extraordinary session of the Commission for Hydrology (December 2018) has been charged (Resolution 18 (EC-70) – Outcomes of the Special Dialogue on Water) with engaging the hydrological community in: (a) suggesting optimal solutions for effective participation of WMO in the global water agenda, and (b) providing recommendations to Congress on ways to integrate hydrological activities into the new WMO structure,

(5) That the specific conditions under which the national hydrological services currently operate and the new direction WMO will take with regard to strengthening its hydrological profile may require specific organizational structures and working
mechanisms to enable WMO to effectively promote and integrate activities in operational hydrology, and contribute effectively to, and benefit from, the integrated Earth system approach embraced by WMO in the new Strategic Plan,

**Recommends** to Congress:

(1) Draft Resolution XX/1 (Cg-18) – Establishment of WMO technical commissions and other bodies for the nineteenth financial period, as provided in Annex 1 to the present recommendation;

(2) Draft Resolution XX/2 (Cg-18) – Research Board, as provided in Annex 2 to the present recommendation;

(3) Draft Resolution XX/3 (Cg-18) – Joint WMO-IOC Committee for Oceanography and Meteorology, as provided in Annex 3 to the present recommendation;

(4) Draft Resolution XX/4 (Cg-18) – Scientific Advisory Panel, as provided in Annex 4 to the present recommendation.

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**Annex 1 to Recommendation 25 (EC-70)**

**Draft Resolution XX/1 (Cg-18)**

**Establishment of WMO technical commissions and other bodies**

**for the nineteenth financial period**

THE CONGRESS,

**Recalling:***

(1) That the Seventeenth Congress requested the Executive Council to provide recommendations to the Eighteenth Congress on constituent body constructs,

(2) Decision 84 (EC-68) – Governance review, and Decision 68 (EC-69) – WMO constituent body reform,

(3) Resolution 43 (Cg-XVI) – Terms of reference of the technical commissions,

**Expressing appreciation** for the work carried out by the Executive Council and its Working Group on Strategic and Operational Planning concerning the construct of technical commissions,

**Having examined** Recommendation 25 (EC-70) – WMO technical commissions and other bodies,

**Recognizing:***

(1) That in accordance with the Convention, Congress has established and reviewed from time to time commissions consisting of technical experts to study and make recommendations to Congress and the Executive Council on subjects within the purpose of the Organization,
That the technical commissions, as per their general terms of reference (Annex III to the General Regulations) have been tasked:

(a) To study and review advances in science and technology, keep Members informed and advise Congress, the Executive Council and other constituent bodies on these advances and their implications,

(b) To develop, for consideration by the Executive Council and Congress, proposed international standards for methods, procedures, techniques and practices in meteorology and operational hydrology including, in particular, the relevant parts of the Technical Regulations, guides and manuals,

(3) That the Congress had classified the technical commissions into two groups:

(a) Basic commissions – dealing with basic operations and facilities, and research in atmospheric sciences,

(b) Application commissions – dealing with applications to economic and social activities,

(4) That the technical commissions have played a major role in engaging the collective expertise of Members in coordinating the design and development of globally harmonized systems and services operated by Members, development of related standards and guidance, which have contributed to the achievement of the purposes of the Organization and bringing benefits to its Members,

Recognizing further:

(1) That the rapidly changing technological and institutional environment and the growing societal demand for information and services in all WMO business areas will require a holistic and integrated approach along the service delivery value chain,

(2) That such holistic approach would be achieved through consolidation and streamlining of expertise and normative work in major organizational domains covering: (a) the integrated infrastructure and methodology for Earth system observations, information management, and generation of forecasts and products, and (b) the development of applications and services, and related methodologies for service delivery to governments, citizens and economic sectors, and c) focused scientific research and capacity development,

(3) That the restructuring of the technical commissions is intended to support the Strategic Plan, which aims to support the development of:

(a) An Earth system science approach to seamless prediction from climate scales down to the mesoscale that is built upon the concept of the weather, water, ocean and climate linkage,

(b) An integrated approach to weather, water, ocean and climate linkages supporting Members’ effort to ultimately unify operational prediction systems using a fully coupled Earth system model approach, concerned with changes in the ocean that have a direct influence on the atmosphere and other elements of the Earth system across all time scales,

(c) A holistic, interdisciplinary approach to services and applications with a strong focus on users and use cases, promoting impact-based approach and supporting common development of standards and methodologies for generic service attributes like
quality, competence, fitness for purpose, accessibility, as well as innovation in service delivery (e.g. through social media),

(4) That, given the capacity development needs of Members, the efficiencies and savings gained from the restructuring of technical commissions will be re-aligned to support activities aimed at enhancing the capacity of Members;

Considering the need to maintain and strengthen the leadership of the Organization in the domains of weather, climate, water and related environmental aspects;

Considering further the review and recommendations of the extraordinary session of the Commission for Hydrology (CHy-Ext) by the EC Working Group on WMO Strategic and Operational Planning (WG/SOP);

Recognizing that, in view of the scale of the restructuring, which is unprecedented in the WMO history, the transition from the existing to the new structure should be realized through a transparent and well-managed process encompassing proactive change management with special focus on communication with all stakeholders, in particular, the regional associations and their Members;

Decides:

(1) To establish, in accordance with Article 8 (g) of the Convention, the following technical commissions for the nineteenth financial period:

(a) Commission for Observation, Infrastructure and Information Systems (COIIS), with terms of reference provided in Annex A; and

(b) Commission for Weather, Climate, Water and Related Environmental Services and Applications (CSA), with terms of reference provided in Annex B;

(2) That the fundamental working principle of the new commissions should be the inclusiveness of the weather, climate, water and other relevant environmental areas covered by the WMO constitutional purpose;

(3) That, due to the multidisciplinary nature and increased work volume, the composition and working arrangements of the new commissions should be elaborated to ensure balanced representation of relevant disciplines, active and balanced regional engagement and gender considerations;

(4) That the two technical commissions shall commence their work as early as possible in accordance with the Transition Plan as provided in Resolution 36 (EC-70) – WMO Constituent Bodies Reform Transition Plan and Communication Strategy;

(5) That, in accordance with final paragraph of Article 8 of the Convention, the president of each new commission and their vice-presidents will be elected by Congress, from amongst current presidents and vice-presidents of technical commissions, as one-time measure aimed at expediting the transition to the new structure of the technical commissions,

(6) Upon completion of the transition period, to disband the existing technical commissions that have been active during the eighteenth financial period, as follows:

Commission for Basic Systems (CBS);
Commission for Instruments and Methods of Observation (CIMO);
Commission for Hydrology (CHy) (pending CHy-Ext recommendations);
Commission for Atmospheric Sciences (CAS);
Commission for Aeronautical Meteorology (CAeM);
Commission for Agricultural Meteorology (CAgM);
Joint WMO-IOC Technical Commission for Oceanography and Marine Meteorology (JCOMM);
Commission for Climatology (CCl);

Expresses appreciation to the presidents and experts who served in the technical commissions during and before the eighteenth financial period for their leadership, commitment and contribution to the work of the Organization;

Elects ... [names] to serve as president and [three names] as vice-presidents of ...;

Adopts the amendment to the General Regulations related to the work and specific terms of reference of the technical commissions as presented in the Annex to this Resolution;

Requests the Executive Council to oversee the transition to the new technical commissions and report on the implementation of this resolution at the nineteenth session of Congress;

Requests the presidents of the new technical commissions to ensure establishment of optimum subsidiary structures as needed to implement the Strategic Plan in the most efficient and effective manner;

Requests further the presidents of the new technical commissions:

(1) To endeavour to maximize efficiency and synergy through establishing strong liaison with relevant internal and external bodies, including, where appropriate, joint bodies and/or inter-agency bodies as well as relevant global and regional partnerships;

(2) To report on the subsidiary structure and the working plans of the commissions at the seventieth-second session of the Executive Council (2020);

(3) To establish working mechanisms and processes that will respond to the priorities and requirements set by Members by developing technical solutions to meet those priorities and requirements in consultation with regional associations, to ensure the solutions are feasible, affordable and implementable at the regional and national levels;

Requests Members to support the establishment of a solid community of expertise that will underpin the technical commissions by nominating knowledgeable, experienced and motivated professionals in the related technical fields and to support their work in the commissions, in terms of adequate working time and financial commitment, in order to ensure the leadership role of the commissions in the development of global standards, applying innovation and building national, regional and global technical capacity needed to achieve the purposes of the Organization;

Requests the presidents of regional associations to work actively with their Members to ensure that nominated experts are representative of geographic, gender and technical diversity, in order to facilitate comprehensive input on regional needs and issues, as well as to facilitate implementation and uptake of evolving technical systems, standards and regulations at national and regional levels;

Requests the Secretary-General to take the required steps that will ensure the smooth transition to the new arrangement of technical commissions in accordance with the transition plan.
Annex 1 to draft Resolution XX/1 (Cg-18)

Terms of reference of the technical commissions

Note: The General Terms of Reference of Technical Commissions provided in Annex III to the General regulations will remain unchanged.

A. Commission for Observation, Infrastructure and Information Systems (COIIS)

General mandate

The overall scope and specific terms of reference for the Commission for Observation, Infrastructure and Information Systems (COIIS) shall be in accordance with the purposes of Organization defined in Article 2 of the Convention, in particular, items (a) through (c) and (e), and Regulations 180 to 196 and Annex III (as amended by this resolution) of the General Regulations.

The Commission shall contribute to: development and implementation of globally coordinated systems for acquiring, processing, transmitting and disseminating Earth system observations, and related standards; coordination of the production and use of standardized analysis and model forecast fields; and development and implementation of sound data and information management practices for all WMO Programmes and their associated application and services areas.

The work of the Commission shall encompass all approved WMO application areas, as listed in the Rolling Review of Requirements, as well as updated and emerging observing, information and infrastructure requirements.

The Commission shall promote the development of integrated systems to cover all application areas wherever possible, and shall ensure that these systems:

(a) Are user-driven and provide earth system observations, processed data and relevant services, products and information to Members;

(b) Are applicable, accessible and with life-cycle management across the full range of WMO Members;

(c) Are built on a modular and scalable principle to the extent possible;

(d) Make full use of existing WMO and other relevant standards and regulations;

(e) Make use of and promote public-private engagement where advantageous;

(f) Incorporate state-of-art optimal and fit-for-purpose technology;
Are based on user requirements developed in coordination with CSA and the Research Board;

Are building upon existing partnerships and networks among communities of practice within the service areas, which are beneficial for WMO Members.

The activities of the Commission shall be guided by the WMO Strategic Plan.

**Specific terms of reference**

(a) Development and maintenance of WMO normative material related to integrated observing systems, data transmission and dissemination systems, data management systems, and data processing and forecast systems as specified in WMO Technical Regulations – the Commission shall:

(i) Coordinate development of new systems and infrastructure-related regulatory material in application areas of its scope;

(ii) Promote and pursue integration of existing regulatory material;

(iii) Keep regulatory material up-to-date through regular amendments, as necessary;

(iv) Ensure the consistency of the new and amended regulatory material across the application areas;

(v) Consider relevant scientific and technological developments to ensure the currency of the regulatory material;

(vi) Accompany recommendations for new and amended regulatory material with related impact, cost-benefit, and risk analysis;

(b) Common infrastructure and systems attributes – the Commission shall:

(i) Promote a culture of compliance with standards and relevant regulatory material among all Members;

(ii) Further develop and promote the use of the Rolling Review of Requirements (RRR) for the assessment of user requirements, the assessment of available capabilities, and the development of gap mitigation strategies to further improve the overall systems capabilities of WMO;

(iii) Develop and promote a unified approach to data management across all disciplines and WMO applications areas;

(iv) Develop common methodologies for quality assurance of observations and other data products across all application areas;

(v) Actively seek engagement of Earth system observational data providers from all relevant government entities, international organizations, private sector, and academia.

(c) Assistance to Members to enhance systems capabilities and enable effective implementation and compliance – the Commission shall:

(i) Consult with regional associations and Members to identify needs for improvements in observing, data transmission and data management capabilities services and develop the required implementation strategies;
(ii) Consult with regional associations to identify experts who can participate in technical commission teams, to facilitate implementation and uptake of evolving technical systems, standards and regulations at national and regional levels;

(iii) Facilitate the regional and national implementation of systems under its remit by developing guidance material aligned with new and amended regulatory material;

(iv) In consultation with the regional associations, identify needs for assistance to Members to improve their capabilities and provide relevant guidance and capacity building, including training;

(v) Propose pilot and demonstration projects as necessary;

(vi) Facilitate transfer of knowledge by supporting relevant events and through communication and outreach activities;

(vii) Providing standards and regulations for the basic measurement of variables characterizing water quantity, quality and sediments; (pending CHy-Ext recommendations)

(viii) Support the technical aspects of the Hydrological Status and Outlook System and the state of the water report; (pending CHy-Ext recommendations)

(d) Cooperation and partnership – the Commission shall:

(i) Establish close coordination and efficient working mechanisms with the Commission for Weather, Climate, Water and Related Environmental Services and Applications (CSA), relevant international organizations in the area of meteorological, hydrological, climatological and other environmental observations, information and infrastructure;

(ii) Establish and maintain close collaboration and coordination with WMO co-sponsored system and programmes, and other major international observing programmes and initiatives;

(iii) Establish in the collaboration with the Research Board consultative mechanisms with relevant scientific and operational user organizations to receive feedback and advice (e.g. ECMWF, EUMETSAT, EUMETNET, UNFCCC, FAO) on systems capabilities;

(iv) Consider opportunities for leveraging resources through establishment of joint, including inter-agency, bodies and projects addressing common areas of system development.

Composition

The composition of the Commission shall be in accordance with General Regulation 183.

Participation of leading technical experts in Earth system observations, information management and predictions in the fields of meteorology, hydrology, climatology, oceanography, atmospheric environment and other fields covered by the terms of reference shall be ensured by Members.

UN and international organizations partners, as well as private partners of WMO may be invited to nominate technical experts in their areas of expertise to participate in the work of the Commission in accordance with General Regulation 184.
**Working procedures**

The Commission shall elect a president and vice-president(s) among the experts on the Commission.

The Commission shall establish effective and efficient working mechanisms and related necessary time-limited subsidiary bodies:

(a) Establish a work programme with concrete deliverables and timelines, aligned with the Organization-wide Strategic and Operating Plan and monitor progress on annual basis by reporting to the Executive Council and Congress;

(b) Use electronic forms of coordination and collaboration effectively;

(c) Establish effective coordination with other technical commissions, the Research Board, JCOM and other relevant bodies in particular through the Executive Council’s Technical Coordination Committee, as appropriate;

(d) Organize communication and outreach to inform the WMO community of ongoing work, achievements and opportunities;

(e) Apply a system for recognition of achievements, promotion of innovation and include young professionals;

(f) Ensure regional and gender balance and inclusiveness in all its structures and work plans;

(g) Ensure adequate representation and consultation with communities of practice among the service areas.

**B. Commission for Weather, Climate, Water and Related Environmental Services and Applications (CSA)**

**General mandate**

The Commission for Weather, Climate, Water and Related Environmental Services and Applications (CSA) scope and specific terms of reference shall be in accordance with the purposes of the Organization defined in Article 2 of the Convention, in particular, items (d) and (e); Regulations 180 to 196 and Annex III (as amended by this resolution) of the General Regulations.

The Commission shall contribute to the development and implementation of globally harmonized weather, climate, water, ocean and environment-related services and applications to enable informed decision-making and the realization of socioeconomic benefits by all user communities and society as a whole.

The Commission shall encompass application areas with substructures as needed to implement the strategic plan including, but not limited to:

(a) Regulated and existing meteorological services (covered by WMO *Technical Regulations* (WMO-No. 49), in accordance with General Terms of Reference 2):
   - (i) aeronautical meteorological services;
   - (ii) marine and oceanographic meteorological services;
   - (iii) agrometeorological services;
   - (iv) public weather services;
   - (v) climatological services;
(vi) hydrological services; (pending CHy-Ext recommendations)

(b) Emerging services under development (currently subject of studies and evaluation for possible inclusion in regulated services, in accordance with General Terms of Reference 1):
   (i) urban services;
   (ii) environmental services;
   (iii) multi-hazard early warning services;
   (iv) polar and mountain area services;
   (v) health;
   (vi) energy;
   (vii) water management (pending CHy-Ext recommendations)
   (vii) land transportation;
   (viii) other, as may become necessary.

(c) Potential category for hydrological services (pending CHy-Ext recommendations)

The Commission shall promote a holistic approach to services and service delivery and assist Members to apply:

(a) Risk-based decision-making in support of disaster risk preparedness and reduction;
(b) A service-oriented culture;
(c) A strong user focus with “fit-for-purpose” services;
(d) Quality management in service delivery;
(e) Standards for competence and qualification of personnel;
(f) Mutually-beneficial public-private engagement providing optimized service delivery and added value to the society;
(g) Accelerated uptake of advanced technology for service delivery;
(h) Systematic evaluation of socio-economic benefits and other relevant market-oriented evaluations of products and services.

The activities of the Commission shall be guided by the WMO Strategic Plan and the WMO Strategy for Service Delivery.

Specific terms of reference

(a) Development and maintenance of WMO normative material related to service delivery, as specified in WMO Technical Regulations, Volume I and its relevant Annexes, the Commission shall:
   (i) Coordinate development of new service-oriented regulatory material in all application areas of its scope based on identified needs of Members;
   (ii) Keep the service-related regulatory material up-to-date through regular amendments, as necessary;
(iii) Ensure the consistency of the new and amended regulatory material across the application areas;

(iv) Enhance capacity for prediction and service delivery;

(v) Consider relevant scientific and technological developments to ensure the currency of the regulatory material;

(vi) Together with the COIIS and the Research Board, coordinate linking science, infrastructure and services interactively;

(vii) Accompany recommendations for new and amended regulatory material with related impact, cost-benefit, and risk analysis.

(b) Common service delivery attributes – the Commission shall:

(i) Promote service-oriented culture in all relevant application areas including a customer focus, quality management, understanding of the value and socioeconomic benefits;

(ii) Share best practices and develop harmonized methodologies for user engagement including identification of requirements and establishment of feedback mechanisms with users necessary for continuous improvement of services;

(iii) Develop methodologies for impact-based products and services in all application areas, innovative service delivery methods and integrated platforms;

(iv) Ensure harmonization of requirements for competency and qualification of personnel involved in service delivery;

(v) Develop common methodology for verification and validation of information and service delivery as part of quality management;

(vi) Build through appropriate studies and projects a better understanding of the economics of service delivery, cost-recovery mechanisms, commercial and market elements, and develop respective guidance to Members;

(vii) Seek the engagement of service providers from private sector and academia.

(viii) Promote global and regional partnerships, including building upon existing partnerships and networks among communities of practice among the service areas, which are beneficial for WMO Members.

(c) Assistance to Members to enhance service delivery capabilities and enable effective implementation and compliance – the Commission shall:

(i) Consult with regional associations and Members to identify needs for new and improved services and analyse related capabilities, and best practices;

(ii) Consult with regional associations to identify experts who can participate in technical commission teams, to facilitate implementation and uptake of evolving services and applications, standards and regulations at national and regional levels;

(iii) Facilitate the implementation by developing guidance material aligned with the promulgation of new and amended regulatory material;
(iv) In consultation with the regional associations, identify needs for assistance to Members and provide relevant guidance and capacity development activities including training;

(v) Propose pilot and demonstration projects as necessary;

(vi) Facilitate transfer of knowledge and best practices by supporting relevant events and through communication and outreach activities.

(d) Cooperation and partnership – the Commission shall:

(i) Establish close coordination and efficient working mechanisms with relevant international organizations such as ICAO, IMO, FAO in the area of service delivery;

(ii) Establish consultative mechanisms with user organizations to receive feedback and advice on services;

(iii) Consider opportunities for leveraging resources through establishment of joint, including inter-agency, bodies and/or projects addressing common areas of service delivery.

Composition

The composition of the Commission shall be in accordance with General Regulation 183.

Participation of leading technical experts in services and applications in the field of meteorology, climatology, hydrology, ocean and the other fields covered by these terms of reference, shall be ensured by Members.

UN, international organizations and private sector partners of WMO may be invited to nominate technical experts in their areas of expertise to participate in the work of the Commission in accordance with General Regulation 184.

Working procedures

The Commission shall elect a president and three vice-presidents among the experts on the Commission.

The Commission shall establish effective and efficient working mechanisms and related necessary time-limited subsidiary bodies:

(a) Establish effective and efficient working mechanisms through an adequate number of subsidiary bodies;

(b) Make an effective use of a broad community of practice encompassing Members collective expertise, including the private and academia sectors;

(c) Establish a work programme with concrete deliverables and timelines, aligned with the Organization-wide Strategic and Operating Plan and monitor progress regularly appropriate performance indicators and targets;

(d) Use effectively electronic forms of coordination and collaboration;

(e) Establish effective coordination with other technical commissions, the Research Board, JCOM and other relevant bodies, in particular through the Executive Council’s TCC, as appropriate;
(f) Organize effective communication and outreach to inform community of ongoing work, achievements and opportunities;

(g) Apply a system for recognition of achievements, promotion of innovation and the participation of young professionals;

(h) Ensure regional and gender balance and inclusiveness in all its structures and work plans;

(i) Ensure adequate representation and consultation with communities of practice among the service areas.

Annex 2 to Recommendation 25 (EC-70)

Draft Resolution XX/2 (Cg-18)

Research Board

THE CONGRESS,

Recalling:

(1) Decision 50 (EC-69) – An integrated research and development approach, which includes the main principles to fill the gap between research and operations and to better integrate science in WMO activities,

(2) Decision 52 (EC-69) – Early career research scientist involvement in WMO activities, which requested all Members to promote and support the early career scientist activities and make them beneficial and accessible to young researchers in their own countries and worldwide,

(3) Recommendation 1 (CAS-17) – The role of science in serving society, which requested the Executive Council Working Group on Strategic and Operational Planning to take into account the need for a stronger WMO leadership in science and research and to strengthen the integrated role of research in the “science-for-services” context,

(4) Recommendation 2 (CAS-17) – Seamless prediction systems, which recommended strengthening partnerships with the United Nations system and other international organizations to promote the WMO research agenda towards seamless prediction, and promoting innovation across the WMO technical programmes and activities to ensure the co-design of new and improved services and products,

Considering that the implementation of the WMO Strategic and Operating Plans will benefit significantly from effective uptake of research into operational systems and political decision making needs a solid scientific foundation,

Considering further the need for a mechanism to coordinate the implementation of the research programmes of the Organization to deliver on the long-term goals and strategic objectives of the Strategic Plan, assisted by the guidance provided by the Scientific Advisory Panel established by Resolution 35 (EC-70),
Decides, according to article 8(h) of the Convention, to establish the Research Board on Weather, Climate, Water and the Environment with the terms of reference as given in the Annex to this Resolution.

Note: This resolution replaces Resolution 43 (Cg-XVI) – Terms of reference of the technical commissions, Resolution 4 (EC-LX) – Role and terms of reference of the Meetings of Presidents of Technical Commissions, Resolution 3 (EC-66) – Coordination between regional associations and technical commissions.

Annex to draft Resolution XX/2 (Cg-18)

Terms of reference of the Research Board on Weather, Climate, Water and the Environment

Research Board on Weather, Climate, Water and the Environment

Mandate

The Research Board translates the strategic aims of WMO and decisions of the Council and Congress into overarching research priorities, and ensures the implementation and coordination of the research programmes to achieve these priorities in accordance with the purposes of Organization defined in Article 2(f) of the Convention.

The Board shall coordinate implementation and resourcing of WMO research programmes taking into account the advice of the Executive Council Scientific Advisory Panel (SAP). The Board shall address Members’ needs and support implementation of the WMO Strategic Plan based on science and implementation plans approved by the Executive Council and any co-sponsor governing bodies, as appropriate, for WMO research programmes and activities.

Specific terms of reference

The Board specifically shall:

(a) Promote convergence and integration between the various research programmes inside of and external to WMO, where appropriate,

(b) Initiate, coordinate and promote research activities in weather, climate, water and related environmental aspects through the WMO and co-sponsored research programmes (WCRP, GCOS, GOOS, WWRP, GAW and possible future research programmes) taking into account the advice provided by SAP and taking into consideration different needs amongst members,

(c) Guide the implementation of WMO research programmes and act as the primary point of contact related to weather, climate, water and related environmental research aspects in WMO,

(d) Ensure close coordination and cooperation between the WMO research programmes and eliminate duplication in structures and bodies,

(e) Maintain an optimal balance between weather, climate, water, ocean and environmental research initiatives and promote the synergies among such initiatives,
(f) Ensure that the research programmes are implemented according to agreed implementation plans and that such plans are current,

(g) Promote the co-design of research initiatives aimed at strengthening the ‘science-to-service’ link between user needs and research project design and between research and operations, to benefit service delivery to Members,

(h) Promote activities to strengthen scientific development in relevant areas for the benefit of all Members and particularly for developing countries and SIDS,

(i) Ensure close coordination among the physical and social sciences,

(j) Promote the science to service and applications,

(k) Establish effective coordination with technical commissions, JCOM and other relevant bodies, as appropriate,

(l) Organize effective communication and outreach to inform community of ongoing work, achievements and opportunities,

(m) Apply a system for recognition of achievements, promotion of innovation and the participation of young professionals.

**Composition**

The Board shall be composed of an optimum number of leading research scientists and research funding managers active in the fields of weather, climate, water, ocean and related environmental and social sciences, taking into account geographical balance and reflecting the WMO gender equality policy, including:

(a) The chairs of the scientific oversight/steering committees of the WMO research programmes (WCRP, WWRP, GAW) as ex officio members,

(b) Representatives from IOC and ICSU and major global and regional research funding organizations based on the Research Board chair and SAP advice,

(c) One representative from each regional association based on their capacity to connect with regional scientific institutions and activities.

The term of engagement shall be of four years with the possibility to renew once for a further four years; for ex officio members the duration shall be based on that of their term.

**Working procedures**

The Board will have a chair and a vice-chair, appointed by Congress. The members will be appointed by the EC.

The Research Board chair, based on recommendations from IOC, ICSU, other relevant international research initiatives, and SAP will propose the three chairs of the research programmes (WWRP, GAW and WCRP), who will be appointed by Executive Council. In case of co-sponsored research programmes, the chair shall be selected by mutual agreement between co-sponsoring organizations.

The chair of the Research Board has the responsibility to ensure coordination of the work in the Research Board with the presidents of the TCs and RAs, who similarly shall coordinate their work with the Research Board chair.
The Board shall meet in principle once per year.

The Board may establish time-bound substructures for the discharge of specific tasks during an intersessional period. Such temporary substructures shall be discontinued at the end of every intersessional period.

The Board shall ensure regional and gender balance and inclusiveness in all its structures and work plans.

Annex 3 to Recommendation 25 (EC-70)
Draft Resolution XX/3 (Cg-18)

Joint WMO-IoC Committee for Oceanography and Meteorology

THE CONGRESS,

Recalling:

(1) Resolution 14 (Cg-XIII) – Joint WMO-IoC Technical Commission for Oceanography and Marine Meteorology (JCOMM),

(2) IOC Resolution XX-12 – Joint WMO-IoC Technical Commission for Oceanography and Marine Meteorology (JCOMM),

Considering the revision of the system of technical commissions as decided by this resolution,

Considering also the expanded collaboration between WMO and IoC of UNESCO in marine meteorology and oceanography, including in services, observation and information management, research and capacity building,

Considering further the evolving needs of a coordinating mechanism between WMO and IoC of UNESCO to support such collaborative activities,

Considering the work of the Joint WMO-IoC Consultation Team on the reform of JCOMM established by Decision 58 (EC-70),

Decides, according to article 8 (h) of the Convention:

(1) To integrate JCOMM components on observation, data management, and processing and forecasting systems into the Commission for Observation, Infrastructure and Information Systems, recognizing IoC co-sponsorship by relevant structures;

(2) To integrate JCOMM component on services into the Commission for Services and Applications, recognizing IoC co-sponsorship by relevant structures;

(3) To establish the Joint WMO-IoC Committee for Oceanography and Meteorology (JCOM), as a high-level coordination mechanism with broader engagement of the key relevant bodies of the WMO and IoC, with the terms of reference as given in the Annex to this Resolution;
Invites the Assembly of IOC to reflect in its decisions the content of this Resolution as it applies to the Joint WMO-IOC Technical Commission for Oceanography and Marine Meteorology;

Instructs the Secretary-General to consult with the Executive Secretary of the IOC on the further definition of the working arrangements of the Joint WMO-IOC Committee for Oceanography and Meteorology and its substructures and to report on implementation at the seventy-second session of the Executive Council.

Note: This resolution replaces Resolution 43 (Cg-XVI) – Terms of reference of the technical commissions, Resolution 4 (EC-LX) – Role and terms of reference of the Meetings of Presidents of Technical Commissions, Resolution 3 (EC-66) – Coordination between regional associations and technical commissions, and Resolution 14 (Cg-XIII) – Joint WMO-IOC Technical Commission for Oceanography and Marine Meteorology (JCOMM), which are no longer in force.

Annex to draft Resolution XX/3 (Cg-18)

Terms of reference of the Joint WMO-IOC Committee for Oceanography and Meteorology

Joint WMO-IOC Committee for Oceanography and Meteorology

The terms of reference of the Joint WMO-IOC Committee for Oceanography and Meteorology (JCOM) shall be:

Mandate

(a) To provide guidance on the coordinated or collaborative development, integration and implementation of the activities related to oceanographic, meteorological, hydrological and climatological observation, data and information management, and services and forecasting systems as well as research carried out by WMO and IOC subsidiary bodies:

(i) For WMO, the Commission for Observation, Infrastructure and Information Systems, the Commission for Services and Applications and the Research Board,

(ii) For IOC, the Committee on International Oceanographic Data and Information Exchange (IODE), the Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems (TOWS-WG) and the Intergovernmental Panel on Harmful Algal Blooms (IPHAB),

(iii) The co-sponsored entities: Global Climate Observing System (GCOS), Global Ocean Observing System (GOOS) and World Climate Research Programme (WCRP);

(b) To report to WMO and IOC governing bodies on these activities, propose new action, as required, and advise them regarding:

(i) Instructions to the relevant subsidiary bodies,

(ii) Any liaison or consultation required with relevant intergovernmental and international stakeholders.
Membership

The membership of JCOM shall be constituted by:

(a) Representatives from WMO and IOC subsidiary bodies:
   
   (i) For WMO, two members of the Commission for Observation, Infrastructure and Information Systems, covering observation, data and information management, and data processing and forecasting systems, two members of the Commission for Services and Applications, covering services, appointed by the respective presidents, and a member of the Research Board appointed by the chair,

   (ii) For IOC, the chairperson of the IODE Committee, the TOWS-WG and IPHAB;

(b) The chairpersons of the steering committees of entities jointly sponsored by WMO and IOC:
   
   (i) Global Climate Observing System,

   (ii) Global Ocean Observing System,

   (ii) World Climate Research Programme;

(c) Members of the WMO and IOC governing bodies:
   
   (i) Three members of the WMO Executive Council appointed by the President, taking into account geographical distribution and gender balance,

   (ii) Three members of the IOC Executive Council appointed by the Chairperson, taking into account geographical distribution and gender balance;

(d) One representative of the International Maritime Organization;

(e) No more than four experts appointed by the co-chairs.

Working procedures

The Committee shall be co-chaired by two co-chairs, one for oceanography and one from meteorology, elected among the members.

The co-chairs shall hold their office for one intersessional period, with the possibility to be re-elected for a second term.

The members elected in WMO and IOC governing and subsidiary bodies and co-sponsored programmes shall also hold their office based on the duration of their term; the experts shall hold their office for one intersessional period, with the possibility to be re-confirmed for a second term.

The co-chairs shall represent the Committee in the sessions of the WMO and IOC governing and subsidiary bodies.

The Committee shall meet in principle in person every two years, in conjunction with the sessions of the WMO and IOC governing bodies, alternating with the WMO Congress and the IOC Assembly. Intersessional work should be carried out by correspondence or virtual means.
The Committee may establish time-bound substructures for the discharge of specific tasks during an intersessional period, provided that this is at no cost for the parent bodies. Such temporary substructures shall be discontinued at the end of every intersessional period.

For the first intersessional period following the adoption of this Resolution, the Committee shall be co-chaired by the current co-presidents of the Joint WMO-IOC Technical Commission for Oceanography and Marine Meteorology.

Chairs of other relevant WMO and IOC working groups, panels and expert teams may be invited by the co-chairs to attend meetings of the Committee as required by the agenda.

Representatives from other United Nations or international organizations may be invited as members of or observers to the Committee as deemed appropriate.

The WMO Secretary-General and the IOC Executive Secretary shall evaluate the financial and secretariat support requirements for the Committee and make adequate provisions in their budget proposals to the respective governing bodies.

Note: Article 26 of the Convention refers to relations with other organizations. Regulations 38–45 refer to joint working groups in principle of the duration of one intersessional period. Regulation 181 refers to joint technical commissions.

Annex to draft Resolution XX/4 (Cg-18)

Terms of reference of the Scientific Advisory Panel

Scientific Advisory Panel
Mandate

The Scientific Advisory Panel (SAP) shall be the scientific advisory body of the Organization, drawing up opinions and recommendations to Congress and to the Executive Council on matters concerning WMO research strategies and the optimal scientific directions to support the evolution of its mandate in weather, climate, water and related environmental and social sciences. The Panel shall provide forward-looking strategic advice on emerging challenges and opportunities, and in particular:

(1) Advise on areas in which, on the basis of available evidence, new technological and scientific advancement would open new applications related to WMO core activities,

(2) Promote the global standing and visibility of WMO as a leading scientific organization in the fields of weather, climate, water and related environmental and social sciences within the UN and otherwise, and enhance the WMO role as facilitator of international cooperation in weather, climate, water, ocean and environmental sciences among all role players,

(3) Promote science vision, and its downstream trends, with WMO and among its Members as the primary driver for innovation, understanding and the development of new and improved weather, climate, water, ocean and related environmental services and know-how;

Composition

The Panel shall be composed of maximum fifteen independent leading internationally recognized experts coming from the fields of weather, climate, water, ocean and related environmental and social sciences.

The opportunity to become a member of the Panel shall be announced publicly for individuals to put their name forward. The members of the Panel shall be appointed by the Executive Council, taking into account regional and gender balance and representation of academia, research bodies, the private sector and user communities reflecting the breadth of engagement in WMO Research Programmes. The selection of the names to be proposed to the Executive Council to be appointed as Panel members shall be done by the Secretariat in consultation with the chair of the Research Board. The term of engagement for members shall be for four years with a possibility to be renewed for a second term.

A WMO Vice-President shall act as an Executive Council focal point for the Panel to ensure cross-communication.

The chair of the Research Board and a representative of the Secretariat shall take part in the meetings of the Panel.

Working procedures

The Panel shall select a chair and a vice-chair.

The Panel shall meet in principle once per year prior to a session of Executive Council.

The chair of the Research Board together with the Secretariat shall support the chair of the Panel in setting up and executing the meetings. The chair of the Panel may invite experts and/or representatives from partner organizations to attend meetings of the Panel as observers.
LIST OF PLANNED REGIONAL EVENTS

Constituent bodies meetings

(a) Joint Meeting of the Working Group on Infrastructure and Technological Development, Working Group on Climate and Working Group on Hydrology and Water Resources in 2019

(b) Joint Meeting of the Working Group on Infrastructure and Technological Development, Working Group on Climate and Working Group on Hydrology and Water Resources in 2021

(c) Four meetings of the Management Group during EC

Regional Climate Outlook Forums

(a) Two Regional Climate Outlook Forums (RCOF) for RCC-WSA and for RCC-SSA in 2019

(b) Two Regional Climate Outlook Forums (RCOF) for RCC-WSA and for RCC-SSA in 2020

(c) Two Regional Climate Outlook Forums (RCOF) for RCC-WSA and for RCC-SSA in 2021

(d) Two Regional Climate Outlook Forums (RCOF) for RCC-WSA and for RCC-SSA in 2022

Workshops and other meetings

(a) Workshop on WIGOS/WHOS in 2019

(b) Workshop on WIS/OSCAR in 2020

(c) Workshop on Disaster Risk Reduction and Impact Based Forecasting 2020

(d) Workshop on the Flash Flood Guidance System and the Severe Weather Demonstration Project in 2019

(e) Workshop on the Global Framework for Climate Services with emphasis on Drought Monitoring in 2020

(f) Workshop on Hydro-climatic forecasting in 2020

(g) Conference of Directors of Ibero-American National Meteorological and Hydrological Services in 2020

(h) Meetings organized in the context of extra budgetary projects in the RA III

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CERTIFICATES OF APPRECIATION

Certificates are awarded to the individuals as a token of appreciation for their outstanding and valuable contribution to the activities in support of the Regional Association III for the intersessional period 2014–2018. A list of recipients of certificates is given below.

List of recipients of certificates

<table>
<thead>
<tr>
<th>Recipient</th>
<th>Member</th>
<th>In recognition of ...</th>
</tr>
</thead>
<tbody>
<tr>
<td>José Arimatéa de Sousa Brito</td>
<td>Brazil</td>
<td>His outstanding contribution to the activities of Regional Association III as Lead of the Working Group on Infrastructure and Technological Development.</td>
</tr>
<tr>
<td>Dora Goniadzki</td>
<td>Argentina</td>
<td>Her outstanding contribution to the activities of Regional Association III as Lead of the Working Group on Hydrology and Water Resources.</td>
</tr>
<tr>
<td>Bárbara Tapia</td>
<td>Chile</td>
<td>Her outstanding contribution to the activities of Regional Association III as Lead of the Working Group on Climate.</td>
</tr>
<tr>
<td>Julián Báez</td>
<td>Paraguay</td>
<td>His outstanding contribution to the activities of Regional Association III as Chairperson of the Regional Association III.</td>
</tr>
<tr>
<td>Antonio Divino Moura</td>
<td>Brazil</td>
<td>His outstanding contribution to the activities of Regional Association III as Lead of the implementation of WIS in South America and promoting the ALERT-AS.</td>
</tr>
<tr>
<td>Miguel Rabiolo</td>
<td>Argentina</td>
<td>His outstanding contribution to the activities of the WMO Office for the Americas.</td>
</tr>
</tbody>
</table>
THE GENDER DIMENSION IN NMHSs OF RA III

Statistics on the Participation of Women and Men in RA III Structures and Activities

Delegates to RA III Sessions

1. As of October 2018, there were four female and eight male Permanent Representatives (PRs) with WMO in RA III. The female PRs represent Argentina, Colombia, Suriname and Uruguay.

2. Table 1 presents the proportion of female and male delegates to the latest five sessions of RA III. Women have been consistently underrepresented in RA III sessions. Only three women attended the 12th session in 1997, accounting for 9% of the total delegates. Female representation remained at this level until 2014 when it rose to 22%.

<table>
<thead>
<tr>
<th>RA III Session</th>
<th>Women %</th>
<th>Men %</th>
</tr>
</thead>
<tbody>
<tr>
<td>XII (1997)</td>
<td>9%</td>
<td>91%</td>
</tr>
<tr>
<td>XIII (2001)</td>
<td>8%</td>
<td>92%</td>
</tr>
<tr>
<td>XIV (2006)</td>
<td>9%</td>
<td>91%</td>
</tr>
<tr>
<td>XV (2010)</td>
<td>8%</td>
<td>92%</td>
</tr>
<tr>
<td>XVI (2014)</td>
<td>22%</td>
<td>78%</td>
</tr>
</tbody>
</table>

Table 1: Proportion of female and male delegates at RA III meetings

3. Figure 1 reflects the representation of women and men in delegations to meetings of the six WMO Regional Associations. Women were least represented in RA II (13%) and RA IV (15%) meetings and best represented at the latest RA VI meeting (31%).

![Proportion of women/men delegates to RA Meetings](image-url)
4. There were no women leading delegations at RA III sessions up until 2010, apart from one female principal delegate in 1997. There were two female principal delegates at the latest sessions in 2010 and 2014.

**RA III Management Group**

5. Women account for a quarter of the RA III Management Group members.

<table>
<thead>
<tr>
<th>Women</th>
<th>Men</th>
<th>Total</th>
<th>Women %</th>
<th>Men %</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>9</td>
<td>12</td>
<td>25%</td>
<td>75%</td>
</tr>
</tbody>
</table>

**Working Groups and Expert Teams**

6. Table 2 presents the proportion of women and men involved in the work of RA III working groups and task teams (as of March 2018). Female participation is highest in the Working Group on Climate Services (36%). It is lowest in the Working Group on Hydrology and Water Resources (21%).

<table>
<thead>
<tr>
<th>Working Group</th>
<th>Women</th>
<th>Men</th>
<th>Total</th>
<th>Women %</th>
<th>Men %</th>
<th>Leads/ Chairs Female</th>
<th>Leads/ Chairs Male</th>
<th>Leads/ Chairs Total</th>
<th>Leads Women %</th>
<th>Leads Men %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydrology &amp; Water Resources</td>
<td>4</td>
<td>15</td>
<td>19</td>
<td>21%</td>
<td>79%</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>100%</td>
<td>0%</td>
</tr>
<tr>
<td>Infrastructure/ Technological Development</td>
<td>11</td>
<td>22</td>
<td>33</td>
<td>33%</td>
<td>67%</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0%</td>
<td>100%</td>
</tr>
<tr>
<td>Climate Services</td>
<td>9</td>
<td>16</td>
<td>25</td>
<td>36%</td>
<td>64%</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>100%</td>
<td>0%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>24</td>
<td>53</td>
<td>77</td>
<td>31%</td>
<td>69%</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>67%</td>
<td>33%</td>
</tr>
</tbody>
</table>

**Table 2: Proportion of women and men on RA III working groups**

7. At 33%, female involvement in the working groups of RA III is the highest among WMO regional associations. Women are best represented in the working structures of RA III, where they account for a third of members. They are least represented in the working structures of RA I (11%).

8. Only three RA III members had a designated Gender Focal Point as of September 2018 (Argentina, Chile and Uruguay).
9. More statistical information, including on the gender balance among NMHS staff, is available in the Progress Report on Implementation of the WMO Policy on Gender Mainstreaming (March 2015) and the Results of the 2013 Global Survey on Gender Mainstreaming in WMO. Half of RA III Members responded to the Survey.

Appointment of Gender Custodians

10. EC-70 requested TCs and RAs to appoint a member of their management groups to serve as “a gender custodian” at constituent body sessions with the specific task of (a) screening the agenda and documentation, (b) identifying relevant entry points for gender and diversity aspects, (c) ensuring their consideration and discussion, and (d) liaising with the Chair of the Advisory Panel of Experts on Gender Mainstreaming and the Secretariat on a continuous basis (Decision 14/1).

WMO Policy on Gender Equality

11. The Seventeenth World Meteorological Congress (Cg-17) adopted Resolution 59 (Cg-17) on Gender Equality and Empowerment of Women which requests WMO technical commissions and regional associations:

   (a) To develop action plans on implementation of the WMO Policy on Gender Equality within their areas of responsibility;
   (b) To continue compiling statistics on the participation of women and men in their work;
   (c) To take action on the outcomes and recommendations of the Conference on the Gender Dimensions of Weather and Climate Services;
   (d) To report to the Executive Council and the World Meteorological Congress on progress.

12. Congress further urged Members to take the following actions, among others:

   (a) To nominate more female candidates to other WMO constituent bodies and their working structures as well as to training events and for WMO fellowships;
   (b) To nominate more female candidates to participate in the work of technical commissions as members of their management groups as well as members of relevant expert teams, working groups and programmes;
   (c) To increase the representation of women in their delegations to WMO constituent body meetings;
   (d) To respond to regular surveys on gender equality in WMO and in National Meteorological and Hydrological Services, and designate gender focal points.

13. As an Annex to the Resolution, Congress adopted an updated WMO Policy on Gender Equality which outlines the following roles and responsibilities for technical commissions (paragraph 8.3):

   “The technical commissions should be aware of and implement the WMO Gender Equality Policy within their area of responsibility. Efforts should be made to ensure that a minimum of at least 30% of the members of their working structures is female and that this percentage rises progressively within each financial period. The longer-term objective will be to reach parity between male and female members.”

14. Technical commissions are expected to report to the Executive Council on progress at least once during each financial cycle (paragraph 9.2).
15. EC-68 endorsed a WMO Gender Action Plan (Decision 77 (EC-68)) as well as agreed with the priority actions identified by the EC Advisory Panel of Experts on Gender Mainstreaming for 2016-2019 (marked in red). The document contains a range of actions intended for implementation by WMO constituent bodies, including technical commissions (see Column B of the WMO Gender Action Plan).

16. Priority actions for constituent bodies include:

(a) Make gender equality a permanent item on agendas and discuss at least once per financial period;
(b) Promote the active role of female delegates in constituent body sessions;
(c) Include a short gender analysis in Strategic Plan 2020-2023;
(d) Maintain the Key Outcomes and KPIs related to gender mainstreaming in OP 2020-2023;
(e) Conduct at least two Women’s Leadership Workshops on the margins of constituent body meetings;
(f) Update the WMO Capacity Development Strategy and Implementation Plan with a view to incorporating relevant aspects of the WMO Gender Equality Policy;
(g) Update the WMO Capacity Development Strategy and Implementation Plan with a view to making them more gender-sensitive;
(h) Report to the EC and Cg on progress at least once per financial period.