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| WEATHER CLIMATE WATER | **World Meteorological Organization****REGIONAL ASSOCIATION II (ASIA)****Eighteenth Session (Phase I)**22 to 25 April 2025, Virtual Session | **RA II-18(I)/INF. 2.1** |
| Submitted by:President of RA II15.IV.2025 |

# Report by the president of the regional association, including reports of Working Groups and the Regional Office for Asia and the South-West Pacific (RAP)

**1. Activities and Achievements since the Seventeenth session of Regional Association II (RA II-17)**

***1.1. Officers of the Association***

Dr Abdullah Ahmed AL MANDOUS (United Arab Emirates (UAE)), served as president of RA II (P/RA II) till June 2023, and was elected at the Nineteenth World Meteorological Congress (Cg‑19) to the office of President of the World Meteorological Organization (WMO) with effect from 3 June 2023. Consequently, Prof. Tran Hong THAI (Viet Nam), the then Vice-president of RA II served as the acting president of the Association and, in this capacity, as an ex-officio member of the Executive Council (EC).

Prof. THAI stepped down as the Vice-president and the acting president of RA II following his appointment as the Vice Minister of the Ministry of Science and Technology of Viet Nam in October 2023. With Prof. THAI’s departure and the vacant seat of president of RA II, Dr AL MANDOUS, the President of the Organization, assumed the responsibility of the acting president of the Region until the P/RA II was elected.

An election by correspondence for P/RA II was conducted from November to December 2023 and Mr Abdullah Rashid Nasser AL KHADOURI (Oman), Director-General of Meteorology of Oman, who was the only nomination that remained for the position, was elected as P/RA II on 19 January 2024, and, by extension, as an ex-officio member of EC.

An election for the Vice-president of RA II (VP/RA II) by correspondence was initiated by P/RA II in April due to its vacancy. Two nominations were received from Ms Danara ALIMBAYEVA (Kazakhstan) and Mr Sahibzad KHAN (Pakistan). Due to the short time frame between the conclusion of the election by correspondence and the planned Eighteenth Session of the RA II (RA II-18), elections for VP/RA II were deferred till the session.

Dr Mrutyunjay MOHAPATRA (India) was elected as the Third Vice-President of WMO at the Nineteenth World Meteorological Congress (Cg-19).

**1.2. Management Group (MG)**

Informal RA II Management Group (MG) meetings were organized for regional consultations on the sidelines of Cg-19. Dr CHEN Zhenlin (China), Mr OBAYASHI Masanori (Japan) and Dr YOO Hee-dong (Republic of Korea) were nominated by consensus to serve as EC members.

Following Mr OBAYASHI’s retirement, Mr MORI Takashi became the new Director-General of the Japan Meteorological Agency (JMA) and Permanent Representative of Japan with WMO in January 2024. After a regional consultation, Mr MORI was nominated as the acting EC member. Following Mr MORI’s retirement in January 2025, one EC seat became vacant in RA II. After a regional consultation, Mr NOMURA Ryoichi was nominated as an acting EC member for RA II.

Following Mr YOO Hee-Dong’s departure, Mr CHANG Dong-Eon became the new Administrator of the Korean Meteorological Administration (KMA), and the Permanent Representative (PR) of the Republic of Korea with WMO from July 2024. After a regional consultation, Mr CHANG was nominated as an EC member for RA II.

Dr DUAN Yihong (China) stepped down as the RA II representative of the Research Board (RB). After consultation among MG members, RA II nominated several candidates for RB’s consideration and Dr LI Jian (China) was selected by RB as the new representative of RA II.

During the intersessional period, the RA II MG convened on four occasions, detailed below:

(1) Nineteenth session of the RA II MG (RA II MG-19), 12 June 2024, hybrid:

RA II MG-19, held at the sidelines of the seventy-eighth session of Executive Council (EC-78), noted the status of RA II activities through the current RA II Operating Plan (OP) (i.e. RA II Work Programme) and discussed the RA II-18. Members stressed the resource challenges inherent in implementing OP (2021–2024) and suggested aligning regional extrabudgetary (XB) projects to further contribute to regional activities. Members had also actively participated in discussions regarding the proposed substructure of RA II for the upcoming intersessional period (2025–2028), proposed by Dr Sahar TAJBAKHSH MOSALMAN, Leader of the RA II Task Team on Regional Concept (TT-RC).

(2) Eighteenth session of the RA II MG (RA II MG-18), 28 and 29 November 2022, hybrid:

RA II MG-18, convened in Abu Dhabi (UAE) with provisions for online participation, highlighted notable events from the State of the Climate in Asia 2021 report, updated the RA II OP (2021–2024) following decisions and outcomes from EC-75, and discussed preparations for the Regional Technical Conference in 2023. MG had also adopted Decision 2.3/1 (RA II MG-18) which approved updates made by the Working Group (WG) Chairs to the OP (2021–2024), approved the updated membership of RA II Expert Teams (ETs) and the Coordination Panel on Hydrology and Water Resources (CP/H), endorsed key regional challenges for the consideration of the RA II Regional Basic Observing Network (RBON) design, and supported India and the Islamic Republic (I.R.) of Iran in hosting the Regional Specialized Meteorological Centres (RSMCs) for Global Numerical Ocean Prediction and for Numerical Ocean Wave Prediction, and the Regional Climate Centre (RCC) for West Asia, respectively. The MG had also approved the first RA II Research Development Project – Hangzhou 2022 Research Development Project (HangzhouRDP).

(3) RA II Executive Group meeting, 24 March 2022

The RA II Executive Group meeting was held on 24 March 2022. Dr AL MANDOUS, then president of RA II, and Dr Wenjian ZHANG, then Assistant Secretary-General (ASG) of WMO, had exchanged views on the RA II Implementation Plan (yearly breakdown of OP). The meeting also reviewed the effectiveness of the Regional Offices and key upcoming meetings.

(4) Seventeenth session of the RA II MG (RA II MG-17), 24 August 2021, online

RA II MG-17, convened online on 14 August 2021, discussed key documents including the RA II OP (2021–2024), proposed RA II substructures and the Regional Partnership Strategy. Members further reviewed and updated the OP (2021–2024), taking into consideration the TT-RC’s recommendations on the substructures of the RA II WGs. Members further discussed on the Regional Partnership Strategy with recommendations to include other regional programmes and publishing the Partnership Strategy on the RA II Community webpage. The meeting approved the project proposal for the pilot project on Public-Private Engagement (PPE) for Smart Meteorological Services in Mega-cities (SMSC), co-hosted by the China Meteorological Administration (CMA), Hong Kong Observatory (HKO), and Macao Meteorological and Geophysical Bureau (SMG), noting that this project was the first of its kind. Lastly, P/RA II requested the WMO Secretariat to create a more definitive role for the vice-presidents of RAs.

**2. Working Groups (WGs), Expert Teams (ETs), Coordination Panel (CP), Regional Focal Points (RFPs), Task Teams (TTs), and Operating Plan (OP)**

The working structure of RA II is comprised of two TTs, two WGs, 18 ETs, one CP, and Regional Focal Points on Research (RFPs/R), aligned with the outcome of WMO technical reform. The activities of the subsidiary bodies have been guided by the RA II OP.

The full list of activities during the intersessional period can be found in [Annex I](#Activity_List).

***2.1.*** ***Working Group on Weather, Climate, Water and Related Environmental Services (WG Services)***

For more information on the WG Services, please refer to [Annex II](#WG_S).

*2.1.1. Services for Disaster Risk Reduction, incl. Early Warnings for All (EW4All) and implementation of the Common Alerting Protocol (CAP)*

The Global Multi-Hazard Alert System – Asia component (GMAS-A) is a flagship project in RA II, and a fast-track programme for the implementation of the CAP in the region. As of March 2025, a total of 21 RA II Members’ weather warnings were posted to the GMAS-A website.

Following an organized field study by China in July 2023 to the Department of Meteorology and Hydrology (DMH) of Lao People’s Democratic Republic (PDR) to learn about DMH’s requirements for weather warning operations, ET-Disaster Risk Reduction (DRR) intends to extend the function of the GMAS-A website to support users’ fast access to weather warnings messages. CMA and HKO will enrich the numerical weather prediction (NWP) products to support the Members’ weather warnings operations.

An online regional webinar on “Extreme Heat and Health Services: tools, good practices, challenges and opportunities in the Asian region” was held on 9 October 2023.

Six of the initial 30 EW4All focus countries are in RA II (Bangladesh, Cambodia, Lao PDR, Maldives, Nepal and Tajikistan). All six have implemented the first steps of the national roll-out (i.e. gap analysis, establishment of a national coordination mechanisms/ focal points, conduct of national EW4All kick-off/consultation workshops, and road map design).

RA II will fully incorporate the EW4All priority activities into its OP, linking to and synergizing with existing regional plans. Simultaneously, other RA II Members not currently among the 30 focus countries, as well as regional organizations (e.g. the Association of Southeast Asian Nations (ASEAN)) have committed to implementing EW4All on their own initiative.

*2.1.2. Climate Services, incl. Regional Climate Centres (RCCs), Regional Climate Forums (RCFs), and State of the Climate in Asia Reports*

Regional Climate Outlook Forums (RCOFs) were regularly conducted to produce Consensus Statements on seasonal outlooks for each targeted region. At the various RCOFs in RA II, objective seasonal forecasting (OSF) was promoted, and its forecast skills were evaluated for further implementation. The State of the Climate in Asia in 2020, 2021, 2022, and 2023 reports were published in December 2021, November 2022, July 2023 and April 2024, respectively. The report incorporated contributions from various partners including the United Nations Economic and Social Commission for Asia and the Pacific (ESCAP), other United Nations agencies, National Meteorological and Hydrological Services (NMHSs), leading scientists and climate centres. I.R. of Iran and Saudi Arabia have expressed their interest in hosting WMO RCCs. I.R. of Iran has applied for the new RCC.

*2.1.3. Aviation Services*

An extensive survey conducted among RA II Members resulted in the generation of a status map on current Significant Meteorological Information (SIGMET) coordination, which showcased 37 operational Meteorological Watch Offices (MWOs) undertaking harmonized SIGMET coordination in the RA II region. Furthermore, a regional survey was initiated to identify the implementation status of the Quality Management System (QMS) for the provision of aeronautical meteorological services and determine the needs of the region. Over 60% of the States/Administrations in the RA II region have responded and over 80% of the responded States/Administrations have implemented or partially implemented a QMS system for aeronautical meteorological service. However, only around 60% of States/Administrations which responded have a competency assessment programme in place. This illustrates the existing gap and further work required to narrow down the gap. To address part of the needs identified, a webinar on QMS implementation, competency assessment and aerodrome nowcasting was organized on 7 May 2024 with around 100 participants attended. A total of 10 training workshops for aeronautical meteorological personnel were conducted over the past four years.

*2.1.4. Urban Services*

A specialized dust early warning system (EWS) was successfully engineered and tailored for Qatar, specifically timed for the Fédération Internationale de Football Association (FIFA) World Cup. An air quality early warning and urban meteorology demonstration project was implemented for enhancing urban services in Pune and Bangalore, India. Furthermore, an integrated urban environment modelling system and service cyberinfrastructure “Urban Environment Science to Service” (UES2S) including a Decision Support System (DSS) for cross-sectorial end-users is being developed for five major cities in India.

*2.1.5. Agricultural Services*

The last meeting of the WMO RA II ET on Agriculture Services (ET-AGR) was held on 29 November 2024 to discuss weather-based advisory services for agriculture across RA II Members. Dr Kamaljit RAY, RA II ET-AGR Leader and Dr Qingliang ZHOU, Chair of the RA II WG Services) along with representatives (core and associate members of ET-AGR) from India, I.R. of Iran, Bangladesh, Nepal and China as well as the WMO RAP Office participated in the meeting online.

The proposal outlined a framework for a unified regional approach to agrometeorology, with key recommendations:

(1) Establishing a Regional Framework for Climate Services (RFCS) for South Asia to support collaborative efforts;

(2) Developing capacity development programmes tailored to the Region's specific challenges;

(3) Enhancing cross-border knowledge sharing and optimizing resource use among Members.

*2.1.6. Hydrological Services*

A review of hydrological services in RA II, based on available references, revealed that 47% of Members have separate institutions for hydrological operations and services, while 41% combine them with meteorological services. The review highlighted significant variation in monitoring infrastructure across the region, with disparities in the level of development and available resources. The report emphasized the need to enhance data management systems, expand monitoring networks, and foster greater collaboration between countries.

Further activities included supporting the development of guidelines and training materials on hydrological forecast verification and cryosphere component modelling. Additionally, case studies were conducted to identify gaps and best practices in the application of CAP for hydrological hazards and the Associated Programme on Flood Management (APFM) guidance.

*2.1.7 Marine Services*

A survey on the status of marine services in RA II was conducted in 2023, since there is no systematic framework on marine services except the Worldwide Met-Ocean Information and Warning Service (WWMIWS) and the status of marine services in this Region is not well recognized.

A Technical Workshop on Marine and Coastal Service was held in Tokyo, Japan, from 4 to 7 December 2023 with 34 participants. At the workshop, the survey results were shared and the overall enhancement of marine services in the Region was discussed, including tighter linkage between regional and national levels, possible contributions of the ET to the EW4All initiative, and cross-regional cooperation with RA V (South-West Pacific).

The workshop highlighted basic directions and focus areas for strengthening marine services in the Region, especially regarding capacity development of Members, enhanced support from regional centres, promoting marine observation sharing, and encouraging collaboration among Members. The results were summarized in the workshop report and will be reflected in future workplans in this field.

***2.2.*** ***Working Group on Observations, Infrastructure and Information Systems (WG Infrastructure)***

For more information on the WG Infrastructure, please refer to [Annex III](#WG_I).

*2.2.1. Regional WMO Integrated Global Observing System (WIGOS) Centres (RWCs)*

Designated at RA II-17 Phase 2, RWC-Beijing (China) and RWC-Tokyo (Japan) had started joint operations from 1 July 2021, in accordance with the RA II RWC concept. RWC-Beijing and RWC-Tokyo alternates their operation annually and continues to follow-up on all tickets initiated during the period of its responsibility, regardless of their status in the Incident Management System (IMS), even after the switch in responsibilities. Coordination meetings for RWC-Beijing and RWC-Tokyo are organized by RA II WG-I every half a year from 2021 to 2024, then annually from 2025, to share progress, experience, plans and discuss problems arising from operations. Six coordination meetings have been conducted.

During the intersessional period, both RWCs continued to carry out both mandatory functions, including metadata management, observation, monitoring and evaluation, and incident management. Monthly monitoring reports were issued. On incident management of Members, more than 80 upper-air, 45 land surface, and 40 aircraft observations quality reports, and 10 RWC monitoring reports have been issued since 2021. Through the IMS, a combined total of 100 incident tickets had been issued, with approximately 65 resolved. This had resulted in the improvement of data quality from 253 stations among 21 Members. On metadata management, both RWCs had identified errors in 282 stations.

Both RWCs provided optional functions, including four online international training courses, in conjunction with WMO Regional Training Centres (RTCs), and attended by more than 1 000 participants from all RAs. The courses focused on observation instruments, WIGOS, and related tools of WIGOS such as the Observing Systems Capability Analysis and Review tool (OSCAR), WIGOS Data Quality Monitoring System (WDQMS), and IMS. Additionally, the RWC-Beijing website was designed and developed.

*2.2.2. Regional Basic Observing Network (RBON)*

The prevailing RA II Regional Basic Observing Network (RBON) is comprised of Regional Basic Climate Network (RBCN) and the Regional Basic Synoptic Network (RBSN) stations, renamed and incorporated as RBON stations in OSCAR/Surface in June 2022.

The RBON design is led by ET-WIGOS. Five key challenges identified by ET-WIGOS for RBON design was endorsed by RA II MG in 2022, which includes heavy rainfall, tropical cyclones/typhoons, drought, extreme temperature events and sand/dust storms. The consultation with the Commission for Observation, Infrastructure and Information Systems (INFCOM) (John Eyre) on mapping hazards to Application Areas was conducted.

ET-WIGOS had subsequently produced a road map for the design of RBON that included the following:

(1) Identify key challenge (completed);

(2) Identify Application Areas;

(3) Identify requirements;

(4) Capabilities assessment;

(5) Gap analysis;

(6) Selection of station;

(7) Approval.

To further facilitate the development of the RA II RBON design, a workshop was conducted in Hong Kong, China, from 17 to 20 February 2025. The workshop agreed on a phased approach towards implementing RBON with Phase I focusing on heavy rainfall and tropical cyclones/typhoons, while Phase II would focus on the remaining key challenges. The workshop also produced guidance documents and defined regional requirements for identified variables and Application Areas.

The WMO and ASEAN Training Workshop on Weather Radar Data Quality Control and Radar Data Exchange was held from 29 January to 2 February 2024 in Bangkok, Thailand. The exchange of radar data in the subregional radar network in Southeast Asia was discussed at the workshop.

*2.2.3. Satellite-related activities*

The annual Asia-Oceania Meteorological Satellite Users’ Conference (AOMSUC) and RA II/V Satellite Coordination meetings have been held since 2020. AOMSUC-11 was hosted by CMA from 1 to 4 November 2021, the training event on 28 and 29 October 2021 and the RA II and RA V coordination meeting on 5 November 2021. AOMSUC-12 was hosted by JMA from 15 to 17 November 2022 with a four-day training event and coordination meeting before the conference AOMSUC-13, hosted by KMA, was held from 3 to 10 November 2023. The conference, which was held in Busan, Republic of Korea from 6 to 9 November 2023, was attended by about 170 participants from 25 Members. The Joint RA II and RA V Coordination Meeting was also held in Busan on 10 November, with about 45 participants and 19 Members’ Reports. RA I and RA III/IV Activities were also shared at the meeting.

In 2024, AOMSUC-14, hosted by the India Meteorological Department (IMD), was held from 2 to 7 December. At AOMSUC-14, a training event and joint coordination meeting was also held. The joint coordination meeting highlighted the cross-regional TT focused on satellite activities related to EW4All, led by the leaders of RA II ET-SOA and RA V ET Satellite Utilization (ET-SAT).

The fifth and sixth session of the WMO Steering Group for the Space-based Weather and Climate Extremes Monitoring in East Asia and Western Pacific (SG SWCEM-EAWP-5/6) were held online on 27 and 28 July 2023, and 2 and 3 October 2024, respectively.

*2.2.4. RA II WIGOS Implementation Workshop*

The RA II WIGOS Implementation Workshop was held in Beijing, China, from 27 to 30 November 2023. 60 experts from RA II Members participated in the Workshop. 67 recommendations were made, covering Global Basic Observing Network (GBON), RBON, WMO-IATA Collaborative AMDAR Programme (WICAP), RWC, radar observation network, emerging technology, Members’ contribution to the EW4All initiative and capacity development.

*2.2.5. WMO Information System (WIS)*

The pre-operation phase for WIS 2.0 was completed. Global Information System Centre (GISC)-Tokyo and GISC-Beijing conducted a connection test in September 2023 as part of RA II’s WIS 2.0 pilot project.

Experts from China, India, Republic of Korea, and Oman attended the WIS 2.0 Training Workshop in Jakarta, Indonesia, from 9 to 13 October 2023. The Workshop covered WIS 2.0 architecture, installing and configuring the WIS 2.0-in-a-box software and operating a WIS 2.0 node. National WIS 2.0 implementation plans were also prepared by participants and discussed at the Workshop.

GISC-Tokyo conducted a workshop for Members from 28 to 30 November 2023. Ten representatives from five Members (Cambodia, Lao PDR, the Philippines, Thailand, and Viet Nam) participated in the workshop physically, and 23 participants (Bhutan, Oman, Qatar, etc.) attended the workshop online.

*2.2.6. WMO Integrated Processing and Prediction System (WIPPS)*

ET-WIPPS conducted reviews of Members’ applications for hosting RSMCs and provided recommendations to the RA II MG for endorsement. The recommendation to support India in hosting the RSMC for global numerical ocean prediction and numerical ocean wave prediction through the Indian National Centre for Ocean Information Services (INCOIS) was endorsed by RA II MG in November 2022.The recommendations to support Japan and China to host Global Producing Centres for Sub-Seasonal Forecasts (GPC-SSF) were endorsed by RA II MG in January 2024.

Progress was also made on WIPPS related RA II Pilot Projects, including:

(1) Develop Support for NMHSs in Numerical Weather Prediction;

(2) Sustain and Enhance the Capacity of NMHSs in the Provision of Official Medium-Range Weather Forecasts;

(3) Annual exercises among RSMCs for environmental emergency response (EER);

(4) The HangzhouRDP: Training courses on the application of nowcasting techniques in multi hazard EWSs), for example, KMA had started to share the data to some RA II Members.

*2.2.7. WMO-IATA Collaborative AMDAR Programme (WICAP)*

ET-WICAP conducted five online dialogues with RA II Members including Hong Kong, China, India, Japan, Republic of Korea, and Saudia Arabia, to learn about the status of their global Aircraft Meteorological Data Relay (AMDAR) programmes and needs for WICAP. This enabled the identification of regional challenges in the implementation of the regional WICAP structure with the most challenging pain point being the financial framework.

*2.2.8. Hydrometry*

Training courses including online content for a hydrological survey was published. Software tools and methods for measuring discharge including backwater and tidal influence, with global application was developed. Preliminary experiments for a new technique for measuring sediment were conducted.

*2.2.9. Ocean Observation*

A questionnaire on members’ capability and needs for ocean observations had been conducted with the result showing a lack of ocean quality infrastructure and quality capacity building, inhibiting the quality of ocean observations. A 2-day workshop on ocean-gliders, including instrumentation, quality assurance (QA) and quality control (QC) was also conducted in October 2023. In November 2024, a marine instrumentation workshop for the Asia-Pacific Region was held. 37 participants from 16 countries took part in the workshop to discuss:

(1) Measurements and Instrumentation of Dissolved Oxygen and pH in seawater;

(2) Biogeochemical Instruments/sensors Calibration and Intercomparison.

***2.3.*** ***Joint Expert Teams (JETs)***

*2.3.1. Third Pole RCC (TPRCC) Network*

The TPRCC-Network completed its Implementation Plan (IP) in early 2022. The IP was finalized to cover a rectangular area of 25°N-50°N Latitude, 65°E-105°E-Longitude, with a 2,000 m contour line within this area. Climate monitoring, long-range forecasting (LRF), and data services functions have been developed by the TPRCC-Network. The TPRCC Joint Demonstration Project (JDP) established the Third Pole Climate Forum (TPCF) following a scoping workshop in November 2023. The workshop also discussed how the TPRCC will contribute to the EW4All initiative and recommended a list of priority hazards for the Third Pole region. TPCF has been convened twice, in June and November 2024, during which Consensus Statements on seasonal climate outlooks were released.

During the period, the JET-TPRCC convened team meetings every 4–6 weeks online to coordinate the implementation of activities planned and documented in the RA II OP and to identify and address data and technical issues encountered in implementing the function development. Together with the Bangkok scoping meeting of TPCF and the inaugural session of TPCF in Lijiang, JET-TPRCC has convened two physical meetings, to agree on follow-up actions according to the recommendations from the workshop and forum. The JET-TPRCC also established its Technical Team on LRF (TT-LRF) to address issues in producing seasonal climate outlook, which held its kick-off meeting online on 17 May 2023. JET-TPRCC was also actively engaged in workshops, sessions and events of relevant subsidiary bodies of WMO constituent bodies or forums, such as the EC Panel on Polar and High-mountain Observations, Research and Services (PHORS), RA II, INFCOM Advisory Group on the Global Cryosphere Watch (AG-GCW), INFCOM Study Group on Cryosphere (SG-Cryo), RCOFs, Arctic RCC-Network, Joint Expert Team of the Standing Committee on Climate Services (SC-CLI) and the Standing Committee on Hydrological Services (SC-HYD) on Cryosphere-related Services (JET-Cryo) under the Commission for Weather, Climate, Hydrological, Marine, and Related Environmental Services and Applications (SERCOM), and provided high-mountain view on infrastructure development.

*2.3.2. Environmental Observations and Services (EOS)*

The Global Air Quality Forecasting and Information System (GAFIS) Steering Committee under the WMO Global Atmosphere Watch (GAW) Programme, in collaboration with CMA, initiated an air quality forecast intercomparison work for the Asian region. CMA-led, the activity collaborated with the European Centre for Medium-range Weather Forecasts (ECMWF), Finnish Meteorological Institute (FMI), National Centres for Environmental Prediction (NCEP)/USA, Kyushu University, and Centre for Climate Research Singapore (CCRS) to gather information on existing global and regional intercomparison efforts to provide best practices for evaluations and to enhance the capabilities of air quality forecasting in RA II.

A “Sand and Dust Storms (SDS) Monitoring and Forecasting Using Innovative Techniques Workshop” was held in Tehran by the Research Institute of Meteorology and Atmospheric Science (RIMAS) of the I.R. of Iran Meteorological Organization (IRIMO) in collaboration with the RA II WG-S, the WMO SDS Warning Advisory and Assessment System (SDS-WAS) and RTCs Tehran and Ankara, with valuable contributions from United Nations ESCAP’s Asian and Pacific Centre for the Development of Disaster Information Management (APDIM) from 8 to 9 May 2023. A second SDS webinar on monitoring and forecasting was held virtually on 12 July 2024.

RTC-Tehran conducted a training course on Enhancing Climate Services Competencies at RIMAS/IRIMO from 15 to 18 October 2023. RIMAS/IRIMO also organized a technical meeting on SDS EWS, mobile phone applications and air pollution on the International Day of Combating SDS on 12 July 2023.

***2.4.***  ***Coordination Panel on Hydrology and Water Resources (CP Hydrology)***

Key gaps and needs were identified based on Members’ feedback during the second RA II Global Hydrological Status and Outlook System (HydroSOS) Implementation workshop which showed a greater demand for sub-seasonal forecasts compared to seasonal forecasts to allow for the generation of effective flood early warnings and hydro-climatological advisories for user sectors. Other key gap areas identified included the development of regional/local hydrological or hydrodynamic models, construction of a high-resolution Digital Elevation Model (DEM), improvement of real-time hydrometeorological data collection/dissemination, index identification, capacity development, etc.

During the intersessional period, CP Hydrology made great strides in coordinating regional hydrological activities, enhancing flood resilience through platforms on Water Resilience and Disasters, strengthened knowledge of hydrological resources, including the Integrated Flood Management (IFM) Helpdesk and HydroSOS, and supported ongoing XB projects in hydrology and water resources.

The second face-to-face RA II CP Hydrology meeting and the first Southeast Asia Hydrological Outlook Forum was held from 27 to 29 November 2023, together with the ESCAP/WMO Typhoon Committee’s WG Hydrology meeting on 29 November 2023 and the fifth Dynamic Water Resource Assessment (DWAT) Global Workshop held on 30 November to 1 December 2023, in Bangkok, Thailand. RA II Members were reminded of the plethora of WMO guidelines, platforms, DSS, and other tools related to hydrological services.

The third face-to-face RA II CP Hydrology meeting was held in Goyang-Si, Republic of Korea, on 1 and 2 July 2024. CP Hydrology members presented updates of hydrology-related activities in RA II, reviewed milestones and discussed potential topics for the next intersessional period.

The full report on the CP Hydrology is given in [Annex IV](#CP_H).

***2.5.*** ***Regional Focal Points on Research (RFPs/R)***

The RFPs/R had organized the first RA II Research Forum at the sidelines of Regional Conference (RECO) 2023. The Research Forum, held on 16 March 2023 in Abu Dhabi, UAE/hybrid, introduced WMO key initiatives under the World Climate Research Programme (WCRP), World Weather Research Programme (WWRP), and the GAW Programme.

RFPs/R had contributed to the RA II Pilot Project on PPE for Smart Meteorological Services in Mega-cities (PPE-SMSC). The PPE-SMSC, co-hosted by CMA, HKO, and SMG, had proposed the first regional RA II Pilot Project on PPE. The project involved Government agencies, private businesses and the academic community of participating Members. It sought to explore an effective PPE mechanism to enable development of open data facility, open, an open platform for developing innovative urban services, common standards, and impact-based forecast and risk-based warning services contributed by stakeholders. A midterm evaluation was conducted for the PPE-SMSC Pilot Project on 9 and 10 November 2023 in Shenzhen, China. The evaluation noted good progress and preliminary outcomes. The project concluded in April 2025. The Final Report of this project is available at <https://wmo.int/files/final-report-wmo-ra-ii-pilot-project-public-private-engagement-smart-meteorological-services-mega>.

RFPs/R had also conducted research on convective-scale ensemble model prediction and application through the Hangzhou Regional Research Development Project (HangzhouRDP). The HangzhouRDP project facilitated the prediction of weather for the nineteenth Asian Games and Asian Para Games, which took place in Hangzhou, China from 23 September to 8 October 2023, and from 22 to 28 October 2023, respectively. A dedicated forecasting system was established and specialized products with characteristic risk probabilities were provided to end user. The nineteenth Hangzhou Asian Games Research Development Project (HangzhouRDP) on Convective-scale Ensemble Prediction and Application maintained the ensemble prediction system (EPS) model run and facilitated weather forecast discussions. The HangzhouRDP was successfully implemented, and its results shared with the research community. A concluding workshop was held from 15 to 17 July 2024 to summarize the findings from the project, discuss its future applications such as extending its products to the Harbin nineth Asian Winter Games and continuing RA II research activities for the subsequent intersession period.

The full report by the RFPs/R is provided in [Annex V](#RFP_R).

***2.6.*** ***Other OP activities***

*2.6.1. UAE to host a RTC in RA II*

UAE proposed to host an additional RTC for RA II in Abu Dhabi. The new centre, to be hosted by the National Centre of Meteorology (NCM) of UAE, in collaboration with Abu Dhabi Polytechnique, will be committed to offering both academic and short-term competency-related courses in accordance with WMO Regulations and guidelines. The aim is to enhance service delivery and capacity development of Members focused on public weather and climate services, aviation, marine and broadcast meteorology. Following regional consultation, the proposal was endorsed by RA II and submitted to EC.

*2.6.2. Strengthening the Delivery of Global and Regional Climate Services*

To strengthen delivery of global and regional climate services, and with the support of KMA’s Trust Fund, the Education and Training (ETR) Division and Services Department of the WMO Secretariat had developed a training package. The training included:

(a) A Climpact online module;

(b) Webinars;

(c) A training syllabus for face-to-face and virtual training;

(d) Regional toolkits;

(e) Workshops.

The first webinar entitled “Integrating Climate Risk Information inro Climate Action” was held on 2 June 2021.

*2.6.3. China – ASEAN Meteorological Forum*

China-ASEAN Meteorological Forums were held in 2016, 2018, and 2023. The Forum revolved around discussions on monitoring regional disasters and information sharing, sharing experiences and achievements in disaster prevention and reduction and the establishment of a joint monitoring and defence against meteorological disasters mechanism. It also promoted technical interaction in meteorological operations and enhanced cooperation on regional disaster preparedness and disaster risk management.

The Third China-ASEAN Meteorological Forum was held in Nanning, China, on 16 September 2023, with the theme of “Closer Regional Cooperation, Smarter Climate Adaptation”. The Forum conducted in-depth discussions over new technologies empowering disaster prevention and mitigation, and reached consensus on deepening regional meteorological cooperative mechanisms, conducting typhoon scientific research, consolidating international training and promoting the implementation of EW4All among others.

*2.6.4. The WMO/ESCAP Panel on Tropical Cyclones (PTC)*

The WMO/ESCAP Panel on Tropical Cyclones (PTC) is an intergovernmental regional body jointly established by WMO and United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP) in 1972, in association with the Tropical Cyclone Programme (TCP) of WMO. The PTC has promoted measures to improve tropical cyclone warning systems in the Bay of Bengal and the Arabian Sea, including the dissemination of technical information on tropical cyclone research and forecasting operations to mitigate the socio-economic impacts of tropical cyclone-related disasters. PTC closely collaborated with the Typhoon Committee in the implementation of the joint project “Synergized Standard Operating Procedures (SSOP) for Coastal Multi-Hazards EWS” and disseminated to beneficiary Members.

PTC convenes regularly, having met on seven occasions between 2021 to 2024.

***2.7.*** ***Extrabudgetary (XB) Projects implemented in WMO Members in RA II***

WMO has set out ambitious goals and objectives in its Strategic Plan which can only be partially realized through the WMO regular budget. To fully achieve its goals, WMO engages in resource mobilization through donors (bilateral and multilateral programmes/ trust funds the WMO Voluntary Cooperation Programme (VCP) or in-kind contributions) and International Financial Institutions (IFIs), namely national or multilateral development banks (MDBs). These XB resources are meant to benefit NMHSs in developing countries and implemented through XB capacity development or demonstration and pilot projects. Some of those may be implemented or led by WMO, while others are managed by other entities.

RA II received an increase of 1.18% of investments over the last intersessional period (2021–2024) at approximately CHF 17.19 million. There are currently 8active projects as of March 2025 with allocated funding of CHF 15.83 million. Several RA II projects are in the pipeline, with WMO as the main implementing partner.

***2.8.***  ***Resources by RA II Members, partners and regional WMO Centres***

RA II Members hosting WMO Centres such as World Meteorological Centre Beijing (WMC Beijing), RWC-Beijing and RWC-Tokyo have provided useful resources during the intersessional period. Since December 2021, RWC-Beijing has provided monthly reports on the “Quality of Radiosonde Observations in Region II (Asia)”, and 6-month summary reports on the “Quality of Land Surface Observations in Region II (Asia)” twice a year. RWC-Tokyo had also provided “Regional WIGOS Centre Monitoring Report” for the Group it was responsible for.

Other valuable news and resources shared were reports from RA II Hydrological Adviser’s Forum, and the launch of the Pilot Project on PPE-SMSC. These resources are a great form of information for RA II Members to refer to, especially on relevant events within the region.

**3. WMO Regional Office for Asia and the south-west Pacific (RAP)**

The Regional Office for Asia and the south-west Pacific (RAP), located in Singapore, continued to support regional activities and enhanced the capacity of Members by promoting and coordinating the implementation of high-priority WMO programmes and projects. RAP had also served as an important link between RA II Members and WMO regional partners, enhancing collaboration with relevant regional partners and funding agencies, as exemplified in the Regional Partnership Strategy.

In 2023, RAP supported the organization of the RECO in RA II by NCM of UAE. The RA II RECO witnessed the successful release of the Abu Dhabi High-level Statement on EW4All in Asia. The statement put forward strong recommendations to all WMO Members to advance the key Multi-Hazard Early Warning System (MHEWS) pillars.

In the same year, a High-Level Regional Forum of the Open Consultative Platform in RA II and V was held in Singapore. In conjunction with the Asia Climate Forum, RAP supported the event with Meteorological Service Singapore (MSS), which was dedicated to climate-defence, resilience, adaptation and mitigation.

In 2024, RAP co-organized the ASEAN Specialized Meteorological Centre (ASMC) – WMO regional forum in Singapore which brought global, regional and national leaders and partners from across the climate services value chain to discuss and promote climate services in supporting climate change adaptation and DRR in Southeast Asia, and the scaling up of EW4All in the region.

RAP is currently headed by Mr Ben CHURCHILL and is supported by eight staff, including a junior professional officer from China, a seconded expert from MSS. It also regularly hosts interns, including from Nanjing University of Information Science and Technology (China). To better support regional activities and closely engage with Members, RAP is looking to recruit additional staff such as programme coordinators.

The Interregional Office for the Arab Region, located in Manama, Bahrain, has continued to successfully facilitate the implementation of WMO regional events, working closely with Members in West Asia to provide support and assistance. Headed by the WMO Representative for the Arab Region, Dr Hesham ABDEL GHANY, the Office has also continued to work closely with regional partners such as the League of Arab States (LAS) and Gulf Cooperation Council (GCC), promoting regional cooperation.

**4. Enhanced regional partnerships, with support from the WMO Regional Office for Asia and the south-west Pacific (RAP)**

The RA continued to maintain and enhance partnerships with intergovernmental organizations through the organization of, and participation in (co-sponsored) meetings and activities, with efforts supported by RAP. Examples of intergovernmental organizations include UNESCAP and its counterpart for Western Asia (ESCWA), United Nations Office for DRR (UNDRR), Food and Agricultural Organization of the United Nations (FAO), World Food Programme (WFP), ASEAN, Regional Integrated MHEWS for Africa and Asia (RIMES), Asian Disaster Preparedness Centre (ADPC), GCC, etc.

RA II Members continued to actively participate in meetings and activities organized by intergovernmental organizations under the umbrella of WMO/ESCAP partnership, and support by RAP, including the following:

(1) State of the Climate Report in Asia, and Regional Climate (Outlook) Forums;

(2) Sessions of ESCAP;

(3) ESCAP Disaster Resilience Week and the Sessions of the ESCAP Committee on DRR;

(4) Asia-Pacific Disaster Reports;

(5) Operationalizing impact-based forecasting and warning services (IBFWS) in Viet Nam, September 2021;

(6) ESCAP/WMO Typhoon Committee Sessions, meetings and activities;

(7) ESCAP/WMO Typhoon Committee Integrated Workshops;

(8) ESCAP/WMO PTC Sessions, meetings and activities;

(9) Joint FAO-WMO-ESCAP Workshop “Bracing for El Nino: Getting Ready for Dry Years in ASEAN with Enhanced Early Warnings and Anticipatory Action”, December 2023.

**5. Regional Challenges and Priorities**

P/RA II highlighted the slate of achievements, challenges and opportunities to WMO Members at the TCC-2023–1, in Geneva, Switzerland, in 2023. The full report is given in [Annex VI](#PRA_Report).

RA II priorities (2025–2027) will be endorsed by RA II-18(Phase I). For more detailed information, refer to [Annex VII](#RAII_Priorities).

**6. Membership in Technical Commissions**

Of the RA II Members, 26 are represented in INFCOM and SERCOM. This representation includes national focal points, with 397 experts from these Members affiliated with INFCOM subsidiary bodies and 134 experts affiliated with SERCOM subsidiary bodies.

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## ANNEX I

## List of activities in the intersessional period (2021–2024)

*For more information, please visit the* [*RA II Community Webpage*](https://community.wmo.int/en/governance/Regional-Association/RA-II)

| **Category** | **Title** | **Date(s)** | **Meeting modality** |
| --- | --- | --- | --- |
| Other meetings | ESCAP/WMO Typhoon Committee – fifty-third session | 23 to 25 February 2021 | Online |
| Subsidiary Body meeting | Second RA II Hydrological Advisers Forum | 26 March 2021 | Online |
| Subsidiary Body meeting | RA II MG-16 | 30 March 2021 | Online |
| Subsidiary Body meeting | First RA II TT-RC Meeting | 19 April 2021 | Online |
| Subsidiary Body meeting | First RA II TT-RP Meeting | 26 April 2021 | Online |
| Events | Nineteenth South Asian Climate Outlook Forum (SASCOF-19) | 26 to 28 April 2021 | Online |
| Subsidiary Body meeting | Second RA II TT-RC Meeting | 28 April 2021 | Online |
| Events | The Seventeenth Session of Forum on Regional Climate Monitoring, Assessment and Prediction for Asia (FOCRAII-17) | 7 May 2021 | Online |
| Events | The twentieth session of North Eurasia Climate Outlook Forum (NEACOF-20) | 20 and 21 May 2021 | Online |
| Events | ASEAN Climate Outlook Forum (ASEANCOF-16) | 24 May 2021 | Online |
| RA II Session | Seventeenth session of Regional Association II (RA II-17) Phase I | 25 and 26 May 2021 | Online |
| Events | Seventh Arab Climate Outlook Forum (ArabCOF-7) and the fourth Gulf Cooperation Council Climate Outlook Forum (GCCCOF-4) | 1 to 3 June 2021 | Online |
| Events | Integrating Climate Risk Information into Climate Action (hosted by KMA) | 2 June 2021 | Online |
| Events | Arab Climate Outlook Forum and Gulf Cooperation Council Climate Outlook Forum (ARABCOF-7 & GCC-COF-4) | 3 June 2021 | Online |
| Subsidiary Body meeting | Joint RA II TT/WG/CP Chairs Meeting | 8 June 2021 | Online |
| Subsidiary Body meeting | First RA II Working Group on Infrastructure (WG Infrastructure) Meeting | 16 June 2021 | Online |
| Subsidiary Body meeting | Second RA II WG Infrastructure Meeting | 22 June 2021 | Online |
| Subsidiary Body meeting | First RA II Working Group on Services (WG Services) Meeting | 25 June 2021 | Online |
| Workshop | RA II Training Workshop on Regional WIGOS Centre (RWC) Functions and Tools (1) (Part I) | 29 June 2021 | Online |
| Workshop | RA II Training Workshop on RWC Functions and Tools (1) (Part II) | 5 July 2021 | Online |
| Workshop | RA II Training Workshop on RWC Functions and Tools (2) (Part I) | 6 July 2021 | Online |
| Subsidiary Body meeting | Second RA II WG Services Meeting | 6 July 2021 | Online |
| Workshop | RA II Training Workshop on RWC Functions and Tools (2) (Part II) | 12 July 2021 | Online |
| Subsidiary Body meeting | Third RA II WG Infrastructure Meeting | 13 July 2021 | Online |
| Subsidiary Body meeting | Third RA II WG Services Meeting  | 14 July 2021 | Online |
| Subsidiary Body meeting | Fourth RA II WG Services Meeting | 20 July 2021 | Online |
| Subsidiary Body meeting | Fourth RA II WG Infrastructure Meeting | 21 July 2021 | Online |
| Subsidiary Body meeting | First Regional Focal Points on Research (RFP/R) Meeting | 23 July 2021 | Online |
| Subsidiary Body meeting | Fifth RA II WG Infrastructure Meeting | 28 July 2021 | Online |
| Workshops | Leaders and Management Programme for Senior Management of NMHSs (hosted by MSS) | 3 to 13 August 2021 | Online |
| Subsidiary Body meeting | Joint RA II TT Chairs Meeting | 8 September 2021 | Online |
| Other meetings | ESCAP/WMO PTC – forty-eighth Session (1) | 20 to 21 September 2021 | Online |
| Other meetings | ESCAP/WMO PTC – forty-eighth Session (2) | 23 September 2021 | Online |
| Events | Twentieth South Asian Climate Outlook Forum (SASCOF-20) | 27 to 30 September 2021 | Online |
| Crosscutting meeting | First Regional Hydrological Assembly | 28 September 2021 | Online |
| Events | Northeast Asia Forum on Meteorological Science and Technology | 28 and 29 September 2021 | Online |
| RA II Session | RA II-17 Phase II | 27 to 30 September 2021 | Online |
| Other meetings | Climate Risk and EWSs (CREWS) Cambodia and Lao PDR Project Launch Event | 4 October 2021 | Online |
| Events | Eleventh Asia-Oceania Meteorological Satellite Users’ Conference (AOMSUC-11) | 28 October to 5 November 2021 | Online |
| Events | The ninth session of the East Asia Winter Climate Outlook Forum (EASCOF-9) | 4 Nov 2021 | Online |
| Other meetings | Forty-second Meeting of the ASEAN Subcommittee on Meteorology and Geophysics (SCMG-42) | 10 and 11 November 2021 | Online |
| Events | ASEAN Climate Outlook Forum (ASEANCOF-17) | 22 to 24, and 26 November 2021 | Online |
| Events | The twenty-first session of North Eurasia Climate Outlook Forum (NEACOF-21) | 22 to 26 November 2021 | Hybrid, Moscow (Russian Federation) |
| Events | The twenty-first South Asian Climate Outlook Forum (SASCOF-21) | 25 November 2021 | Online |
| Subsidiary Body meeting | Third RA II Hydrological Advisers Forum | 30 November 2021 | Online |
| Workshop | Sixth International Workshop on Meteorological Science and Technology in Central Asia (hosted by CMA) | 30 November to 1 December 2021 | Online |
| Workshop | Tokyo Climate Centre Training Seminar on One-month Forecast | 1 to 7 December 2021 | Online |
| Other meetings | ESCAP/WMO Typhoon Committee – Sixteenth Integrated Workshop | 2 to 3 December 2021 | Online |
| Events | Eighth Arab Climate Outlook Forum (ArabCOF-8) and the Fifth Gulf Cooperation Council Climate Outlook Forum (GCCCOF-5) | 6 and 7 December 2021 | Online |
| Workshop | Workshop on Regional Disaster Warning Capacity Enhancement in Asia | 9 December 2023 | Online |
| Workshop | Sixth Marine Instrumentation Workshop for Asia-Pacific Region | 13 to 17 December 2021 | Online |
| Subsidiary Body meeting | Sixth RA II WG Infrastructure Meeting | 26 January 2022 | Online |
| Subsidiary Body meeting | Fifth RA II WG Services Meeting | 10 February 2022 | Online |
| Crosscutting meeting | Pilot Project Smart City – Project Coordination Group Meeting  | 18 February 2022 | Online |
| Other meetings | ESCAP/WMO Typhoon Committee – Fifty-Fourth Session | 23 to 25 February 2022 | Online |
| Crosscutting meeting | Pilot Project Smart City – Kick-off Meeting | 25 February 2022 | Online |
| Subsidiary Body meeting | Sixth RA II WG Services Meeting | 2 March 2022 | Online |
| Subsidiary Body meeting | Seventh RA II WG Infrastructure Meeting | 3 March 2022 | Online |
| Subsidiary Body meeting | First RA II Research and Innovation Coordination Meeting | 7 March 2022 | Online |
| Workshops | Training Workshop: Foundational Seasonal Prediction in South Asia | 19 to 21 April 2022 | Online |
| Events | Twenty-second South Asian Climate Outlook Forum (SASCOF-22) | 26 April 2022 | Online |
| Events | ASEAN Climate Outlook Forum (ASEANCOF-18) | 24 to 26 May 2022 | Online |
| Events | The Ninth Arab Climate Outlook Forum (ArabCOF-9) and the sixth Gulf Cooperation Council Climate Outlook Forum (GCCCOF-6) | 29 and 30 May 2022 | Online |
| Subsidiary Body meeting | Eighth RA II WG Infrastructure Meeting | 23 May 2022 | Online |
| Subsidiary Body meeting | First RA II Executive Group (EC) Meeting | 24 March 2022 | Online |
| Subsidiary Body meeting | Fourth RA II Hydrological Advisers Forum | 29 March 2022 | Online |
| Events | The eighteenth session of Forum on Regional Climate Monitoring, Assessment and Prediction for Asia (FOCRAII-18) | 9 May 2022 | Online |
| Events | The twenty-second session of North Eurasia Climate Outlook Forum (NEACOF-22) | 26 May 2022 | Online |
| Subsidiary Body meeting | Seventh RA II WG Services Meeting | 1 June 2022 | Online |
| Other meetings | ESCAP/WMO PTC – forty-ninth Session | 27 to 30 June 2022 | Online |
| Workshop | International Distance Training Course on WIGOS, (RTC-Beijing) | 17 to 19 August 2022 | Online |
| Subsidiary Body meeting | Leaders Meeting – ET of WG Services | 25 August 2022 | Online |
| Subsidiary Body meeting | RA II WG Infrastructure ET Kick-off meeting | 12 September 2022 | Online |
| Subsidiary Body meeting | RA II WG Services ET Kick-off meeting | 14 September 2022 | Online |
| Subsidiary Body meeting | First Meeting – RA II ET-Global Data-processing and Forecasting System (GDPFS) | 20 September 2022 | Online |
| Events | The Twenty-third South Asian Climate Outlook Forum (SASCOF-23) | 26 to 28 September 2022 | Online |
| Subsidiary Body meeting | First Meeting – RA II ET-WIS | 27 September 2022 | Online |
| Subsidiary Body meeting | First Meeting – RA II ET-WICAP | 28 September 2022 | Online |
| Subsidiary Body meeting | First Meeting – RA II Coordination Panel on Hydrology and Water Resources (CP/H) | 29 September 2022 | Online |
| Events | Webinar on the process for the designation of GBON stations (RA II and RA V) | 7 October 2022 | Online |
| Subsidiary Body meeting | First Meeting – RA II ET-AVI | 11 October 2022 | Online |
| Subsidiary Body meeting | First Meeting – RA II ET-WIGOS | 11 October 2022 | Online |
| Workshop | Tokyo Climate Centre Training Seminar on Global Warming Projection Information | 9 to 15 November 2022 | Online |
| Workshop | The Second International Distance Training Seminar on Leadership and Management for Senior Management of NMHSs | 17 to 21 October 2022 | Hybrid, Beijing (China) |
| Subsidiary Body meeting | First Meeting – RA II ET-CS | 28 October 2022 | Online |
| Subsidiary Body meeting | RA II CP/H Second Meeting | 31 October and 1 November 2022 | Hybrid, Vientiane (Lao PDR) |
| Subsidiary Body meeting | First Meeting – RA II ET-AGR | 9 November 2022 | Online |
| Event | The tenth session of the East Asia Winter Climate Outlook Forum (EASCOF-10) | 10 November 2022 | Online |
| Subsidiary Body meeting | First Meeting – RA II ET-US | 11 November 2022 | Online |
| Event | The Twelfth Asia-Oceania Meteorological Satellite Users’ Conference (AOMSUC-12) | 11 to 18 November 2022 | Online |
| Subsidiary Body meeting | First Meeting – RA II ET-MS | 15 November 2022 | Online |
| Subsidiary Body meeting | Joint RA II/V Satellite Coordination Meeting | 18 November 2022 | Online |
| Subsidiary Body meeting | RA II ET-WIGOS Second Meeting | 21 November 2022 | Online |
| Events | ASEAN Climate Outlook Forum (ASEANCOF-19) | 21 to 25 November 2022 | Online |
| Subsidiary Body meeting | First Meeting – JET-EOS | 23 November 2022 | Online |
| Subsidiary Body meeting | RA II MG-18 | 28 and 29 November 2022 | Hybrid, Abu Dhabi (UAE) |
| Other meetings | ESCAP/WMO Typhoon Committee – Seventeenth Integrated Worksop | 29 and 30 November 2022 | Online |
| Events | The twenty-third session of North Eurasia Climate Outlook Forum (NEACOF-23) | 29 and 30 November 2022 | Online |
| Events | The Tenth Arab Climate Outlook Forum (ArabCOF-10) and the Seventh Gulf Cooperation Council Climate Outlook Forum (GCCCOF-7) | 1 to 5 December 2022 | Online |
| Workshop | The Seventh International Workshop on Meteorological Science and Technology in Central Asia | 6 and 7 December 2022 | Hybrid, Urumqi (China) |
| Subsidiary Body meeting | Fifth RA II Hydrological Advisers Forum | 14 December 2022 | Online |
| Workshop | Workshop on the Implementation of CAP for RA II Members | 14 December 2022 | Online |
| Subsidiary Body meeting | RA II JET-EOS 2nd Meeting | 17 January 2023 | Online |
| Workshop | The Second RA II HydroSOS IP Workshop | 26 January 2023 | Online |
| Subsidiary Body meeting | WG-I Annual Meeting | 30 January 2023 | Online |
| Workshop | Weather radar workshop under Regional WIGOS project and Typhoon Committee WGM/AOP3, “Development of regional radar network” | 31 January to 3 February 2023 | Online |
| Workshop | Utilization of Water Resources Information System (WRIS) in Integrated Flood Control, WMO Regional Training Centre Indonesia (RTC-Indonesia) | 31 January 2023 | Online |
| Subsidiary Body meeting | WG-S Annual Meeting | 2 February 2023 | Online |
| Subsidiary Body meeting | RA II ET-WIS Second Meeting | 15 February 2023 | Online |
| Subsidiary Body meeting | RA II ET-GDPFS Second Meeting | 27 February 2023 | Online |
| Other meetings | ESCAP/WMO Typhoon Committee – fifty-fifth Session  | 7 to 9 March 2023 | Online |
| High-level meeting | RA II RECO 2023 | 13 to 16 March 2023 | Hybrid, Abu Dhabi (UAE) |
| Subsidiary Body meeting | RA II ET-AVI Second Meeting | 4 April 2023 | Online |
| Subsidiary Body meeting | RA II ET-CS Second Meeting | 4 April 2023 | Online |
| Events | The Twenty-Fifth South Asian Climate Outlook Forum (SASCOF-25) | 27 to 29 April 2023 | Online |
| Workshops | Seminar on the Impacts of Climate Change on Agriculture for Developing Countries  | 7 April 2023 | Online |
| Subsidiary Body meeting | Joint RA II and RA V Hydrological Advisers Forum | 7 May 2023 | Online |
| Events | The nineteenth session of Forum on Regional Climate Monitoring, Assessment and Prediction for Asia (FOCRAII-19) | 8 to 10 May 2023 | Nanning, China |
| Subsidiary Body meeting | RA II ET-MS Second Meeting | 9 May 2023 | Online |
| Subsidiary Body meeting | Eighth RA II WG Services Meeting | 11 May 2023 | Online |
| Workshops | International Distance Training Course on Agricultural Meteorology | 15 to 26 May 2023 | Online |
| High-level meeting | Pre-Congress briefing for WMO RA II Members | 16 May 2023 | Online |
| Subsidiary Body meeting | RA II WG-S pre-Congress meeting | 17 May 2023 | Online |
| Subsidiary Body meeting | Eleventh RA II WG Infrastructure Meeting | 29 May 2023 | Online |
| Events | ASEAN Climate Outlook Forum (ASEANCOF-20) | 30 May 2023 | Online |
| Events | The Eleventh Arab Climate Outlook Forum (ArabCOF-11) and the Eighth Gulf Cooperation Council Climate Outlook Forum (GCCCOF-8) | 5 June 2023 | Online |
| Events | The twenty-fourth session of North Eurasia Climate Outlook Forum (NEACOF-24) | 14 June 2023 | Hybrid, Moscow (Russian Federation) |
| Subsidiary Body meeting | First Meeting – ET-SOA | 6 July 2023 | Online |
| Subsidiary Body meeting | RA II ET-AVI third Meeting | 10 July 2023 | Online |
| Other meeting | Seminar on the RA II Research Development Project/ nineteenth Hangzhou Asian Games Research Development Project on Convective-scale Ensemble Prediction and Application (HangzhouRDP) | 10 to 13 July 2023 | Online |
| Other meetings | The Fifth session of the WMO Steering Group for the SWCEM in East Asia and Western Pacific | 27 and 28 July 2023 | Online |
| Subsidiary Body meeting | Twelfth RA II WG Infrastructure Meeting | 31 July 2023 | Online |
| Events | Third China-ASEAN Meteorological Forum | 15 to 17 September 2023 | Nanning (China) |
| Events | The Twenty-Sixth South Asian Climate Outlook Forum (SASCOF-26) | 26 and 27 September 2023 | Online |
| Workshop | Regional Webinar on Extreme Heat and Health Services: tools, good practices, challenges and opportunities in the Asian region | 9 October 2023 | Online |
| Workshop | The third International Distance Training Workshop on Management and Leadership for Senior Management of NMHSs | 9 to 22 October 2023 | Beijing (China) |
| Subsidiary Body meeting | RA II ET-MS third Meeting | 17 October 2023 | Online |
| Subsidiary Body meeting | RA II ET-WIGOS third Meeting | 20 October 2023 | Online |
| Subsidiary Body meeting | RA II ET-CS third Meeting | 23 October 2023 | Online |
| Subsidiary Body meeting | RA II ET-AVI Fourth Meeting | 25 October 2023 | Online |
| Subsidiary Body meeting | RA II ET-WIGOS Fourth Meeting | 26 October 2023 | Online |
| Events | Thirteenth Asia-Oceania Meteorological Satellite Users’ Conference (AOMSUC-13) | 3 to 10 November 2023 | Hybrid, Jincheon and Busan (Republic of Korea) |
| Events | The eleventh session of the East Asia Winter Climate Outlook Forum (EASCOF-11) | 6 to 8 November 2023 | Hybrid, Tokyo (Japan) |
| Workshops | Scoping Workshop on the Establishment of the TPCF | 7 to 9 November 2023 | Hybrid, Bangkok (Thailand) |
| Subsidiary Body meeting | Thirteenth RA II WG Infrastructure Meeting | 13 November 2023 | Online |
| Subsidiary Body meeting | Tenth RA II WG Services Meeting | 14 to 17 November 2023 | Chonngqing, China |
| Events | ASEAN Climate Outlook Forum (ASEANCOF-21) | 17, 20, 21, 23 November 2023 | Online |
| Workshops | WIGOS Implementation Workshop for the WMO RA II Members | 27 to 30 November 2023 | Hybrid, Beijing (China) |
| Events | The Twelfth Arab Climate Outlook Forum (ArabCOF-12) and the Ninth Gulf Cooperation Council Climate Outlook Forum (GCCCOF-9) | 28 November 2023 | Online |
| Events | The Twenty-Seventh South Asian Climate Outlook Forum (SASCOF-27) | 29 November 2023 | Online |
| Crosscutting meeting | Joint WCRP/WWRP Webinar 2: Asian-Australian Monsoon | 30 November 2023 | Online |
| Workshop | The Fifth Dynamic Water Resource Assessment (DWAT) Global Workshop | 30 November to 1 December 2023 | Bangkok (Thailand) |
| Events | The twenty-fifth session of North Eurasia Climate Outlook Forum (NEACOF-25) | 4 to 5 December 2023 | Hybrid, Moscow (Russian Federation) |
| Workshop | RA II Technical Workshop on Marine and Coastal Services | 4 to 7 December 2023 | Hybrid, Tokyo (Japan) |
| Other meetings | WMO Aeronautical Meteorology Scientific Webinar for RA II and V | 5 December 2023 | Online |
| Subsidiary Body meeting | RA II ET-AVI Fifth Meeting | 18 December 2023 | Online |
| Workshop | Tokyo Climate Centre Training Seminar on Seasonal Forecast | 29 January to 2 February 2024 | Tokyo (Japan) |
| Subsidiary Body meeting | RA II ET-AVI Sixth Meeting | 28 February 2024 | Online |
| Events | The Twenty-Eighth South Asian Climate Outlook Forum (SASCOF-28) | 29 April 2024 | Pune, India |
| Subsidiary Body meeting | Seventh RA II Hydrological Advisers Forum | 30 April 2024 | Online |
| Other meetings | WMO RA II Aeronautical Meteorology Webinar 2024 | 7 May 2024 | Online |
| Events | Twentieth Session of Forum on Regional Climate Monitoring, Assessment and Prediction for Asia (FOCRAII-20) | 9 to 11 May 2024 | Qingdao (China) |
| Events | The twenty-sixth session of North Eurasia Climate Outlook Forum (NEACOF-26) | 14 to 16 May 2024 | Online |
| Subsidiary Body meeting | Fifteenth RA II WG Infrastructure Meeting | 21 to 23 May 2024 | Hybrid, Changsha (China) |
| Subsidiary Body meeting | RA II ET-AVI Seventh Meeting | 24 May 2024 | Online |
| Events | ASEAN Climate Outlook Forum (ASEANCOF-22) | 29 to 30 May 2024  | Hybrid, Vientiane (Lao PDR) |
| Events | The Thirteenth Arab Climate Outlook Forum (ArabCOF-13) and the Tenth Gulf Cooperation Council Climate Outlook Forum (GCCCOF-10) | 3 Jun 2024 | Online |
| Subsidiary Body meeting | RA II MG-19 | 12 Jun 2024 | Hybrid, Geneva (Switzerland) |
| Other meetings | National Focal Points on Radio Frequency Matters – Asia-Pacific Countries meet and greet | 20 Jun 2024 | Online |
| Workshops | Valedictory Session of WMO RA II ET-US iLEAPS Indian Institute of Tropical Meteorology (IITM) Desk joint workshop  | 27 Jun 2024 | Hybrid, Pune (India) |
| Subsidiary Body meeting | RA II CP/H third Meeting | 1 and 2 July 2024 | Goyang-Si (Republic of Korea) |
| Subsidiary Body meeting | RA II ET-MS Fourth Meeting | 2 July 2024 | Online |
| Subsidiary Body meeting | Sixteenth RA II WG Infrastructure Meeting | 10 July 2024 | Online |
| Other meetings | RA II International Webinar on SDS Monitoring and Forecasting | 12 July 2024 | Online |
| Other meetings | The Concluding Workshop on HangzhouRDP and the First Workshop on the WMO RA II Research Activities | 15 to 17 July 2024 | Hybrid, Beijing (China) |
| Subsidiary Body meeting | Third RA II TT-RC Meeting | 22 July 2024 | Online |
| Subsidiary Body meeting | RA II JET-EOS third Meeting | 23 July 2024 | Online |
| Subsidiary Body meeting | Second RA II TT-RP Meeting | 29 July 2024 | Online |
| Subsidiary Body meeting | Eleventh RA II WG Services Meeting | 5 August 2024 | Online |
| Subsidiary Body meeting | RA II ET-AVI Eighth Meeting | 23 August 2024 | Online |
| Events | ASMC – WMO Regional Forum “Towards a Weather-Ready and Climate-Resilient ASEAN” | 4 to 6 September 2024 | Singapore |
| Other meetings | SDS-South Asia node meeting | 23 and 24 September 2024 | New Delhi, India |
| Events | The Twenty-Ninth South Asian Climate Outlook Forum (SASCOF-29) | 25 and 26 September 2024 | Online |
| Other meetings | WMO Steering Group for the Space-based Weather and Climate Extreme Monitoring (SWCEM) in East Asia and Western Pacific Sixth meeting | 1 and 2 October 2024 | Online |
| Other meetings | Heads of RTC Components meeting | 1 and 3 October 2024 | Abu Dhabi (UAE) |
| Subsidiary Body meeting | WMO RA II ET-WIPPS Fifth meeting | 21 October 2024 | Online |
| Subsidiary Body meeting | TPRCC-Network Task Team meeting | 24 October 2024 | Online |
| Events | The twenty-seventh session of North Eurasia Climate Outlook Forum (NEACOF-27) | 31 October 2024 | St. Petersburg (Russian Federation) |
| Events | The twelfth session of the East Asia Winter Climate Outlook Forum (EASCOF-12) | 6 to 8 November 2024 | Daejon (Republic of Korea) |
| Subsidiary Body meeting | RA II RBON design – preparatory telecon No 1 | 11 November 2024 | Online |
| Other meetings | Briefing Session on WMO Early Warning Services Technical Regulations (EWS-TR) | 25 November 2024 | Online |
| Events | ASEAN Climate Outlook Forum (ASEANCOF-23) | 26 to 29 November 2024 | Online |
| Subsidiary body meeting | WMO RA II ET-AVI Ninth meeting | 28 November 2024 | Online |
| Events | The fourteenth Asia-Oceania Meteorological Satellite Users’ Conference (AOMSUC-14) | 2 to 7 December 2024 | New Delhi (India) |
| Workshops | WMO VCP and HKO Workshop on Aviation Meteorological Science and Service Department | 3 to 6 December 2024 | Hong Kong, China |
| Events | The Thirtieth South Asian Climate Outlook Forum (SASCOF-30) | 5 December 2024 | Online |

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## ANNEX II

## Report of the RA II Working Group on Weather, Climate, Hydrological, Marine and Related Environmental Services and Applications (WG Services)

Submitted by Chair: Mr ZHOU Qingliang

**1. Introduction**

This report summarizes major activities by the (Joint) Expert Teams ((J)ETs) under the RA II Working Group on Weather, Climate, Hydrological, Marine and Related Environmental Services and Applications (WG Services), viz the ET on Agricultural Services (ET-AGR), ET on Climate Services (ET-CS), ET on Disaster Risk Reduction (ET-DRR), ET on Hydrological Services (ET-HS), ET on Marine Services (ET-MS), ET on Services for Aviation (ET-AVI), ET on Urban Services (ET-US), and the JET on Environmental Observations and Systems (JET-EOS) since the Seventeenth session of RA II (RA II-17).

1. **Working Group Structure**

The WG is composed of five ETs: ET-AGR, ET-CS, ET-DRR, ET-HS, ET-MS, ET-AVI, and ET-US. The JET-EOS has a primary reporting line to the WG Services, with a secondary reporting line to the Working Group on Observation, Infrastructure and Information Systems (WG Infrastructure). The JET on the Third Pole Regional Climate Centre (JET-TPRCC) has a primary reporting line to the WG Infrastructure and a secondary reporting line to the WG Services (see [Annex III](#WG_I)).

**3. Terms of Reference (ToR)**

Under the guidance of the president of RA II (P/RA II) and the RA II Management Group (MG), and in collaboration with the relevant bodies of the Commission for Weather, Climate, Hydrological, Marine, and Related Environmental Services and Applications (SERCOM), the WG Services’ ToR are given as follows:

(1) Follow-up on the resolutions, decisions and recommendations of the World Meteorological Congress (Cg), Executive Council (EC), RA II and RA II MG, technical commissions, and the Research board (RB), addressing services and application-related matters (Long-Term Goal (LTG) 1), for the activities to be undertaken at a regional level;

(2) Identify and regularly monitor critical gaps and needs for new and improved service and analyse related capabilities among Members, particularly for developing Members, including (but not exclusively) the implementation of the regional aspects of the Global Multi-Hazard Alert System (GMAS), operationalization of objective seasonal forecasts and associated tailored products, Regional Climate (Outlook) Forums (RC(O)Fs) and develop a road map and regional implementation plan to support improvements and capacity development activities (LTG 4), to be included in the RA II Operating Plan (OP)(i.e. Work Programme);

(3) Draft and update, on a regular basis, the RA II OP of the relevant components pertaining to services and applications, and monitoring the progress of the implementation for the RA II session review and approval;

(4) Provide feedback to SERCOM on RA II Members’ requirements and needs on weather, climate, water and related environmental services and applications including providing inputs to the proposed work plan of the Commission;

(5) Collaborate with RA II Members, SERCOM and other bodies, as necessary, to support, monitor, and regularly review and audit relevant regional centres established by WMO bodies, ensuring that the services and functions being delivered by them continue to respond to the needs of the region and are in compliance with WMO standards and guidelines;

(6) Consult with SERCOM on the identification of common expert to assist with the sharing of regional priorities and requirements and the implementation of technical priorities and associated capacity building activities;

(7) Facilitate the production of the pilot report on the State of the Climate in Asia and the further development of the concept leading to the publication of a regular report on the State of the Climate in Asia;

(8) Propose and monitor RA II pilot and demonstration projects, workshops and forums, and share information on these in advance, with the support of Members;

(9) Facilitate the sharing of knowledge, experience and technology among RA II Members;

(10) Submit annual reports to the president of RA II, according to the RA II OP and share the report with Members and the MG of SERCOM.

**4. Membership of key positions**

RA II WG Services comprises of a Chair and three Vice-chairs. Each ET is led by a leader, who reports the activities of the ET to the Chair. The current membership of key positions in RA II WG Services is given below:

|  |  |  |  |
| --- | --- | --- | --- |
| **(Joint) Expert Team** | **Name** | **Role** | **Member** |
| ET-AGR | Ms Kamaljit RAY | Vice-chair of WG Services, Leader of ET-AGR | India |
| ET-CS | Mr SATO Hirotaka | Vice-chair of WG Services,Leader of ET-CS | Japan |
| ET-DRR | Mr ZHOU Qingliang | Chair of WG Services, Leader of ET-DRR | China |
| ET-HS | Mr Md. Arifuzzamaa BHUIYAN | Leader of ET-HS | Bangladesh |
| ET-MS | Mr KOHNO Nadao | Leader of ET-MS | Japan |
| ET-AVI | Ms Christy LEUNG | Leader of ET-AVI | Hong Kong, China |
| ET-US | Mr Sachin GHUDE | Leader of ET-US | India |
| JET-EOS | Ms Saviz SEHAT | Vice-chair of WG Services,Leader of JET-EOS | I.R. of Iran |

**5. Major Activities of ET-AGR**

ET-AGR, led by Dr Kamaljit RAY, had facilitated an online meeting on 9 November 2022. Two further meetings were held to discuss the establishment of agrometeorological advisory services (AAS) in RA II Members and enhancing outreach to Members implementing AAS, development of different tools and techniques to improve AAS in RA II Members and conduct an impact assessment of AAS.

Dr RAY noted that AAS was not established very prominently in most RA II Members and therefore proposed additional initiatives to increase visibility of AAS. In 2023, the India Meteorological Department (IMD) organized 340 Farmers Awareness Programme trainings to create awareness among farmers regarding weather forecasts and Agrometeorological Advisories. Additionally, IMD had successfully integrated IMD services with the State Government’s IT platforms, enabling about 16 million farmers easy accessibility to relevant information. Other IMD-related developments include the Indian Space Research Organisation (ISRO)-IMD Vegetation Information System platform for monitoring village-level crop health using satellite data, and specialized weather forecast based on major pests and diseases during the Kharif and Rabi season.

Since 2014, the Islamic Republic of Iran Meteorological Organization (IRIMO) had initiated a comprehensive climate information services project, called TAHAK, for end-users by focusing on farming communities. TAHAK identified user needs and established two-way communication between IRIMO and end-users, which is designed to run in seven main operational phases. The project objectives have been in line with the Global Framework for Climate Services (GFCS).

Relevant training opportunities included the Seminar on the Impacts of Climate Change on Agriculture for Developing Countries, organized by the WMO Regional Training Centre (RTC)-Nanjing on 7 April 2023, and the International Distance Training Course on Agricultural Meteorology, organized by RTC-Beijing from 15 to 26 May 2023. Additionally, the Meteorological Cadre Training Institute of the CMA had led in the planning and organizing of several Special Training Courses on Food Security Meteorological Services, which provided training in vital operational techniques for grassroot agrometeorological staff.

ET-AGR held its most recent meeting on 29 November 2024. Activities in 2024 focused on identifying agrometeorological experts/staff and document the improvement of services and training needs in the Region. A small documentation of the agrometeorological information needs of vulnerable communities in RA II Members was prepared. The second focus was on developing and providing trainings for the improvement of AAS using latest remote sensing tools by IMD in collaboration with the South Asian Forum for Agrometeorology (SAFOAM), South Asian Meteorological Association (SAMA), and WMO in Pune, India during Q2 2025. An urgent need was identified to update global standards and guidelines, especially within the WMO framework, to address the dynamic challenges of agricultural meteorology. In this context, SAFOAM and SAMA suggested establishing a RFCS for South Asia to support collaborative efforts – a suggestion that has already been taken up by the South Asia Hydromet Forum (SAHF) with support from the Climate Risk and Early Warning Systems (CREWS) initiative and UK Met Office and development partners including WMO, World Bank, and the Regional Integrated Multi-hazard Early Warning System for Africa and Asia (RIMES).

For ET-AGR-related activities in the next intersessional period (2025–2028), it was suggested that a survey of the existing Agricultural Meteorological services in RA II, and the documentation of the agrometeorological information needs of vulnerable communities in the be conducted. It was also recommended to integrate modern technologies, such as AI, satellite-based data, and hyperlocal forecasting, as they are critical for improving the precision and reach of weather-based advisory services. Continuous capacity development for stakeholders, public-private partnerships, and effective communication channels remain essential activities for the ET-AGR for sustaining these services.

**6. Major Activities of ET-CS**

Mr KYODA Masayuki, the first leader of ET-CS by September 2023, had conducted two online meetings. Following Mr KYODA, Mr SATO Hirotaka, the current leader of ET-CS, had held two online meetings during the intersessional period. Major activity areas of the ET include the RCCs and the RCOFs, the State of the Climate in Asia reports and the GFCS.

The following key activities are summarized below:

***(1) Objective Seasonal Forecasting (OSF)***

OSF was promoted at the various RCOFs in RA II. For further implementation of OSF, ET-CS members evaluated the forecast skill of OSF based on multi-model ensembles from dynamical models. The results had contributed to discussions about the implementation of OSF at the East Asia Winter Climate Outlook Forum (EASCOF-11).

***(2) State of the Climate in Asia reports***

ET-CS had contributed to the annual State of the Climate in Asia reports from 2021 to 2024. At least two co-lead authors had been selected from the ET since the State of the Climate in Asia 2022 report.

The State of the Climate in Asia 2023 report was successfully launched on 23 April 2024 in Bangkok, Thailand, with provisions for online participation. The report highlighted Asia as the most disaster-impacted region in 2023 with floods and storms contributing to the highest number of mortalities, economic damages and affected the largest number of people. The report also emphasized the increasing number of extreme events in 2023, such as heat waves. For more information, please see: [*State of the Climate in Asia 2023*](https://library.wmo.int/records/item/68890-state-of-the-climate-in-asia-2023) (WMO-No. 1350).

***(3) Regional Climate Centre (RCC) candidates***

During the intersessional period, ET-CS had supported the designation process of RA II RCCs. The ET noted that the I.R. of Iran and Saudi Arabia had expressed interest in hosting WMO RCCs. Following the application for a new RCC by the I.R. of Iran, ET-CS had discussed next steps for the implementation of the new proposed RCC in April 2023.

***(4) Global Framework for Climate Services (GFCS)***

ET-CS had contributed to two online workshops related to the GFCS, namely the regional workshop on the WMO Checklist for Climate Services Implementation on 16 December 2021 and the Introductory Forum on National Climate Services Information System (CSIS) Focal Points for RA II from 11 to 12 October 2023. These workshops provided an opportunity to familiarize Members in RA II with the GFCS and the CSIS in particular.

Furthermore, for the successful implementation of GFCS, sharing good practices and lessons learnt in climate-related activities among Members in similar climatological regions is important. For this purpose, ET-CS members supported its dedicated website operated by RCC-Tokyo at <https://ds.data.jma.go.jp/tcc/RaiiInfoshare>. The content was updated in December 2021 and January 2022 based on a questionnaire survey.

**7. Major Activities of ET-DRR**

Mr ZHOU Qingliang is the Chair of the RA II WG Services and Leader of ET-DRR. For the intersessional period, ET-DRR had led two Implementation Projects from the RA II OP: “Strengthen MHEWS: Global Multi-Hazard Alert System Asia (GMAS-A)” and “Promote impact-based forecast and warning services (IBFWS)”. ET-DRR had also coordinated the demonstration project (DP) “Promote WMO Cataloguing of Hazardous Events (WMO-CHE)”. ET members worked closely with the Standing Committee (SC) on DRR and Early Warning Services (SC-DRR) and the Study Group (SG) on Services for Energy (SG-ENE) of SERCOM.

The key activities are summarized below:

***(1) GMAS-A***

GMAS-A was the ET’s flagship project which sought to accelerate the implementation of the CAP. On 9 December 2021, the China Meteorological Administration (CMA) hosted an online Workshop on Regional Disaster Warning Capacity Enhancement in Asia. To further address the need for training geared towards the implementation of the Common Alerting Protocol (CAP) in RA II Members, ET-DRR, with the support of the WMO RAP Office and the DRR, Multi-Hazard EWS Office and Public Service Branch (DMPS) of the WMO Secretariat, organized an online Workshop on the Implementation of CAP for RA II Members on 14 December 2022. The Workshop delivered the concept of CAP and the steps required for Members to be CAP-compliant, with a demonstration of CAP implementation on Oman. As of March 2025, weather warnings issued by 21 RA II Members have been posted to the GMAS-A website.

CMA had also organized a field study in July 2023 to the Department of Meteorology and Hydrology (DMH) of Lao People’s Democratic Republic (PDR) to learn its requirements for weather warnings operation.

***(2) Impact-based Forecast and Warning Services (IBFWS)***

An online regional webinar on “Extreme Heat and Health Services: tools, good practices, challenges and opportunities in the Asian region” was held on 9 October 2023, with the support of the WMO RAP Office and the WMO/World Health Organization (WHO) Joint Climate and Health Office. The event shared state of the art extreme heat information services including current practices and remaining gaps and provided opportunities for exchange and collaboration with experts from National Meteorological and Hydrological Services (NMHSs) and their partners in RA II. Together with the United Nations Economic and Social Commission for Asia and the Pacific (ESCAP), WMO organized a workshop “Strengthening the capacity for multi-hazard risk assessment and early warning in north-east Asia” from 30 October to 1 November 2024 in Beijing, targeting mainly participants from Mongolia and kindly hosted by CMA, with support from several ET-DRR experts.

***(3) Implementation of the Early Warnings for All (EW4All) initiative in RA II***

ET-DRR supported several EW4All activities in RA II such as the Belt and Road Forum on EW4All and the fiftieth China Study Tour (12 April 2023); the third China-ASEAN Meteorological Forum (15 to 17 September 2023); the sixth China-Arab States Expo Forum on High-quality Meteorological Development and Cooperation (21 to 24 September 2023); the Northeast Asia Seminar on Meteorological Science and Technology (12 to 13 October 2023); the Seminar on the RA II Research Development Project/nineteenth Hangzhou Asian Games Research Development Project on Convective-scale Ensemble Prediction and Application (HangzhouRDP) (10 to 13 July 2023); the Midterm Evaluation Meeting of the Pilot Project “Public Private Engagement (PPE) on Smart Meteorological Service in Mega-Cities in RA II” (9 to 10 November 2023); the First International Conference on Indian Ocean Tropical Cyclone (9 and 10 October 2023); and the eighth International Training Course on Tropical Cyclones Monitoring and Forecasting (11 November to 1 December 2023). Further information on EW4All in RA II (Asia) is included in [RA II-18(I) INF04.3](https://meetings.wmo.int/ra-2-18/InformationDocuments/Forms/AllItems.aspx).

Towards the next intersessional period, ET-DRR will be continuing and expanding the scope of the GMAS-A IP to support users’ fast access to weather warning messages. CMA and the Hong Kong Observatory (HKO) had indicated support to enrich the Numerical Weather Prediction (NWP) products for Members’ weather warnings operations. It will look into contributing to the WMO Coordination Mechanism to support humanitarian activities (WCM), advance the implementation of the WMO-CHE initiative in RA II Members, and contribute to trainings for NMHSs on Business Continuity Management (BCM).

**8. Major Activities of ET-HS**

Led by Mr Md. Arifuzzamaa BHUIYAN, ET-HS collaborated on all the activities with other experts under the CP Hydrology and participated in the annual face-to-face CP Hydrology meetings on three occasions during the intersessional period, with the third meeting held on 1 and 2 July 2024, in Goyang-Si, Republic of Korea. ET-HS led the RA II OP Implementation Project (IP) “Improvement in Hydrological Services” with nine activities during the intersessional period of 2021 to 2024. Among these, the activity “Flood hazard map for pilot site” was not conducted due to a lack of a nominated expert.

The key activities are summarized below:

***(1) Report of comparative studies on hydrological measurements, information provision and hydrological services for RA II Members***

A study led by Dr Yashar FALAMARZI examined the state of hydrological services in RA II. The study found that 47% of Members have dedicated hydrological services institutions, and 41% integrate these services with meteorological services. A key finding was the significant variation in monitoring infrastructure across the region, with some countries possessing well-developed systems while others lacked adequate resources. While short-term hydrological forecasting is common, the study found challenges with long-term and sub seasonal to seasonal (S2S) forecasting due to data quality issues and sharing limitations.

The report recommended enhancing data management systems, expanding monitoring networks, and improving collaboration between countries to improve hydrological services. Public awareness and information dissemination through modern technologies such as smartphones and Base Transceiver Station (BTSs) are also recommended to improve emergency response and public safety. Topics for further consideration include water quality modelling, groundwater management, and the impact of climate change on hydrological components.

***(2) Integrated Decision Support System (DSS) for flood and drought forecasting concept developed for a pilot site***

Led by Mr BHUIYAN, this activity aims to develop an Integrated DSS for flood and drought forecasting in Bangladesh by assessing climate and hydrological information requirements and analysing the limitations of existing systems. The flood forecasting DSS enhances accuracy through an automated data collection and processing system and improved visualization capabilities, while the drought forecasting DSS builds predictive models using water level-based drought indices. Additionally, machine learning and statistical models (autoregressive integrated moving average model (ARIMA) and Random Forest) have been applied to improve drought prediction accuracy. Future directions include developing region-specific models, enhancing data accessibility, building user-friendly DSS tools, strengthening collaboration with relevant organizations, and capacity development.

Dr Hwirin KIM, Head of the Hydrological and Water Resources Services Section at the WMO Secretariat also advised the development of a manual for the DSS tool for flood- and drought-prone areas in Bangladesh and shared the manual with other RA II Members.

***(3) Report on approaches to establishing the deterministic error in NWP outputs and how they should best be used in establishing hydrological forecasts with enhanced accuracy***

Led by Dr Ashok DAS (on behalf of Dr Pulak GUHATHAKURTA), the report investigated the approaches to establishing the deterministic error in NWP outputs and their application in improving hydrological forecasts. The study focused on enhancing the accuracy of Quantitative Precipitation Forecasts (QPF) from IMD’s Global Forecast System (GFS) model at the river subbasin scale using Model Output Statistics (MOS). A multivariate regression analysis was conducted using observational data and 11 key meteorological parameters. Four parameters – QPF, precipitable water, absolute vorticity (850hPa) and vertical velocity (700hPa) – showed a strong correlation with observed rainfall and were used to develop a MOS-based regression model. The model significantly reduced the Root Mean Square Error (RMSE) and improved skill scores like Probability of Detection (POD) and Critical Success Index (CSI). Independent verification using monsoon data from 2023 confirmed the enhanced accuracy of QPF. Future work aimed to focus on refining the model by incorporating more seasonal data and additional meteorological parameters to further improve prediction reliability.

***(4) Cryosphere component modelling report and capacity building workshop***

Led by Ms Valeria KOLIY, a technical report reviewed experiences in modelling snowpack and soil freezing in permafrost within operational hydrological models. It emphasized the importance of incorporating these cryosphere components to accurately represent runoff generation processes, particularly in polar regions, mountainous areas, and countries with moderate climates. The report also highlighted ongoing efforts to refine and verify the snow cover model used by the Russian Hydrometeorological Centre, including plans to add a soil freezing block component and extend its application to Central Asia.

To further enhance understanding and application of cryosphere component modelling, a workshop was held on 1 and 2 July 2024. Using the Russian Hydrometeorological Centre’s model as a basis, educational materials were developed and discussed, enabling participants to gain practical experience in modelling these components and their impact on river discharge and groundwater levels. Challenges encountered, such as incomplete snow cover modelling, led to further model improvements.

***(5) Case studies on CAP and Associated Programme on Flood Management (APFM)***

Two case studies were conducted to examine the application of CAP and APFM guidance in RA II.

The first case study, led by Mr MASTHAWEE, focused on CAP implementation for flood warnings in the Russian Federation and the Republic of Kazakhstan. It highlighted the long-term benefits and QC needs demonstrated by Russian Federation’s decade-long experience with CAP, while also noting Kazakhstan’s recent efforts to define hazard classes for its river basins. The study emphasized the importance of training, QC, and collaboration for effective CAP implementation and suggested further research on urban flooding.

The second case study, led by Dr PARK, examined the application of APFM guidance for flood management practices and alert dissemination in RA II. It outlined the objectives, progress, challenges and potential solutions for implementing APFM guidance, aiming to integrate land use, water resources, and risk management to minimize flood losses. The study emphasized the need for ongoing data collection, literature review, and analysis of current flood management systems to identify best practices and areas for improvement.

**9. Major Activities of ET-MS**

Mr KOHNO Nadao, Leader of ET-MS, had conducted two key activities and five online meetings during the intersessional period. Following the tenth RA II WG Services Meeting in November 2023, the formal participation of METAREA Coordinators were newly confirmed with the total number of ET-MS members doubled to when the ET started. The ET also invites additional experts of Expert Team under SC-MMO of SERCOM and RA V ET on Marine Meteorological and Oceanographic Services (ET-MMO) Leaders as observers, to promote cross-regional cooperation.

The following key activities are summarized below:

***(1) Survey on the status of marine services in the region (2023)***

A comprehensive survey on marine services was conducted to understand the status of marine services in RA II, since there is no respective systematic framework on marine services except the International Hydrographic Organization's Worldwide Navigational Warning Service (WWMIWS) and the status of marine services in this Region is not well recognized although they are much different among Members. An inquiry sheet was sent out to 27 RA II Members except landlocked countries (via the ET members and the designated National Marine Services Focal Points where they exist) in August/September 2023. Although the survey was informally conducted, 18 Members responded, and the results were summarized and analysed to identify the gaps and requirements. The results were also shared among the ET members for discussing focus area in strengthening the marine services in the Region, at the WMO RA II Technical Workshop on Marine and Coastal Services (see below).

***(2) WMO RA II Technical Workshop on Marine and Coastal Services, 4 to 7 December 2023, Tokyo, Japan***

Kindly hosted by the JMA, ET-MS organized the WMO RA II Technical Workshop on Marine and Coastal Services from 4 to 7 December 2023. The workshop had 34 participants who were not only ET-MS members but also from RA II and RA V Members related to marine services and EW4All activities. At the workshop, the survey results from key activities were shared and the overall enhancement of marine services in the Region was discussed. The EW4All focus countries on Asia and the Pacific (except those without coastlines) were invited to the workshop to discuss possible contributions by the ET to the implementation of EW4All in their countries. Cross-regional cooperation with RA V was also discussed.

A key challenge identified by ET-MS was the lack of focus on the marine domain in many NMHSs. Hence, the ET had placed priority on the enhancement of coastal services, which is also aligned with the Coastal Inundation Forecasting Initiative (CIFI) and EW4All, and on offshore or oceanographic services as a second priority. The capacity development of Members in the marine field is the issue with highest priority and ET-MS is going to support more training opportunities. The work of ET-MS has built on several existing regional frameworks, and thus, enhanced products from regional centres and tighter linkage of regional and national levels were encouraged. The ET will promote marine observation sharing with the RA II WG on Infrastructure’s ET on Ocean Observations (ET-OO) and cross-regional collaboration with RA V. The workshop results including the survey results were summarized in the workshop report and will be reflected in the future workplan of ET-MS, as part of the RA II OP.

Another key challenge identified were difficulties in conducting regional activities such as surveys due to overlaps with global activities of the WMO/the Secretariat, such as the (annual) global data collection from Members for monitoring and evaluating (M&E) progress with the WMO Strategic Plan. Better coordination between the RA, technical commissions, other WMO bodies and the WMO Secretariat is required to reduce such overlaps.

**10. Major Activities of ET-AVI**

Led by Ms Christy LEUNG, the ET-AVI held 10 online meetings during the intersessional period.

ET-AVI worked on the implementation of bilateral or multilateral arrangements for issuance of harmonized Significant Meteorological Information (SIGMET) by MWOs. In the past few years, different regional SIGMET coordination groups had facilitated the coordination between different MWOs along the boundaries of the flight information region (FIR). ET-AVI had performed an extensive survey among RA II Members and a status map on current SIGMET coordination was formulated. Currently, there are 37 operational MWOs undertaking harmonized SIGMET coordination.

ET-AVI also worked on the implementation of a QMS for the provision of aeronautical meteorological services. The ET conducted a regional survey to identify the implementation status of QMS and competency assessment and determine the needs in the region in early 2024. Over 60% of the States/Administrations in the RA II region have responded and over 80% of the responded States/Administrations have implemented or partially implemented a QMS system for aeronautical meteorological service. However, only around 60% of States/Administrations which responded have a competency assessment programme in place. This illustrates the existing gap and further work required to narrow down the gap. The summary report was uploaded onto the WMO website for reference in late 2024.

To address part of the needs identified above, a webinar on QMS implementation, competency assessment and aerodrome nowcasting was organized on 7 May 2024 with the support from RAP Office. Speakers from WMO HQ and SC-AVI was invited to deliver on related WMO frameworks. Insights and experience from different stakeholders on the implementation of QMS and competency assessment, and local aerodrome nowcasting strategies was shared. A total of around 100 participants participated in the webinar.

During the intersessional period, a total of 10 trainings and workshops were conducted for aeronautical meteorological personnel. The trainings and workshops focused on a wide range of topics on aviation meteorology, including aviation hazardous weather, SIGMET Coordination, QMS implementation and service development.

**11. Major Activities of ET-US**

Dr Sachin GHUDE, leader of ET-US, organized two meetings and workshops during the intersessional period.

During the ET-US meeting on 11 November 2022, discussions centred around urban climatic variables, early warning systems (EWSs), and collaboration with existing regional efforts. ET-US reviewed the urban services offered by Members’, identified gaps, and planned follow-up actions to strengthen capacities. Improving urban services in RA II should focus on three key actions:

1. Understanding Member needs through surveys and gap analyses, with a workshop in 2024;
2. Coordinating capacity development for underdeveloped urban services, emphasizing systematic training on urban meteorology;
3. Developing an integrated urban services DP, utilizing existing regional frameworks.

The key activities of ET-US are detailed below:

***(1) Specialized dust EWS tailored for Qatar at the Fédération Internationale de Football Association (FIFA) World Cup***

A specialized dust EWS tailored for Qatar was successfully engineered for the FIFA World Cup in 2022. ET-US members, particularly those based in India, played a key role in supporting the training of the Qatar Civil Aviation Department with the necessary skills and knowledge to operate and sustain the newly implemented long-term dust EWS. The 15-day training endeavour underscored ET-US’ commitment to fostering sustainability and ensuring the effective utilization of the developed system, thereby contributing to the overall resilience of Qatar’s urban services infrastructure.

***(2) Air quality early warning and urban meteorology demonstration project***

An air quality early warning and urban meteorology demonstration project was implemented to enhance urban services in Pune and Bangalore, India. The project was conducted in coordination with the Centre for Development of Advanced Computing (C-DAC) urban National Supercomputing Mission (NSM) project, titled “Urban Modelling: Development of Multi-Sectorial Simulation Lab and Science-based Decision Support Framework to Address Urban Environment Issues”.

***(3) Workshop on Urban Environmental Integrated Science and Stakeholders’ Capacity Building***

ET-US had conducted a Workshop on Urban Environmental Integrated Science and Stakeholders’ Capacity Building from 12 to 14 January 2023 at FLAME University, Pune, India. The Workshop was an integral part of a collaborative NSM Urban Modelling project to exchange the progress, achievements, technical developments, and to deliberate the scientific analysis of the project for communication with stakeholders. Coinciding with the Workshop was a half-day stakeholder meeting and training on High-Performance Computer (HPC)-based model workflows and DSS. The broad themes discussed at the training workshop included scientific achievements, uniqueness and differences in the quasi-operational system, and future pathways.

***(4) Stakeholder Meeting on Environment and Climate Data Infrastructure assessment on 31 October 2023, Pune, India***

A stakeholder meeting, organized by C-DAC and the Indian Institute of Tropical Meteorology (IITM) Pune, was held to assess the environmental and climate data infrastructure needs, challenges and opportunities on 31 October 2023, at C-DAC in Pune, India. An integrated urban environment modelling system and service cyberinfrastructure Urban Environment Science to Service (UES2S) is being developed by a consortium consisting of C-DAC, Indian Institute of Science (IISc), Indian Institute of Technology (IIT) Bhubaneswar, IITM Pune, and the University of Texas Austin, USA. The meeting had three major components, namely:

1. Data as a service (Data-Hub);
2. Modelling platform as a service (Science Gateway);
3. DSS for cross-sector end user decisions. It facilitates the translation of scientific data into multistakeholder interactive services.

The system is being piloted for five cities (viz. Pune, Bangalore, Bhubaneshwar, Delhi and Ahmedabad). During the event, C-DAC and IITM showcased the outcomes of the Urban Integrated Environmental Modelling and Services research and cyberinfrastructure.

***(5) Applications-Oriented School on Weather Research and Forecasting (WRF) Modelling System***

From 21 to 25 August 2023, an Applications-Oriented School on WRF Modelling System was carried out at C-DAC Innovation Park, Pune, India. The training school conceptualizes the application-oriented training on WRF modelling system and capacity building. The school was intended to introduce the participants to the underlying parallel processing concepts, understand scientific configurations, and provide hands-on training on WRF execution on HPC. The school programme was inclusive of the lectures by experts on the WRF modelling system, HPC ecosystem, case studies, and visualization techniques. The programme was conceptualized jointly with the SAMA members.

**12. Major Activities of JET-EOS**

Dr Saviz Sehat KESHANI, Leader of JET-EOS, had conducted three online trainings with members over the intersessional period. She was also an invited panellist for the RA II International Webinar on Sand and Dust Storms (SDS) Monitoring and Forecasting. Dr KESHANI had focused on the development of an Integrated SDS Early Warning and Monitoring System over West Asia. Its long-term goal would be to enhance the ability of West Asian countries to deliver timely and high-quality SDS forecasts, observations, information and knowledge to end-users through an international partnership of research and operational communities. Currently, the developed system provides 72-hour forecasts for 35 countries. The last meeting of the SDS-South Asia node was held in India on 23 and 24 September 2024.

On the activity of conducting a study on the status of SDS EWSs in RA II Members, availability of SDS data in the region, needs (in terms of) SDS intensity, duration and frequency (DF) of WMO and other organizations, and on the requirements and specifications of (web-based) SDS early warning and monitoring for the region, alongside respective capacity development. A lack of focal points within the NMHSs had been a challenge with few responses from Members received. Nevertheless, JET-EOS members recognized the importance of conducting such a comprehensive survey and therefore recommended for this activity to be included in the next intersessional period (2025–2028).

The Global Air Quality Forecasting and Information System (GAFIS) project was proposed and established in 2019 by the WMO Global Atmosphere Watch (GAW) Programme, an emerging WMO Science for Service and Research to Operation initiative, to support the health community, international partners and society, and to improve the air quality forecast and information systems on the global, regional and national scale. The GAFIS Asia Pilot was approved at RA II-17 (Phase II). The GAFIS Steering Committee (under WMO GAW), in collaboration with CMA, had initiated an air quality forecast intercomparison work for the Asia region. Led by CMA, and in collaboration with the European Centre for Medium-range Weater Forecasts (ECMWF), Finish Meteorological Institute (FMI), and the National Centers for Environmental Prediction (NCEP)/USA, Kyushu University of Japan, and the Centre for Climate Research Singapore (CCRS), had gathered information on existing global and regional intercomparison efforts to provide best practices for evaluation, and to enhance the capabilities of air quality forecasting in RA II.

Data, information, knowledge, and application gaps were shared between participants across the research and operational communities. CMA had established a specialized website that depicted PM2.5, O3, and NO2 observation data, forecast results, and verification results. The collaborators had shared archived model data from 1 January 2022 onwards, enabling model data to forecast in near real-time.

On 1 August 2022, a distance learning Workshop on the WMO-CHE was held at the RIMAS of the I.R. of IRIMO, in collaboration with the WMO RTC-Tehran. Of 64 participants, 17 were from Algeria, Indonesia, Nigeria, Qatar, Russian Federation, and Türkiye, while 47 were from the I.R. of Iran.

A “SDS Monitoring and Forecasting Using Innovative Techniques Workshop” was held at RIMAS/IRIMO in collaboration with the RA II WG-S, WMO SDS-WAS, and RTCs Tehran and Ankara, with valuable contributions from the Asian Pacific Centre for the Development of Disaster Information Management (APDIM) of ESCAP. The Workshop was held in Tehran, I.R. of Iran, on 8 and 9 May 2023.

RTC-Tehran and the WMO Education and Training (ETR) Division of the WMO Secretariat provided a training course on Enhancing Climate Services Competencies from 15 to 18 October 2023 at RIMAS/IRIMO. RIMAS/IRIMO also organized a technical meeting on SDS EWS, mobile phone applications, and air pollution to celebrate the International Day of Combating SDS on 12 July 2023.

The last JET-EOS meeting took place on 23 July 2024. It was requested to modify the existing Global Air Quality survey for RA II to specifically address both air quality and SDS. Furthermore, the team recommended to include the improvement of drought observation and services in the RA II OP, in collaboration with the ET on Drought (ET-DRG) under the Standing Committee for Agriculture (SC-AGR) of SERCOM and the RA II ET-AGR, ET-CS, and ET-HS.

The RA II ET on the WMO Integrated Global Observation System (ET-WIGOS) identified SDS as one of five key regional challenges for the RBON design and is currently working to define Application Areas for RBON. This process involves identifying observational requirements. RBON will address data needs from all Application Areas, including SDS. To facilitate more comprehensive RBON coverage, RA II JET-EOS would be best placed to provide detailed information on the observational requirements for RBON in terms of SDS, including elements and frequency required for data exchange.

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## ANNEX III

## Report of the Working Group on Observations, Infrastructure and Information Systems (WG Infrastructure)

Submitted by Chair: Mr SATO Yoshiaki

**1. Introduction**

This report summarizes major activities in association with the (Joint) Expert Teams ((J)ETs) under the RA II Working Group on Working Group on Observation, Infrastructure and Information Systems (WG Infrastructure), viz the ET on Hydrometry (ET-HM), ET on Ocean Observations (ET-OO), ET on Radio Frequency (ET-RF), ET on Regional Instrument Centres (ET-RIC), ET on Regional WMO Integrated Global Observation System (WIGOS) Implementation (ET-WIGOS), ET on Satellite Observations and Applications (ET-SOA), ET on WMO Integrated Processing and Prediction System (ET-WIPPS)[[1]](#footnote-2), ET on WMO Information System (ET-WIS), ET on WMO-IATA Collaborative global Aircraft Meteorological Data Relay (AMDAR) Programme (ET-WICAP), and JET on the Third Pole Regional Climate Centre (JET-TPRCC) since the Seventeenth session of RA II (RA II-17).

**2. Working Group Structure**

The WG is composed of nine ETs: ET-HM, ET-OO, ET-RF, ET-RIC, ET-WIGOS, ET-SOA, ET-WIPPS, ET-WIS, and ET-WICAP. JET-TPRCC has a primary reporting line to the WG Infrastructure, with a secondary reporting line to the WG on Weather, Climate, Hydrological, Marine and Related Environmental Services and Applications (WG Services).

**3. Terms of Reference (ToR)**

Under the guidance of the president of RA II (P/RA II) and the RA II Management Group (MG), and in collaboration with the relevant bodies of the Commission for Observation, Infrastructure and Information Systems (INFCOM), the ToR are given as follows:

(1) Follow-up on the resolutions, decisions and recommendations of the World Meteorological Congress (Cg), Executive Council (EC), RA II and RA II MG, technical commissions, and the Research Board (RB), addressing observation and infrastructure-related matters (Long-Term Goals (LTGs) 2 and 4), for the activities to be undertaken at a regional level;

(2) Identify and regularly monitor critical gaps and needs for improvement in RA II Members’ capabilities, particularly for developing Members, to implement WMO standards and regulations, including the implementation of the regional aspects of the WIGOS, Global Basic Observing Network (GBON), WIS 2.0, and WMO Global Data-processing and Forecasting System (GDPFS) implementation plans, and develop a regional road map and implementation plan to support Members as needed and promote and support capacity development activities (LTG 4);

(3) Draft and update the infrastructure component of the RA II OP, with regards to activities pertaining to Observation, Infrastructure, Information and Data-processing and Forecasting Systems for the approval of the RA II sessions; Establish, with the support of the regional office, the regional infrastructure systems baselines and benchmarks in the RA II Operating Plan (OP) for each RA II Member, brief the progress to the RA II MG on a regular basis, for facilitating the improvements, supports and monitoring progress;

(4) Provide feedback to INFCOM in RA II Members’ requirements and needs on Observation, Infrastructure, and Information Systems including providing inputs to the proposed work plan of the Commission;

(5) Collaborate with RA II Members, INFCOM, and other bodies, as necessary, to support, monitor and regularly review and audit relevant regional centres established by WMO bodies, ensuring that the services and functions being delivered by them continue to respond to the needs of the region and are in compliance with WMO standards and guidelines;

(6) Consult with INFCOM on the identification of common experts to assist with the sharing of regional priorities and requirements and the implementation of technical priorities and associated capacity building activities;

(7) Propose and monitor RA II pilot and demonstration projects, workshops and forums, and share information on these in advance, with the support of Members;

(8) Facilitate the sharing of knowledge, experience and technology among RA II Members;

(9) Submit annual reports to the president of RA II, according to the RA II OP and share the report with Members and the MG of INFCOM.

**4. Membership of key positions**

RA II WG Infrastructure comprises of a Chair and three Vice-chairs. Each ET is led by a leader, who reports the activities of the ET to the Chair. The current membership of key positions in RA II WG Infrastructure is given below:

|  |  |  |  |
| --- | --- | --- | --- |
| **(Joint) Expert Team** | **Name** | **Role** | **Member** |
| ET-HM | Dr ROH Youngsin | Leader of ET-HM | Republic of Korea |
| ET-OO | Ms YU Jianqing | Leader of ET-OO | China |
| ET-RF | Dr Wanchalearm PETSUWAN | Leader of ET-RF | Thailand |
| ET-RIC | Mr Krishnanand HOSALIKAR | Leader of ET-RIC | India |
| ET-WIGOS | Dr SHI Lijuan | Vice-chair of WG Infrastructure, Leader of ET-WIGOS | China |
| ET-SOA | Mr KIM Dohyeong | Leader of ET-SOA | Republic of Korea |
| ET-WIPPS | Mr Ahad VAZIFEH | Vice-chair of WG Infrastructure, Leader of ET-WIPPS | I.R. of Iran |
| ET-WIS | Mr SATO Yoshiaki | Chair of WG Infrastructure, Leader of ET-WIS | Japan |
| ET-WICAP | Mr LEE Yiu-fai | Leader of ET-WICAP | Hong Kong, China |
| JET-TPRCC | Ms MA Lijuan | Leader of JET-TPRCC | China |

**5. Major Activities of ET-HM**

Mr ROH Youngsin, leader of ET-HM, had facilitated progress on three key focus areas for ET-HM with aims to strengthen the capacity of Members related to hydrological surveys.

During the intersessional period, training courses including 15 online contents for hydrological survey was published. Led by Dr Eunjeung SHIM, the training courses provided proper hydrological survey methodologies and standards to produce reliable and high-quality results. To further improve understanding of hydrological surveys, the Korea Institute of Hydrological Survey (KIHS) has developed instructional materials such as video lectures, guidelines documents, and software tools. To facilitate dissemination of the developed content, a “First Workshop for development of rating curves from field measurement to assessment of rating” was held for RA II hydrological experts on 3 July 2024, in Goyang-Si, Republic of Korea.

ET-HM had also developed software tools and methods for measuring discharge including backwater and tidal influence, with global application. Led by Mr ROH, the Discharge Calculation Software (CalPAD) programme enables the calculation of data related to discharge, velocity and uncertainty, given data on water level, water depth and distance. Other software tools, including EDPad and MDCPad, were developed for real-time discharge measurement. EDPad is used to extract raw data from Acoustic Doppler Velocity Meter (ADVM) and is useful for data handling of index velocity measured by ADVM. MCDPad is used to develop index rating for real-time measurement and provides a procedure for developing index rating and discharge calculation.

The ET had also introduced a new technique for measuring sediment load through operational testbeds using Acoustic Doppler Current Profiler (ADCP). Through the development of the technique, nine testbeds were experimented on for various H-ADCP and riverbed characteristics. While preliminary experiments had shown SSC and sediment load can be calculated in real-time using developed relation, further real-time operations at the testbeds have been planned in the next intersessional period to ensure its credibility.

**6. Major Activities of ET-OO**

Ms YU Jianqing, leader of ET-OO, had facilitated the implementation of the implementation project on improving ocean observations. Aside from its related activities, ET-OO had collaborated with ET-WIGOS, ET-WIS, and the Standing Committee on Observing Systems and Monitoring Networks (SC-ON) of INFCOM.

During the intersessional period, ET-OO had conducted a questionnaire on members’ capability and needs for ocean observations. The results had shown a lack of ocean quality infrastructure and quality capacity building, inhibiting the quality of ocean observations.

ET-OO had submitted an ocean best practice on “10 000 rated underwater glider”. Additionally, a 2-day workshop on ocean-gliders, including instrumentation, quality assurance (QA) and quality control (QC) was conducted in October 2023.

To facilitate the quality of different dissolved oxygen sensors, ET-OO had conducted an instrument intercomparison in 2023. Conducted in the lab and/or in-situ, the intercomparison took note of the accuracy, precision, drift and reliability of the instruments. In November 2024, a marine instrumentation workshop for Asia-Pacific Region was held, and 37 participants from 16 countries attended to discuss about:

1. Measurements and Instrumentation of Dissolved Oxygen and pH in seawater;
2. Biogeochemical Instruments/sensors Calibration and Intercomparison.

**7. Major Activities of ET-RF**

Dr Wanchalearm PETSUWAN, leader of ET-RF, led the demonstration project on coordinating radio frequency coordination (RFC).

During the intersessional period, ET-RF had worked closely with ET-RFC on a variety of matters. ET-RF had coordinated with the Expert Team on Radio Frequency Coordination (ET-RFC) of INFCOM to propose the WMO Position to the International Telecommunication Union (ITU) regional meeting (The automatic picture transmission (APT) Conference Preparatory Group for WRC (APG)). The ET had also collaborated with them to reflect regional perspectives to create ToR for national focal points (NFPs) on RF matters and derive questionnaires for NFPs to provide the necessary information for capacity development.

Together with ET-RFC, there was an online meeting/seminar, the meet and greet for NFPs on RF matters (Asia-Pacific Countries) on 20 June 2024. There were about 20 NFPs from the Asia-Pacific Region participated in this meeting/seminar.

For the upcoming related activity of ET-RF, the ET-RFC, in collaboration with ITU, organized a Training Workshop on Radio Frequency Matter for the Asia-Pacific Region in a hybrid format. The workshop was held on 3 and 4 March 2025 in Singapore. The primary audience of the workshop were NFPs from the Asia-Pacific Region.

**8. Major Activities of ET-RIC**

Mr Krishnanand HOSALIKAR, Vice-chair of RA II WG-I and leader of ET-RIC, leads the project on improving services of RICs.

During the intersessional period, ET-RIC had participated and supported the RA II WIGOS Implementation Workshop in November 2023. At the workshop, ET-RIC had recommended India’s proposal to host the third RA II RIC. The proposed third RIC in Pune, India, would mainly support South Asia Members (Bangladesh, Bhutan, Maldives, Myanmar, Nepal, and Sri Lanka) with discussions facilitated during the Twenty-Eighth session of the South Asia Climate Outlook Forum (SASCOF-28) on 29 April 2024.

**9. Major Activities of ET-WIGOS**

Ms SHI Lijuan, Vice-chair of RA II WG-I and leader of ET-WIGOS, held four ET meetings in the intersessional period. Additionally, five coordination meetings were held between Regional WIGOS Centre (RWC)-Beijing and RWC-Tokyo since 1 January 2022.

During the intersessional period, RWC-Beijing and RWC-Tokyo had provided incident management of RA II Members. Since 2021, 78 upper-air observations quality reports, 45 land surface observations quality reports, 39 aircraft observations quality reports and 10 RWC monitoring reports have been issued. Through the Incidents Management System (IMS), 108 incident tickets had been issued by both RWCs, 68 of which have been closed. The data quality of 253 stations across 21 Members in RA II had observed improvement.

RWC-Beijing and RWC-Tokyo had also focused on metadata management of RA II Members. Since 2021, 282 stations with metadata errors were found, of which 72 had been rectified. The RWCs had also assisted with updating of metadata for 14 Members, and the registration of two Members on OSCAR/Surface.

Since 2021, RWC-Beijing and RWC-Tokyo had jointly organized four online international training courses. The courses focused on observation instruments, WIGOS, and related tools of WIGOS such as the Observing Systems Capability Analysis and Review tool (OSCAR), WIGOS Data Quality Monitoring System (WDQMS), and the IMS. The online courses were attended by more than 1 000 participants from all six regional associations. Aside from training courses, both RWCs had provided support at various events, meetings and suggestions for WIGOS-related matters such as the Technical Guidelines for Regional WIGOS Centres on WDQMS.

ET-WIGOS had initiated the Regional Basic Observing Network (RBON) design, having identified key regional challenges of heavy rainfall, tropical cyclones/typhoons, drought, extreme temperature events, and SDS. The key challenges were approved in RA II MG-17. The ET had initiated the implementation of next steps, having consulted experts from INFCOM (John Eyre) on mapping hazards to Application Areas. A road map for the design of RBON, a seven-step process, was drafted and approved. A RBON Implementation Workshop was held from 17 to 20 February 2025 in Hong Kong, China, to further progress on RBON implementation. Currently, the ET is on track with the road map.

ET-WIGOS, particularly core member Mr HAGIYA Satoshi, had facilitated capacity building in regional Radar Techniques through the Guidelines for the Participation in Experimental Regional Radar Composite Data Exchanges in Southeast Asia. The Guidelines were jointly developed by the Meteorology, Climatology, and Geophysical Agency of Indonesia (BMKG), MET Malaysia, Thai Meteorological Department (TMD), and Japan Meteorological Agency (JMA) in 2019. A sample regional map was created offline by JMA, using data shared by participating members.

**10. Major Activities of** **ET-SOA**

Mr KIM Dohyeong, leader of ET-SOA, had held an online meeting with ET members to establish accountability for SOA-related projects in the RA II OP 2021–2024 (i.e. RA II-17-I-IP-6, and RA II-17-I-PP-1).

During the intersessional period, ET-SOA has provided supports and contributions to the yearly AOMSUC alongside a training event for participants, and the annual Joint RA II and RA V Coordination Meeting. Since 2021, the event was chronologically hosted by the China Meteorological Administration (CMA), JMA, and the Korea Meteorological Administration (KMA), respectively.

The eleventh Asia-Oceanic Meteorological Satellite Users’ Conference (AOMSUC-11) was hosted by CMA from 1 to 4 November 2021, the training event from 28 to 29 October 2021 and the RA II and V coordination meeting on 5 November 2021. AOMSUC-12 was hosted by JMA from 15 to 17 November 2022 with a four-day training event and coordination meeting before the conference AOMSUC-13, hosted by KMA, was held from 3 to 10 November 2023. The conference, which was held in Busan, Republic of Korea from 6 to 9 November 2023, was attended by about 170 participants from 25 Members. The Joint RA II and RA V Coordination Meeting was also held in Busan on 10 November, with about 45 participants and 19 Members’ Reports. RA I and RA III/IV Activities were also shared at the meeting. AOMSUC-14 was hosted by the India Meteorological Department (IMD) from 2 to 7 December 2024, alongside the training event and the joint RA II and V coordination meeting.

The annual event has been successful in the provision of updated trainings and lectures on satellite applications for RA II and RA V Members, and fruitful discussions on collaboration opportunities with regional satellite partners.

ET-SOA has also provided support to the fifth session of the WMO Steering Group for the Space-based Weather and Climate Extremes Monitoring in East Asia and Western Pacific (SG SWCEM-EAWP-5) which was held online on 27 and 28 July 2023.

**11. Major Activities of ET-WIPPS**

Mr Ahad VAZIFEH, Vice-chair of RA II WG-I and leader of ET-WIPPS, had held five online meetings during the intersessional period.

Between 2021 to 2024, ET-WIPPS had successfully completed and implemented all related activities, as stated in the RA II OP 2021–2024. This included the questionnaire on Members’ activity on the application of Numerical Weather Prediction (NWP) products in their services, online training workshop for the application of NWP within the WMO Quality Management System (QMS) framework, completion of the rolling review of user needs amongst the NWP user community/National Meteorological and Hydrological Services (NMHSs)/RSMCs, the introduction of best practices on impact-based forecasts, three pilot projects and annual Environmental Emergency Response (EER) exercises amongst the Regional Specialized Meteorological Centres (RSMCs).

Further achievements of pilot projects are detailed below:

***(1) Hangzhou Research Development Project***

On the Hangzhou Research Development Project (HangzhouRDP), CMA had held the Thirteenth International Training Course on the Application of Nowcasting Techniques in Multi-Hazard Early Warning. The course actively contributed to the United Nations EW4All initiative. Meteorological officials and forecasters from 20 countries had attended. Due to the successful turnout, the course could be considered again in the next intersessional period.

***(2) Develop Support for National Meteorological and Hydrological Services in Numerical Weather Prediction***

Supported by KMA, a dedicated website for the global community was built and hosted by RTC-Korea. The website contains OPEN NWP data from 2024, enhancing Members’ capacity in developing relevant NWP models.

***(3) To Sustain and Enhance the Capacity of NMHSs in the Provision of Official Medium-Range Weather Forecasts***

A collaboration between Members Hong Kong, China and the Republic of Korea, the pilot project provided RA II Members access to existing NWP products, real-time and prognostic charts, and software packages for use in NWP models. Training workshops, EPS Guidance and the promotion of real-time access will be enhanced in the next phase.

During the intersessional period, ET-WIPPS has also conducted reviews of Members’ applications for hosting RSMCs and provided recommendations to RA II MG for endorsement. The recommendation to support India in hosting the RSMC for global numerical ocean prediction and numerical ocean wave prediction through INCOIS was endorsed by RA II MG in November 2022.The recommendations to support Japan and China to host Global Producing Centres for Sub-Seasonal Forecasts (GPC-SSF) were endorsed by RA II MG in January 2024.

**12. Major Activities of ET-WIS**

Mr SATO Yoshiaki, Chair of RA II WG-I and leader of ET-WIS, had conducted two ET meetings and had frequent email communications with members during the intersessional period.

During the intersessional period, four RA II Members (China, India, Japan, and Republic of Korea) had participated in the WMO WIS 2.0 pre-operational phase (POP) activities. Additionally, two WIS workshops, hosted by JMA, were conducted in January 2022 and November 2023 for their Area of Responsibility. Workshop materials, which included hands-on material for the WIS2.0 in a Box introduction with support from China, helped Members’ operation of the WIS2.0 in a Box.

ET-WIS had conducted a survey on the implementation of WMO Unified Data Policy. 22 responses were received. Through the survey, the ET would seek to address emerging data issues and the Data Policy implementation.

**13. Major Activities of ET-WICAP**

Dr LEE Yiu-fai, leader of ET-WICAP, had conducted four online meetings. ET-WICAP had additionally held online dialogue sessions with several RA II Members.

During the intersessional period, ET-WICAP members had touched-base with NMHSs in RA II operating Aircraft Meteorological Data Relay (AMDAR) programmes such as India, Saudi Arabia, Japan, Hong Kong, China, and Republic of Korea. A summary report from the dialogue sessions is being prepared. However, due to existing financial frameworks, regional implementation of the WICAP structure was impeded.

Other activities of ET-WICAP included supporting global and regional activities such as the RA II WIGOS Implementation Workshop, the development and testing of Aircraft-based Observations Metadata Repository (ABO-MR), the promotion of the WMO Workshop on Aircraft-based Water Vapour Measurements for Forecasting and Aviation Application.

**14. Major Activities of JET-TPRCC**

Dr MA Lijuan, leader of JET-TPRCC, had facilitated the completion of the TPRCC-Network’s Implementation Plan in early 2022.

Committed to resolving the downstream impact of climate anomalies, since its establishment, activities carried out by JET-TPRCC include:

1. The review and update of metadata for stations that registered cryospheric observations in OSCAR/Surface;
2. A questionnaire on Members’ willingness, requirements and plans for cryospheric observations (in-situ and remote sensing);
3. Training at the regional level for WMO-recommended best practices for the measurement of cryospheric observations and its uses;
4. A workshop on addressing gaps in technical issues;
5. A workshop on the identification of TPRCC-Network’s specific functions, referencing the WIPPS framework;
6. Hosting the Third Pole Climate Forum (TPCF).

Its main achievements included:

1. An agreement on the approach for Long-range Forecasting (LRF) functions;
2. The production of monthly and seasonal products on surface air temperature and precipitation such as the Seasonal Climate Bulletin, available to users;
3. Operational data function for implementation of mandatory TPRCC functions;
4. The operation of a web portal, hosted by China, in the delivery of climate demonstration services.

JET-TPRCC has achieved several milestones in 2024. The mechanism of the TPCF was established as a flagship activity of the TPRCC-Network for communication with regional users. It is planned to be held twice a year, and two sessions have been convened in June and November 2024, during which Consensus Statements on seasonal climate outlook were released. During the inaugural session of the TPCF, the TPRCC-Network commenced its demonstration phase, and a formal letter was sent to all concerned Members by the Secretary-General of WMO to invite broad usage of the products and services delivered by the TPRCC-Network. The third session of the TPCF is to be held in June 2025 in New Delhi, India.

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## ANNEX IV

## Report of the Coordination Panel on Hydrology and Water Resources(CP Hydrology)

Submitted by: Dr CHO Hyo Seob and Dr Sung KIM

**1. Introduction**

This report summarizes major activities in association with the RA II Coordination Panel on Hydrology and Water Resources (CP Hydrology) since the Seventeenth session of Regional Association II (RA II-17).

**2. Terms of Reference (ToR)**

Under the guidance of the president of RA II (P/RA II) and the RA II Management Group (MG), led by the Chair of CP/H and in collaboration with the Working Group on Observation, Infrastructure and Information Systems (WG Infrastructure) and Working Group on Weather, Climate, Hydrological, Marine and Related Environmental Services and Applications (WG Services):

(1) Support the Regional Hydrological Adviser (RHA) in ensuring that the contributions in operational hydrology pertaining to the region’s priorities are coordinated across infrastructure, services and research domains, and are coordinated with weather, climate and other thematic areas; Contribute to the RA II Operating Plan (OP) relevant to the hydrological and water resource matters;

(2) Recommend hydrological-related substructures under the WG Infrastructure and the WG Services according to specific tasks;

(3) Liaise with the Hydrological Coordination Panel (HCP) of the Executive Council (EC), ensuring alignment on behalf of the association;

(4) Service as the organizing committee for the Regional Hydrological Assembly and the Regional Hydrological Advisers’ Forums, as necessary.

**3. Membership of key positions**

| **Name** | **Role** | **Member** |
| --- | --- | --- |
| Dr CHO Hyo Seob | Chair of CP Hydrology | Republic of Korea |
| Dr Sung KIM | Co-chair of CP Hydrology and Regional Hydrological Adviser of RA II | Republic of Korea |
| Dr JANG Cheolhee | Leader | Republic of Korea |
| Dr MIYAMOTO Mamoru | Leader | Japan |
| Dr Hoang Minh NGUYEN | Core member | Viet Nam |
| Ms Tursyn TILLAKARIM | Core member | Kazakhstan |
| Dr Sergey Vasilievich BORSCH | Core member | Russian Federation |
| Dr Hyeonjun KIM | Core member | Republic of Korea |
| Dr Serik SAIROV | Core member | Kazakhstan |

**4. Major Activities of CP Hydrology**

CP Hydrology had convened in-person on three occasions during the intersessional period, with the third face-to-face meeting held on 1 and 2 July 2024 in Goyang-Si, Republic of Korea. CP Hydrology led the Implementation Projects “Promote cooperation in hydrology and water resources among RA II Members and ensure coordination among the hydrology substructures in RA II” and “Improve capabilities on Water Resources Assessment” of the RA II OP during the intersessional period of 2021 to 2024.

Aside, CP Hydrology experts had contributed and supported other meetings such as the Asia-Oceania Geosciences Society Annual Meeting (AOGS) session, Dynamic Water Resources Assessment (DWAT) in Connection with the Global Hydrological Status and Outlook System (HydroSOS) of WMO, from 23 to 28 June 2024 in Gangwon-do, Republic of Korea, and the First Southeast Asia Pilot Hydrological Outlook Forum in Bangkok, Thailand on 29 November 2023.

Key achievements are detailed below:

***(1) Enhancement of Flood Resilience through Platforms on Water Resilience and Disasters***

Led by Dr Mamoru Miyamoto, the Platform on Water Resilience and Disasters has been established in Thailand as a crosscutting and consolidated governance for flood resilience enhancement among relevant stakeholders. A design of the Online Synthesis System for Sustainability and Resilience (OSS-SR) which integrates knowledge, technology, know-how, and experience of different disciplines related to water disasters, a strategic programme for fostering “Facilitators” who are catalytic beings to translate and advise expertized knowledge and information regarding water-related disaster management to various stakeholders, and thematic actions of the Platform were summarized in the implementation plan based on the discussions in the first kick-off meeting and examples in the Philippines.

***(2) Expansion of the Integrated Flood Management (IFM) Helpdesk to include Integrated Water Resources Management (IWRM) with RA II perspective***

Led by Dr Mamoru Miyamoto, inputs from RA II Members on the IFM Helpdesk were summarized and analysed by CP Hydrology. The feedback was reflected onto the concept note of new Helpdesks. Notably, the impact to agricultural productivity, future change adaptation and stakeholder coordination was highlighted as floods, while significant hazards, are integral for rice production in many monsoon countries in RA II but noting the region’s low water resource endowment per capita, would require coordinated decision-making among all related stakeholders to ensure adaptation to future hydrological extremes exemplified by climate and social changes.

***(3) Use of the Associated Programme on Flood Management (APFM) Helpdesk to promote development of extrabudgetary project proposals in RA II***

The APFM is a programme developed to support countries in flood control and management, to reap benefits from floodplains while mitigating flood damages, in partnership with the Global Water Partnership (GWP). CP Hydrology successfully enhanced the understanding of RA II Members about APFM through meetings, workshops and training courses held during the intersessional period, led by Dr Hoang Minh Nguyen. Additionally, CP Hydrology identified potential donors for extrabudgetary project proposals, with the support of WMO, APFM, and the Viet Nam Development Bank.

***(4) Capacity development in hydrology and water resources***

During the intersessional period, CP Hydrology had contributed to capacity development in hydrology and water resources, with a focus on Central Asia region through webinars and trainings, led by Ms Tursyn Tilakarim. A webinar was held in February 2023 for RA II Members in Central Asia to improve understanding of WMO activities. Training in hydrological forecasts and forecasting tools for university at the national level (Kazakhstan) was conducted from 22 to 24 November 2023, and a training on methods of flow forecasting in National Meteorological and Hydrological Services (NMHSs) by using modern forecasting tools (hydrological models) for Central Asia countries was conducted from 22 to 24 May 2024.

In particular, the online training on flow forecasting methods saw the participation of 21 participants from five countries. The training included practical elements, such as the setting up and calibration of the hydrological model. Subsequent consultations with specialists of the NMHSs of Central Asia Members were conducted as a follow-up.

***(5) Support to ongoing extrabudgetary projects in hydrology and water resources***

Support by the CP Hydrology was provided, led by Dr Nguyen Hoang Minh, for ongoing extrabudgetary (XB) projects in hydrology and water resources in RA II through the organization of meetings, workshops and taking recommendations from experts. Of the five ongoing XB projects in RA II, a project supported by CP Hydrology during the intersessional period was the Southeast Asia Flash Flood Guidance System (SeAFFGS). CP Hydrology had collaborated with WMO and the focal points of Cambodia and Lao PDR on training requirements and agenda development. Dr Nguyen had supported the resulting refresher operational training on SeAFFGS as a trainer in October 2023.

***(6) Implementation of Dynamic Water Resources Assessment Tool (DWAT) software***

Led by Dr Cheolhee Jang and Hyeonjun Kim, CP Hydrology had completed the development of the DWAT versions 1.3 and 2.0 in 2022 and 2023 respectively. DWAT had been piloted and successfully implemented in various basins in RA II. Correspondingly, user manuals and video tutorials for the DWAT versions were also provided as guidance materials for Members, and global workshop or a technical session were held annually in utilizing the software.

***(7) Quarterly seasonal hydrological outlook report provided to major water users including efficacy of seasonal outlook***

Led by Dr Sergei Borshch, during realization of project implementation, the status of seasonal and sub-seasonal hydrological forecasting in the Central Asian RA II region on the example of NHSs of the Russian Federation, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan was studied, and the requirements of the main users of this region for hydrological products were determined. As a result of the research, the requirements of various users were established depending on their activities. For each of the activity, the types of hydrological forecasts that must be used for the efficient and safe execution of planned works were determined. The following recommendations were developed for the improvement of sub-seasonal and seasonal forecasting in Central Asia countries:

(a) Most methods used for preparing long-term and medium-term forecasts are based on the use of statistical or physical-statistical methods. In this regard, it is necessary to carry out regular (at least once every five years) update of forecast methods;

(b) It is necessary to automate the process of preparing and issuing forecasts as much as possible, including use modern information technologies (geoinformation systems, the Internet, etc.);

(c) It is necessary to expand and deepen the cooperation of the hydrological community with meteorologists involved in climate modelling, including within the framework of the WMO North Eurasian Climate Centre.

***(8) Hydrological Status and Outlook System (HydroSOS) – Central Asia***

Led by Dr Serik Sairov, HydroSOS implementation of Central Asia NMHSs was conducted and reported during the intersessional period. Seasonal and sub-seasonal hydrological forecasts and prognostic products are beneficial for multiple sectors of the economy. However, RA II Members, particularly in Central Asia, have varying levels of development in the provision of such forecasts. In this regard, the HydroSOS will greatly support Members in issuing seasonal and sub-seasonal hydrological forecasts. The report analysed the methods used in the preparation and issuance of hydrological forecasts and highlighted the lack of information in the zone of river flow formation from neighbouring territories, limiting the use of many forecasting methods. At this stage, work is underway to identify solutions to problems identified and to develop a methodology for hydrological forecasting, particularly for Central Asia Members.

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## ANNEX V

## Report of the Regional Focal Points on Research (RFPs/R)

Submitted by: Dr CHEN Jing

**1. Introduction**

This report summarizes major activities in association with the RA II Regional Focal Points on Research (RFPs/R) since the Seventeenth session of Regional Association II (RA II-17).

**2. Terms of Reference**

The RFPs/R shall preferably be selected from the group of RA II experts appointed to the Research Board (RB) and under the guidance of the president of RA II (P/RA II) and the RA II Management Group (MG), and in collaboration with the Working Group on Observation, Infrastructure and Information Systems (WG Infrastructure), Working Group on Weather, Climate, Water and Related Environmental Services and Applications and the Thematic Coordinator:

(1) Follow-up on the resolutions, decisions and recommendations of the World Meteorological Congress (Cg), the Executive Council (EC), the RA II and RA II MG, addressing research matters (Strategic Goal 3), for the activities to be undertaken at a regional level;

(2) Identify research needs among Members, including the implementation of the regional aspects of the World Weather Research Programme (WWRP), the World Climate Research Programme (WCRP) and the Global Atmospheric Watch(GAW) Programme, and support capacity development activities (Strategic Goal 4), to be included in the RA II OP;

(3) Reach out and promote collaboration with research institutions, academia and other stakeholders to enhance national and regional partnerships for weather, climate, water and environmental related research, on behalf of the association.

**3. Membership of key positions**

|  |  |  |
| --- | --- | --- |
| **Name** | **Role** | **Member** |
| Dr CHEN Jing | Research Framework Programme on WWRP | China |
| Dr Ashis Kumar MITRA | Research FP on WCRP | India |
| Dr Mai Van KHIEM | Research FP on GAW Programme and WWRP | Viet Nam |

**4. Major Activities of RFPs/R**

The RA II RFPs/R led the Research Development Project (RDP) known as the nineteenth Hangzhou Asian Games Research and Development Project on Convective-scale Ensemble Prediction and Application (HangzhouRDP). The project focused on 0 to 36-hour time frame and aimed to enhance understanding and improve forecast accuracy for severe weather events (SWE), particularly rainfall and wind at the local scale. The goal of the RDP was to provide enhanced meteorological services for large-scale sports events like the nineteenth Hangzhou Asian Games. The project was implemented between 2023 to 2024 and led by the Centre for Earth System Modelling and Prediction (CEMC) of the China Meteorological Administration (CMA), and the Zhejiang Provincial Meteorological Bureau, and in collaboration with CMA’s subsidiaries: the National Meteorological Centre, the National Meteorological Information Centre, the Huafeng Meteorological Media Group, and the CMA Training Centre.

Key achievements from the HangzhouRDP are detailed below:

***(1) Enhanced Convective-scale Ensemble Prediction Technologies***

Significant advancements were made in convective-scale ensemble prediction, post-processing and verification methods at sub-kilometre and minute intervals, enhancing the forecasting accuracy of high-impact weather events. Results and processes from the regional project have been shared with other Members.

***(2) Development of Meteorological Service Capabilities for Severe Events***

The project carried out three technical research methods:

1. Multiscale, singular vector perturbation scheme;
2. Stochastic physical propensity perturbation scheme;
3. Set-based data assimilation method.

Two sets of numerical prediction systems were established, including a deterministic prediction model with a horizontal resolution of 1 km, and a convective ensemble prediction system (EPS) with a horizontal resolution of 3 km. The convective-scale ensemble prediction contained 15 members and had a forecast lead time of 84-hours. A demonstration platform for connective-scale ensemble forecasting products was developed.

To facilitate the meteorological support service needs of different competition areas, and outdoor venues for the Hangzhou Asian (and Paralympic) Games, convective-scale ensemble forecasting products were specially curated for the different events.

***(3) Successful Execution of Meteorological Services for the nineteenth Hangzhou Asian Games***

Accurate forecasts were provided for various events during the nineteenth Hangzhou Asian Games and Asian Paralympic Games, including precise precipitation forecasts for the Fire Collecting Activity, the Asian Games opening and closing ceremonies, and the Asian Paralympic Games Torch Relay Ceremony. Additionally, reliable meteorological conditions were predicted for the Asian Paralympic Games opening ceremony, golf and equestrian events when severe convective weather and temperature affected them.

***(4) Contribution to Enhancing Regional Forecasting Capability***

Two training courses on convective-scale ensemble prediction technology were hosted by the project: the Provincial-level training course in September 2023 on the application of numerical forecasting products, and the international training course in April 2024 on the application of nowcasting techniques in multi-hazard early warning. The courses promoted the forecasting capabilities of RA II Members.

***(5) Promotion of Regional and Interregional Meteorological Cooperation***

The project played an important role in international meteorological cooperation through the training of convective-scale ensemble prediction methods and collaboration with the Paris RDP team via workshops for the “Paris 2024 Research and Development Project”. This initiative has contributed significantly to global meteorological advancements and collaboration within the industry and paved the way for other regional research projects.

***(6) Established a Feedback Process between Stakeholders***

An established feedback process is necessary between weather forecasters, decision-makers and data from numerical weather prediction (NWP) products. For the HangzhouRDP, forecasters constructed their forecasts based on the NWP model results and verification of previous forecast. The Chief Service Officer provided suggestions to the Asian Organizing Committee according to the forecast provided and the requirements of the meteorological element indicators of the event. Finally, the Asian Organizing Committee decided accordingly. The sub-organizing committee will provide feedback on the accuracy of the forecast according to the actual situation and the Chief Service Officer will adjust the service strategy according to the feedback received. In a similar manner, the forecaster will provide feedback on the accuracy of the product and other problems to the model developer, for the model developer to adjust the model product. Such a process ensures that the forecasts are always improving and would closely reflect reality.

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## ANNEX VI

## Report of the P/RA II at Technical Coordination Committee (TCC)-2023–1, 17-19 October 2023, Geneva, Switzerland

**1. Asia is a vast, disaster-prone and diverse region.**

The population of Asia is approximately 4.7 million in 2023, based on the latest United Nations estimates. The population is equivalent to 59% of the total world population. **This makes Asia the largest region (population-wise) to be covered by early warnings.**

Asia and the Pacific remains the most disaster-prone region in the world where 2 million people have lost their lives to disasters since 1970. Extreme weather and climate change impacts are increasing in Asia, which ricocheted between droughts and floods in 2022, ruining lives and destroying livelihoods. Melting ice and glaciers and rising sea levels threaten more socio-economic disruption in future.

Asia, the continent with the largest land mass extending to the Arctic, is warming faster than the global average. The warming trend in Asia between 1991–2022 was almost double the warming trend in the 1961–1990 period, according to the WMO State of the Climate in Asia (SoCA) 2022 report.

There were 81 weather, climate and water-related disasters in Asia in 2022, of which over 83% were flood and storm events. More than 5,000 people lost their lives, more than 50 million people were directly affected and there were more than US$ 36 billion in economic damages.

Many countries in this region are home to hundreds of different ethnic groups with their own distinct languages, cultures, and lifestyles. Many of these groups have their own systems of governance, religious belief and practice as well.

**2. EW4All provides an unprecedented opportunity for Asian society to address all four pillars and NMHSs raise their visibility.**

The Regional Conference in RA II (RA II RECO 2023) was held in Abu Dhabi, United Arab Emirates (UAE) from 13 to 16 March 2023. The high-level event on early warnings for all (EW4All) concluded with the endorsement of the Abu Dhabi High-level Statement on “EW4All”. The statement put forward strong recommendations to all WMO Members, to advance the four key multi-hazard early warning systems (MHEWS) pillars on risk knowledge and management; observations and forecasting; dissemination and communication; and preparedness and response, as well as support for key initiatives such as Greenhouse Gas Monitoring and contributing to development of higher-resolution climate modelling.

Highest level of the National Meteorological and Hydrological Services (NMHSs) in the region would be represented by the China Meteorological Administration (CMA), Korea Meteorological Administration (KMA), Islamic Republic of Iran Meteorological Office (IRIMO) and National Centre of Meteorology (NCM) of UAE, where the Heads of the Service are at Vice Minister level, while most of the services are at Director General (DG) or Director level. The United Nations EW4All initiative provides an unprecedented opportunity for Asian Members to address not only the traditional pillar 2, but to connect with all the governmental agencies and public to address all four pillars.

According to the EW4All Executive Action Plan, 42% of Members (Total 34) in RA II provide 24/7 warning services.

The results of a survey revealed that an alternative methodology of measuring the actual population covered by early warning systems (EWS), rather than number of Members providing early warning services is preferred. Applying that methodology would reveal Members such as China covering 97.2% of the population (or approximately 1.3 billion people) with EWS.

**3. Integrate all cross-regional, regional and subregional collaboration mechanisms into RA II Operating Plan, the primary platform in the region.**

The 19th session of the World Meteorological Congress (Cg-19) (held from 22 May to 2 June 2023, in Geneva, Switzerland) in its resolution “United Nations EW4All initiative” requested the regional associations, with the assistance of the Regional Offices, to ensure that focused actions on the implementation of EW4All falling within their terms of references (ToRs) are prioritized in their respective work plans for the next financial period.

RA II Working Group on Observation, Infrastructure and Information Systems (WG Infrastructure) and the RA II Working Group on Weather, Climate, Water and Related Environmental Services and Applications (WG Services), with the support from RA II Coordination Panel on Hydrology and Water Resources (CP Hydrology) and RA II Regional Focal Points on Research (RFPs/R) are to prioritize the activities in the current RA II Operating Plan (OP), to put more emphasis on addressing EW4All, and to identify gaps that could be reflected in the next round of the update.

**It was suggested that the RA II Operating Plan (Implementation Plan) be considered the primary platform for all regional technical agendas within WMO RA II to be carried out under RA II to avoid inconsistency in planning and procedures**. This could include all activities carried out in the EW4All focus countries on Asia, and all extrabudgetary projects carried out in RA II geographically, since most of these projects were not properly discussed under the RA II umbrella.

**4. Continue to strengthen coordination between TCs and RAs, especially at the level of experts and chairs of subsidiary bodies of TCs and RAs.**

Further encourage cross-representation among WMO bodies, e.g. between Technical Commissions (TCs) and RA Working Groups/Expert Teams (WGs/ETs) where possible.

Continue to ensure information sharing and alignment of the needs and priorities in the RA II OP especially on EW4All through the Technical Coordinators in the WMO Regional Office for Asia and the South-West Pacific (RAP). Invitations to meetings of the TCs’ management group are encouraged to be extended to key experts within the region such as the Chairs of the RA WGs. On this note, time difference for online participation and language barriers are still ongoing concerns.

**5. There is a large potential to cooperate with regional partners, especially under the EW4All initiative.**

**The cooperation and collaboration with other United Nations agencies and international institutions has become more necessary than ever to create synergies,** use common know-how and tap on the larger resources of other institutions in the interest of Members.

The seventeenth session of Regional Association II (RA II-17) decided to develop and regularly update a RA II Partnership Strategy (RPS). The RPS aims to improve synergy, coherence and efficiency at national, subregional, regional and interregional levels to enhance political advocacy, and support and engender strategic partnerships for capacity development requirements of RA II Members on weather, climate, water and related environmental services.

The RPS aims to align the activities of WMO and the NMHSs of Members to support the attainment of key political and development agendas. The strategy will be guided by WMO Earth Systems Approach and regional goals under the United Nations Sustainable Development Goals (United Nations SDGs), the Paris Agreement and the Sendai Framework.

A highlight for regional partnerships was the High-Level Regional Forum of the Open Consultative Platform in Regional Associations II and V (RAs II and V), held in Singapore on 18 April 2023. This was held in conjunction with the Asia Climate Forum, a dedicated climate-defence, resilience, adaptation and mitigation focused conference and exhibition, previously known as the InterMet Asia, from 19 to 20 April 2023.

Under the leadership of Dr MOHAPATRA, Chair of the RA II Task Team on Review of the Regional Partnership and Subregional Cooperation (TT-RP), who was recently elected as the Third Vice-President of the WMO, this strategy will soon be updated.

As a joint effort, the SoCA 2022 report, one of a series of WMO regional State of the Climate reports, was released during a meeting of the United Nations ESCAP Committee on Disaster Risk Reduction (DRR) (25 to 27 July 2023, Bangkok, Thailand). It was accompanied by [an interactive story map](https://public.wmo.int/en/our-mandate/climate/wmo-statement-state-of-global-climate/Asia-2022#:~:text=There%20were%2081%20weather%2C%20climate,damages%2C%20according%20to%20the%20report.) with special focus on agriculture and food security. The expected increase in the frequency and severity of extreme events over much of Asia will impact agriculture, which is central to all climate adaptation planning.

**6. WMO Regional Centres could function and collaborate better, to support RA II Members in effective warning services and business continuity planning.**

It was suggested that World Meteorological Centres (WMCs) and Regional Specialized Meteorological Centres (RSMCs) in RA II could play a stronger role supporting Members’ MHEWS by strengthening the interoperability of existing relevant programmes, systems and initiatives, and facilitating collaboration between the Centres in a more coordinated way under the overall guidance of the RA.

It was suggested that a full review of the status of RA II Members, particularly those of developing countries, on their capacity development needs for business continuity and contingency plans be conducted. It would be useful to note the support provided by the Regional Centres concerned, where appropriate, with the purpose of covering emergency situations at a national.

**7. Regional reform should be considered more seriously WMO-wide. The design should be more holistic. The resource invested in RA II is not enough to ensure designed role.**

The technical reform of WMO was a success, although the direction of regional reform remains unclear. **There must be a WMO-wide consensus that regional (association) reform is necessary, fit-to-purpose and resourceful.**

In Convention, the RA is a high-level political body that next to Congress (Cg) and the Executive Council (EC), have the following main functions:

(1) To promote the execution of the resolutions of Cg and the EC in their respective Regions;

 This means the RA should play a role to facilitate the implementation of Cg resolutions at national level, based on resources available for the RA to organize capacity development activities.

(2) To consider matters brought to their attention by the EC;

 This will mainly refer to group needs of the region, but sometimes can be very diverse. It is suggested that the Headquarters of WMO Secretariat share all results obtained from surveys conducted amongst Members and make it available by regions for RA WGs.

(3) To discuss matters of general interest and to coordinate meteorological and related activities in their respective Regions;

 WG level structure is aligned with the global. RA will establish ETs to address region-specific interest.

(4) To make recommendations to Cg and the EC on matters within the purposes of the Organization;

 In the current Cg agenda, there is no slot for RA to make such recommendations into a decision, rather than for information.

(5) To perform such other functions as may be conferred on them by Cg.

This is case-by-case, with resource implications.

**8. The regional office and representative office supporting RA II business need to be strengthened, including structure, staff member and other resources.**

It is highly appreciated that the Secretary-General relocated the RAP to Singapore in 2018, raising the visibility of WMO and RA II in the region and enabling closer cooperation with NMHSs at a national level. It should be noted that the RAP Office supports governance of two regional associations, which effectively doubles the workload in terms of regional sessions, WGs, ET and providing support to two regional presidents and vice-presidents.

However, **long-standing misunderstanding on the role of the RA, regional extrabudgetary projects and Regional Office has caused a lot of confusion.**

One of the major tasks of the regional office is to support RA business. However, according to the General ToRs of RA (Annex II to the General Regulations), **the RA is not only supposed to be supported by the small regional office, but the whole Secretariat.** It is suggested that WMO resources, including staff and budget support to be evaluated and invested into Regional Offices to better support regional associations, as necessary.

**In addition, with the current structure and staff number in the region, it is far below the required level of resources needed to support the two largest, most populated, most disaster-prone and most diverse regions, both at regional level and national level.**

For context, the WMO Secretariat has 3.5 full time equivalent staff located in the RAP Office (Singapore) and Representative Office for Arab Region (Bahrain) focused on RA II business; and 4.5 full time equivalent staff in the RAP Office and Representative Office for the south-west Pacific (Samoa) focused on RA V business. By comparison, RA I (Africa) has nearly 30 staff in the Regional Office for Africa (RAF) Office and the two Representative Offices in Africa. The addition of two new positions for technical coordination on services and infrastructure in 2021 is appreciated but there is a strong case for further strengthening the regional support. In addition to increased capacity in supporting regional governance, RA II and RA V would benefit from WMO Secretariat having additional capability in project management, partnerships and resource mobilization, technical coordination, communication and engagement.

In carrying out the functions specified in Article 18 (d) of the Convention within the allotted geographical areas defined in Annex II of the General Regulations, under the general guidance of Cg and the EC and with support from the Secretariat, each RA, in close coordination and collaboration with other bodies concerned, shall:

(1). Coordinate and organize its Members’ activities related to the planning, implementation and evaluation of agreed programmes, strategies and activities, at the regional and subregional levels;

(2) Ensure that WMO is visible and recognized in its Region, and engage stakeholders in regional initiatives and projects related to the strategic priorities of the Organization; promote visibility and institutional capacity building of its Members, and identify and address critical deficiencies for long-term sustainable modern services through supporting Members in the development of national strategic plans on meteorological and hydrological services; facilitate the exchange of best practices to communicate the socio-economic benefits of meteorological and hydrological services;

(3) Identify requirements and priorities among Members and regional bodies with the support of Regional Offices and communicate them, together with any impediments to the timely implementation of planned programmes, strategies and activities, to the EC, technical commissions and other bodies, as appropriate, as the starting point of the WMO Strategic and Operational Planning Process; collaborate with Members, technical commissions and other bodies, as necessary, to support, monitor and regularly review all the regional centres established by WMO bodies, ensuring excellent performance, sustainable operations and effective services to regional Members; consult with technical commissions, Research Board (RB), and other bodies, as appropriate, on the identification of common experts to assist with the sharing of regional priorities and requirements and the implementation of technical priorities and associated capacity building activities; identify technical gaps and promote training to develop future experts;

(4) Promote cooperation and efficiency by establishing regional networks and facilities based upon identified regional needs, in close coordination with the technical commissions concerned; monitor the performance of regional networks and facilities, and the open sharing of data and technical expertise, and require corrective measures, as necessary;

(5) Contribute to the WMO Strategic Plan, OP and other implementation plans, as necessary, to reflect agreed strategic priorities from a regional perspective and ensure the engagement of Members in focused activities aimed at achieving the expected results of the WMO Strategic Plan;

(6) Structure its work to address regional priorities and make the best use of the expertise of its Members to provide guidance and assistance, in accordance with the needs of the Region;

(7) Build and promote cooperation and partnerships with relevant regional organizations, including the United Nations Regional Economic Commissions, other United Nations bodies, subregional organizations, development partners, non-governmental organizations, professional associations and academic and research organizations;

(8) Advocate, through its president, to regional political and economic entities, and support Permanent Representatives in advocating to their governments, the necessary political and financial support to Members’ capabilities to ensure provision of and access to vital meteorological, climatological, hydrological and other related environmental information and services.

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## ANNEX VII

## RA II Priorities (2025–2027)

| **WMO Strategic Plan 2024-2027** | **RA II Priorities 2025-2027** | **Key Result Areas in the RA II Operating Plan (2025-2027) and related activities** |
| --- | --- | --- |
| *Goal 1: Better serve societal needs: delivering authoritative, accessible, user-oriented and fit-for-purpose information and services* |
| 1.1 Strengthen national multi-hazard early warning/alert systems and extend reach to better enable an effective response to the associated risks | **1** Promote Impact-based Forecast and Warning Services (IBFWS); Strengthen Multi-Hazard Early Warning Services (MHEWS); Promote the Global Multi-Hazard Alert System for Asia (GMAS-A) | **RA II-18-S-IP-1**: Strengthen Multi-Hazard Early Warning/Alert Systems and Services: GMAS-A**RA II-18-S-IP-2**: Enhance IBFWS**RA II-18-J-DP-3**: Improve observations and services for environmental needs, including air quality, and sand and dust storms**RA II-18-S-PP-1**: Serving Members in RA II by promoting the establishment of a Centre of Excellence (CoE) on Urban Multi-hazard Early Warning**RA II-18-S-PP-2**: Pilot heat health warnings in urban areas |
| 1.2 Broaden the provision of policy- and decision-supporting climate information and services | **2** Improve the provision of climate information and services (including on the socio-economic impacts of extreme events) and contribution to the Global Framework for Climate Services (GFCS), including through Regional and National Frameworks for Climate Services (RCFSs/NCFSs); Strengthen the Regional Climate (Outlook) Forums (RC(O)Fs); Develop annual State of the Climate in Asia reports; Improve agricultural meteorological services; Establish more Regional Climate Centres (RCCs) as planned | **RA II-18-S-IP-3**: Climate services delivery of RA II and regional mechanisms improved**RA II-18-S-IP-**4: Improve Agricultural Meteorological Services**RA II-18-J-DP-4**: Improve drought observations and services |
| 1.3 Develop hydrological services for sustainable water management and adaptation | **3** Reinforce Members’ capacities in hydrometry and sediment transport; Improve hydrological services including flood and drought forecasting services; Implement the Global Hydrological Status and Outlook System (HydroSOS) in RA II; Promote the Meteorology, Climate and Hydrology (MCH) database management system; Enhance Member’s capability to forecast flash floods and urban floods/inundation | **RA II-18-S-IP-5**: Promote cooperation in hydrology and water resources among RA II Members and ensure coordination among hydrology substructures in RA II**RA II-18-S-IP-6**: Improve water resources assessment and management, including forecasting and warning (DWAT, HydroSOS, APFM, IDMP)**RA II-18-S-IP-7**: Enhance hydrological services through new technologies (AI, DT, ML, Satellite/remote sensing) and capacity building**RA II-18-S-PP-3**: Pilot flood hazard map |
| 1.4 Enhance the value and innovate in the provision of decision-supporting weather information and services | **4** Increase collaboration with partners and stakeholders in the aviation and marine sectors and improve the provision of meteorological information services by Members for these sectors, conforming to current and foreseen future international requirements | **RA II-18-S-IP-8**: Improve Meteorological Services for Aviation**RA II-18-S-IP-9**: Improve Marine/Coastal Services |
| 1.5 Accelerate the development of integrated systems and services to address global risks associated with irreversible changes in the cryosphere and downstream impacts on water resources and sea level rise | **5** Operationalise the Third Pole Regional Climate Centre (TPRCC) Network; Strengthen observations and services in polar and high mountains areas | **RA II-18-J-DP-2**: Promote polar and high-mountain activities; Address Global and Regional Impacts of Changes in the Cryosphere; and High-level Ambitions on Cryosphere |
| *Goal 2: Enhance Earth system observations and predictions: Strengthening the technical foundation for the future* |
| 2.1 Optimize the acquisition of Earth system observation data through the WMO Integrated Global Observing System (WIGOS) | **6** Strengthen Regional WIGOS Centres (RWCs) and Regional Instrument Centres (RICs); Implement Global Basic Observing Network (GBON) and Regional Basic Observing Network (RBON); Improve satellite observations and utilization including stakeholder specific (event driven) integrated satellite applications; Develop regional Aircraft Meteorological Data Relay (AMDAR) programmes; deliver capacity building in Radar Techniques; Improve ocean observations and data sharing; Promote activities under the Systematic Observations Financing Facility (SOFF) and the WMO Voluntary Cooperation Programme (VCP) to enhance infrastructure capabilities | **RA II-18-I-IP-1**: Enhance the operation of RWCs to support GBON and SOFF implementation**RA II-18-I-IP-2**: Develop RBON in support of the EW4All initiative**RA II-18-I-IP-3**: Strengthen the collection of Aircraft-Based Observation (ABO) data**RA II-18-I-IP-4**: Ensure the traceability of WIGOS measurement**RA II-18-I-IP-5**: Improve Ocean Observations**RA II-18-I-IP-6**: Improve satellite observations and applications**RA II-18-I-DP-1**: Coordination on Radio Frequency (RF) related matters**RA II-18-I-DP-3**: Capacity Building in Radar Techniques**RA II-18-I-DP-4**: High quality calibration of weather radar**RA II-18-I-DP-5**: Reinforcing Members’ capacities in hydrometry, sediment transport and soil moisture |
| 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 (WIS) | **7** Implement WIS2.0; Promote data sharing and implementation of WMO Unified Data Policy | **RA II-18-I-IP-7**: Implement WIS2.0 |
| 2.3 Enable access to and use of numerical analysis and Earth system prediction products at all temporal and spatial scales from the WMO Integrated Processing and Prediction System (WIPPS) | **8** Improve access and use of numerical analysis and prediction products from WIPPS (successor of GDPFS); Strengthen multi-model ensemble prediction and downscaling; undertake a Rolling Review of User Needs; Enhance collaboration among WIPPS centres and National Meteorological and Hydrological Services (NMHSs) | **RA II-18-I-IP-8**: Improve WIPPS products to support the EW4All initiative**RA II-18-I-DP-2**: An emerging and cost-effective technology for upper-air measurements – Round-trip Drifting Sounding System (RDSS) |
| *Goal 3: Advance targeted research: Leveraging leadership in science to improve understanding of the Earth system for enhanced services* |
| 3.1 Advance scientific knowledge of the Earth system | **9** Promote linkages between science and services through research in NMHSs and new partnerships with academia; Improve observations and services for environmental and energy needs, including air quality, and sand and dust storms**10** Embrace the integration of new technologies across the value chain to harness the benefits of Artificial Intelligence (AI) advancements | **RA II-18-R-DP-1**: Promote application of HangzhouRDP outcomes**RA II-18-R-DP-2**: Improve research on weather modification |
| 3.2 Enhance the science-for-service value cycle ensuring scientific and technological advances improve predictive capabilities and analysis |
| 3.3 Advance and contribute to policy-relevant science |
| *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* |
| 4.1 Address the needs of developing countries to enable them to provide and utilize essential weather, climate, hydrological and related environmental services | **11** Develop and deliver trainings to align with and serve all regional priorities; Enhance capacities of regional centres, including RTCs, based on needs of Members; Strengthen cooperation among all WMO centres, including WIPPS centres, observational centres, and RTCs in the region**12** Increase the utilization of social media; Raise awareness of the community including through partnerships between NMHSs and the media; Promote science at regional/national level, including activities during the World Meteorological Day and Long-term observing stations | All training and education activities for RA II MembersMonitor and regularly review all Compliance Reviews of regional centres in accordance with WMO regulationsExtrabudgetary projects implemented in the region**RA II-18-J-DP-1**: Construction of a thematic resource repository for the Centennial Observing Station |
| 4.2 Develop and sustain core competencies and expertise |
| 4.3 Scale up effective partnerships for investment in sustainable and cost-efficient infrastructure and service delivery |
| *Goal 5: Strategic realignment of WMO structure and programmes for effective policy- and decision-making and implementation* |
| 5.1 Optimize WMO constituent body structure for more effective decision-making | **13** Monitor, evaluate and report regional activities; Evaluate and enhance socio-economic value of weather, climate, and water services**14** Strengthen and expand regional partnerships, including with United Nations (UN) entities, technical partners and funding agencies; Promote inter-regional coordination and cooperation; Share good practices of cooperation and collaboration with the private and academic sectors and identify issues for leveraging cooperation and collaboration between sectors | Efficient and effective RA sessionsEnhance engagement with the UN systemEnhance engagement and promote high-level events with regional organizations and development partners**RA II-18-J-DP-5**: Enhance engagement with (sub)regional partners and private sectors |
| 5.2 Nurture WMO strategic partnerships |
| 5.3 Advance equal, effective and inclusive participation in governance, scientific cooperation and decision-making |
| 5.4 Environmental sustainability |

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1. Previously, the Expert Team on Seamless Global Data-processing and Forecasting System (ET-GDPFS) [↑](#footnote-ref-2)