PROGRESS ACTIVITY REPORT OF THE EIGHTEENTH SESSION OF THE REGIONAL ASSOCIATION V (SOUTH-WEST PACIFIC) (RA V-18)

Parts I and II

(unedited and in official WMO languages when available)
INFORMATION ON THE VIRTUAL SESSION AND NAMING CONVENTION

The eighteenth session of the Regional Association V (RA V-18) will be held virtually through Zoom, from 1 to 3 September 2021.

The opening of RA V-18 will take place on 1 September 2021 at 0200 UTC (0400 CEST). Detailed information on the session can be found on the main page of the RA V-18 website.

Virtual session

Information on the online platform used and how to connect to the meeting is available on the “Online session” tab of the RA V-18 website.

Naming convention

WMO Members: Principal Delegate (PD), Alternate (Alt), and Delegate (Del)

- Principal Delegate (Principal): Member name/PD/Surname
- Alternate: Member name/ALT/Surname
- Delegate: Member name/DEL/Surname

President, Vice-Presidents of WMO

- President of WMO: P/WMO
- Vice-Presidents of WMO: 1st VP/ WMO; 2nd VP/WMO; 3rd VP/WMO

Presidents and Vice-presidents of Regional Associations, Regional Hydrological Advisers, Presidents and Vice-presidents of Technical Commissions, Chairs of WMO bodies, and Invited Experts

- Presidents of regional associations: P/RA I (II, ..., VI) for presidents (acting presidents)
- Vice-presidents of regional associations VP/RA (II, ..., VI)
- Regional Hydrological Advisers: HA/RA I (II, ..., VI)
- Presidents of technical commissions: P/INFCOM, P/SERCOM
- Co-Vice-presidents of technical commissions: VP/INFCOM/Surname, VP/SERCOM/Surname
- Chair, body acronym: (C/HCP)
- Invited Experts: Expert/Surname
Representatives of International Organizations/Non-Members

- Organization name/Surname
- Non-Member name/Surname

Secretariat

- Secretariat/Surname

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REPORT BY THE PRESIDENT OF THE ASSOCIATION

1. This report covers the period from the seventeenth session of the Association (October 2018) to August 2021.

Members of the Association

2. The Republic of Nauru became the 193rd Member of WMO on 16 May 2019. Consequently, the number of Members of the Association has grown from 23 to 24.

Officers of the Association

3. Mr 'Ofa Fa'anunu (Tonga) served as president of the Association. Mr Tauala Katea (Tuvalu) served as vice-president of the Association before stepping down from the role in 2020. While an election by correspondence for the role of vice-president was initiated, no nominations were received by the extended deadline of 18 December 2020. As such, with the agreement of the president of the Association, the President of WMO, Prof. Gerhard Adrian, authorized the suspension of the election by correspondence. The role of vice-president has remained vacant since.

Subsidiary bodies of the Association

4. The seventeenth session of the Association re-established the Management Group (MG), the RA V Tropical Cyclone Committee for the South Pacific and South-East Indian Ocean (TCC), and the four working groups: Working Group (WG) on Weather Services (WG-WXS), Working Group on Climate Services (WG-CLS), Working Group on Hydrological Services (WG-HYS), and Working Group on Infrastructure (WG-INFR).

5. Despite the disruptions resulting from the COVID-19 pandemic, the subsidiary bodies of the Association successfully convened on the following occasions during the intersessional period:

   (a) MG meetings:

      • Eighteenth session (RA V MG-18): 2 May 2019, online
      • Joint MG Meeting for Asia and the South-West Pacific: 29–31 October 2019, Singapore
      • Nineteenth session (RA V MG-19): 6 June 2019, Geneva, Switzerland
      • Twentieth session (RA V MG-20): 12 December 2019, online
      • Twenty-first session (RA V MG-21), RA V MG Virtual Discussion Series I: 20 August 2020, online
      • Twenty-second session (RA V MG-22): 29 April 2021, online

   (b) Tropical Cyclone Committee for the South Pacific and South-East Indian Ocean:
• Eighteenth session (RA V TCC-18): 28–31 July 2020, online
• Nineteenth session (RA V TCC-19): 27–29 July 2021, online

(c) Working Group on Hydrological Services:
• First RA V Hydrological Advisers’ Forum: 15 October 2020, online
• Second RA V Hydrological Advisers’ Forum: 18 March 2021, online

(d) Working Group on Infrastructure:
• Meeting of the RA V Task Team on Aircraft-Based Observations and Workshop on the WMO and International Air Transport Association (IATA) collaborative Aircraft Meteorological Data Relay (AMDAR) Programme (WICAP) in RA V: 24–26 September 2019, Singapore
• Joint meeting of the RA V Task Team on Satellite Utilization and the RA II WMO Integrated Global Observing System (WIGOS) Project (held during the tenth Asia-Oceania Meteorological Satellite Users’ Conference): 7 December 2019, Melbourne, Australia

6. Reports detailing the work of the subsidiary bodies are given in Annex I (TCC), Annex II (WG-WXS), Annex III (WG-CLS), Annex IV (WG-HYS) and Annex V (WG-INFR).

Major activities and achievements

7. The twenty-second session of the RA V Management Group (RA V MG-22) noted that the eighteenth session of the World Meteorological Congress (Cg-18) had agreed to proceed onto the next phase of the WMO Reform, with a request for a comprehensive review of the WMO regional concept and approaches to strengthen the role and enhance the effectiveness of regional associations. Recognizing the importance and timeliness of the request, MG strongly supported and approved in principle the establishment of two new Task Teams: (1) Task Team on the Regional Concept (TT-RC) and (2) Task Team on Regional Cooperation, Collaboration and Partnerships (TT-RCCP).

(a) The Task Team on the Regional Concept (TT-RC) was established to develop the new RA V regional working structure, to review the terminology of the RA V subsidiary bodies, and to guide the overall reform of approaches towards RA V business processes considering the broader organizational reform of WMO. The Task Team convened twice on 18 and 25 August 2021 and held productive discussions regarding the new working structure for the Association;

(b) The Task Team on Regional Cooperation, Collaboration and Partnerships (TT-RCCP) was established to analyse, map and review existing intra- and inter-regional partnerships, to study the potential of enhancing existing partnerships and establishing new partnerships, and to develop and regularly update an RA V Partnership Strategy. The Task Team is expected to convene after the current session.

8. Progress was made during the intersessional period regarding the establishment of an RA V Regional WIGOS Centre (RWC). Proposals from Fiji, Indonesia and Singapore to host a sub-regional RWC were endorsed by the president of the Association. It was agreed that responsibilities of the three nodes would be split by geographic criteria, instead of function. That is, each node would be responsible for all RWC functions for their affiliated Members. The nodes are expected to soon embark on the pilot phase, during which they will fulfil all mandatory RWC functions for their home country, as well as for an additional partner Member should they wish to. A training workshop for the three RWC nodes as well as pilot phase partner Members is expected to be held in September 2021. A broader workshop targeted at
National Focal Points on WIGOS, WIGOS Data Quality Monitoring System (WDQMS) and OSCAR/Surface will be held at a later date. It should be noted that the twenty-first session of the RA V Management Group (RA V MG-21) recognized that Australia was still committed to being part of the RA V RWC, and that they would be able to proceed with the necessary steps after the conclusion of the ongoing update of their communications and data processing systems.

9. Discussions on the designation of the Southeast Asia Regional Climate Centre Network (SEA RCC-Network) were conducted on various occasions, including during Regional Climate Outlook Forums (RCOFs), the WMO RA V Southeast Asia Regional Climate Centre Network Meeting held in Bangkok, Thailand, on 15–16 November 2019, and most recently virtually on 4 June 2021. Noting that the SEA RCC-Network had remained in demonstration phase since November 2017 and that a move towards designation was necessary, the Secretariat has made plans for a workshop focusing on preparation for the designation phase to be conducted later this year.

10. The two RCOFs, namely the ASEAN Climate Outlook Forum (ASEANCOF) and the Pacific Islands Climate Outlook Forum (PICOF) continued to convene regularly during the intersessional period, issuing consensus outlooks for the respective regions. The twice-yearly ASEANCOF successfully convened its eleventh to sixteenth sessions, alternating between virtual and physical meetings before converting to a fully virtual format from its fifteenth session in view of the ongoing COVID-19 pandemic. Beginning April 2020, PICOF sessions were held twice a year instead of annually, following a review that found annual sessions insufficient for providing much-needed information on the state of the El Niño Southern Oscillation (ENSO) and climate and ocean outlooks. The biannual sessions would henceforth be held in April and October, coinciding with the South-West Pacific dry season and tropical cyclone season respectively. During the intersessional period, the fourth to eighth sessions of PICOF were successfully conducted.

11. Following the Resolution of RA V-17 on the production of an annual statement on the status of the regional climate in RA V, a draft of the Report on the State of the Climate for the South-West Pacific, led by Dr Blair Trewin (Australia) and supported by inputs from RA V Members and UN organizations has been completed. The report was submitted for final review by the WMO Secretariat in August 2021. RA V Members were also invited to review the draft report and provide feedback as part of the internal review process. The report is expected to be ready for launch in September 2021.

12. The Upper-Air Observatory in Singapore was certified as a Global Climate Observing System (GCOS) Reference Upper-Air Network station (GRUAN) in May 2019, making it the first certified GRUAN site located in the equatorial region. The site now serves as a key station in the tropics to measure essential upper-air climate variables.

13. The Training Course on Aeronautical Meteorology for the National Meteorological and Hydrological Services of the South-West Pacific Island States and Territories was held from 27–31 May 2019 in Singapore. Organized by the Meteorological Service Singapore (MSS), the course developed Members’ capacities to generate operational products necessary to meet the regulatory frameworks of the International Civil Aviation Organization (ICAO) and WMO, including the implementation of competency frameworks for aeronautical meteorological personnel and of quality management systems.

14. The Building Resilience to High-Impact Hydrometeorological Events through Strengthening Multi-Hazard Early Warning Systems (MHEWS) in Pacific Small Island Developing States (SIDS) project, implemented with funds provided to WMO by the Government of Canada as its contribution to the Climate Risk and Early Warning System (CREWS) initiative, continued to support various activities, such as training courses on tropical cyclones and IT services in the region:
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(a) Thirteenth RA V Training Course on Tropical Cyclones: 9–13 September 2019, Nadi, Fiji;

(b) SPREP/WMO/CREWS Pacific SIDS Project funded Regional Training Workshop on IT for Pacific SIDS NMSs: 28 October–1 November 2019, Apia, Samoa;

(c) The sixth meeting of the Regional Sub-programme Management Team (RSMT) of WMO Severe Weather Forecasting programme (SWFP) in South Pacific: 23 July 2020, online;


15. Pacific Small Island Countries and Territories (PICTs) in RA V continued to contribute to the planning and implementation of Pacific Meteorological Council (PMC) activities, including the development of the Pacific Islands Meteorological Strategy 2017–2026 and the Pacific Roadmap for Strengthened Climate Services 2017–2026, ensuring alignment with the WMO Strategic Plan. PICTs also actively participated in events such as meetings of the PMC and its associated Panels.

(a) Fifth Meeting of the Pacific Meteorological Council (PMC-5) and related events: 2–9 August 2019, Apia, Samoa; including Women Leadership Workshop in Meteorology and Hydrology, and Master Class in Communication for Meteorology and Hydrology, 2–3 August 2019;

(b) Pacific Meteorological Council Out-of-Session Meeting: 5 May 2021, online;

(c) PMC Panel Meetings:
   • PMC Panel on Aviation Weather Services (PIAWS): 24 April 2019, 5 September 2019, 24 October 2019, 14 July 2020 and 13 July 2021, online
   • PMC Panel on Climate Services (PICS) Panel: 5 March 2020, 8 July 2020 and 4 March 2021, online
   • PMC Panel on Education, Training, and Research (PIETR): 4 November 2020, online
   • PMC Panel on Marine and Oceans Services (PIMOS): 21 May 2019, 18 July 2019, 3 March 2021, online

(d) A Green Climate Fund (GCF) project funding proposal for “Enhancing Early Warning Systems (EWS) to Build Better Resilience to Hydrometeorological Hazards in Pacific SIDS” for five SIDS Members (Fiji, Papua New Guinea, Solomon Islands, Timor Leste and Vanuatu) is currently under development.

16. The Coastal Inundation Forecasting Demonstration Project – Fiji (CIFP-F), funded by the Government of the Republic of Korea since 2013, was successfully concluded following the Final Stakeholders Meeting held in Nadi, Fiji, on 19–21 November 2019.

17. The Impact-Based Forecast and Warning Services (IBFWS) Regional Workshop for the Pacific SIDS of WMO RA V was held in Honiara, Solomon Islands, on 16–20 September 2019. A delegation from RA V participated in the Symposium on IBFWS held in Exeter, United Kingdom, on 2–4 December 2019.

**WMO Regional Office for Asia and the South-West Pacific**

18. Since its relocation to Singapore in September 2018, the WMO Regional Office for Asia and the South-West Pacific (RAP) has effectively enhanced the capacity of Members by
promoting and coordinating the implementation of high priority WMO programmes and projects. As the interface for WMO's activities in the region, RAP has served as an important link between RA V Members and WMO's regional partners, enhancing collaboration with relevant regional partners and funding agencies. RAP has also effectively supported the president and subsidiary bodies of the Association in discharging their responsibilities.

19. In 2019, RAP organized the Joint MG Meeting for Asia and the South-West Pacific, promoting interregional cooperation between RA II and RA V. RAP also supported the organization of the second Leadership and Management Programme (LAMP) for Senior Management of National Meteorological and Hydrological Services (NMHSs) of RAs II and V from 26 to 30 August 2019, focusing on the capacity development of NMHSs as well as its leaders. The well-received program was sponsored and organized by MSS and the WMO Education and Training Programme (ETRP) and attended by several Heads of NMHSs. The third run of the program was held virtually from 3 to 13 August 2021, having been delayed due to the COVID-19 pandemic. Mr Ben Churchill, Head of RAP, was present at the opening of the well-attended program, which also welcomed senior officials from NMHSs outside of RAs II and V.

20. The RAP was headed by Dr Chung-Kyu Park until his retirement in August 2020. Dr Park is succeeded by Mr Ben Churchill. In June 2021, two new technical coordinators focusing on services and infrastructure respectively were recruited to serve at RAP. The recent expansion increases RAP's headcount to seven staff, including a seconded expert from Meteorological Service Singapore.

21. The Representative Office for the South-West Pacific, located in Apia, Samoa, has continued to successfully facilitate the implementation of WMO regional events, working closely with Members in the South-West Pacific to provide support and assistance. In June 2019, a new associate project officer joined the Office to support the implementation of projects in the South-West Pacific.

Missions of the president

22. In his capacity as the president of RA V, Mr 'Ofa Fa’anunu attended the eighteenth session of the World Meteorology Congress (Geneva, 2019), as well as the sessions of the Executive Council (Geneva, 2019; online, 2020, 2021), the Financial Advisory Committee and the WMO Bureau. He was also present at the Meetings of Presidents of Regional Associations and the Joint Meetings of the Presidents of Regional Associations and Presidents of Technical Commissions. The president also presided over MG meetings and Regional Forums.

Membership in Technical Commissions

23. Twelve Members out of 24 joined the Commission for Observation, Infrastructure and Information Systems (INFCOM) and SERCOM. 186 experts from 8 Members were registered on the Expert Network. Detailed analyses are available at this site and also accessible through the relevant tab on the session website (https://meetings.wmo.int/RA-V-18/).

Acknowledgements

24. The president of the Association would like to express his appreciation and gratitude to all who have contributed to the work of the Association. Special thanks are due to the leads and vice-leads of the RA V Working Groups, as well as to the Chair and Vice-Chair of TCC and the Regional Hydrological Adviser. Thanks are due to the Members of the Association as well, who have hosted and actively participated in various meetings and training events during the intersessional period.
25. The president would also like to deeply thank the Secretary-General of WMO and the Secretariat, in particular the Regional Office for Asia and the South-West Pacific, for the valuable support they have accorded to him, as well as for all the advice provided.
1. **Introduction**

TCC was established in 1985 to ensure the provision of quality and well-integrated warning services for tropical cyclones across the RA V region south of the equator, to ensure the safety of people and property both on land and across the oceans.

Since RA V-17 in October 2018, the TCC met on its previous bi-annual schedule in July 2020, but via a much-shortened videoconference due to the impact of the COVID-19 pandemic. The move to an online meeting presented an opportunity to meet annually (thus achieving the desire of Members expressed in previous TCC sessions) and the TCC met again via videoconference with a slightly longer session in July 2021.

2. **TCC Structure and Membership**

The TCC is composed of one Chair (Mr Chris Noble, New Zealand), a Vice-Chair (Mr Moleni Tu’uholoaki, Tonga), and nominated experts from the 20 Members of RA V within the TCC’s area of responsibility. Additionally, WMO non-member Pacific island countries and territories are invited to participate as observers, the Chair of the RA I TCC (Mr Emmanuel Cloppet, La Réunion) is invited to serve as an ex-officio member, and other experts (such as from international or regional organizations and agencies) are also invited to participate as necessary.

3. **Terms of Reference**

The Terms of Reference for the TCC were established under Resolution 15 (RA V-17) and are available for reference in the RA V Abridged Final Report of the Seventeenth Session (https://library.wmo.int/doc_num.php?explnum_id=5693). A draft Resolution to re-establish the TCC with updated Terms of Reference has been prepared and submitted for consideration at RA V-18.

4. **Task Teams**

Following the Joint MG meeting in Singapore in October 2019, the RA V WG Leads and TCC Chair, considering regional priorities from the last RA Session in 2018, proposed a new Task Team Structure for RA V which was endorsed by the MG meeting in December 2019. With regard to Task Teams under the TCC, the Chair proposed the TCC should stand alone without a sub-structure until the needs and work of the Committee could be discussed further, with a view to establishing time-bound Task Teams as deemed necessary but not as a matter of course noting the previous Task Teams were effectively dormant while the focus of their Terms of References (TORs) and work was actioned elsewhere.

5. **Activities**

5.1 **TCC Sessions**

The 18th session of the TCC was held online (for the first time in response to the COVID-19 pandemic) on 28, 29 and 31 July 2020 from 0100–0300 UTC each day on the Microsoft Teams platform. Due to a much-shortened session, presentations from Members were restricted to those impacted by Severe Tropical Cyclone (TC) Harold, along with operational updates from warning centres, while all Members were encouraged to submit written updates for inclusion in
the session report. Additionally, the Operational Plan was successfully updated (but without the selection of new cyclone names) and Members received limited scientific and programmatic updates.

During TCC-18, the Committee welcomed Nauru as its newest and 20th member, following the Republic of Nauru joining the WMO as its 193rd Member in May 2019. The TCC also thanked the outgoing Chair, Mr Mike Bergin (Australia), who stepped down as Chair of the Committee for 12 years and retired after a long and distinguished career with the Bureau of Meteorology.

Key issues discussed included: improving communication between the Regional Specialized Meteorological Centre (RSMC) Nadi and Members to exchange information, the need for feedback on RSMC Nadi’s Storm Surge Model and spot forecast locations for Members, provision of message templates and communication tests for backup arrangements, inclusion of cyclone name pronunciations in the Tropical Cyclone Operation Plan (TCOP), the need for a training plan for TC forecast competencies and the challenges of the current COVID-19 situation.

The 19th session of the TCC was also held online, but with a slightly longer session of 0030–0330 UTC on 27, 28, 29 July 2021 on the Zoom platform. With more time allocated to the session, every Member was given the opportunity to present their successes, challenges and impacts felt during recent cyclone seasons. The Operational Plan was successfully reviewed and updated with replacement cyclone names also selected. Additionally, warning centres provided updates and scientific and programmatic topics were also presented.

During TCC-19, the Committee noted the former director of the Fiji Meteorological Service, Mr Misa Funaki, had left Fiji and was now working for the WMO Secretariat in the Marine Services Division. The Committee expressed its thanks to Misa for his years of service to FMS/RSMC Nadi and for his dedication to the region and wished him well in his new role.

Key issues discussed included: differences in cyclone analysis and improved coordination/communication with RSMC Nadi, the challenges of handling multiple systems, shifting to IBFWS that are also accessible and inclusive of all user’s needs, promotion of the single authoritative voice and official information, training needs, the status of the various TC Seasonal Outlooks produced, and the ongoing challenges due to COVID-19 including resourcing, restrictions and budget constraints.

5.2 TCOP Review

The TCOP, its review and ongoing refinement, is arguably the most important responsibility of the Committee. At the request of the Committee and under arrangement with the WMO Secretariat, Mr Mike Bergin conducted a full review of the TCOP during 2019 involving a small reference group (comprising Ofa Fa’anunu as president of RA V, Chris Noble as TCC Chair, Moleni Tu’uholoaki as TCC Vice-Chair, Amit Singh from RSMC Nadi and David Grant from the Tropical Cyclone Warning Centers (TCWC) Brisbane) and including other Members as needed. The fully reviewed TCOP was shared with Members ahead of TCC-18 where it was ratified by the Committee.

5.3 Events

Events attended by the Chair, as representative of the Committee, have included:

- 7th Regional Conference on Management of NMHSs (RECO-7) in RA V, Nuku’alofa, Tonga, 12–13 Oct 2018
- 9th Tropical Cyclone RSMCs and TCWCs Technical Coordination Meeting (TCM-9), Hawaii, USA, 9–12 Dec 2018
- RA II and RA V Joint MG Meeting for Asia and the South-West Pacific, Singapore, 29–31 Oct 2019
5.4 Capacity Development and Training

A range of tropical cyclone related capacity development and training activities have taken place since RA V-17, promoted to, and attended by Members. These have included:

- 9th Session of the International Workshop on Tropical Cyclones (IWTC-9), Hawaii, USA, 3–7 Dec 2018
- 13th RA V Training Course on Tropical Cyclones, Nadi, Fiji, 9–13 Sep 2019
- TC Module training session for users in the region, facilitated by Joe Courtney (Bureau of Meteorology), online, 12 Jan 2021
- WMO Tropical Cyclone Probabilistic Forecast Products (TC-PFP) Workshop, held online under the World Weather Research Programme (WWRP) activity area, 15/17/18 Jun 2021
- Numerous Regional Focus Group meetings provided through the Australian Virtual Laboratory (VLAB) Centre of Excellence. An archive of past meetings and recordings is available at: http://www.virtuallab.bom.gov.au/archive/regional-focus-group-recordings/
  - Detecting and forecasting Tropical Cyclone Rapid Intensification, Joe Courtney (Bureau of Meteorology), 2 Oct 2018
  - Satellite measurement of surface winds for Tropical Cyclones: Current and emerging imagers, Joe Courtney (Bureau of Meteorology), 19 Feb 2019
  - High Resolution Himawari-8 Target Area Observation case study of Tropical Cyclone Veronica, Mr Bodo Zeschke (Bureau of Meteorology), 28 May 2019
  - A case study of Typhoon / Tropical Storm Krosa, including the High Resolution Himawari-8 Target Area Observations of the mesovortices within the centre of the system, Mr Bodo Zeschke (Bureau of Meteorology), 29 Aug 2019
  - Some forecasting highlights from Tropical Cyclone Damien, Joe Courtney (Bureau of Meteorology), 26 Feb 2020
  - Tropical Cyclone Harold: Intensity and structural variations using microwave and scatterometry, Joe Courtney (Bureau of Meteorology), 29 Apr 2020
  - Satellite analysis for Tropical Cyclone over KMA, Mr Jun Park (KMA), 13 Aug 2020
  - 2020/21 Tropical Cyclone pre-season update, Joe Courtney (Bureau of Meteorology), 9 Dec 2020
  - The Australian season of non-developers? A review of recent tropical lows: 08, 10, 11 and 12U, Joe Courtney (Bureau of Meteorology), 16 Feb 2021
Overview of the Atypical Rapid Intensification Process of Tropical Cyclones, Dr David Ryglicki (Marine Meteorology Division, Naval Research Laboratory, California), 7 May 2021

- Courses run through the Pacific International Training Desk in Hawaii, with website at: http://pacificdesk.org/

Additional online presentations have included:

- Tropical Cyclones and Climate Change: Implications for Australia and the South Pacific, Dr Hamish Ramsay (CSIRO), 23 Feb 2021
- July 2021 Long-Range Outlook for the 2021/22 Southwest Pacific Tropical Cyclone Season, Dr Andrew Magee (University of Newcastle), 23 July 2021. See the TCO-SP website for more details including the full outlook: https://tcoutlook.com/

Upcoming events:

- The next WMO RA V Training Course on Tropical Cyclones is being planned as an online event from 12–15 Oct 2021
- The Third International Workshop for the Satellite Analysis of Tropical Cyclones (IWSATC-III) is scheduled as an online event from 7–10 Dec 2021

5.5 SWFP-South Pacific

SWFP for the South Pacific had its inception in 2009 as the Severe Weather Forecasting and Disaster Risk Reduction Demonstration Project (SWFDDP) following the 15th session of Congress in 2007. The subproject entered its full demonstration phase in 2010 with the participation of nine SIDS in the South Pacific, focusing mainly on heavy rain, strong winds, damaging waves and tropical cyclone development. The “Cascading Forecasting Process”, designed to provide severe weather advice to the last mile, is enabled via contributions from global and regional centres, with RSMC Wellington acting as lead regional centre and host of the project website (MetConnect Pacific).

Management oversight is provided by a Regional Subproject Management Team (RSMT) which is composed of designated representatives of participating NMHSs, contributing global and regional centres, and is chaired by Mr James Lunny (New Zealand). The RSMT has historically met alongside the TCC and reported activities and recommendations to the Committee.

The 6th meeting of the RSMT was held on 23 July 2020 and discussed: Resolution 15 (Cg-18) ‘Strengthening multi-hazard early warning services in areas prone to all flooding types and severe weather’, recommendations from the previous RSMT meeting (Noumea, New Caledonia, July 2018), relevant recommendations from the last meeting of the Severe Weather Forecasting Programme (SWFDP) Steering Group (Pretoria, South Africa, October 2019), SWFP Feedback/Reporting mechanism(s), and reviewing and updating the Regional Sub-programme Implementation Plan (RSIP).

Key recommendations included: SWFDDP becomes SWFP-South Pacific in accordance with Resolution 15 (Cg-18), efforts continue to transition into full operations including identification of a suitable regional entity to undertake management responsibilities and secure funding, participating NMHSs continue to strive to meet project criteria as established in Nadi in August 2013, reporting activities and feedback to global and regional centres remains important and should continue, and training should be planned and executed.

At TCC-19, the RSMT Chair advised the Committee that funding provided by Environment and Climate Change Canada though the CREWS initiative was used to develop and deliver online training and to upgrade the SWFP website. The online training was delivered by NZ MetService trainers to the 10 participating SIDS (Solomon Islands, Vanuatu, Fiji, Samoa, Kiribati, Tuvalu,
Tonga, Niue, Cook Islands and Nauru) using techniques developed through the WMO 2020 Online Course of Education and Training Innovations. Training took place from 18–22 May 2021 for those east of the dateline and from 24–28 May for those to the west. Completion of the SWFP website upgrade is expected in the second half of 2021.

6. Tropical Cyclone Season Summaries

In the 2018/19 season, a total of 15 tropical cyclones were named in the combined Australian and South Pacific basins; 8 named by Australia, 5 by Fiji and 2 by Indonesia. Unusually, the season began with the very early formation of TC Liu in late September, well before the official start of the season on 1 November. The season also lasted beyond the official end on 30 April with TCs Lili and Ann forming in May. Of the 15 named cyclones, 8 were severe (cat 3+) and 1 reached category 5 (TC Veronica, off the northwest coast of Australia). While Veronica weakened before landfall, its impacts included flooding, and economic losses (largely associated with mining disruptions) were estimated at about AU$ 1.7 billion.

In the 2019/20 season, a total of 14 tropical cyclones were named in the combined Australian and South Pacific basins; 7 named by Australia, 6 by Fiji and 1 by Indonesia. Notably, activity was late to start in the Australian region where the first cyclone (TC Blake) forming in January, the second latest start on record behind the 1986/87 season. Activity also continued beyond the end of the season with TC Mangga named by TCWC Jakarta in May. Of the 14 named cyclones, 6 were severe (cat 3+) and 1 reached category 5 (TC Harold, to the east of Australia). Harold proved to be a devastating end to the season in the South Pacific, being named by TCWC Brisbane near the Solomon Islands where tragically 27 lives were lost overboard from a ferry. Harold then underwent rapid intensification as it approached Vanuatu, achieving category 5 intensity prior to landfall where another 2 lives were lost. Following its peak intensity as it crossed Vanuatu, Harold went on to impact Fiji as a category 4 system, where another fatality occurred, and then impacted Tonga as a category 5 system. Combined, damages from Harold have been estimated in excess of US$ 123 million.

In the 2020/21 season, a total of 12 tropical cyclones were named in the combined Australian and South Pacific basins; 7 by Australia, 4 by Fiji and 1 by Indonesia. Unusually, TC Yasa was the earliest category 5 cyclone in a season in the South Pacific and was the 4th most intense cyclone on record in the South Pacific. Of the 12 named cyclones, 5 were severe (cat 3+) and 2 reached category 5 (TC Yasa and TC Niran, both occurring east of Australia). Tragically, Severe Tropical Cyclone Seroja (named by TCWC Jakarta) resulted in an estimated 272 fatalities (most in Indonesia and East Timor from flooding and landslides, with one in Australia), while fatalities also occurred from cyclones Yasa (4), Ana (1) and Lucas (2). Cyclones were also costly this season, with damages for Seroja estimated at more than US$ 490 million, and for Yasa and Niran in excess of US$ 200 million each.
1. Introduction

At the 17th Session of Regional Association V (RA V-17, Tonga, October 2018), the WG-WXS did not propose any updates to the existing Task Team (TT) structure nor related work plans in anticipation of the larger WMO reorganization under formulation and not yet approved at the time. A significant outcome of RA V-18 was the development and subsequent approval of 12 regional priorities to drive activities over the coming inter-session period. At the joint RA II/V MG Meeting (Singapore, October 2019), following conclusion of Cg-18 and EC-71 (June 2019), the 12 regional priorities were mapped to the RA V Management and Working Groups. Three priorities, describing aviation weather services, marine weather services, and multi-hazard early warning services (MHEWS), were assigned to WG-WXS. The WGs and TCC were tasked with reviewing their respective composition and structure, taking into account the new WMO reorganization and subsidiary body structure, and propose any updates.

The WG-WXS proposed an updated TT structure to reflect three priority themes of aviation weather, marine weather, and MHEWS. In addition, the Coastal Inundation and Storm Surge and SWFP – South Pacific were realigned from the TCC to the WG-WXS. This reorganization was presented and approved by MG at a meeting conducted virtually in April 2021.

The global COVID-19 pandemic contributed to a dramatic decrease in aviation and maritime activity across the region. Restricted or closed borders and quarantine requirements all but eliminated the possibility of in-person workshops and training in 2020 and 2021.

2. Working Group Structure

The restructured WG-WXS will be composed of one lead, one vice-lead, Task Team on Aeronautical Meteorology (TT-AM), Task Team on Marine Meteorology (TT-MM), and Task Team on Multi-Hazard Early Warning Systems (TT-MHEWS). The new TT-MM will incorporate the Coastal Inundation including Storm Surge (CISS) team and the TT-MHEWS will incorporate the SWFP-South Pacific team, both formerly associated with the TCC.

Based on resolutions from Cg-18 and EC-72 calling for alignment of regional bodies to the new Commission structure, the WG-WXS is mapped to the Services Commission as follows:

<table>
<thead>
<tr>
<th>RA V WG-WXS</th>
<th>WMO Services Commission Standing Committees (SC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TT-AM</td>
<td>SC on Services for Aviation</td>
</tr>
<tr>
<td>TT-MM</td>
<td>SC on Services for Marine Meteorological and Oceanographic Services</td>
</tr>
<tr>
<td>TT-MHEWS</td>
<td>SC on Services for Disaster Risk Reduction and Public Services</td>
</tr>
</tbody>
</table>
3. Terms of Reference

3.1. Task Team on Aeronautical Meteorology (TT-AM)

(i) To strengthen the provision of aeronautical meteorological services amongst Members through, inter alia, facilitating the uptake of modern technologies and addressing deficiencies in service provision;

(ii) To coordinate with relevant bodies of WMO Technical Commissions in monitoring global developments in the provision of aeronautical meteorological services and update Members of significant trends through suitable platforms such as regional meetings and workshops;

(iii) To develop and provide Members with guidance on cost recovery mechanisms as they relate to the provision of aeronautical meteorological services;

(iv) To identify regional ICAO activities and training opportunities to strengthen the engagement of Members with stakeholders in the aviation community at the national and regional levels;

(v) To support Members’ implementation and maintenance of quality management systems (QMS) based on the updated ISO 9001:2015 standards, through education and training programmes that may include a regional workshop;

(vi) To promote activities enabling Members to acquire the qualifications and competencies required for effective aeronautical meteorological service provision, and the implementation of a sustainable competency assessment framework.

3.2. Task Team on Marine Meteorology (TT-MM)

(i) To strengthen the provision of marine meteorological services amongst Members through, inter alia, facilitating the uptake of modern technologies and application of quality management principles in service delivery;

(ii) To identify critical gaps in marine data coverage and address these gaps through the integrated design of observing networks;

(iii) To promote the development of coastal inundation and storm surge projects in the RA V Region, such as the Coastal Inundation Forecasting Project (CIFP);

(iv) To enable the development of new operational capacity, specialized training, effective outreach and mitigation, by leveraging existing efforts under the WMO RA V working structure, such as the joint WMO Tropical Cyclone and Marine Meteorology and Oceanography Training Workshops, and output from the CIFP capacity development activities, and relevant bodies of WMO Technical Commissions.

3.3. Task Team on Multi-Hazard Early Warning Systems (TT-MHEWS)

(i) To enhance Members’ capabilities in impact- and risk-based forecast and warning products and services to enable better preparedness and response to hydrological and meteorological events, through appropriate education and training programmes and coordination with relevant bodies of WMO Technical Commissions;

(ii) To strengthen national capacity in multi-hazard early warnings including in reaching the last mile;

(iii) To strengthen partnerships with key national stakeholders in the disaster risk management community to increase reach to community level;
(iv) To mobilize strategic resources involving development partners and national
governments and assisting NMHSs to develop long-term strategies and operational
plans to address the identified capacity needs;
(v) To establish strategic, functional and mutually beneficial development partnerships
and alliances with the key global, regional and national entities in the UN,
intergovernmental and non-governmental organizations, the private sector, and
academia;
(vi) To encourage the prioritization of activities to improve early warning for severe
weather in the least developed countries and SIDS of RA V.

4. Membership

Mr Raymond Tanabe served as the WG-WXS lead. Dr Landrico Ureta Dalida Jr. (Philippines)
and Mr Grahame Reader (Australia) served as the co vice-leads. A request for nominations for
the new Task Teams was distributed in June 2021 and nominations were received from
Malaysia, the Philippines, and USA. Additional nominations from RA V Members are welcome.

5. Supporting Activities and Events

<table>
<thead>
<tr>
<th>Date</th>
<th>Activity/Event</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>12–13 October 2018</td>
<td>7th Regional Conference on Management of NMHSs (RECO-7)</td>
<td>Nuku’alofa, Tonga</td>
</tr>
<tr>
<td>15 April 2019 – 10 May 2019</td>
<td>PITD Guam Cohort #2</td>
<td>Guam</td>
</tr>
<tr>
<td>24 April 2019</td>
<td>PMC PIAWS Panel meeting</td>
<td>Virtual</td>
</tr>
<tr>
<td>1–26 April 2019</td>
<td>PITD Hawaii Cohort #1</td>
<td>Honolulu, Hawaii</td>
</tr>
<tr>
<td>10 May 2019 – 14 June 2019</td>
<td>PITD Guam Cohort #3</td>
<td>Guam</td>
</tr>
<tr>
<td>11 May 2019 – 5 April 2019</td>
<td>PITD Guam Cohort #1</td>
<td>Guam</td>
</tr>
<tr>
<td>20 May 2019 – 14 June 2019</td>
<td>PITD Hawaii Cohort #2</td>
<td>Honolulu, Hawaii</td>
</tr>
<tr>
<td>21 May 2019</td>
<td>PMC PIMOS Panel meeting</td>
<td>Virtual</td>
</tr>
<tr>
<td>14 June 2019 – 19 July 2019</td>
<td>PITD Guam Cohort #4</td>
<td>Guam</td>
</tr>
<tr>
<td>18 July 2019</td>
<td>PMC PIMOS Panel meeting</td>
<td>Virtual</td>
</tr>
<tr>
<td>15–26 July 2019</td>
<td>PITD Hawaii Cohort #3 (in-country)</td>
<td>Pago Pago, American Samoa</td>
</tr>
<tr>
<td>3 August 2019</td>
<td>CREWS Pacific SITD project Steering Committee meeting</td>
<td>Apia, Samoa</td>
</tr>
<tr>
<td>5–9 August 2019</td>
<td>PMC-5</td>
<td>Apia, Samoa</td>
</tr>
</tbody>
</table>
6. Ongoing Major Activities of Relevance to the Region

- CREWS Pacific 2.0
- COSPPac2
- GCF – Enhancing Climate Information and Knowledge Services for resilience in 5 island countries of the Pacific Ocean
- Weather Ready Pacific Decadal Programme of Investment
- Weather Ready Nations
- Pacific International Training Desk (virtual instruction and webinars)
- Update to WMO Publication #1150 in final review

7. Postponed Major Activities

South-West Pacific Conference of Meteorology for Aviation

Resolution 4 (RA V-17) requested the Secretary-General to organize a regional conference on the future of aeronautical meteorological service provision. A concept note, South-West Conference on Meteorology for Aviation, was developed in 2019 with a target date in the second quarter of 2020. The COVID-19 pandemic prevented this conference from occurring and a decision was made not to conduct this conference virtually.
1. Regional Climate Centres in RA V

Discussions on the designation of the Southeast Asia Regional Climate Centre Network (SEA RCC-Network) were conducted on various occasions, including during RCOFs, the WMO RA V Southeast Asia Regional Climate Centre Network Meeting held in Bangkok, Thailand, on 15–16 November 2019, and most recently virtually on 4 June 2021. Noting that the SEA RCC-Network had remained in demonstration phase since November 2017 and that a move towards designation was necessary, the Secretariat has made plans for a workshop focusing on preparations for the designation phase to be conducted this year.

<table>
<thead>
<tr>
<th>Node Title</th>
<th>Lead Agency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Node on Long-Range Forecasting</td>
<td>MSS (Singapore)</td>
</tr>
<tr>
<td>Node on Climate Monitoring</td>
<td>PAGASA (Philippines)</td>
</tr>
<tr>
<td>Node of Operational Data Services</td>
<td>BMKG (Indonesia)</td>
</tr>
<tr>
<td>Training</td>
<td>MSS, PAGASA, BMKG</td>
</tr>
</tbody>
</table>

The RA V Pacific Regional Climate Centre (RCC) Network is currently in the demonstration phase and consists of five nodes (Long-Range Forecasting, Climate Monitoring, Climate Change Projections, Operational Data Services and Training) led or co-led by a lead institution(s) together with a consortium of support members. Discussions on the formal designation of the Network were also conducted on many occasions, such as the Pacific Islands Climate Outlook Forum (PICOF).

<table>
<thead>
<tr>
<th>Node Title</th>
<th>Lead Agency/Co-Lead</th>
<th>Consortium Members</th>
</tr>
</thead>
<tbody>
<tr>
<td>Node on Long-Range Forecasting</td>
<td>NIWA (New Zealand) &amp; BoM (Australia)</td>
<td>Meteo-France, NOAA, University of Hawaii, APCC, SPREP &amp; SPC</td>
</tr>
<tr>
<td>Node on Climate Monitoring</td>
<td>NOAA &amp; University of Hawaii (United States of America)</td>
<td>BoM, SPC, SPREP &amp; NIWA</td>
</tr>
<tr>
<td>Node on Climate Change Projections</td>
<td>CSIRO (Australia)</td>
<td>USGCRP, BoM &amp; SPREP</td>
</tr>
<tr>
<td>Node of Operational Data Services</td>
<td>BoM (Australia)</td>
<td>NOAA, University of Hawaii, SPC &amp; NIWA</td>
</tr>
<tr>
<td>Training Function</td>
<td>SPREP</td>
<td>NOAA, University of PNG, BoM, NIWA, SPC &amp; CSIRO</td>
</tr>
</tbody>
</table>

2. RCOF in RA V

The two RCOFs, namely the ASEAN Climate Outlook Forum (ASEANCOF) and the Pacific Islands Climate Outlook Forum (PICOF) continued to convene regularly during the intersessional period, issuing consensus outlooks for the respective regions. The twice-yearly ASEANCOF successfully convened its eleventh to sixteenth sessions, alternating between virtual and
physical meetings before converting to a fully virtual format from its fifteenth session in view of the ongoing COVID-19 pandemic. The list of sessions is provided below.

<table>
<thead>
<tr>
<th>Session</th>
<th>Dates</th>
<th>Venue/Format</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASEANCOF-11</td>
<td>29 October–2 November 2018</td>
<td>Kuala Lumpur, Malaysia</td>
</tr>
<tr>
<td>ASEANCOF-12</td>
<td>May 2019</td>
<td>Online correspondence</td>
</tr>
<tr>
<td>ASEANCOF-13</td>
<td>18–19 November 2019</td>
<td>Bangkok, Thailand</td>
</tr>
<tr>
<td>ASEANCOF-14</td>
<td>May 2020</td>
<td>Online correspondence</td>
</tr>
<tr>
<td>ASEANCOF-15</td>
<td>23–27 November 2020</td>
<td>Online</td>
</tr>
<tr>
<td>ASEANCOF-16</td>
<td>20–24 May 2021</td>
<td>Online</td>
</tr>
</tbody>
</table>

Beginning April 2020, PICOF sessions were held twice a year instead of annually, following a review that found annual sessions insufficient for providing much-needed information on the state of the El Niño Southern Oscillation (ENSO) and climate and ocean outlooks. The biannual sessions would henceforth be held in April and October, coinciding with the South-West Pacific dry season and tropical cyclone season respectively. During the intersessional period, the fourth to eighth sessions of PICOF were successfully conducted. The list of sessions is provided below.

<table>
<thead>
<tr>
<th>Session</th>
<th>Dates</th>
<th>Venue</th>
</tr>
</thead>
<tbody>
<tr>
<td>PICOF-5</td>
<td>17–18 October 2019</td>
<td>Noumea, New Caledonia</td>
</tr>
<tr>
<td>PICOF-6</td>
<td>21 April 2020</td>
<td>Online</td>
</tr>
<tr>
<td>PICOF-7</td>
<td>22–23 October 2020</td>
<td>Online</td>
</tr>
<tr>
<td>PICOF-8</td>
<td>21 April 2021</td>
<td>Online</td>
</tr>
</tbody>
</table>

3. Report on the State of the Climate for the South-West Pacific

Following the Resolution of RA V-17 on the production of an annual statement on the status of regional climate in RA V, a draft of the Report on the State of the Climate for the South-West Pacific, led by Dr Blair Trewin (Australia) and supported by inputs from RA V Members and UN organizations has been completed. The report was submitted for final review by the WMO Secretariat in August 2021. RA V Members were also invited to review the draft report and provide feedback as part of the internal review process. The report is expected to be ready for launch in early-September 2021.

4. PMC Panel on Climate Services (PICS)

The purpose of the PMC Panel on Climate Services (PICS) is to provide technical advice to the PMC on matters related to the implementation of the Global Framework for Climate Services (GFCS) and the strengthening and coordinating of climate services at the community, national and regional levels. PICS conducted regular online meetings during this intersessional period (5 March 2020, 8 July 2020 and 4 March 2021) to discuss seasonal outlooks in the Pacific. PICS decided to produce a Pacific Change Monitor. A Steering Committee was established to oversee the planning, preparation, and drafting on this document. The Committee has had meetings on 28 October 2020, 25 November 2020, and 27 January 2021.
5. ASEAN Regional Climate Data, Analysis and Projections (ARCDAP)

The ARCDAP workshop series was conceived in 2017 following a proposal from the WMO RA V Working Group on Climate Services to consolidate the various national and regional level climate projection studies that had been conducted in ASEAN and to work towards formulating a set of best practices in generating climate change scenarios.

During this intersessional period, two workshops were successfully held. Both were hosted by the ASEAN Specialized Meteorological Centre (ASMC), organized by the Centre for Climate Research Singapore (CCRS) in collaboration with WMO, and co-sponsored by the Meteorological Service Singapore (MSS) and Environment and Climate Change Canada through the Climate Risk and Early Warning Systems Initiative (Canada-CREWS). ARCDAP-2 was held from 25 to 29 March 2019 in Singapore and ARCDAP-3 was held virtually from 15 to 18 March 2021. ARCDAP-3 had originally been scheduled to take place physically from 17 to 21 February 2020 in Singapore but was postponed due to the emerging COVID-19 pandemic.

6. Membership

<table>
<thead>
<tr>
<th>Task Team on Climate Services Information System (TT-CSIS)</th>
<th>Name</th>
<th>Member</th>
</tr>
</thead>
<tbody>
<tr>
<td>TT Leader</td>
<td>Mr John Marra</td>
<td>Unites States of America</td>
</tr>
<tr>
<td>Member</td>
<td>Mr Divesh Anuj</td>
<td>Fiji</td>
</tr>
<tr>
<td>Member</td>
<td>Mr Indra Gustari</td>
<td>Indonesia</td>
</tr>
<tr>
<td>Member</td>
<td>Mr Adi Ripaldi</td>
<td>Indonesia</td>
</tr>
<tr>
<td>Member</td>
<td>Mr John Powell</td>
<td>New Zealand</td>
</tr>
<tr>
<td>Member</td>
<td>Ms Ana Liza Solis</td>
<td>Philippines</td>
</tr>
<tr>
<td>Member</td>
<td>Mr Raizan Rahmat</td>
<td>Singapore</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Task Team on Climate Data Management/Data Rescue (TT-CDM)</th>
<th>Name</th>
<th>Member</th>
</tr>
</thead>
<tbody>
<tr>
<td>TT Leader</td>
<td>Mr Urip Haryoko</td>
<td>Indonesia</td>
</tr>
<tr>
<td>Member</td>
<td>Ms Varanisese Vimusumusu Vuniyayawa</td>
<td>Fiji</td>
</tr>
<tr>
<td>Member</td>
<td>Ms Tri Nurmayati</td>
<td>Indonesia</td>
</tr>
<tr>
<td>Member</td>
<td>Ms Fariza Yunus</td>
<td>Malaysia</td>
</tr>
<tr>
<td>Member</td>
<td>Ms Valerie Deschamps</td>
<td>New Caledonia</td>
</tr>
<tr>
<td>Member</td>
<td>Ms Rosalina De Guzman</td>
<td>Philippines</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Task Team on Climate Change (TT-CC)</th>
<th>Name</th>
<th>Member</th>
</tr>
</thead>
<tbody>
<tr>
<td>TT Leader</td>
<td>Mr Yuriy Koleshov</td>
<td>Australia</td>
</tr>
<tr>
<td>Member</td>
<td>Mr Bipendra Prakash</td>
<td>Fiji</td>
</tr>
<tr>
<td>Member</td>
<td>Ms Victoire Laurent</td>
<td>French Polynesia</td>
</tr>
<tr>
<td>Member</td>
<td>Mr Supari</td>
<td>Indonesia</td>
</tr>
<tr>
<td>Member</td>
<td>Ms Sheila Dwi Ayu Kusumaningtyas</td>
<td>Indonesia</td>
</tr>
</tbody>
</table>
7. Terms of Reference

7.1 Working Group on Climate Services

(i) To coordinate observational aspects of climate services including through liaison with the Global Framework for Climate Services, GCOS and the Global Ocean Observing System;

(ii) To provide advice on methods to strengthen and improve climate system monitoring, analyses and indices;

(iii) To keep abreast of the activities of the World Climate Services Programme, Commission for Climatology, the World Climate Research Programme and its core research projects, Global Framework for Climate Services, the Intergovernmental Panel on Climate Change, the United Nations Framework Convention on Climate Change and other climate-related bodies, to report results of meetings and workshops, and to encourage strong regional involvement in these bodies;

(iv) To provide advice on and assist in the implementation of various climate information and prediction services in RA V in climate-sensitive sectors such as agriculture, water, renewable energy, urban and building planning, disaster risk reduction, air quality and health;

(v) To examine, coordinate, report on and encourage the use of Geographical Information Systems in the provision of climate services;

(vi) To provide advice on, assist in identifying and coordinate attendance at climate-related education and training courses/workshops, including information technology and management courses, based on a survey of the training requirements in the Region;

(vii) To provide further advice and proposals on the role, structure and mechanism of the Regional Climate Centres (RCCs) in the region, and assist in seeking their WMO designation processes;

(viii) To provide advice and proposals on other important climate-related issues as they develop and evolve;

7.2 Task Team on Climate Services Information System (TT-CSIS)

(i) To provide advice on and assist in the implementation of various climate information and prediction services in RA V, in the various climate-sensitive sectors, including through Regional and National Climate Outlook Forums and RCCs;

(ii) To provide advice on, assist in identifying and coordinate attendance at climate-related education and training courses/workshops, including information technology and management, based upon a survey of the training requirements in the Region;
(iii) To provide further advice and proposals on the role, structure and mechanism of the RCCs in the region including their designation process;
(iv) To review and provide advice/guidance on the use of statistical and dynamic climate modeling and downscaling to produce usable regional and national climate forecasts and products;
(v) To provide advice and proposals on other important climate-related issues as they develop and evolve;
(vi) To provide advice on examples of User Interface for the provision of climate data, product and services;
(vii) To encourage the collaboration of RA V countries to enhance technical capacities in seasonal prediction;
(viii) To provide advice to the WG-CLS on the above issues;

Within these Terms of Reference, the TT will seek to collaborate and align with regional meteorological communications work done in other relevant forums having a common objective.

### 7.3 Task Team on Climate Data Management/Data Rescue (TT-CDM)

(i) To provide advice on methods and mechanisms, including through the International Data Rescue Portal (I-DARE) and other means in the region to identify the needs in data rescue and related technologies for project design and implementation;
(ii) To ensure technological watch on the development of new climate data bases and provide advice on their management systems that can be made available to the NMHSs for their modern archiving of climate data and generating data products and services, based on WMO Climate Data Management specifications and guidelines;
(iii) To assess the existing methodologies for quality control and homogenization of climate data and provide advice on their suitability for their use in developing high quality climate datasets;
(iv) To investigate existing best practices and tools for generating climate monitoring products and provide recommendations on their implementation at national and regional level;

Within these Terms of Reference, the TT will seek to collaborate and align with regional meteorological communications work done in other relevant forums having a common objective.

### 7.4 Task Team on Climate Change (TT-CC)

(i) To keep abreast of the activities of CCl, IPCC, the United Nations Framework Convention on Climate Change (UNFCCC) and other climate-related bodies, report results of meetings and workshops, and encourage strong regional involvement in these bodies;
(ii) To provide advice on methods of dynamical and statistical downscaling techniques for climate change projection;
(iii) To provide advice on the potential impacts of climate change in various economic sectors;
(iv) To provide advice to the WG-CLS on the above issues;
Within these Terms of Reference, the TT will seek to collaborate and align with regional meteorological communications work done in other relevant forums having a common objective.

7.5 Task Team on User Tools and Methodology for Operational Agrometeorology (TT-UTMOA)

(i) To analyse and evaluate the use of crop simulation models in the NMHSs and institutions in RA V and suggest the procedures to implement them;

(ii) To review the studies on agro climatic and agro ecological zonation that make use of GIS and Agro meteorological Information Systems in RA V and determine the best procedures for their implementation throughout the Region;

(iii) To evaluate and propose appropriate methodologies for the application of remote sensing in agriculture in the Region;

(iv) To review and evaluate the operational use of seasonal to inter-annual climate forecasts sustainable agriculture in South West Pacific and make recommendations to improve the presentation of the forecasts for the users;

(v) To review reports of climate change scenarios for RA V and catalogue the various agricultural impacts associated with such scenarios;

(vi) To investigate the drought indices that are commonly used in RA V to evaluate the relation between these indices and the spatial impacts in the agricultural activity;

(vii) Enhancement of the communication channels for the improved dissemination of agricultural meteorological information;

(viii) To evaluate the different ways of diffusion of agro meteorological information for the different users, obtain feedback from the users and to propose appropriate mechanisms to improve it;

(ix) To liaise with the relevant Commission for Agricultural Meteorology (CAgM) Expert Teams and TTs as appropriate;

Within these Terms of Reference, the TT will seek to collaborate and align with regional meteorological communications work done in other relevant forums having a common objective.
1. **Introduction**

The Working Group structure was revised following RA V-16 (Tonga, 2018). Since then it was not possible to convene a physical meeting, and virtual meetings have been associated with the Hydrological Adviser fora, as noted below.

2. **Working Group Structure**

The Working Group is composed of one lead, one vice-lead, a Task Team on Operations and Infrastructure (TT-OI) and a Task Team on Hydrology Applications and Services (TT-HAS). Each TT consists of one leader and several experts. The membership is listed below.

3. **Activities of the Working Group**

(i) Two fora for RA V Hydrological Advisers have been held, the first in December 2020 and the second in March 2021, with assistance from the Secretariat. In addition to the Hydrological Advisers, Permanent Representatives and other experts in the region were also invited as observers. Unfortunately, attendance from Hydrological Advisers was relatively low. Further regular fora are planned (the next probably being an information session on the Water and Climate Coalition).

(ii) Information topics covered at the two fora included the WMO reform, data policy, HydroSOS, HydroHub Phase 2, APFM Helpdesk, MCH software, and the Flood Forecasting Guidance System (FFGS).

(iii) The concept note for a Pacific-HYCOS Phase 2 proposal was reviewed and updated by the Secretariat and has been used as the basis for an Adaptation Fund pre-concept proposal for strengthening flash flood forecasting and related systems in relevant Pacific Island countries. This proposal is currently still being drafted. A wider-ranging project HYCOS-type proposal is also being considered.

(iv) Hydrological experts from the region have contributed to the Standing Committees and Joint Expert Teams of both Technical Commissions, as well as participated in the sessions.

(v) Experts have also been involved with the HydroHub Innovation Committee and it is notable that recent Innovation Calls have resulted in new technologies that are likely to have application in the Region, for measuring water levels at difficult sites and measuring flash flood flows.

(vi) The Hydrological Status and Outlook System (HydroSOS) is a WMO global project that will enable countries to share near real-time hydrological data and receive hydrological outlook products that are informed from global weather forecast models. It will enable and assist Members to upgrade their hydrological information products. Experts have been involved in the development of the pilot proposals and system components.

(vii) Experts have been involved with the Coastal Inundation and Forecasting Project in Fiji and subsequently the commissioning of the Flash Flood Guidance System (FFGS) in Nadi.

(viii) A distance learning course, specifically designed for the training needs of Pacific Island hydrology field technicians, was compiled jointly by COMET, the Secretariat and NIWA. The 10-week course, first run in 2017, was subsequently adapted and run for several African countries and is planned for re-run in the
Region.

(ix) Together with the HydroHub, work began on the compilation of an on-line training and troubleshooting course for ADCPs both for this Region and a group of African countries. Covid-19 issues have postponed progress on this.

(x) Experts have continued membership of, and attendance at, groups including the Hydrological Coordination Panel (HCP), the HCP Project Advisory Group, HydroHub Innovation Committee, the JET-HYDMON of INFCOM, the Standing Committee on Hydrology (SC-HYD) of SERCOM and its task teams, and others.

4. Challenges

(i) There remain 7 countries (as of March 2021) that have not appointed a Hydrological Adviser. Although there have been 28 and 19 participants respectively in the two Hydrological Advisers Fora, only 6 and 4 Hydrological Advisers (respectively) participated.

(ii) It has been noted that all of the 9 RA V hydrological experts contributing to WMO Constituent Bodies come from only 3 out of the 22 Member countries.

(iii) There remain challenges in being able to push the regional needs upward in the WMO structure. We need to use the reform to assist with this, as well as the recommendation (below) for more WG-HYS involvement of the regional hydrological experts.

(iv) For many National Hydrological Services, major weaknesses continue to be in the areas of poor data quality and continuity, data processing backlogs, fragmented database management, outmoded data policies and, commonly, a lack of usable flood flow measurements.

5. Recommendations for the Regional structure and governance

(i) The WMO reform has implied that the regional structure should follow the wider WMO structure. However, with low participation by Hydrological Advisers in the region, it is strongly suggested that we keep our structure simple and continue with a WG-HYS.

(ii) It is also suggested that the Hydrological Assembly concept of having such a session concurrent with Regional Sessions be adopted (as for Congress and as likely to be adopted in the other 5 Regions). The WG-HYS would be responsible for convening this.

(iii) It makes sense that hydrological experts in the Region who are involved in Commission activities be encouraged to work and communicate with the WG-HYS and through this group to the HAs and the RA V MG. Therefore, it is recommended that the WG-HYS involve them, as relevant, in each Hydrological Advisers Forum, Hydrological Assembly and Management Group Activity reports, with the goal of driving Regional needs upward to the Constituent Bodies (mainly the Commissions).

6. Looking forward

(i) A key task for the Working Group will be the development of a Hydrological Action Plan as a contribution to the Regional Operating Plan.

(ii) A task within this will be a regional implementation plan for HydroSOS.

(iii) Work will continue on capacity building activities in hydrology and water resources of relevance to the less advanced NMHSs of the region.

7. Membership
<table>
<thead>
<tr>
<th>Task Team</th>
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<tr>
<td><strong>Lead</strong></td>
<td>Mr John Fenwick</td>
<td>New Zealand</td>
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<td><strong>Vice-lead</strong></td>
<td>Mr Roy Badilla</td>
<td>Philippines</td>
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<td><strong>Task Team on Operations and Infrastructure (TT-OI)</strong></td>
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<tr>
<td>TT Leader</td>
<td>Mr Evan Baddock</td>
<td>New Zealand</td>
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<tr>
<td>Member</td>
<td>Mr Viliame Vereivalu</td>
<td>Fiji</td>
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<td><strong>Task Team on Hydrology Applications and Services (TT-HAS)</strong></td>
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<td>TT Leader</td>
<td>Mr Urooj Khan</td>
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<td>Member</td>
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ANNEX V

Report of the Working Group on Infrastructure (WG-INFR)
Submitted by Lead: Karl Monnik (Australia), unedited

1. Introduction

The purpose of the Working Group Infrastructure in Region V is to contribute to the improvement of infrastructure (observations data and information services) for weather, climate and water in Region V through implementation of WIGOS and WMO Information System (WIS).

WG-INFR was re-established via Resolution 19 (RA V-17) (WMO No.-1226).

From a meteorological observations’ perspective, WMO Region V is a highly challenging monitoring environment:

- 23 countries
- Small land mass compared to ocean area
- Significant weather challenges including cyclones/typhoons, thunderstorms, monsoonal rain, drought, fires & smoke/smog
- Lack of reliable data communications
- Difficult access to power

Figure 1. WMO Region V, South West Pacific
2. **Highlights of the 2018–2021 session**

- WG-Infrastructure chose to focus on the establishment of a RWC as the primary focus for RA V. Excellent progress was made with three countries submitting nominations to participate in a virtual centre.
- Fiji, Indonesia, and Singapore have submitted their proposals to host RWCs and President of RA-V has endorsed their applications. Australia has expressed its desire to contribute once its IT system upgrades are complete.
- WG-INFR together with RA-V RAP have arranged several meetings to progress the planning for the RWC. The first virtual training session is scheduled for late September which is an important milestone.

3. **Summary of the 2018–2021 session**

At RA-V-17 in October 2018, the following Resolution was recorded:

- Decides to endorse the intention of Australia and Singapore to establish a virtual RWC in pilot mode through a collaborative effort, with potential contributions offered also by Fiji and Indonesia.
- Requests its MG to support the establishment of this RWC.
- Urges Australia and Singapore to proceed with developing and submitting their proposal to the president of RA V to establish an RWC in pilot mode, per the technical guidelines; Urges Indonesia and Fiji to articulate their specific intended contributions to the RWC and to joining the RWC pilot as and when appropriate.

In January 2020 interested Members were asked to submit their proposals to contribute to a virtual RWC at their earliest convenience but no later than the end of February 2020.

In October 2020 Lead of RA V WG on Infrastructure chaired a virtual meeting with the participation of:

- Project managers and technical experts from Fiji, Indonesia and Singapore
- WMO Secretariat (RAP and WIGOS Branch)
- WG-INFR

Fiji, Indonesia and Singapore briefed the meeting of their current status and future plans. The preparation of a “Concept of Operations” for further review and discussion was planned for a follow-up meeting.

Bases on outcomes from a Workshop and other meetings involving Fiji, Indonesia, Singapore, the Chair of WG-INFR RA V and WMO Secretariat (RAP Office and WIGOS Branch) agreed that:

- The responsibilities of the RWC nodes will be split based on geographic criteria, i.e. RA V Members to be covered. It was agreed to start an initial pilot phase operation whereby each RWC takes care of network stations in their own country plus those stations from one partner Member*, which are being identified.
- Training on RWCs functions and tool for RA V will be organized online in two parts, Part I, as an initial training for RWCs and WIGOS related National Focal Points from partner Members* that will be involved at the initial pilot phase operations. This training is scheduled for September 2021 after WMO RA V – 18 session. Part II will be organized as a Workshop targeted to National Focal Points (NFPs) on WIGOS, NFPs on WDQMS and NFPs on OSCAR/Surface from all RA V Members.

The monitoring, evaluation and incident management functions that will be performed by the virtual RWC will increased the visibility of member commitments to the Regional Basic Synoptic Network (RBSN) and the Global Basic Observing Network (GBON) for the benefit of all.
Members. It is expected to lead to better support for restoring missed observations and addressing quality issues.

Finally, it is expected to provide important information to support the ability to benefit from the Systematic Observations Financing Facility (SOFF) in R-V.

The oversight of the RWC is planned as follows (Figure 2).

![Figure 2: Proposed oversight of the RA-V virtual RWC](image)

4. **Working Group Structure**

The Working Group is composed of a lead, a vice-lead, and two Task Teams and two sub-teams; a Task Team on WIGOS; Task Team on Regional WIGOS Centre (TT-RWC); and two sub-teams on Sub Team on Aircraft-based Observations (ST-ABO) and Sub Team on Satellite Utilization (ST-SU); a Task Team on Regional Implementation and Operation of WIS (TT-WIS).

Team activity was limited due to a number of issues, partly due to the uncertainty concerning the restructure of the WMO. There was no opportunity for teams to meet face-to-face which is often an important impetus to kick-start working relationships.

During 2019 Mr Kumar took responsibility for the WG while the lead was on long-service leave.

5. **Membership**

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<tr>
<th>Task Team on Regional WIGOS Centre (TT-RWC)</th>
<th>TT Leader</th>
<th>Member</th>
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<td></td>
<td>Mr Kevin Alder</td>
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<td>Member</td>
<td>Mr Karl Monnik</td>
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<td>Member</td>
<td>Mr Adarsh Kumar</td>
<td>Fiji</td>
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<td>Mr Adarsh Kumar</td>
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6. Terms of Reference

(i) To monitor, promote and develop strategies for the regional development and sustainable implementation of the WIS, including the steps described in the WIS Implementation Plan for RA V (South-West Pacific); a high priority remains overcoming the persistent shortcomings of the Regional Meteorological Telecommunication Network for time-critical and operation-critical data exchange; avenues include Pacific-wide satellite communications, collaboration in the development and support of the RA dio and InterNET (RANET) communication system, reception of the Emergency Managers Weather Information Network, and improved access to Internet services;

(ii) To monitor, promote and develop integrated strategies for the regional development and sustainable implementation of the observing systems of WMO Programmes and co-sponsored Programmes, in particular through the WIGOS Implementation Plan for RA V (South-West Pacific); specific areas of focus are tabulated in that Plan;

(iii) To review and propose updates for the WIGOS Implementation Plan;

(iv) To identify means for strengthening liaison with bodies involved in the development and implementation of relevant observing and information systems;

(v) To identify education and training requirements for relevant information and communication techniques and observing systems and operations;

(vi) To provide input for WMO regulatory material related to observations and information systems;

(vii) To coordinate Task Teams to complete specific tasks and submit proposals to the RA V MG for winding up completed teams and starting new teams;

(viii) To report to and advise the president and MG of the Association on the above issues.
Summary of the 2018-2021 session

An RA V WICAP Workshop (WMO-IATA Collaborative AMDAR Program) and Sub-Team on Aircraft-based Observations (ST-ABO) Meeting was held in Singapore on 24-26 September 2019.

The Workshop attendees included:
- ST-ABO Members (Australia, Fiji, Malaysia)
- RA V Members with established Aircraft Observations Programmes (Singapore, New Zealand, USA)
- RA V Members seeking to establish Aircraft Observations Programmes/Understand the benefits (Philippines, Papua New Guinea)
- Commercial Representatives involved in the provision of Aircraft Observations (IATA, Flyht, Collins Aerospace)
- WMO Representatives

The Workshop provided a broad introduction to WMO WIGOS, AMDAR and WICAP activities, as well as the (potential) benefits of improved Aircraft Observations coverage in RA V.

Immediately following the Workshop, the ST-ABO met (with all the RA V Members present for the Workshop participating). This meeting allowed the group to discuss the next steps for Aircraft Observations in RA V.

From March 2020, COVID impacted many of the key airlines in RA V, which has made progressing Aircraft Observations in the Region difficult. Conditions are expected to improve in the next RA V Session.

Terms of Reference for the ST-ABO

The terms of reference of the Sub-Team on Aircraft Based Observations, Region V South West Pacific are as follows:

(a) To coordinate activities and oversight the operation of the RA V AMDAR Programme under the WMO-IATA Collaborative AMDAR Programme. In particular, consolidate and maintain annually, 1) regional requirements for AMDAR data provision, and 2) regional developmental and operational plans for the Region V AMDAR Programme, to be resourced by RA V Members;

(b) In collaboration with regional members and the WMO Inter-Programme Expert Team on Aircraft-based Observations, to develop a regional implementation plan for aircraft-based observations (ABO) and AMDAR as a component of the Regional WIGOS Implementation Plan;

(c) To collaborate with regional airlines and national civil aviation authorities on the establishment of programmes to deliver aircraft-based observations on the WMO Global Telecommunication System;
(d) To assist designated regional centres in the process of developing and maintaining
data-processing and quality monitoring systems for ABO;

(e) To undertake and assist in technical training, workshops, promotion and outreach on
ABO, targeting both regional Members and the aviation transport industry;

(f) To consult with data users and applications areas to determine and promote regional
requirements for ABO;

(g) To report to the RA V Management Group and the WMO Secretariat on progress.
UPDATE ON CAPACITY DEVELOPMENT PROJECTS IN RA V

Capacity Development Projects and Activities in RA V

WMO implements a portfolio of extra-budgetary funded projects and activities amounting to over CHF 13.01 million worth of investment in weather, water and climate services in support of WMO Members in RA V.

Projects’ alignment with WMO Long-Term Goals

1. Investment in projects under implementation are aligned with WMO Long-term Goals as follows:
   a. 53%: LTG: 1 - Better serve societal needs
   b. 19%: LTG: 2 - Enhance Earth system observations and predictions
   c. 0%: LTG: 3 - Advance targeted research
   d. 25%: LTG: 4 - Close the capacity gap on weather, climate and hydrological services
   e. 2%: LTG: 5 – Strategic realignment of WMO structure and programmes

2. The graph below provides a breakdown of the RA V project portfolio alignment with the WMO strategic objectives.
Overview of RA V Projects and Activities

1. Environment and Climate Change Canada (ECCC) has allocated CAD 10 million in 2016 to the project entitled “Building Resilience to High-Impact Hydrometeorological Events through Strengthening Multi-Hazard Early Warning Systems in Small Island Development States (SIDS) and Southeast Asia”. Running until March 2022, the multi-country project will strengthen weather-, climate- and water-related impact-based decision support services and therefore help protect lives and property in three regions, Southeast Asia (CAD 4.4 million), the Caribbean (CAD 2 million), and the Pacific (CAD 3.6 million). The projects’ objective is to strengthen the capacity of national meteorological and hydrological services to provide accurate and timely forecasts which include effective, risk-informed multi-hazard early warning services. This will be achieved through sponsoring WMO flagship activities in the Project regions, such as the Severe Weather Forecasting Programme (SWFP) and the Flash Flood Guidance System (FFGS) in support of wider WMO strategic objectives on disaster risk reduction and service delivery.

2. The CREWS Initiative is funding three Projects in the region:

   a) “Strengthening Hydro Meteorological and Early Warning Services in the Pacific” implemented from 2017 until 2021 with a funding of US$ 2.5 million. The project is co-implemented with the Pacific component of the ECCC funded project. The goal of the project is to (i) Strengthen the Regional Specialised Meteorological Centre (RSMC Nadi) within Fiji Meteorological Service ability to support other Pacific Islands receiving services from RSMC Nadi (ii) Enhance Pacific Island Countries and Territories’ NMHS’ capacity for impact-based forecasts of extreme weather events (such as floods, droughts, cyclones and storms).

   b) Since 2021, the CREWS Initiative financed the second phase of the project: “Strengthening Hydro Meteorological and Early Warning Services in the Pacific 2.0”. The total funding for the project is US$ 4.5 million and the project is implemented by WMO in partnership with UNDRR and the World Bank GFDRR. The objective is to further enhance the effectiveness of Pacific Island National and Regional Early Warning systems by improving the integration of national and regional hydrometeorological centres, their production of meaningful severe hazard information and its communication to benefit local population in times of need.
The third project supports the Papua New Guinea National Weather Service (see project page), with the objective to develop the capacity of the national meteorological agency and strengthen its cooperation with key sectoral ministries, departments and other stakeholders for agriculture, disaster management, energy and infrastructure. It started in 2017 and will close in December 2021. It supported the development of the PNG NWS Strategic Plan (2019-2023), with the vision “to be an organization of strong regional standing. That is highly valued by the community for our pivotal role in enabling a safe, prosperous, secure and healthy Papua New Guinea”. Australia BoM is supporting the project implementation and making available forecasting products from its ACCESS models, both at seasonal and weather timescales.

(3) EU-funded Intra-ACP Climate Services and Related Applications Project (ClimSA): The Intra-ACP (African, Caribbean, Pacific Group of States) Climate Services and Related Applications Project (ClimSA) – with EUR 85 million in funding from the European Union – aims to improve the production, access to and use of climate information, services and applications for decision makers. The project will foster sustainable development through the prevention of desertification, preservation of ecological biodiversity and the sustainable use of water management in ACP countries. The WMO grant of EUR 5.5 million under ClimSA covers the period 2020-2024 and approximately 15% will fund Pacific-related activities. Under ClimSA, WMO is supporting ACP regional partners to improve the climate services value chain in five priority sectors: agriculture, disaster risk reduction, energy, health, and water. Underpinned by capacity development and knowledge management, WMO technical guidance addresses observations, data, predictions, models and the mainstreaming of climate services into policy processes. WMO main activities in the Pacific region include:

(a) Supporting stakeholder-driven identification of Pacific-region-specific priority needs and products via Regional Frameworks for Climate Services and National Frameworks for Climate Services and user stakeholder national and regional consultations;

(b) Providing expert advice on country-level delivery of services, validation of the results of the use of the products generated, and associated socio-economic benefits;

(c) Promoting strengthened operational exchanges of data and products between NMHSs at country level and the Pacific RCC-Network;

(d) Equipping the Pacific RCC-Network with tools and capacities to produce and deliver tailored climate services; and

(e) Promoting exchange of knowledge and best practices across the regions and supporting content development for the Intra-ACP Climate Services Annual Fora.

(4) Republic of Korea has been supporting a demonstrator for the coastal inundation forecasting initiative in Fiji. Initial funding was from Korea International Cooperation Agency (KOICA). Since 2016, the Korea Meteorological Administration KMA provided a total funding of US$ 1,189,200. Fiji CIFDP was supported by WMO Technical Commission experts (former JCOMM and CHy) including from Australia, Canada, Japan, New Zealand, Republic of Korea, and United States of America. The ‘Demonstration’ component is now complete, and the early warning system has been operational since December 2019. The Fiji Meteorological Service now has strengthened capacity to produce and disseminate early warning information on coastal flooding, which helps save lives and protect property in low-lying, populated coastal areas. This was particularly noted during its use during the Tropical Cyclone Harold (2020). Refinements to the operations, funded by KMA, have been delayed due to the global pandemic (e.g. travel restrictions to and from
Fiji Islands). A no-cost extension has been granted, until June 2022 to complete these outstanding activities.

(5) The Flash Flood Guidance System (FFGS) with global coverage (Resolution 21, (Cg-XV)) mitigates the impacts of flash floods and enhances early warning capabilities of the NMHSs, currently covers sixty-seven (67) countries and more than three billion people around the world saving lives and decreasing economic losses. FFGS is a forecaster’s tool designed to provide accessible observed and forecasted data, supported by extensive hydrometeorologist, Information Technology (IT) and Radar Hydrology training programs that aims to support forecasters at national and regional levels in their effort to provide effective warnings on the occurrence of flash floods. It has been jointly developed by the World Meteorological Organization (WMO) and the Hydrologic Research Centre (HRC), with the support of the National Oceanic and Atmospheric Administration (NOAA) and the United States Agency for International Development/Bureau for Humanitarian Assistance (USAID/BHA).

The following regional FFGS projects are implemented, under implementation or under consideration in RA V:

(a) South Eastern Asia Oceania (SAOFFGS) (operational): Brunei Darussalam, Indonesia, Malaysia, Papua New Guinea, Philippines, Timor- Leste;

(b) Stand-Alone Fiji FFGS (FijiFFGS) (operational): Fiji.

Below is a visual representation of the current extra-budgetary projects in the region.

Beneficiary Countries in the Pacific

![Map of Beneficiary Countries in the Pacific]

**Development Partnerships**

(1) Systematic Observations Financing Facility: The goal of the Systematic Observations Financing Facility (SOFF) is to strengthen local and global resilient development and climate adaptation through improved observing systems leading to better weather forecasts and climate services. In 2019, the World Meteorological Congress and its 193
member countries and territories agreed to establish the Global Basic Observing Network (GBON). For the first time, GBON sets out a clear obligation for all WMO Members to acquire and internationally exchange the most essential surface-based observational weather data. However, many countries will need substantial investments and strengthened capacity to achieve and maintain compliance with the GBON requirements.

SOFF will provide technical and financial assistance in new ways – applying internationally agreed metrics to guide investments based on the requirements of the GBON, using data exchange as a measure of success, and creating local benefits while delivering on global public good. Past investments in meteorological capacity, often supported by the international community through time-bound projects, have not, in many instances, yielded lasting benefits because of inadequate budgets for operations and maintenance. SOFF will provide grant support to LDCs and SIDS for capital investments and contribute to cover operations and maintenance, ensuring the benefits of investments in observational capacity are sustained. The creation of SOFF is a commitment and priority action of the Alliance for Hydromet Development.

(2) The Country Hydromet Diagnostics (CHD): A standardized, practical, integrated approach for Voluntary Country Support Initiative (CSI) peer review of the performance of public national hydrometeorological services, their operating environment, and their contributions; Informing Alliance members and Government investment decisions; Tracking progress in closing the hydromet capacity gap.

(3) The Alliance for Hydromet Development: The Alliance aims to unite efforts to close the capacity gap on high-quality weather forecasts, early warning systems, and climate information as the foundation for resilient and sustainable development. The Alliance brings together major climate and development finance partners – 13 members including the largest funders of hydromet development. A high-level commitment from CEOs and heads of agency signed the declaration and launched the Alliance during COP-25 held in Madrid. The creation of the SOFF is a commitment of the Alliance.

(4) Alliance Hydromet Gap Report: It aims at tracking progress and establishing a baseline for the Alliance commitments, capture lessons learned and guide investments and identify high impact Alliance priority actions. The first Alliance Hydromet Gap Report is expected to be launched in July 2021 at the United Nations High-level Political Forum.

**Other programmes addressing the capacity gap on weather, water, climate and related environmental services**

(1) State of Climate Services report: a multi-agency report, coordinated by WMO, on the state of climate services for assessing adaptation needs in climate-sensitive socio-economic sectors. The 2020 State of Climate Services Report, prepared by WMO and 17 partners organizations and initiatives, highlights progress made in EWS implementation globally and identifies where and how governments can invest in effective EWS to strengthen countries’ resilience to multiple weather, climate and water-related hazards. Partners value it as an important synthesis of the evidence on where, and what kind of, investments are needed. Partners include: Adaptation Fund; Agence Française de Développement; Climate Policy Initiative; Climate Risk and Early Warning Systems initiative; Food and Agriculture Organization of the United Nations; Group on Earth Observations; Green Climate Fund; Global Environment Facility; International Federation of Red Cross and Red Crescent Societies; Risk-informed Early Action Partnership; United Nations Office for Disaster Risk Reduction; United Nations Development Programme; World Bank Group and its Global Facility for Disaster Reduction and Recovery; World Food Programme; the World Health Organization – World Meteorological Organization Climate and Health Office, and WMO.
(2) Checklist for Climate Services Implementation: WMO Members assess their capacity for providing climate services and documenting associated socio-economic outcomes and benefits through a checklist that addresses functional capacities across the climate services value chain. Functional capacities assessed by the checklist are organized into six groups: Governance, Basic Systems, the User Interface, Capacity Development, Provision and Application of Climate Services, and Monitoring and Evaluation of socio-economic benefits. Many of these functional capacities constitute “basic”, “essential”, “full” or “advanced” functionalities. The Checklist for Climate Services data provide a basis for assessing country capacities and needs in each component of the climate services value chain, and for categorizing the overall level of service provided by the Member according to WMO criteria. It provides essential information to inform project proposal development, baselines assessments, and monitoring and evaluation for projects and WMO KPIs.

(3) WMO Hydrology Survey to collect information on governmental and non-governmental organizations that are responsible for operational hydrology within countries, their capabilities, structure, hydrological networks, data-management and hydrological forecasting characteristics. The collected information is extremely valuable in the identification of capacity gaps at the national level, supporting regional priority activities, and informing the investment decisions of stakeholders involved, including development partners.

(4) Community Platform (previously WMO Country Profile Database - CPDB):

The WMO Community Platform provides the following features for WMO Members:

(a) A centralized Experts Database with self-service functionality to ensure contact information, roles and group memberships are up to date.

(b) Information collected regarding countries and territories are available in the Member Profiles. Self-assessed information can be updated by the Members themselves.

Based on the consolidated data available in the Community Platform, monitoring and evaluation can be systematically improved, more comprehensive Member profiles can be created, as well as thematic dashboards for different stakeholders to better support evidence-based decision-making.

Members are strongly encouraged to respond to the data collection campaign expected in 2021 to ensure the quality of information in the Member Profiles is accurate.

The graph below is an example of the analysis done with the data collected from Members during Cg-18 that will be updated during the 2021 data collection campaign.
RA V-18/INF. 4.3(1), p. 7

WMO is deploying data from Climimpact, Climate Information Platform (CIP) of the Swedish Meteorological and Hydrological Institute (SMHI) https://climateinformation.org/ Climate Research Unit (CRU), International Research Institute for Climate and Society (IRI), Climate Explorer of the Royal Netherlands Meteorological Institute (KNMI) https://climexp.knmi.nl/start.cgi and other WMO accredited sources to generate maps and graphs showing historical trends and projections relevant to national adaptation planning.
REPORT ON EDUCATION AND TRAINING ACTIVITIES

1. Short-term training programmes provided to RA V experts between 2018 and the first half of 2021

Since the seventeenth session of Regional Association V (RA V) in 2018 and through the first half of 2021, a number of activities have been carried out by the World Meteorological Organization (WMO) and jointly with RA V Members. This resulted in 123 experts from 16 Members having participated in training activities (40 females and 83 males).

2. Leadership and Management Programme Activities

The Secretary-General has tasked the Secretariat to give priority to Decision 49 (EC-70) – Governance of education and training (2018), which requested the Secretary-General to
strengthen the Organization’s support to fellowships and continuing education and to capacity development overall, so as to provide a strong basis for strengthening the capacity of Members and in particular to focus also on leadership and management skills as well as technical skills. Recognizing that the development of leadership and management skills of senior officials of National Meteorological Hydrological Services (NMHSs) will go a long way in enhancing the overall capacity of Members, the Secretary-General has been giving rapt attention to this decision and is committed to supporting such activities.

2.1. **First Leadership and Management Programme for Senior Management of National Meteorological and Hydrological Services of RA II and RA V [Singapore]**

Further to the above background, the WMO Secretariat, in collaboration with the Meteorological Service Singapore (MSS) organized an inaugural "Leadership and Management Programme for Senior Management of NMHS in RA II and V" in Singapore in 2018, under MSS’ sponsorship.

The programme was well-received and 20 senior participants attended, including several Heads of NMHSs. At the seventeenth session of RA V, Members emphasized the importance of management training and supported the continuation of the programme.

2.2. **Second Leadership and Management Programme for Senior Management of NMHSs of RA II and RA V [Singapore]**

Consequently, a second run was organized during 26-30 August 2019. The programme was sponsored and organized by MSS and the Education and Training Programme (ETRP) of WMO and delivered at the Lee Kuan Yew School of Public Policy (LKYSPP), located on the campus of the National University of Singapore.

The programme was attended by senior managers from Bangladesh, Brunei Darussalam, China, Cook Islands, Fiji, Iran (Islamic Republic of), Iraq, Japan, Malaysia, Nepal, Pakistan, Papua New Guinea, the Philippines, Samoa, South Africa, Thailand, Tonga, Vanuatu, and Viet Nam. Seven of the participants were Heads of NMHSs.
The LKYSPP, National University of Singapore, was engaged to conduct the programme, while the WMO Education and Training Office provided the WMO perspective on the role, operation and management of NMHSs. It is expected that the recently concluded programme in Singapore will further enhance the scope and effectiveness of WMO leadership and management related activities. The evaluation of the programme’s outcomes will provide constructive recommendations and additional impetus to this WMO activity.

2.3. Third Leadership and Management Programme for Senior Management of NMHSs of RA II and RA V [Singapore]

The third run of the leadership and management programme series was planned for 2020. However, because of the COVID-19 pandemic, it was postponed to 2021. The programme was again jointly organized by MSS and WMO over a two-week period from 3–6 and from 10-13 August 2021. As the COVID-19 travel restrictions continued, the programme was conducted virtually and targeted the senior management (Permanent Representatives, Director-Generals, Directors or equivalent) of the NMHSs and aimed to develop critical management skills in the leadership of NMHSs, with priority given to Members of RA II (Asia) and RA V (South-West Pacific), and developing and least developed Members from other regional associations. The programme was highly engaging, intensive, experiential and dynamic, with a strong focus on experience sharing, and was conducted entirely in English. [Singapore]

2.4. Joint leadership and management Publication (WMO-MSS-LKYSPP-MSS) [Singapore]

A joint WMO, LKYSPP, MSS publication is being prepared with the objective to aid senior managers of NMHSs in policy related and strategic decisions as they manage and lead NMHSs. The title of the publication will be "Enhancing Leadership and Management of NMHSs in Changing/Challenging World", will cover below listed areas, and it is targeted to be published in 2021 early 2022. [Singapore]
3. WMO Regional Training Centres (RTCs) in RA V

3.1. WMO RTC in Indonesia

The WMO RTC in Indonesia was recognized by the WMO Executive Council at its sixty-fourth session (EC-64) held in 2012 and it consists of two components: the Agency for Meteorology, Climatology and Geophysics (BMKG) and the Research Centre for Water Resources (RCWR). The BMKG component delivers short-term residence and distance learning courses related to meteorology, climatology and geophysics as well as soft skills like leadership and management for first line managers. The RCWR component is specialized in hydrology and delivers short courses and activities related to hydrology.

The Executive Council at its forty-eighth session (EC-48) established mechanisms for the continuous monitoring of WMO RTC activities. In addition to the WMO Education and Training Office (ETR) monitoring their activities on an ongoing basis, it is required that a two-step review process should be applied to every WMO RTC after every two financial periods (eight years), if possible. The review process consists of the completion of a self-assessment questionnaire followed by an external review led by a nominated expert. This exercise is a necessary oversight function that ensures that the standard of the RTCs and their performances are kept at desired levels. The review process has started and is expected to be completed in 2021, if the COVID-19 pandemic restrictions allow. If this would not be possible, a remote review option could be considered to conclude the external review exercise.

3.2. WMO RTC in Philippines

The WMO RTC in the Philippines was designated as a WMO RTC (then Regional Meteorological Training Centre (RMTC)) for the South-West Pacific in 1968 with the Institute of Meteorology, now the Research and Development and Training Division (RDTD) of the Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA) as its only component. In 1978 the Department of Meteorology and Oceanography (DMO), now the Institute of Environmental Science and Meteorology (IESM), University of the Philippines (UP) was added as the University Component of the RMTC, now known as RTC.

The status of the WMO RTC in the Philippines was reconfirmed in 1984 by the Executive Council at its thirty-sixth session (EC-36), in 2002 by the Executive Council at its fifty-fourth session (EC-54), and in 2011 by the Sixteenth World Meteorological Congress (CG-16). The RTC was externally reviewed in December 2018 and the status of the RTC was reconfirmed by the WMO Executive Council at its seventy-second session (EC-72) held in 2020.
The two components of the RTC Philippines, PAGASA and UP, have worked closely to form the integrated RTC. The RTC PAGASA component provides operational and job-oriented training and the UP component provides excellent graduate students to transfer and join PAGASA. The two components complement each other which provides a complete cycle to prepare well-trained and qualified personnel for service delivery in NMHSs in the Region.

4. **WMO Course on Marine Weather Forecasting Services for English Speaking Pacific Island Nations**

A course designed to strengthen marine meteorology service delivery will be offered in English in WMO Regional Association V, to all Members in the Pacific Islands, during 2021. The course will include the use of blended learning modalities: Phase 1 will be online, and Phase 2 will be a blend of online and classroom (to be offered when travel restrictions are lifted). Phase 1, online format, will be offered over a period of 13 weeks, from 2 August to 29 October 2021, requiring a total of about 60-70 hours effort.

This Course has been developed in response to Resolution 73 (Cg-18) – Strengthening the Capacity of Members in Service Delivery. The goal of the online course (Phase 1) is to promote best practices for Impact-Based Forecasting for marine customers, with a focus on familiarization and effective implementation of the regulations for provision and continuous improvement of marine meteorological services. The purpose is to help WMO Members to improve marine meteorological service delivery by:

(a) Increasing their understanding of the needs of clients (e.g. at sea or along coasts) who use marine weather information for protection of property and safety of life at sea;

(b) Raising awareness and understanding of the regulations outlined in WMO documents relevant to marine and coastal service, especially the Manual on Marine Meteorological Services (WMO-No. 558), to effect successful implementation of WMO requirements for marine meteorological services; and

(c) Guiding the use and implementation of the WMO Regulations and service delivery framework outlined in WMO documents relevant to marine and coastal service, especially the Guide to Marine Meteorological Services (WMO-No. 471).

The first phase of this WMO Course is designed to be practical and highly interactive. It will include many short readings, but even more opportunities for interaction with facilitators and fellow participants. During the course, participants will work on activities to complete a Marine Service Delivery Context Analysis for their NMHSs. Participants will be expected to work independently (or in groups belonging to the same NMHS) on these and other activities. Course work will include interviews and other interactions with management, marine customers, and other stakeholders, as well as an examination of current service delivery practices.

Course participants working for the same NMHS will be expected to coordinate their work and complete a single Marine Service Delivery Context Analysis. Some NMHSs may also be teamed up with other NMHSs with similar needs and capabilities. This will ensure that the coursework is relevant and of ongoing utility to their NMHS through the collective efforts of the participants working as a team.

All participants will be expected to dedicate a minimum of five hours each week during the 13-week course to enable completion of learning and project tasks. It is critical to the success of this course that this time is made available to participants apart from their weekly work responsibilities.
5. **Online course on Innovations in Education and Training**

During 25 May–30 July 2020, the WMO ETR Office launched its Online Course on Innovations in Education and Training, as a WMO Global Campus Initiative activity. This course offered new ways of learning and encouraging Members to engage more effectively with WMO resources and came at an opportune time, during the global COVID-19 quarantine. The course was based on the ETR Office publication WMO *Global Campus Innovations* (ETR-No. 27). The first of several proposed webinars related to the course was offered on 3 June 2020. It is entitled “An Overview of Distance Learning: Opportunities and Challenges”.

The objectives of the course were to: (i) encourage adoption of innovations in the education and training institutions of WMO Members by exploring their potential benefits and analysing examples of their use by other Members; and (ii) use an innovation process model to plan an innovation for implementation within the participants’ institutions, working in national groups or as individuals.

The course was offered in both a Certificate Path and Open Path. Certificate Path participants were required to write four structured Reflection Papers on four chapters in the publication, as well as complete an “Innovation Implementation Plan” for their institution. Open Path participants were asked to contribute to the discussions about the readings and in the general forums, but also could earn digital open badges for this participation.

The launch has proved highly successful, with 252 participants from over 60 Members from all six regions, including 53% female and 47% male participants. The large course was managed by the ETR Office with the help of 61 authors and facilitators, where many volunteer facilitators were graduates from past WMO courses for trainers. All contributing authors of the WMO *Global Campus Innovations* publication were also engaged with the course by moderating discussions of their chapters.

RA V was well-represented in the course, with a total of 46 participants attending the training event.

6. **Responding to Challenges Beyond the New Normal: A Global Campus Event**

As part of support to training institutions, a WMO Global Campus Event, ”Responding to Challenges Beyond the New Normal”, was held online from 20–22 January 2021. The event was attended by representatives of RTCs, key WMO Education and Training partners, WMO National Education and Training Focal Points, and the WMO Secretariat technical departments, regional offices, and all Member services. In total, 175 participants, comprising 42 institutions from 33 countries actively participated in the activities organized during the three days of the event.

All resources shared during this WMO Global Campus Event can be accessed in the event’s page; Responding to Challenges Beyond the New Normal: A WMO Global Campus Collaborative Webinar and will be included in the proceedings (in preparation). The action plans produced during the event will provide significant input to the Symposium on Education and Training (SYMET-14) planned for later in 2021.

7. **Webinar on the impact evaluation of training using the Success Case Method (SCM)**

Following the completion of the Training Programme on Climate Change Adaptation and Disaster Risk Reduction (PACC-RRC), partners of PACC-RRC conducted an impact evaluation. The evaluation aimed to ascertain how trainees have used new learning to achieve organizational value, and at the same time, pinpoint the critical systemic factors that can make or break impact.
The SCM, developed by Robert Brinkerhoff was used, and as part of the initial activities of this impact evaluation, a webinar was organized by the ETR Office to share information about how the SCM works and can be leveraged for positive results with training initiatives.

The webinar, which was open to WMO Members, RTCs and partner training providers and programmes, was attended by 50 representatives from more than 20 countries, including all WMO Regional Associations. The impact evaluation of PACC-RRC was concluded in June, and the final report is under editorial review for publication by ETR in 2021.

8. Training Package for Strengthening the Delivery of Global and Regional Climate Services

The ETR Office is collaborating with the Services Department on the development of a training package for “Strengthening the Delivery of Global and Regional Climate Services”, which includes: (i) a Climpact online module; (ii) webinars; (iii) a training syllabus for face-to-face and virtual training; (iv) regional toolkits; and (v) workshops. This project is being supported by the Korean Meteorological Administration, through a trust fund.

The first webinar, entitled “Integrating Climate Risk Information into Climate Action”, took place on 2 June 2021 with an audience that passed 200 attendees. The event gathered great interest from RA V, counting 21 attendees from five countries.

The second webinar “Supporting Local Climate Action Through Climate Indices” will be offered on 7 July 2021.

9. WMO Fellowships Activities between 2017 and 2020

9.1. Overview of fellowships in 2017-2020

During 2017-2020, there were 774 requests for WMO long-term fellowship opportunities, of which 265 were awarded in total. RA V had 50 requests among which 14 were awarded during the past four years, accounting for 6% and 5% globally.
The awarded fellowships were reduced by almost half in 2020, due to the outbreak of the pandemic.

9.2. **Requests vs awarded fellowships from 2017 to 2020 in RA V**

In the past four years, 14 fellows out of 50 requests (28%) were awarded, hosted by six countries.

The United Kingdom, Australia and the Philippines are the most requested host Members in RA V.

The United Kingdom, the Philippines and India hosts the most awarded fellows in RA V.
In the past four years, there were 14 awarded fellows, including one Permanent Representative (PR) familiarization visit. Those following a MSc course were awarded the most fellowships with a total of eight. There was no PR visit in 2020 due to the COVID-19 travel restrictions.

Female fellowship requests and awards are still lower than those of their male counterparts. In this reporting period, there are 11 female applicants which constitutes 22% of the entire requests.
The female awarded rate of 36% is much higher than the request rate of 22% due to various efforts of gender equality policy of WMO.

9.3. WMO-RTC Indonesia Blended Group Training on Numerical Weather Prediction (NWP) for NHMSs in RA V

Blended Group Training on Numerical Weather Prediction (NWP) at the WMO RTC Indonesia hosted by the Agency for Meteorology, Climatology and Geophysics of the Republic of Indonesia (BMKG) was virtually opened on 20 May 2021. The blended course is composed of two parts: the online phase from 20 May to 2 July which will focus mainly on theory and the follow-up on-campus phase in the RTC premises in 2022 when conditions permit. The on-campus part will consolidate the theoretical knowledge and conduct the practical curricula which are difficult to instruct online.

The course is aimed at scientific personnel at NHMSs in WMO RA V whose work relates to NWP and it will equip participants with NWP knowledge and practical skills. The goal of the course is to develop the capacity of the participants to improve understanding and implementation of high-resolution NWP including model configuration, physical parameterization, operating environment, post-processing techniques, visualization of model output, verification techniques and application of NWP in the respective countries. NWP models of Weather Research and Forecasting (WRF) and Consortium for Small-scale Modelling (COSMO) will be explored in this training course. Emphasis will be given to the simulations of mesoscale weather systems. The course is also expected to enhance the capacity on application of NWP models for the tropics in operational weather services.

The opening ceremony, organized online on 20 May, was addressed by Prof. Dwikorita Karnawati, the Permanent Representative of Indonesia with WMO;
Dr Yinka R. Adebayo, Director of the Education and Training Office of WMO; and Mr Maman Sudarisman, Director of RTC Indonesia. The course was opened by Mr 'Ofa Fa'anunu, President of WMO Regional Association V, by video. The opening ceremony was also attended by Mr Ben Churchill, the Head of Regional Office for Asia and the South-West Pacific of WMO. Synchronous activities and live sessions are conducted using the Zoom application while the BMKG Learning Management System (BMKG-LMS) is used for asynchronous activities including self-study modules.

Thirty-eight participants from 14 WMO Members including Fiji, Indonesia, Kiribati, Malaysia, Papua New Guinea, the Philippines, Qatar, Samoa, Saudi Arabia, Solomon Islands, Timor-Leste, Tuvalu, Zambia and Zimbabwe benefited from the course.

The closing ceremony was held online on 2 July. The Director of the Education and Training Office of WMO and the Director of RTC Indonesia delivered speeches. Participants who pass the evaluation will obtain course certificates.
REPORT BY THE CHAIR OF THE CAPACITY DEVELOPMENT PANEL

Introduction

The second meeting of the Executive Council (EC) Capacity Development Panel (CDP-2) was held virtually on 3 and 4 February 2021. The meeting inter alia reviewed and deliberated on the reports of the expert and task teams, discussed their future work plans, proposed recommendations for seventy-third session of the Executive Council (EC-73), and agreed on its integrated future activities, including a plan for review of the Capacity Development Strategy.

Expansion of membership

Following an expansion of the membership of the Panel, as recommended by EC-72, the meeting was joined by the following additional members representing; the Commission for Weather, Climate, Water and Related Environmental Service Applications (SERCOM), the Hydrological Coordination Panel (HCP), the Research Board (RB), the WMO-IOC Joint Collaborative Board (JCB), and the Commission for Observation, Infrastructures and Information Systems (INFCOM). Prior to the second session of CDP, these additional members earlier joined the intersessional work of the various Task and Expert Teams, namely: (i) Expert Team on Policy Development and Institutional Matters, (ii) Expert Team on Human Resources Development, Education and Training, (iii) Expert Team on Capacity Development through WMO Technical Departments, (iv) Expert Team on Resource Mobilization, Partnerships and Development Assistance and (v) Task Team on Revision of Capacity Development Strategy.

Observations on matters relating to capacity development and coordination

The Panel made various observations on aspects of WMO capacity development activities that are worthy of considering in the course of policy and programme coordination, development and implementation, and these were reported to EC-73.

Recommendations for consideration by the Executive Council

In furtherance of its future activities, the Panel also made recommendations for consideration by EC-73.

Revision of the WMO Capacity Development Strategy

The task team on the revision of the WMO Capacity Development Strategy is in the planning stages of the project. The team sees that there are several key drivers in revising the strategy. These include: (i) WMO governance structure, (ii) WMO Strategic Plan, (iii) input from the CDP Expert Teams, (iv) input from Technical Commissions, and (v) input from the Regional Associations.

Calendar year 2021 will commence the work of this task team. The following are the tasks to be achieved:

(1) Engaging additional subject matter experts and task team members;
(2) Creating a realistic roadmap to create a first draft of the WMO Capacity Development Strategy and Implementation Plan;

(3) Cross-walking the contents of the existing *WMO Capacity Development Strategy and Implementation Plan* (WMO-No. 1133) with the new *WMO Strategic Plan 2020–2023* (WMO-No. 1225);

(4) Ensure assessment of key development needs/gaps in each Region (including consideration of significant upcoming initiatives under the Technical Commissions and RB which may require capacity development support) feed into the revised Capacity Development Strategy (2022);

(5) Assessing the reports and recommendations from the Expert Teams from CDP-2;

(6) Seeking input from the appropriate WMO Technical Departments;

(7) Creating a table of contents and project timeline for the new WMO Capacity Development Strategy and Implementation Plan.

Once the contents and timeline are approved, appropriate task team members will begin drafting the new document.

In connection with the revision of the capacity development strategy, I am pleased to report that the Permanent Representative of the USA has offered the services of Dr Michael Smith as a Subject Matter Expert (SME) to support the work of the Capacity Development Panel. He holds a PhD and master's degree in economics and an undergraduate degree in political science and geophysics. Considering the fact that an expert is needed to boost the work of the Panel in the revision of the capacity development strategy, on behalf of the Panel, I have accepted this offer. Dr Smith is a senior economist in the Office of the Chief Economist of the United States National Oceanic and Atmospheric Administration (NOAA). As Dr Smith, whose services are fully paid for by the USA for 12 months to support the Panel on a half-time basis, has worked in various areas including focusing on the economics of natural disasters and economic impacts of climate change, I have no doubt that he will contribute a lot to the work of the Panel including its coordination with the Secretariat in the revision of the capacity development strategy.

**Future activities**

In terms of its future work, the Panel will continue to work through its Experts and Teams on various aspects of its mandate. The Teams have given an indication of their respective activities, details of which are contained in the report of its meetings. It is expected that the outputs from the works of the Teams will form key elements for revision of the WMO Capacity Development Strategy, as well as form critical elements of prospective decisions and resolutions of EC on capacity development and related endeavours of the Organization.

**Conclusion**

The Panel has achieved a lot during the short time that it has worked after its inauguration. This is mainly due to the commitment of its members and the support provided by the Secretariat. The Panel looks forward to continued support by all stakeholders as we all look forward to success in its future activities.

The full report of the second meeting of the Panel is available in the CDP Moodle here.