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FOR PARTICIPANTS ONLY

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WORKING GROUP ON HYDROLOGY (WGH)
ACTIVITIES PROGRESS REPORT 2025

(For TC 20th IWS)

Drafted and Submitted by WGH

(Draft)

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I. ORGANIZATION OF WGH 14th ANNUAL MEETING

1. Referring to the decision of the 57th Session of the ESCAP/WMO Typhoon Committee (TC), the 14th Annual meeting of TC Working Group on Hydrology (WGH) will be hosted jointly by National Weather Service, Weather Forecast Office (WFO) Guam, USA and the Ministry of Land, Infrastructure, Transport and Tourism (MLIT), Japan in Guam, USA on 23-25 September 2025 with the generous offer of financial support.

2. The proposed theme of the meeting is "Strategic Action for a Resilient Tomorrow: Strengthening Interagency Coordination and Data-Driven, Multi-Hazard Early Warning Systems to Address Typhoon Impacts" with the following purposes:

   - to review and present the status, achievements, and progress in hydrological components to Members in 2025;
   - to review the implementation status and progress of WGH Annual Operating Plans (AOPs) in 2025;
   - to propose the implementation plan and success indicators for WGH AOPs for 2026, including budget requirements;
   - to discuss the preparation and hydrological contribution to prepare the 20th Integrated Workshop / High-level Forum to be held in Macao, China, from 02 to 05 December 2025, and the TC 58th Annual Session 2025 to be held in Jeju, Republic of Korea, from 10 to 13 March 2026.

3. The meeting was held at the Pacific Islands Club Guam, Tumon, Guam. The Joint Organizing Commission (JOC) provided a hybrid mode for the meeting with the link to the online meeting https://attendee.gotowebinar.com/register/1965524472694398 33.

4. The annual meeting was chaired by WGH chairperson Mr. Mamoru MIYAMOTO, and attended by 34 participants in total from 10 out of 14 Members of the Typhoon Committee, namely: China; Japan; Lao People's Democratic Republic (Lao PDR); Malaysia; the Philippines; Republic of Korea; Singapore; Thailand; USA and Viet Nam. The Typhoon Committee Secretariat (TCS) also participated in the meeting in person.

5. At the opening ceremony, Ms. Genevieve C. Miller, Meteorologist-In-Charge, National Weather Service WFO Guam delivered welcome speech; Mr. Mamoru MIYAMOTO, Senior Researcher, the International Centre for Water Hazard and Risk Management under the auspices of UNESCO (ICHARM) delivered opening remarks.

6. The meeting exchanged the information on the Strategic Action for a Resilient Tomorrow: Strengthening Interagency Coordination and Data-Driven, Multi-Hazard Early Warning Systems to Address Typhoon Impacts, and invited 4 Keynote speeches including:

   - Ms. BRUNTY Jessica, P.E., Civil Engineer (Hydraulics), U.S. Army Corps of Engineers, Honolulu District, virtually presented "Risk-informed Decision making: from analysis to

action".

- Dr. YEO Chris (Myeong-Ho), Ph.D., P.E. - Associate Professor of Water Engineering & Hydrology, Chair of the Environmental Science Graduate Program, University of Guam, presented "Advance Mitigation Framework for Extreme Rainfalls under Climate Change".
- Dr. HABANA Nathan C., Ph.D., Associate Professor, Groundwater Hydrology, University of Guam, presented "Rainfall intensity, duration, and flash flood model analysis".
- Mr. MARUYAMA Kazuki, Director for International Coordination of River Engineering, Water and Disaster Management Bureau, MLIT, presented "Flood and Disaster Early Warning System in Japan".

7. The meeting was informed with appreciation that the Department of Irrigation & Drainage (DID), Malaysia, is willing to host the 15th annual meeting for WGH in second or third week of September 2026 in Malaysia in cooperation with the Ministry of Land, Infrastructure, Transport and Tourism (MLIT), Japan.

8. The meeting also encouraged Members to consider the possibility of hosting the 16th annual meeting for WGH in 2027. It will be further discussed at TC 20th IWS to be held in Macao, China, from 2-5 December 2025.

II. The Summary of Member Report on Hydrological Component in 2025

9. The WGH reviewed the flood-related disaster that occurred in 2025 and hydrological activities conducted in Members in the year, and also noted the special measures taken in Members for boosting the capacity of water-related disaster forecasting and early warning.

10. In 2025, Cambodia...

11. In 2025, a total of 9 typhoons/tropical cyclones made landfall in China, 2.0 more than the average number (7.0) for the same period in normal years, affected by the heavy typhoon rainfall, the water level of 345 rivers in 14 provincial regions of China surpassed the warning water level, and some even exceeded guaranteed and historical flood water level.

    In 2025, China experienced significant autumn flood, with multiple typhoons forming and making landfall during the autumn flood season, overlapping heavy rainfall areas. Since late August, a total of 10 typhoons have formed, 1.3 more than the annual average (8.7), with 4 of these typhoons making landfall along the coastal areas of Guangdong, 1.2 more than the annual average (2.8). Particularly since September 23, the Pearl River Basin has been successively affected by three typhoons: "Ragasa", "Bualoi", and "Matmo". The areas with concentrated heavy rainfall overlaps in Guangxi, western Guangdong, and Hainan. A total of 101 rivers in the Pearl River Basin experienced floods exceeding warning levels, including 13 exceeding protection levels and 5 exceeding historical flood records.

    On the aspects of Flood Risk Early Warning for Small and Medium-Sized Rivers, China has actively adopted a series of effective measures.: (1)Developing the digital basin foundation for small and medium-sized rivers. Based on DEM (Digital Elevation Model) and the integrated water conservancy map data, a nationwide digital basin has been constructed, covering over 328,000 runoff generation and confluence units for river basins larger than 25 square kilometers. (2)Researching and developing a distributed flood forecasting model library for small and medium-sized rivers. Efforts have been made to research, improve, and refine distributed

hydrological models with physical mechanisms, such as the Geomorphology-Based Hydrological Model (GBHM) featuring geomorphic characteristics, the multi-parameterization land surface process model NoahMP, and the gridded Xin'anjiang Model. A national-scale model parameter dataset has been built using soil data, land use data, vegetation coverage data, and other relevant datasets. (3)Collecting early warning indicators for small and medium-sized river floods: Water regime authorities across the country have been organized to collect and sort out early warning indicators—including early warning levels, alert levels, and guaranteed water levels (discharges), as well as embankment (bank) elevations—from 6,261 stations built along 4,138 small and medium-sized rivers. Additionally, flood impact ranges refined to the township level have been compiled. (4)Building a prototype system for flood forecasting and early warning of small and medium-sized rivers at the ministerial level. The system integrates high-resolution short-term precipitation forecast products (with a horizontal resolution of 1km×1km) for "cloud-rain" processes and short-range precipitation forecast products (with a horizontal resolution of 3km×3km). It calculates the river water level and discharge processes, as well as early warning products, for small and medium-sized rivers nationwide over the next 24 hours on a daily basis. Since the prototype system was put into trial operation on July 1, 2025, total of 4,416 early warning messages for 3,696 small and medium-sized rivers have been issued, providing technical support for preventing small and medium-sized river floods caused by local heavy rainfall

12. In 2025, DPRK....

13. In 2025 (as of 9 September), nine tropical cyclones affected Hong Kong, China, leveling the record for the highest number of tropical cyclones affecting the territory between January and September since 1946. In July, Typhoon Wipha necessitated the issuance of the highest tropical cyclone warning, Hurricane Signal No. 10, again since Super Typhoon Saola hitting Hong Kong in 2023. Also, Severe Tropical Storm Tapah necessitated the issuance of No. 8 Gale or Storm Signal in September, whereas Severe Tropical Storm Wutip necessitated the issuance of Strong Wind Signal No.3 in June. Severe Typhoons Danas, Podul, Kajiki, Tropical Storm Nongfa and two Tropical Depressions in June and August necessitated the issuance of Standby Signal No. 1.

    During Wipha's approach to Hong Kong on 19 – 20 July, it rapidly intensified into a Typhoon and skirted past about 60 km south of the Hong Kong Observatory Headquarters. The hurricane-force winds in the eyewalls of Wipha battered many places in the territory. Although Wipha only reached typhoon intensity, its impact on Hong Kong in terms of wind strength recorded at various stations within the territory was comparable to those of Super Typhoons Hato in 2017 and Saola in 2023. In terms of rainfall, Wipha was the wettest tropical cyclone affecting Hong Kong so far in 2025, with an accumulated rainfall of 140.0 millimetres recorded at the Headquarters and rainfall exceeding 250.0 millimetres in some areas on 19 – 21 July. Under the influence of Wipha, a maximum sea level of 3.03 m (above chart datum) and a maximum storm surge of 1.61 m (above astronomical tide) were recorded at Tai Po Kau.

    During Wipha's passage, more than 33 people were injured in Hong Kong. There were at least 2,672 reports of fallen trees and seven reports of flooding. Over 500 flights were cancelled at Hong Kong International Airport. There have been at least five reports on collapsed scaffolds. Public utilities, including traffic lights and lampposts, were damaged, and glass curtain walls on commercial buildings were shattered. Farmland in the New Territories and fishing rafts were also damaged. A three-story ship was adrift and crushed into a wharf during heavy waves.

In term of rainfall, although Hong Kong was much drier than usual in the first half of 2025, with outbreaks of heavy rain in July and August, the accumulated rainfall in the first eight months of the year caught up the normal value for the same period. An active southwest monsoon and upper-air disturbances brough heavy showers and squally thunderstorms in late July and early August. The outbreaks of heavy showers necessitated the issuance of the Black Rainstorm Warnings for four times in just eight days. In particular, the Hong Kong Observatory Headquarters registered a record-breaking daily rainfall of 368.9 millimetres on 5 August, the highest daily rainfall in August since records began in 1884. This daily rainfall amount was already more than 80 percent of the August normal rainfall. There were a number of flooding and landslide reports over the territory.

For hydrological activities, the Drainage Services Department have developed the Mosaic Model Map (M^3), which is a real-time flood risk visualization system to address Hong Kong's increasingly complex flood challenges. The city's steep terrain, dense urbanization, and frequent intense rainfall events demand a rapid and reliable solution. M^3 integrates pre-run hydraulic models with live hydrometric data—including rainfall, tidal levels, and two-hour nowcasts—to produce accurate flood forecasts every four minutes across 23 catchments. Such approach replaces traditional, slower modeling methods with a scalable, adaptive system that operates on standard infrastructure and evolves with new climate data. M^3's intuitive interface ensures accessibility for engineers and emergency team, enabling swift deployment of resources and timely public warnings. Its street-level precision enhances emergency response and mitigates flood-related losses. By delivering dependable, real-time insights, M^3 significantly strengthens Hong Kong's flood resilience and supports the development of a safer, more responsive urban environment.

14. In recent years, Japan has experienced an increase in severe short-term rainfall events, with hourly precipitation exceeding 50 mm. Rising mean sea surface temperatures have raised concerns about intense typhoons and damages. Torrential rains and larger typhoons have already caused frequent flood damage. The impacts of global warming are becoming increasingly evident, and water-related disasters are expected to grow both more severe and more frequent in the future.

    From August 7 to 11, 2025, heavy rain fell widely across the Kyushu region in southwestern Japan. At the rainfall observatory in Koshi City, Kumamoto Prefecture, within the Koshigawa River basin of the Kikuchigawa River system, 362 mm of rain was recorded in 24 hours. Over the past five years, weir renovations and riverbed excavation works (about 440,000 m^3) were carried out on the Koshigawa River, lowering water levels by about two meters near 5k400. Without these river improvements, a large-scale flood similar to the one in July 2012 -which affected 103 households and had rainfall comparable to that of the August 2025 flood - would likely have occurred.

    Japan is also contributing to international discussion on climate and disaster resilience. At the UN 2023 Water Conference, the outcomes of Interactive Dialogue 3 ("Water for Climate, Resilience, and Environment: Source to Sea, Biodiversity, Climate, Resilience, and DRR") helped shape the International Workshop Agreement on Hydrological Risks (IWA50). This initiative, approved by ISO-TMB on April 30, 2025, aim to identify current and potential standardization needs in addressing hydrological risks. As the next step, IWA Secretariat will present a draft framework of the outcome document at the 1st International Workshop on October 7, 2025, followed by the 2nd Workshop, where the first full draft will be proposed.

15. In late July and August 2025, Laos experienced severe weather and flooding due to Tropical Storm Wipha and later Typhoon Kajiki, causing casualties, significant displacement, damaged homes, and infrastructure, with Khammouane Province being particularly affected by floods and landslides. The Mekong River levels also rose, impacting Vientiane and other areas. The Laos-China Railway suspended services, and authorities issued warnings for further heavy rains, flash floods, and landslides.

    In Khammouane province of Laos, heavy rainfall flooded eight villages. Flash floods also hit Xaysomboun province after several days of continuous rain, causing rivers to overflow and inundate homes and roads. The remnants of Kajiki caused heavy rain and flash flooding in the North.

16. In 2025, nine tropical cyclones affected Macao, China (as of 12 September). Macao Meteorological and Geophysical Bureau (DSMG) continued to organize the "Tropical Cyclone and Storm Surge Exchange Meeting" for member departments of the Civil Protection Structure in 2025, as an effort to enhance knowledge of tropical cyclone and storm surge, establish a common language between DSMG and the emergency response departments, and strengthen the collaboration among members of the Civil Protection Structure in disaster prevention and reduction efforts.

    To enhance flood forecasting and warning capabilities, DSMG has introduced various model products in forecast operation. In 2025, DSMG continues to experiment with machine learning methods and establish models based on historical local meteorological and flood data, to predict inundation levels in Macao during storm surges and rainstorms.

    To enhance flood monitoring capabilities, DSMG installed additional water level station in an inland flooding black spot in 2025, in order to help monitor flood level during rainstorms and storm surges.

17. In Malaysia, the rhythm of the monsoon season often brings with it the persistent threat of flooding. Between November 2024 and March 2025, the nation recorded 1,110 flood incidents, a stark reminder of nature's force. The vast majority, 758 of these cases, were monsoon floods, underscoring the profound impact of seasonal rainfall. These events, diligently monitored by the flood forecasting and warning system, paint a picture of a nation continually on alert.

    The scale of this challenge is mapped out annually. For 2025, a total of 3,683 flood hotspots were identified nationwide. While this figure represents a promising decline from 4,619 in 2024, the threat remains widespread, affecting 126 districts from the dense river basins of Pahang and Kelantan to the coasts of Sabah and Sarawak. A hotspot isn't just a location; it's a community that has faced flooding at least three times in the past three years, each incident leaving a lasting mark.

    However, protecting these communities is a complex task fraught with significant challenges. Effective forecasting, the first line of defence, often grapples with inconsistent rainfall data and critical communication failures that can silence sensors when they are needed most. On the ground, warning infrastructure like sirens is vulnerable to vandalism and high maintenance cost. Above all, the forecasting models themselves must constantly evolve, adapting to a landscape altered by new development and the unpredictable nature of climate change.

    To meet these challenges, Malaysia has deployed a multi-layered strategy that blends technology, partnership, and community action. During the 2023/2024 monsoon, a massive Public-Private Partnership saw over 5 million flood warning SMS messages sent directly to citizens' phones, a

testament to a coordinated national effort. Complementing this broad approach is the Community-Based Siren (CbS) system, a grassroots solution for rural areas. This system empowers local communities by not only triggering sirens and mobile alerts in their own dialect but also by giving them ownership to safeguard the equipment and lead the dissemination of warnings.Beyond just sending alerts, the very philosophy of forecasting is undergoing a revolution. The nation is shifting towards Impact-Based Forecasting (IBF), a smarter approach that moves beyond asking "what the weather will be" to answering the crucial question: "what the weather will do." This advanced model estimates the real-world impact on homes, farms, and infrastructure, enabling authorities to take pre-emptive action like targeted evacuations.

To ensure these sophisticated systems are truly effective, the Flood Forecasting and Warning Impact Assessment (FFIA) provides a crucial feedback loop. This structured process evaluates the real-world success of these programs, analysing their socio-economic impact and identifying gaps for improvement, ensuring that every tool is sharpened for maximum effect.

Looking ahead, the next frontier in this ongoing battle is artificial intelligence. By leveraging AI and machine learning, forecasting models are evolving from static tools into dynamic, adaptive systems. AI can analyse vast, real-time datasets—from weather patterns to social media chatter—to uncover hidden trends and deliver predictions with unprecedented accuracy and speed. This represents a significant leap forward, promising a future where Malaysia can not only respond to the tides but anticipate and outsmart them, building a more resilient nation through technology, community, and strategic foresight.

18. In the Philippines, ten (10) tropical cyclones were recorded from January to August 2025. These cyclones, ranging from tropical depressions to typhoons, brought heavy rains, localized flooding, and landslides. One notable event prompted the declaration of a State of Calamity in Pangasinan. Overall, the period saw a moderate number of cyclones, with Severe Tropical Storm Crising (Wipha) and Typhoon Emong (Co-May) being the most significant in terms of intensity and damage. Government preparedness and response measures were crucial in mitigating the impacts on affected communities.

    The Flood Forecasting and Warning Centers (FFWCs) issued 266 flood bulletins and advisories, the majority from the Pasig-Marikina and Tullahan River Basins in Metro Manila. Most warnings were associated with TC Crising (Wipha), which enhanced the southwest monsoon (Habagat), triggering widespread flooding. In addition, 2,755 General Flood Advisories (GFAs) were released nationwide, with Regions III, IV-B, XIII, and BARMM receiving the most due to their exposure to easterlies, ITCZ, shear line, and TC -enhanced monsoon systems. PAGASA also issued a total of 181 Hydrological Dam Situationers for Magat Dam and for the Agno River Basin, supporting dam operations and flood warnings at Ambuklao, Binga, and Angat Dams.

    In terms of progress toward key result areas, PAGASA launched the Ensemble Modelling to Advance Flood Prediction in the Philippines (EnsFlood) project in May. This three-year initiative aims to improve flood forecasting in six telemetered major river basins by applying ensemble modeling techniques to provide more detailed and reliable flood warning information. Another initiative is the AI4RP Project, which seeks to develop and implement an AI-powered system to enhance the country’s weather forecasting capabilities. With AI, PAGASA aims to extend rainfall forecasts from five to 14 days, providing greater lead time for disaster preparedness and response. In hydrology, AI-generated rainfall forecasts are being integrated into flood models. A model for the Bicol River Basin has already been developed and is currently undergoing verification. Another key initiative is the Multi-Hazard Impact-Based Forecasting and Early Warning System

(MHIBFEWS), a five-year project funded by the Green Climate Fund. Its goal is to strengthen community resilience by shifting the focus from forecasting hazards to assessing their potential impacts, taking into account exposure and vulnerability. In other words, the system emphasizes not only what the weather will be, but what it will do. The project is being piloted in highly vulnerable areas, including Tuguegarao City and Legazpi City, which will serve as models for nationwide application. For the flood component, probabilistic hazard maps and flood models are currently being developed. PAGASA is also advancing the Integrated Hydrological Data Management System (HDMS) Phase III, which will serve as a centralized platform for storing, editing, and retrieving hydrometeorological data. The system will also feature enhanced visualization tools to improve the dissemination of hydrological information. Moreover, PAGASA is expanding its flood forecasting and early warning systems. A dedicated project is underway for Greater Metro Manila and Laguna Lakes and surrounding provinces, while an AI-based flood early warning system is being implemented in the Laoag River Basin. PAGASA is also partnering with Local Government Units to develop Community-Based Flood Early Warning Systems (CBFEWS), with ongoing projects in nine provinces across the country.

19. In 2025, Republic of Korea (ROK) did not directly suffer from typhoon attacks. As of 31st August, there were total about 14 typhoons occurrences in this year and none of them had landed at Korea Peninsular. However, ROK did suffer from severe flood damages due to heavy concentrated rainfall occurred at southern and western parts of Korea Peninsular during the summer season. Heavy rainfall fell across various parts of the country from 10th to 20th July due to the influence of the active monsoon front. The cumulative 5-day rainfall amount in heavy downpours areas (such as Sancheong, Hapcheon, Hadong, Changnyeong, and Haman which located at Gyeongnam province) occupied about 63% of annual rainfall amount where the average annual rainfall amount was about 1266 mm. In other words, a total of about 720 mm of rainfall amount has been recorded within 5 days and this unprecedented concentrated heavy rainfall heas resulted in severe flood damages in the affected areas. The landslides triggered by heavy rainfall that occurred at a village in Sancheong County on 19th July caused 4 casualties, 2 residents in missing, and 2 residents in cardiac arrest.

    In 2025, the Flood Control Offices at ROK issued a total of 126 flood watches and 43 flood warnings nationwide between June to early September. Flood occurrences in 2025 were mainly due to concentrated heavy rainfall of unprecedented magnitude and intensity that exceeded the design capacity of river embankments and sewer drainage systems.

    In order to mitigate and address flooding issues efficiently, The Ministry of Environment of ROK exploits AI, digital twin models, and smart CCTV to enhance flood risk detection, improve AI-based flood and urban inundation forecasts, and expanding the pilot operations of urban inundation forecasts. The early flood warning issue locations have been expanding from 75 to 223 (3 times increase) whereby each location is integrated with Long Short-Term Memory (LSTM) deep learning algorithm for flood monitoring and forecasting in interval of 10 minutes. Apart from that, “The Dam-River Digital Twin Water Management Platform” has been established to recreate real dam and river hydrological information in a 3D virtual space using various sensors and data. The application of this platform has also been extended to all local governments where they can now access a wide range of hydrological information for all 3,816 river sections nationwide (including areas without water level stations), such as water level forecasts, CCTV footage of national rivers, flood hazard maps and vulnerable area information, downstream impacts of dam discharges, and alerts on access risks near rivers during floods.

20. In 2025, Singapore was not directly affected by tropical cyclones. However, its weather may have been influenced indirectly by tropical cyclones located over the western Pacific. During the 2025 West Pacific Typhoon season, there were a few occasions during which tropical cyclones resulted in the convergence of prevailing winds around the surrounding region of Singapore. On 8 and 10 June 2025, Singapore experienced Sumatra Squalls likely associated with the intensification of a tropical depression over the South China Sea, which was upgraded to Tropical Storm WUTIP on 11 June 2025. Strong winds were recorded on both days and heavy rain on 8 June 2025. Singapore has occasionally experienced flash flooding due to the presence of localised thunderstorms. In 2025, flash floods had occurred on 13 and 20 April. Singapore also updated on the progress of the KRA in hydrology: implementation of Smart Drainage Grid system for sensor data management and analytics; as well as various efforts to strengthen flood resilience among communities. In addition, Singapore shared about the KRA in the following regional activities, which had contributed to Southeast Asia's capability building in extreme weather and tropical cyclone seasonal outlook: (i) Southeast Asia Regional Climate Centre Network (SEA RCC-Network), (ii) ASEAN Climate Outlook Forum (ASEANCOF), and (iii) Subseasonal-to-Seasonal Predictions for Southeast Asia (S2S-SEA).

21. In 2025, Thailand was directly affected by KALMAEGI (2525), a tropical cyclone that originated in the western North Pacific. It intensified into typhoon and moved across the Philippines into the South China Sea before making landfall in Vietnam. The storm moved further into Cambodia and Laos, and eventually entering northeastern Thailand. KALMAEGI was the only tropical cyclone that entered Thailand during this period (As 15 Nov.2025).

    At the beginning of rainy season, the monsoon and tropical storms were downgraded to the strong low-pressure area and brought widespread heavy rainfall, leading to severe flooding in several areas in Thailand. Started with Tropical cyclone "WIPHA" caused very heavy rain over the eastern part of the Northern Region on July 22, 2025, especially in Nan, Chiang Rai, and Phayao provinces, where very heavy rain occurred in a wide area. Subsequently, the heavy to very heavy rain spread to the western part of the Northern Region, covering Ching Mai, Lamphun, Lampang, Mae Hong Son, and Tak Provinces on July 23, 2025, rainfall more than 90 mm. per day included: 1) Nan Province 2) Chiang Rai 3) Phayao Province 4) Chiang Mai Province 5) Lampang Province 6) Phrae Province 7) Tak Province. This resulted in accumulated rainfall on July 22 – 23, 2025 of 427.0 millimeters at Pua District and 340.6 millimeters at Chiang Klang District in Nan Province. The rainfall recorded at these two stations was classified as extremely severe, with a return period of more than 1,000 years (probability of occurrence 0.1%). Heavy rain also resulted in increased inflow to large dams in the North. During July 22-August 3, 2025, Sirikit Dam received an accumulated inflow of approximately 2,300 million cubic meters (mcm) of water, followed by Bhumibol Dam and Kwae Noi Bamrung Daen Dam with cumulative inflow of 841 and 130 mcm respectively. The highest daily inflow during the Tropical cyclone "WIPHA" event reached 300.42 mcm. for Sirikit Dam. Tropical cyclone "WIPHA" also caused widespread flooding and resulted in the highest recorded water level in the Nan River at the Nan Hydrological Station (N.1), Mueang Nan District, Nan Province. This was the highest water level ever recorded, reaching 9.49 meters (A.D.) or 201.69 meters (M.S.L.), with a discharge rate of 2,735.50 cubic meters per second on July 24, 2025, rising sharply from approximately 400 cubic meters per second in the day. The storm also caused the river to overflow its banks by up to 2.49 meters in Mueang Nan District, located in the upper northern region of Thailand. Next in August, Typhoon "KAJIKI" and Tropical cyclone "NONGFA" caused river overflows in several basins, including the Wang River Basin and Pa Sak River Basin in the lower northern region, as well as

the Eastern Mekong Basin and Chi River Basin in the upper northeastern region. Lately in September, the slightly affected by Typhoon "RAGASA" and "BUALOI" and the monsoon trough continued to lie across Thailand, causing heavy to very heavy rainfall in the upper northern region. Reports indicated riverbank overflows in Lamphun and Chiang Mai provinces within the Ping River Basin.

The accumulated heavy rainfall in the northern and central regions of Thailand from late July to the end of October resulted in a large volume of water flowing into the Chao Phraya River Basin in the central region of the country. The peak discharge 2,850 cubic meters per second on October 20, 2025. As October 31, 2025, the total water storage in 35 large-scale reservoirs across Thailand amounts to 62,885 million cubic meters, representing 89% of the total water capacity of 70,926 million cubic meters. The water storage in year 2025 is more than in year 2024 by 3,807 million cubic meters.

22. In 2025, the region of Guam, USA has been experiencing a fairly quiet year, with only 11 TCs across the region, with 8 of the 11 occurring at the end of 2024, between October 1, 2024 and December 31, 2024. Of the 11, only 3 TCs resulted in any Watches or Warnings being issued for our Area of Responsibility (AOR). The first was Typhoon Man-Yi, November 11-13, 2024. Man-Yi developed north of Pohnpei on Nov 7, 2024. It was slowly moving west toward Guam and the Commonwealth of the Northern Mariana Islands (CNMI). A Tropical Storm Watch was issued for Guam and the CNMI on November 11, 2024 The Watches for Guam and Rota were upgraded to warnings the morning of November 12, with Tinian and Saipan watches upgraded later in the evening. A Flash Flood Watch was also issued. After Man-Yi passed by south of Guam, the warnings for Tinian and Saipan were cancelled the morning of November 13, with the Warnings for Guam and Rota being cancelled during the afternoon. Tropical Storm conditions and heavy rainfall did not occur. The next storm to affect the warning points in Guam ' s AOR was Typhoon Krosa. July 24-27, 2025. Tropical Storm Watches were issued for the CNMI, including the islands of Agrihan, Pagan and Alamagan in the Northern CNMI. A Flash Flood Watch was issued for Guam and the CNMI the afternoon of July 23. The watches were upgraded to Warnings for the Northern CNMI the morning of July 25, while the watches were cancelled for the CNMI. The Northern CNMI islands remained in Tropical Storm conditions until the evening of July 27. The Flash Flood Watch was cancelled during the afternoon of July 25. Localized nuisance flooding did occur, though Flash Floods were not observed. Rainfall amounts range from 4.24 inches (~108 mm) at Saipan Airport and 2.97 inches (~75 mm) at Guam Airport, with an overall average across the islands of 2 to 5 inches (~51 to 127 mm).

Finally, comes Typhoon Podul, August 7–8, 2025. Podul only resulted in Tropical Storm Watches being issued for the Northern CNMI early in the afternoon on August 7, but no warnings were issued. Watches were cancelled the afternoon of August 8. There were no large, organized Flash Flood or Flood events over the past 12 months. However, several Flash Flood Warnings were issued through the year for localized heavy rainfall events, along with numerous Flood Advisories for Urban and Small Stream nuisance flooding events.

Flooding events have been few, with no large-scale flood events over the past year. There were a few cases of nuisance flooding and localized flash flooding, but no significant flood pattern.

Drought did plague several islands across the western North Pacific at the beginning of 2025. Drought Information Statements were issued beginning on January 24, 2025. Drought continued to worsen through the next few months, with the worst conditions occurring in May and June,

when Guam and the CNMI reached extreme drought along with Wotje and Utirik in the Marshall Islands. Drought conditions began to improve in late June, with Drought Information Statements ending in early August.

23. In 2025, Vietnam has been facing a flood season with unusual and extreme storm-induced rainfall and flooding in Vietnam, typically affected by storms Wutip, Wipha and Kajiki. The most serious abnormality was the disaster from June 11 to 14, 2025 due to the impact of storm No. 1 (Wutip) - the first storm was formed in the East Sea in June after more than 40 years in history. The storm did not make landfall directly into Viet Nam, but its circulation caused exceptionally heavy rainfall from South of Ha Tinh to Da Nang provinces, with total rainfall of 250-550mm, many places exceeding 800mm and major floods on rivers from Quang Tri to Quang Nam provinces during 12th and 14th June. This is a historic disaster, clearly demonstrating the seasonal shift and increasing extreme intensity of weather and climate in Vietnam.

    The prominent disaster situation related hydrology in Vietnam can be mentioned as:

    - Heavy rainfall as results of storms Wutip, Wipha and Kajiki impact led to major flooding in the North and Central provinces of Vietnam, causing serious damage to people's lives and property.
    - Flash floods and landslides are dangerous hydrological phenomena that have taken place in mountainous areas.
    - The saline intrusion in the Mekong delta area always occurs in every dry season. The severity of saline intrusion will depend on the situation of the upstream Mekong flow.

III. Progresses of WGH AOPs in 2025 and Implementation Plan for 2026

24. The project leaders and/or their representatives from China, Japan, RO Korea presented the progress in 2025 and the implementation plan for 2026. The participants reviewed and discussed the implementation status in 2025 and the success indicators for 2026 of WGH AOPs.

25. The WGH AOPs in 2025 and beyond were summarized in Table 1. The implementation status of WGH AOP 2025 is summarized in Annex 1.

Table 1: The list of WGH AOPs in 2025 and beyond

Item	Projects	Driver	Duration
AOP1	Knowledge Sharing on Storm Surge Inundation Mapping	USA	2020~2026
AOP2	Improvement of Hydrological Data Quality Control System by Using AI technology	ROK	2023~2027
AOP3	Improvement of Flood Forecasting modelling by Using AI technology	ROK	2023~2027
AOP4	Review and enhancement on specifications for hydrological information and forecasting in TC Members	China	2025~2027
AOP5	Application Study on New Generation of Integrated Micro-siphon Rain Gauge in TC Members	China	2025~2027
AOP6	Flood Risk Mapping with Ground/Satellite Observation Data	Japan	2024~2027

AOP7	Flood resilience enhancement through Platform on Water Resilience and Disasters	Japan	2023~2027
AOP8	Training Course on Hydrological Monitoring and Flood Management for Developing Countries	China	2023~2028
AOP9	Synergized Standard Operating Procedures for Coastal Multi-Hazard Early Warning System (SSOP)-Phase III	USA	2025~2027

AOP1: Knowledge Sharing on Storm Surge Inundation Modeling

26. The implementation plan of the project for 2025 was approved at TC 57th Session as blow:

- The Members that are participating in the pilot study now have the toolset and guidance to implement POSSIM in their respective countries for further research and development.
- The Members now have a direct way of tracking, communicating, and updating their version of POSSIM through various means in tandem with guidance from the project leader.
- Localization time highly depends on local resources, data access and research expertise. USA would like to propose to TCS to extend AOP1 by another year, to 2026. This would provide the TC members in the pilot study enough time to run extensive simulations of past and current storms, in addition to communicating any issues in implementation and operation of POSSIM to project lead for further improvement of POSSIM.
- To conduct 2/3-day training workshop in October 2025 in conjunction with WGH 14th annual meeting.

27. The leader of this project Mr. Edwin Montvila from National Weather Service (NWS), Weather Forecast Office (WFO) Guam informed the implementation status and progresses in 2025 as follows:

- The Pacific Ocean Storm Surge Inundation Model (POSSIM) has been upgraded to a fourth, and final, iteration by AOP1 FP, utilizing much more sophisticated and reliable algorithms with much more optimized calculation techniques while not only minimizing processing overhead, but also pushing the limits of POSSIM. The new iteration is nicknamed "POSSIM 3.0."
- a 5-day training workshop for AOP1 from 15 to 19 September 2025 was held successfully in National Weather Service, Weather Forecast Office (WFO) Guam with 5 participants from China, Philippines and Thailand.
- POSSIM now has a preliminary technical documentation paper to explain the very basic functionality of the new POSSIM. The full comprehensive technical guide regarding all the algorithms involved will be completed by the end of November 2025.

28. The implementation plan of the project for 2026 was proposed for approval at TC 58th Session as below:

- The Members that are participating in the pilot study continue to have the toolset and guidance to implement POSSIM in their respective countries for further research and development.

- The Members continue to have a direct way of tracking, communicating, and updating their version of POSSIM through various means in tandem with guidance from the project leader.
- Localization time continues to depend highly on local resources, data access, and research expertise.

29. Guam, USA requested to extend AOP1 by another year, to 2027. This would provide the TC Members in the pilot study enough time to run extensive simulations of past and current storms, in addition to communicating any issues in implementation and operation of POSSIM to project lead for further improvement of POSSIM.

30. Malaysia has requested to join AOP1, which would mean the next workshop would need to include training on methodologies similar to what has been done with previous TC Members in 2025 workshop.

AOP2: Improvement of Hydrological Data Quality Control System by Using AI technology

31. The proposed activities/implementation plan for the project in 2025 which was approved at TC 57th Session was described as below:
    - To conduct application and practical testing in 4 pilot target TC Members (Malaysia, Lao P.D.R, Philippines, Thailand) with final version of hydrological data quality control system
    - To modify the AI hydrological quality control system
32. The implementation status and progresses of the project achieved in 2025 were described as:
    - conducting the demand analysis and testing using hydrological data from 4 pilot target TC Members (Malaysia, Lao P.D.R, Thailand, Philippines)
    - gathering the user's demands and add one more target TC member (Vietnam)
    - To report the result of application and demand analysis in 20th IWS
    - modifying the GUI of AI hydrological data quality control system
    - adopted AI module for modification of missing and unusual data
    - To host the training course for system operation/maintenance in Lao P.D.R on Nov. 2025.
    - To publish the technical report of hydrological data quality control using AI in 20th IWS
33. The implementation plan of the project for 2026 was proposed for approval at TC 58th Session as blow:
    - To apply and test the developed AI hydrological data quality control system within the pilot target Members;
    - To integrate the AI hydrological data quality control system with AI flood forecasting system;
    - To host the training program for system operation/maintenance in each target TC Members.

AOP3: Improvement of Flood Forecasting Modelling by Using AI Technology

34. The proposed implementation plan of the project for 2025 which was approved at TC 57th Session was described as blow:

- To conduct application and practical testing in 4 pilot target TC Members (Malaysia, Lao P.D.R, Philippines, Thailand) with AI deep-learning technique for flood forecasting
- To develop the AI flood forecasting system

35. The implementation status and progresses of the project achieved in 2025 were described as:
    - Conducting the demand analysis and testing using hydrological data from 4 pilot target TC Members (Malaysia, Lao P.D.R, Thailand, Philippines)
    - gathering the user's demands and add one more target TC member (Vietnam)
    - To report the result of application and demand analysis in 20th IWS
    - developing the AI flood forecasting system using LSTM
    - To host the training course for system operation/maintenance in Lao P.D.R on Nov. 2025.
    - To publish the technical report of flood forecasting system using AI in 20th IWS
36. The implementation plan of the project for 2026 was proposed for approval at TC 58th Session as blow:
    - To apply and test the developed AI flood forecasting system within the pilot target Members
    - To integrate the AI flood forecasting system with AI hydrological data quality control system
    - To conduct a training workshop for system operation/maintenance in each target TC Members

AOP4: Review and Enhancement on Specifications for Hydrological Information and Forecasting in TC Members

37. The objective of proposal is to (1) review and assess the status of standardization of hydrological information and forecasting in TC Members; (2) to exchange and share the knowledge and experiences on specifications of information and forecasting among TC Members; and (3) to put forward a guidance recommendations on promoting the specifications for hydrological information and forecasting for TC Members, as the output of this proposal.
38. The proposed implementation plan of the project for 2025 which was approved at TC 57th Session was described as blow:
    - Kick-off of the AOP, developing a detailed work-plan with involved TC Members;
    - Organizing a workshop in China for the selected Members to discuss the standardization of hydrological information and forecasting;
    - Conducting literature review, field survey with involved members & gathering their opinions.
39. The implementation status and progresses of the project achieved in 2025 were described as:
    - Conducted literature review, field survey with involved members (Malaysia, Philippines, Lao PDR and Thailand etc.) & gathered their opinions， and completed a preliminary literature review report on flood forecasting and early warning.

- Organized a workshop in October 2025 in Dehong, Yunnan province of China for the selected Members (Malaysia, Philippines, and Thailand) to discuss the standardization of hydrological information and forecasting.
- Attended the Scientific Experiment on EXOTICCA-II 2025 and Typhoon Observation International Seminar 26 June – 27 June 2025 in Hainan of China, maked a presentation titling "Key Technologies for the digital twin smart flood control system of the Huaihe River Basin" and exchanged ideals with experts from USA, German, Japan, Korea, Hong Kong. Given a course lecture on China flood forecasting on "Training course on water ecosystem protection and restoration technologies for developing countries" in November 2024.
- As the main contributor, completed the revision of the Chinese national standard "Hydrological Information and Forecasting Specification", and as the technical leader, participated in the revision of industry standards for small and medium-sized rivers.

40. The implementation plan of the project for 2026 was proposed for approval at TC 58th Session as blow:
    - To conduct the field survey with involved members & gathering their opinions, drafting the new normative technical documents for hydrological information & forecasting and soliciting opinions from all TC members.
    - To draft the review report for finalizing the normative technical documents.
    - To organize training course and sharing the results with TC Members.
    - To submit the report on specification of hydrological information and forecasting as AOP's implementation outcome for review and release.

AOP5: Application Study on New Generation of Integrated Micro-siphon Rain Gauge in TC Members

41. The objective of the proposed AOP is to carry out the promotion and application of integrated micro-siphon Rain Gauge with high precision and resolution in TC Members, so as to (1) enhance the efficiency of early warning of rainstorm disasters, and (2) provide early warning of disasters for the public, provide basic data support for the government to implement disaster prevention and reduction decision-making and deployment, and reduce disaster losses.
42. The proposed implementation plan of the project for 2025 which was approved at TC 57th Session was described as blow:
    - 1st Quarter, 2025: (1) to collect participating Members and select demonstration application areas; (2) to work out the preliminary implementation plans, and formulate follow-up work arrangements.
    - 2nd -3rd Quarter, 2025: to conduct application study in China, including collecting typhoon heavy rainfall observation literature data, carrying out theoretical analysis and experience summary, analyzing the problems existing in the installation, operation support and collaborative observation of observation equipment, study solutions, and determine the follow-up installation and operation plan of equipment.

- 4th Quarter, 2025: conduct training on the new generation of integrated Micro-siphon Rain Gauge for participating Members.

43. The implementation status and progresses of the project achieved in 2025 were described as:

- In March 2025, an expert seminar was organized to discuss the application area of rain gauge. After discussion, Xima Rainfall Field Science Observation and Research Station in Dehong Prefecture, Yunnan Province, was identified as the application area. The rain gauge is planed to be installed at three different heights: ground level, 0.7m, and 4m, To study the impact of wind speed on rainfall observation.
- Upgrading the equpment with recent advancements in Rain Gauge Technology: the insect-proof filter has been redesigned.A camera has been added to prevent these issues proactively.
- In September 2025, the rain gauges scheduled for pilot study in China have been successfully installed at the Xima Station. The equipments have commenced data collection.
- AOP5's progress was reported at WGH 14th annual meeting held in Guam, USA on 22-26 September 2025,
- A workshop for AOP5 was held in Dehong Prefecture, Yunnan Province on 21-25 October, 2025. The 20 participants in total came from China, Malaysia and Thailand; ESCAP/WMO Typhoon Committee Secretariat (TCS) also attended the workshop. the workshop included the completion of on-site technical training for rain gauges focusing on training of installation and observation of rain gauge, and discussed the implementation plan for 2026:
  - → to install two Micro-siphon Rain Gauge at the rainfall station in Kuala Lumpor, Malaysia selected by DID Malaysia in first quarter 2026; and then collect observed data for pilot study.
  - → to install two Micro-siphon Rain Gauge in PAGASA Philippines?
  - → Thailand?

44. The implementation plan of the project for 2026 was proposed for approval at TC 58th Session as blow:

- Technical training programs for rain gauges to be advanced;
- Finalizing the technical guidelines and user manual;
- The installation of rain gauges in Malaysia, the Philippines and Thailand to be completed; and
- Conducting data collection and analysis in 4 pilot Members, namely China, Malaysia, Philippines and Thailand.

AOP6: Flood Risk Mapping with Ground/Satellite Observation Data

45. The proposed implementation plan of the project for 2025 which was approved at TC 57th Session was described as below:

- To improve flood mapping using flow scale with sensitive analysis,

- To analyze the operation patterns of the Pasak Dam and the lateral inflow into the upstream section of Rama VI Dam to the downstream inundated area,
- To combine the above factors to the inundation area using sensitivity analysis, and
- To create the flood risk map by probability scale for the downstream area of the Pasak Dam using Rainfall-Runoff-Inundation (RRI) model.

46. The implementation status and progresses of the project achieved in 2025 were described below:
    - Necessary hydrological data were obtained from the Royal Irrigation Department (RID) of Thailand to support model development and analysis,
    - Statistical analysis of rainfall was conducted using GSMaP (Global Satellite Mapping of Precipitation) as satellite rainfall observation data, and
    - The RRI model for the downstream area of the Pasak Dam was developed. Calibration of the model is scheduled to be implemented.
47. The implementation plan of the project for 2026 was proposed for approval at TC 58th Session as below:
    - To follow up on the flood risk map created in 2025.

AOP7: Flood Resilience Enhancement through Platform on Water Resilience and Disasters

48. The proposed implementation plan of the project for 2025 which was approved at TC 57th Session was described as blow:
    - Develop the agreed implementation and action plans of the Platform together with relevant stakeholders
    - Conduct data integration and inventory of modeling for the Online Synthesis System for Sustainability and Resilience (OSS-SR)
49. The implementation status and progresses of the project achieved in 2025 were described as:
    - The implementation plan and action table have been successfully developed through the second plenary meeting of the Platform on Water Resilience and Disasters in Thailand.
    - Design of the OSS-SR has been developed together with the identification of candidates for “Facilitator” fostering in Thailand
    - Three challenges in the Platform on Water Resilience and Disasters in the Philippines: 1) area expansion, 2) stakeholder expansion, 3) theme expansion were clearly identified and undertaken, particularly in the Davao region
50. The implementation plan of the project for 2026 was proposed for approval at TC 58th Session as blow:
    - Consolidate the cooperation among stakeholders in Thailand to promote initiatives to enhance the resilience of water-related disasters
    - Implement data and model integration for OSS-SR and develop the capacity for learning them.
    - Accelerate and upscale initiatives for the three expansions above-mentioned in the Platform on Water Resilience and Disasters in the Philippines

AOP8: Training Course on Hydrological Monitoring and Flood Management for Developing Countries

51. The proposed implementation plan of the project for 2025 which was approved at TC 57th Session was described as blow:

- Apply for the 5th Training Course Flood Control and Early-Warning and Forecasting and Hydrological Monitoring for Developing Countries in 2025. At the same time, as NIHWA-YZU (WMO RTCs) was designated in the 78th session of the WMO Executive Council 2024, it will provide continuous training and education in the field of hydrology for WMO members, aiming at improving the professional ability of hydrology and related sciences.
- By building a professional training center and carrying out a series of training work, the on-going training will enhance the technical ability and professional level of China and other developing countries in the fields of hydrological forecasting and flood control early warning and forecasting, and contribute China's strength to Typhoon Committee members and global water resources management, flood control and disaster reduction and cooperation.

52. The implementation status and progresses of the project achieved in 2025 were described as:

- The two-weeks face to face training class was held on September 3-16, 2025. Total 31 participants from 8 countries attended the training class. The training was comprised by four main parts: lectures, study visiting, seminar and cultural experience. The training course is mainly convened to allow participants to learn about Water management philosophy and Chinese experience, China’s hydrological monitoring technology, acquire general ideas on how to apply the automatic system of hydro-meteorological data observation and transmission, and have futher cooperation between participating countries and China.
- More and more participating countries come from Typhoon Committee Member countries joined the training class, such as Cambodia, Philippines, Laos, Malaysia, Thailand and Vietnam. Total 20 trainees from 2024-2025.
- There will be a wide spread of participation through different countries and more and more countries pay attention to the training course under the influence of NIHWA-YZU (WMO RTCs).
- The training course has been well received by the students, and the efforts of the training team and relevant departments have been fully affirmed in previous training.
- The training course has provided the platform of sustainable capacity building for TC Members and solid technical and institutional support for global water governance and regional water security.

53. The implementation plan of the project for 2026 was proposed for approval at TC 58th Session as blow:

- Apply for the 6th Training Course Flood Control and Early-Warning and Forecasting and Hydrological Monitoring for Developing Countries in 2026. At the same time, under the platform of NIHWA-YZU (WMO RTCs), NIHWA will provide continuous training and

education in the field of hydrology for WMO members, aiming at training more technical experts in the water resources sector for developing countries among the TC Members.

- Strengthen cooperation with NIHWA and TC WGH, jointly enhance the hydrological monitoring and forecasting capabilities of relevant countries and reduce the adverse impacts of floods on human activities.
- Under the platform of NIHWA-YZU (WMO RTCs), NIHWA plan to carry out demonstration and pilot projects for hydrological information monitoring and transmission technologies in TC Members, promote the promotion and cooperation of China's hydrological monitoring and flood forecasting technologies in relevant countries, and provide China's water governance solutions

AOP9: SSOP-III

54. The project on Synergized Standard Operating Procedures for Coastal Multi-Hazard Early Warning System (SSOP)-Phase III with 3 years period from 2023 to 2025, led by USA, was launched officially at TC 55th Session.

55. It was proposed at TC 57th Session to submit the updated proposal report to ESCAP for approval. So far, the team is still waiting for the response from ESCAP, and there is no expectation of how things will progress in the future.

56. Considering above-mentioned situation, WGH decided to suspend this AOP until the feedback from ESCAP confirms that it can be restarted.

Proposals of New AOPs

57. The meeting reviewed WGH's ongoing AOPs, and noted that almost all AOPs will be concluded in 2027. Considering this situation, WGH recognized the importance and urgency of calling on and encouraging Members to propose new project initiatives for further discussion.

58. Ir. Dr. Norlida Mohd Dom, WGH focal point in Malaysia, Director of the National Flood Forecasting and Warning Centre, Department of Irrigation and Drainage (DID) Malaysia, expressed that DID Malaysia is willing to lead two AOPs for WGH in next years, (1) Regional Adaptation and Knowledge Sharing on Rainfall Thresholds for Flash Flood Forecasting; and (2) Improvement of Flood Monitoring Through Advanced Sensors and Warning Equipment.

New Proposal 1: Regional Adaptation and Knowledge Sharing on Rainfall Thresholds for Flash Flood Forecasting

59. The background information of the proposal on Regional Adaptation and Knowledge Sharing on Rainfall Thresholds for Flash Flood Forecasting (RTFFF) is to addresses the challenge of devastating flash floods in Malaysia, where generic rainfall thresholds are inadequate for accurate and localized warnings. Malaysia's Department of Irrigation and Drainage (DID) is already undertaking a national "Rapid Flow Forecasting project" to establish scientifically validated local thresholds. This AOP's background is the opportunity to leverage this national work for regional benefit. It proposes sharing Malaysia's methodology, findings, and results with all Typhoon Committee members to foster collaboration and establish regional best practices.

60. The purpose will focus on sharing expertise across the Typhoon Committee, including:

- Document and Share: Malaysia's comprehensive methodology for establishing flash flood hotspot-specific rainfall thresholds.
- Validate and Report: regional applicability of the Southeastern Asia-Oceania Flash Flood Guidance System (SAOFFGS) parameters using Malaysian data, providing actionable insights for TC members. and
- Develop and Disseminate: adaptable regional best-practice guidelines and a technical manual based on the Malaysian study.

61. Members will be actively engaged through a "two-track" collaborative approach. This includes:

- Technical workshops on threshold determination and SAOFFGS validation
- A working group to share technical specifications and best practices.

62. This dual strategy directly supports the TC's strategic goals for technology (KRA 2) and capacity building (KRA 4), ultimately helping all Members reduce flood-related mortality and economic losses (Targets 1 & 2).

63. The expected outcomes and benefits of the proposal can be briefed as below:

- Shared best-practice methodology: accessible, documented approach for flash flood thresholds.
- Improved regional understanding: actionable insights enhancing the tool's utility.
- Enhanced regional capacity: increased technical expertise in threshold determination and localized warning development.
- Framework for regional collaboration: a platform for ongoing knowledge exchange and mutual support.
- Contribution to TC goals: empowers members with better tools for flash flood risk reduction (supporting Targets 1 & 2 of TC Strategic Plan 2021-2016).

64. The methodology activities includes:

- Sharing Malaysia's National Methodology by finalizing detailed documentation of the study, conducting technical workshops to present the case study, and distributing a detailed report on the approach and learnings.
- Regional SAOFFGS Validation Reporting by documenting the assessment of SAOFFGS parameters using Malaysian data , reporting on any discrepancies and limitations found , and developing recommendations for TC members on how to calibrate and adapt the tool.
- Developing Regional Guidelines and Capacity Building by adapting the Malaysian technical manual into a regional best-practice document , organizing regional training sessions based on these guidelines , and establishing a collaborative platform for ongoing knowledge sharing

65. The proposal of RTFFF is scheduled to last 5 years from 2027 to 2031 with a road-map as below:

- Year 2027: Foundation & Initial Sharing. To initial engagement with TC members through Q&A sessions, and report dissemination and to gather the preliminary interest for guideline adaptation.
- Year 2028: Guideline Development & Platform Launch. To conduct the first official workshop to present draft guidelines and gather active feedback; platform launch encourages initial sharing of related national experiences or challenges from other members.
- Year 2029: Capacity Building & Early Adoption. To conduct activities for the deeper engagement through targeted training; supporting pilot implementation efforts; active knowledge exchange via the collaborative platform.
- Year 2030: Regional Case Studies & Guideline Updates. To conduct the joint development of regional case studies; collaborative review and update of guidelines; sharing RTFFF calibration results..
- Year 2031: Consolidation & Sustainability. To host the final workshop to present impact assessment, update guidelines, joint publications and planning for sustained collaboration beyond the AOP time frame.

New Proposal 2: Improvement of Flood Monitoring Through Advanced Sensors and Warning Equipment

66. The background information of the proposal is fundamentally driven by the severe flood risk in Malaysia, where flooding is recognized as the country's most significant natural disaster, having caused extensive losses in major historical events and currently placing 5.7 million people at direct risk. This initiative builds upon the foundation established by Malaysia's proven National Flood Forecasting and Warning Programme (PRAB), which has already substantially improved national capabilities by extending the flood forecasting lead time from one day to seven days and enhancing warning dissemination from six hours to two days before an event. The AOP represents the next strategic phase to further augment the accuracy, reliability, and resilience of this established system against increasingly complex weather events

67. The purpose of the proposal is to create a strategic opportunity to enhance the accuracy, efficiency, and reliability of the overall flood early warning system through targeted technological upgrades. This involves the re-engineering of key sensors and warning equipment, with a critical focus on ensuring the data integrity of monitoring and dissemination information under the most challenging hydrological conditions. The project aims to develop and test prototypes of advanced equipment such as improved water level and velocity sensors to meet the robustness and reliability of the monitoring systems. By doing so, it can achieve optimal development and maintenance costs, thereby strengthening real-time monitoring capabilities and more effective warning dissemination.

68. The goals of the proposal is (1) to improve flood monitoring and dissemination through there engineering of advanced sensors and warning equipment, focusing on velocity radar sensors, water level radar sensors, and omnidirectional siren horns. (2) to develop and test prototypes of this advanced equipment in line with World Meteorological Organization (WMO) to ensure robustness and reliability with optimum development and maintenance costs. and (3) to enhance

regional capacity among TC Members, universities, and local associates through collaborative knowledge sharing on hardware design, testing methodologies, and joint field trials.

69. The methodology activities include a project structured around three main activities spanning a five-year roadmap (2027–2031):

- Re-engineering of Advanced Monitoring Sensors: This involves the design and prototyping of a Velocity Radar Sensor for continuous, non-contact river flow velocity measurement to improve the accuracy of flood discharge estimation during high flows. Concurrently, a Water Level Radar Sensor will be prototyped for high-accuracy, non-contact monitoring of river levels, focusing on resilience against debris and reduced maintenance needs.
- Development of Wide-Coverage Warning Systems: This activity focuses on developing and testing a prototype Omnidirectional Siren Horn designed for 360-degree, community-wide flood alerts to enhance the "last mile" effectiveness of public alerts. Field trials will be conducted to validate the siren's effective acoustic range and clarity against conventional directional sirens.
- Regional Collaboration and Knowledge Sharing: A working group will be established with interested TC Members to share technical specifications, design challenges, and testing data. This collaboration is crucial for co-developing a Best-Practice Manual for the deployment, calibration, and maintenance of these modernized systems for all TC Members.

70. The expected outcomes and benefits of the proposal can be briefed as below:

- Improved monitoring accuracy: a quantifiable increase in the accuracy and reliability of real-time river velocity and water level data, leading to better inputs for flood forecasting models.
- Enhanced warning effectiveness: a wider, more effective "last mile" warning coverage due to the implementation of omnidirectional siren technology, improving public preparedness.
- Strengthened regional capacity: a robust framework and best-practice guide for deploying advanced hydrological sensors and warning equipment, shared among TC Members to enhance regional standards.
- Reduced disaster impact: a direct contribution to TC Targets 1 and 2 by providing more accurate initial data for warnings and ensuring those warnings effectively reach vulnerable communities.

71. The proposal is scheduled to last 5 years from 2027 to 2031 with a road-map as below:

- Year 2027: The primary goal is to form a collaborative group with partner nations to share initial literature review, best practices and identify technical specification. Report in the WGH Annual Meeting.
- Year 2028: Host annual workshop to share prototype of selected equipment and initial results test with regional partners, fostering collaborative development. Report in the WGH Annual Meeting.
- Year 2029: Share the experience, challenges, and results of the field pilot test with partners to guide their own implementation efforts. Report in the WGH Annual Meeting.

- Year 2030: Work with partners to co-develop a "Best Practices" guide for validation and certification accordance with WMO and local standards. Report in the WGH Annual Meeting.
- Year 2031: Host a workshop to demonstrating success, sharing replicable knowledge, and establishing a sustainable framework for future cooperation. Report in the WGH Annual Meeting.

Summary of WGH AOPs in 2026 and Beyond

72. The WGH AOPs for 2026 and beyond were listed in Table 2, and the success indicators of AOPs for 2026 are shown in Annex 2.

Table 2: The list of WGH AOPs in 2026 and beyond

Item	Projects	Driver	Duration
AOP1	Knowledge Sharing on Storm Surge Inundation Mapping	USA	2020~2027
AOP2	Improvement of Hydrological Data Quality Control System by Using AI technology	ROK	2023~2027
AOP3	Improvement of Flood Forecasting modelling by Using AI technology	ROK	2023~2027
AOP4	Review on specifications for hydrological information and forecasting in TC Members	China	2025~2027
AOP5	Application Study on New Generation of Integrated Micro-siphon Rain Gauge in TC Members	China	2025~2027
AOP6	Flood Risk Mapping with Ground/Satellite Observation Data	Japan	2024~2027
AOP7	Flood resilience enhancement through Platform on Water Resilience and Disasters	Japan	2023~2027
AOP8	Training Course on Hydrological Monitoring and Flood Management for Developing Countries	China	2023~2028
AOP9	Synergized Standard Operating Procedures for Coastal Multi-Hazard Early Warning System (SSOP)-Phase III	USA	suspended
AOP10?	Regional Adaptation and Knowledge Sharing on Rainfall Thresholds for Flash Flood Forecasting ?	Malaysia	2027-2031
AOP11?	Improvement of flood monitoring through advanced sensors and warning equipment ?	Malaysia	2027-2031

IV. Review TCTF allocation for WGH AOP activities in 2025 and Proposed Request for 2026

73. WGH reviewed the allocation of TCTF ($29000USD) for WGH activities and usage (up to September) in 2025 shown in table 3.

Table 3 The summary of TCTF Budget Request for 2025 Activities

Item	Projects	Driver	Budget	Usage
1	Knowledge Sharing on Storm Surge Inundation Mapping	USA	10000	done
2	Improvement of Hydrological Data Quality Control System by Using AI technology	ROK	-	-
3	Improvement of Flood Forecasting modelling by Using AI technology	ROK	-	-
4	Review on specifications for hydrological information and forecasting in TC Members	China	3000	done
5	Application Study on New Generation of Integrated Micro-siphon Rain Gauge in TC Members	China	3000	done
6	Flood Risk Mapping with Ground/Satellite Observation Data	Japan	-	-
7	Flood resilience enhancement through Platform on Water Resilience and Disasters	Japan	3000	not yet
8	Training Course on Hydrological Monitoring and Flood Management for Developing Countries	China	7000	done
9	Synergized Standard Operating Procedures for Coastal Multi-Hazard Early Warning System (SSOP)-Phase III	USA	-	-
10	Supporting hosting WGH 14th annual meeting in 2025		3000	No usage
	Total		29000	

74. The Participants expressed their highest appreciation to all Members for their in-kind contribution in the year, and encouraged all Members continue their strong support.

Table 4 The summary of TCTF Budget Request for 2026 Activities

Item	Projects	Driver	Budget
1	Knowledge Sharing on Storm Surge Inundation Mapping	USA	10000
2	Improvement of Hydrological Data Quality Control System by Using AI technology	ROK	-
3	Improvement of Flood Forecasting modelling by Using AI technology	ROK	-
4	Review on specifications for hydrological information and forecasting in TC Members	China	3000

5	Application Study on New Generation of Integrated Micro-siphon Rain Gauge in TC Members	China	5000
6	Flood Risk Mapping with Ground/Satellite Observation Data	Japan	-
7	Flood resilience enhancement through Platform on Water Resilience and Disasters	Japan	3000
8	Training Course on Hydrological Monitoring and Flood Management for Developing Countries	China	5000
11	Supporting hosting WGH 15th annual meeting in 2026		3000
	Total		29000

75. Based on the discussion, WGH proposed the budget request of $29,000USD for supporting its activities in 2026 shown in table 4.

V. Chairmanship and Focal Points of WGH

76. The meeting was informed that TCS received an Official Letter, signed by Mr. KIM Kue Bum, Director General of Han River Flood Control Office (HRFCO), Ministry of Environment of the Republic of Korea, informing the change in Vice-Chairperson for WGH, Ms. PARK Hye-Jin, Director of Water Resources Information Center of HRFCO, will take the position of WGH vice-chairperson in place of Dr. CHO Hyo Seob.

77. The participants expressed their highest appreciation to the government of the Republic of Korea through HRFCO for the remarkable contribution to WGH, and also expressed their sincerest gratitude to Dr. Hyo Seob CHO for his valuable contribution and strong support to WGH serving as vice chairperson since 2015.

78. WGH also reviewed and updated the information of the focal points in Members.

VI. Discussing publishing AOP technical report under the name of Typhoon Committee

79. The TC publication was also discussed during the review of AOPs implementation at WGH 14th annual meeting, held in Guam, USA from 23 to 25 September 2025. The messages from the AOP leaders related to TC publication were briefed below for further consideration by TCS and the Committee.

- The outcomes and/or outputs of AOPs implementation by the Working Groups are very important achievements of technical cooperation among TC Members. These achievements should be shared both within and beyond the region to showcase the activities of technical cooperation and help to raise the regional and international profile and visibility of Typhoon Committee.
- Given the limited funds available for publishing the physical, the publication of e-book (PDF) versions of AOP technical report should be promoted and encouraged.
- Members wishing to publish their technical reports as TC publications should submit the manuscript and corresponding application as TC publication to TCS.

- TCS shall:
  - → allocate a series number of TC technical publication;
  - → provide the standard format of TC publication to the Member for report editing ;
  - → assist in applying the ISBN number for the official publication, if required;
- The Members responsible for publishing the e-book shall bear all expenses, and work closely with TCS by:
  - → editing the document strictly in accordance with the publication format requirement.
  - → providing a small number of necessary physical copies to the ISBN agency and TCS for archiving purposes;
  - → ensuring the e-book (PDF) to be shared on TC web-page; etc.

VII. Conclusions

80. On the basis of the discussion and outcomes at 14th WGH annual meeting, participants recognized the importance in following aspects for further direction of WGH:

- AOP technical report publication .....
- AOP proposal ....
-
- Any inputs and suggestions are welcome

VIII. Recommendations to the Committee

81. On the basis of the deep discussion and communication, participants agreed to submit the following recommendations to the Committee at TC 57th Annual Session to be held in early 2025:

- to appoint Ms. PARK Hye-Jin, Director of Water Resources Information Center of HRFCO, the Republic of Korea, as vice-chairperson of WGH.
- to thank Dr. Hyo Seob CHO, Director General, Geum River Flood Control Office, the Republic of Korea, for his contribution to WGH serving as vice chairperson since 2015.
- to request US$29,000 from TCTF for supporting overall WGH activities for 2026 calendar year.
- to thank WFO-Guam, USA and MLIT, Japan for co- hosting WGH 14th Annual Meeting on 23-25 September, 2025.
- to request ??? to host WGH 15th annual meeting in 2026.
- To request ??? to consider the possibility of hosting WGH 16th annual meeting with funding support in 2027.
- to approve AOP1 “Knowledge Sharing on Storm Surge Inundation Modeling” led by Guam, USA to extend one more years to 2027.

Annex 1. Implementation Status of WGH AOP 2025

Annex 2. Successor Indicators of WGH AOP 2026

Annex 1. Implementation Status of WGH AOP 2025

KRA	Objective Number	Objective	Action	Other WGs Involved	TCS Responsibility	Expected Quarter Completed	Other Organizations Involved	Success Indicators	Funding Required	Funding Sources	YES/NO
KRA 1 KRA 2 KRA 3 KRA 4 KRA 7	1	Knowledge sharing on Storm Surge Inundation Modeling	To share, prepare and localize Pacific Ocean Storm Surge Inundation Modeling (POSSIM) program with TC members (possibly PTC members in future)	WGDRR WGM	Coordination	(a) First (b) Second (c) Third (d) Fourth	NIHWA, China; RID, Thailand	(a-b) have TC Members complete localization of POSSIM in their respective countries. (b-d) have TC Members run simulated and archived storms using historical data and/or bulletins in their respective domains. (b-d) have TC Members continue to update the functionality of POSSIM for their local needs, while coordinating with primary focal point. (c-d) i. complete reports indicating performance, strengths, weaknesses, improvements, and future expectations of POSSIM; ii. to help TC Members improve in interpreting produced data, as well as improve methodology in communicating expected impacts in vulnerable zones in their respective domains; iii. establish criteria for successful implementation as studies continue into 2025, including but not limited to; iv. UI improvement, performance improvement, algorithm improvement, local bias adjustments. v. Training workshop in Oct, 2025	10000	MWR, China; SMG, Macao, China; RID, Thailand; PAGASA, Philippines	Ongoing Ongoing Ongoing Ongoing
KRA2 KRA3 KRA4	2	Improvement of Hydrological Data Quality Control System by using AI technology	To apply, test and modify the TC member Hydrology Data Quality Control System		See above	(a) First (b) Second (c) Third (d) Fourth	PAGASA, Philippines; DID, Malaysia; DMH, Laos; RID, Thailand	(a-c) To conduct application and practical testing in 4 pilot target TC Members (Malaysia, Lao P.D.R, Philippines, Thailand) with final version of hydrological data quality control system (d)To modify the AI hydrological quality control system		HRFCO, ME	On-goning On-goning
KRA2 KRA3 KRA4	3	Improvement of Flood Forecasting modelling by using AI technology	To establish the modification plan of EFFS and to apply in practical		See above	(a) First (b) Second (c) Third (d) Fourth	PAGASA, Philippines; DID, Malaysia; DMH, Laos; RID, Thailand	(a-c) To conduct application and practical testing in 4 pilot target TC Members (Malaysia, Lao P.D.R, Philippines, Thailand) with AI deep-learning technique for flood forecasting (c-d)To develop the AI flood forecasting system		HRFCO, ME	On-goning On-goning
KRA3	4	Review on specifications for hydrological information and forecasting in TC Members	To review the status of specifications on hydrological information and forecasting in TC Members; To figure out the area to be enhanced.		See above	(a) First (b) Second (c) Third (d) Fourth	PAGASA, Philippines; DID, Malaysia DMH, Lao PDR; RID, Thailand	(a-b) to collect participating Members and develop a detailed work-plan with involved TC Members (b-c) To organize a workshop in China for the selected Members to discuss the standardization of hydrological information and forecasting (b-d) To conduct literature review, field survey with involved members & gathering their opinions	3000	HWC, China	YES YES YES
KRA3 KRA4	5	Application Study on New Generation of	To initiate the field pilot study and workshop for		See above	(a) First (b) Second (c) Third	PAGASA, Philippines; DID, Malaysia.	(a) to collect participating Members and select demonstration application areas; (b-c) to conduct application study in China (c-d) to conduct training workshop on the	3000	NIHWA, China	YES YES

		Integrated Micro-siphon Rain Gauge in TC Members	selected Members			(d) Fourth		new generation of integrated Micro-siphon Rain Gauge for participating Members.			YES
KRA 1 KRA 2 KRA 3 KRA 4 KRA 5	6	Flood Risk Mapping with Ground/Satellite Observation Data	To develop Flood Risk Map at the target river basin		See above	(a) First (b) Second (c) Third (d) Fourth	RID, Thailand	(a-b)Flood mapping by flow scale based on the validated model (b-d)Developing the final version for Flood Risk Map		MLIT	Yes Ongoing
KRA 1 KRA 2 KRA 3 KRA 4 KRA 5	7	Flood resilience enhancement through Platform on Water Resilience and Disasters	To finalize implementation plan and update the Platform	WGM WGDRR	See above	(a) First (b) Second (c) Third (d) Fourth	PAGASA, Philippines; RID, ONWR & TMD, Thailand	(a-b) action plan of the Platform agreed with relevant stakeholders (c-d) data integration and inventory of modeling for Online Synthesis System for Sustainability and Resilience	3000	ICHARM	Yes Yes
KRA 1 KRA 2 KRA 3 KRA 4 KRA5	8	Training Course on Hydrological Monitoring and Flood Management for Developing Countries	Enhancement of capacity building of TC Members on flood monitoring and forecasting		See above	(a) First (b) Second (c) Third (d) Fourth	NHSs of all Members	(a-d) to compile the training materials as TC publications; (c-d) to provide continuous training and education in the field of hydrology for TC & WMO members, aiming at improving the professional ability of hydrology and related sciences	7000	NIHWA	On-going YES
KRA1 KRA3 KRA4 KRA5	9	SSOP-III	To submit the proposal to ESCAP for approval		See above	(a) First (b) Second (c) Third (d) Fourth	AWG WGM WGDRR	(a-d) update the proposal report and submitted it to ESCAP for approval		ESCAP	Suspended

- KRA 1: Enhance capacity to monitor the impacts of tropical cyclone related disasters, including reduction of mortality rates and direct economic losses, and strengthen tropical cyclone related disaster risk reduction (DRR) activities in various sectors.
- KRA 2: Enhance capacity in tropical cyclone forecast and disaster risk prediction using multi-hazard impact-based forecasts, risk-based warnings, understandable information designed in collaboration with users, and cutting-edge information technology, leveraged from the latest advances in big data analytics, artificial intelligence, machine learning, and social science to support early warning systems, decision making and disaster response.
- KRA 3: Improve flood mitigation measures and integrated water resource management to reduce the impacts of flooding caused by tropical cyclones.
- KRA 4: Strengthen capacity development activities in meteorology, hydrology, DRR and civil protection sectors, to enhance nationally to locally coordinated mechanisms for tropical cyclone early warning information to reach the last mile; and combine public awareness with the appropriate response to protect life and property from tropical cyclones.
- KRA 5: Promote visibility and enhance Typhoon Committee's Regional and International collaboration mechanisms to build partnerships, enhance capacity development, share best practices, and encourage active participation of international organizations in the disaster risk reduction programmes.
- KRA 6: Create a framework for cooperative scientific research on tropical cyclone and related disciplines, particularly in relation to climate change, and include support for translating research outcomes to services by developing relevant experiments, research projects, conducting field surveys, and publishing and promoting research findings.
- KRA 7: Enhance the resilience of vulnerable communities, especially coastal communities, to tropical cyclone impacts.

Annex 2. Success Indicators of WGH AOP 2026

KRA	Objective Number	Objective	Action	Other WGs Involved	TCS Responsibility	Expected Quarter Completed	Other Organizations Involved	Success Indicators	Funding Required	Funding Sources
KRA 1 KRA 2 KRA 3 KRA 4 KRA 7	1	Knowledge sharing on Storm Surge Inundation Modeling	To share, prepare and localize Pacific Ocean Storm Surge Inundation Modeling (POSSIM) program with TC members (possibly PTC members in future)	WGDRR WGM	Coordination	(a) First (b) Second (c) Third (d) Fourth	NIHWA, China; DSMG, Macao, China; RID, Thailand DID, Malaysia?	(a) have TC Members complete localization of POSSIM in their respective countries. (b-c) have TC Members run simulated and archived storms using historical data and/or bulletins in their respective domains. (b-c) have TC Members continue to update the functionality of POSSIM for their local needs, while coordinating with primary focal point. (c-d) i. complete reports indicating performance, strengths, weaknesses, improvements, and future expectations of POSSIM; ii. to help TC Members improve in interpreting produced data, as well as improve methodology in communicating expected impacts in vulnerable zones in their respective domains; iii. establish criteria for successful implementation as studies continue into 2026, including but not limited to; iv. UI improvement, performance improvement, algorithm improvement, local bias adjustments. v. Training workshop in Aug/Sep, 2026 and fiinal hand-off	**10000**	MWR, China; SMG, Macao, China; RID, Thailand; PAGASA, Philippines; DID, Malaysia?
KRA2 KRA3 KRA4	2	Improvement of Hydrological Data Quality Control System by using AI technology	To apply, test and modify the TC member Hydrology Data Quality Control System		See above	(a) First (b) Second (c) Third (d) Fourth	PAGASA, Philippines; DID, Malaysia; DMH, Laos; RID, Thailand	(a-b) To conduct application and practical testing in 4 pilot target TC Members (Malaysia, Lao P.D.R, Philippines, Thailand) with final version of hydrological data quality control system (c) To distribute the AI hydrological quality control system (d) To integrate the system with AI Flood Forecasting System		HRFCO, ME
KRA2 KRA3 KRA4	3	Improvement of Flood Forecasting modelling by using AI technology	To establish the modification plan of EFFS and to apply in practical		See above	(a) First (b) Second (c) Third (d) Fourth	PAGASA, Philippines; DID, Malaysia; DMH, Laos; RID, Thailand	(a-b) To conduct application and practical testing in 4 pilot target TC Members (Malaysia, Lao P.D.R, Philippines, Thailand) with final version of Flood Forecasting System (c) To distribute the AI Flood Forecasting System (d) To integrate the system with AI hydrological quality control system		HRFCO, ME
KRA3	4	Review on specifications for hydrological information and forecasting in TC Members	To review the status of specifications on hydrological information and forecasting in TC Members; To figure out the area to be enhanced.		See above	(a) First (b) Second (c) Third (d) Fourth	PAGASA, Philippines; DID, Malaysia DMH, Lao PDR; RID, Thailand	(a-b)To conduct the field survey with involved Members (b-c) To draft the review report and report at WGH meeting and IWS (d) To organize workshop and sharing the results with TC Members.	3000	HWC, China
KRA3 KRA4	5	Application Study on New Generation of Integrated Micro-	To initiate the field pilot study and workshop for selected Members		See above	(a) First (b) Second (c) Third (d) Fourth	PAGASA, Philippines; DID, Malaysia.	(a-b) the installation of rain gauges in Malaysia and the Philippines; (b-c)technical training programs for rain gauges.	5000	NIHWA, China

		siphon Rain Gauge in TC Members						(c-d)Data collection and analysis in three pilot Members		
KRA 1 KRA 2 KRA 3 KRA 4 KRA 5	6	Flood Risk Mapping with Ground/Satellite Observation Data	To develop Flood Risk Map at the target river basin		See above	(a) First (b) Second (c) Third (d) Fourth	RID, Thailand	(a)Developing the final version for Flood Risk Map (b-d)To compile the results and create a report		MLIT
KRA 1 KRA 2 KRA 3 KRA 4 KRA 5	7	Flood resilience enhancement through Platform on Water Resilience and Disasters	To update implementation plan and consolidate the Platform	WGM WGDRR	See above	(a) First (b) Second (c) Third (d) Fourth	PAGASA, Philippines; RID, ONWR & TMD, Thailand	(a-b) Updated action table (c-d) OSS-SR implementation design	3000	ICHARM
KRA 1 KRA 2 KRA 3 KRA 4 KRA5	8	Training Course on Hydrological Monitoring and Flood Management for Developing Countries	Enhancement of capacity building of TC Members on flood monitoring and forecasting		See above	(a) First (b) Second (c) Third (d) Fourth	NHSs of all Members	(a-d) to compile the training materials as TC publications; (c-d) to conduct 6th Training Course	5000	NIHWA
KRA1 KRA3 KRA4 KRA5	9	SSOP-III		AWG WGM WGDRR	See above	(a) First (b) Second (c) Third (d) Fourth	ESCAP	Suspended		ESCAP

- KRA 1: Enhance capacity to monitor the impacts of tropical cyclone related disasters, including reduction of mortality rates and direct economic losses, and strengthen tropical cyclone related disaster risk reduction (DRR) activities in various sectors.
- KRA 2: Enhance capacity in tropical cyclone forecast and disaster risk prediction using multi-hazard impact-based forecasts, risk-based warnings, understandable information designed in collaboration with users, and cutting-edge information technology, leveraged from the latest advances in big data analytics, artificial intelligence, machine learning, and social science to support early warning systems, decision making and disaster response.
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