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FOR PARTICIPANTS ONLY
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SUMMARY OF MEMBERS' REPORTS 2024

(submitted by AWG Chair)

Summary and Purpose of Document:

This document presents an overall view of the progress and issues in meteorology, hydrology and DRR aspects among Typhoon Committee (TC) Members with respect to tropical cyclones and related hazards in 2024

Action Proposed

The Committee is invited to:

- (a) take note of the major progress and issues in meteorology, hydrology and DRR activities in support of the 19 Priorities detailed in the Typhoon Committee Strategic Plan 2022-2026; and
- (b) Review the Summary of Members' Reports 2024 in APPENDIX B with the aim of adopting it as an "Executive Summary" for distribution to Members' governments and other collaborating or potential sponsoring agencies for information and reference.

APPENDICES:

- 1) Appendix A – DRAFT TEXT FOR INCLUSION IN THE SESSION REPORT
- 2) Appendix B – SUMMARY OF MEMBERS' REPORTS 2024

**APPENDIX A:
DRAFT TEXT FOR INCLUSION IN THE SESSION REPORT**

6.2 SUMMARY OF MEMBERS' REPORTS

1. *The Committee took note of the Summary of Members' Reports 2024 highlighting the key tropical cyclone impacts on Members in 2024 and the major activities undertaken by Members under the TC Priorities and components during the year.*
2. *The Committee expressed its sincere appreciation to AWG Chair for preparing the Summary of Members' Reports and the observations made with respect to the progress of Members' activities in support of the 19 Priorities identified in the TC Strategic Plan 2022-2026 and their relevance to the Early Warnings for All (EW4All) initiative of the United Nations.*

Recommendations of AWG

3. *Consider the key tropical cyclone impacts on Members in 2024 and review the initiatives and activities to be pursued in support of the 19 TC Priorities to mitigate future impacts.*
4. *Adopt Section 2 of the Summary of Members' Reports 2024 as an "Executive Summary" to be distributed to Members' governments for information and reference.*
5. *Any other text to be included in the Session Report.*

APPENDIX B: SUMMARY OF MEMBERS' REPORTS 2024

T C Lee (AWG Chair)

This document concisely summarizes the key tropical cyclone activity/impacts in the Typhoon Committee region in 2024 and Members' major initiatives supporting the Typhoon Committee Priorities based on Members' Reports submitted for the 19th Integrated Workshop (19th IWS)/AP-TCRC Forum held in Shanghai, China during 19 – 22 November 2024. For detailed information and interpretation, please refer to the corresponding Member Report in the Member Report Section of the 19th IWS website:

(<https://www.typhooncommittee.org/19IWS/general19IWS.html>)

1. Objectives

The objectives of this Summary are to extract the key aspects of tropical cyclone impact and related topical issues of regional interest in Members' countries or territories, and to consolidate the information and observations for:

- (a) the attention of Members' governments to encourage allocating the necessary resources for the purposes of operational effectiveness and readiness, disaster mitigation and risk reduction, or leveraging available resources and support for technology transfer and capacity-building through regional cooperation initiatives; and
- (b) reference by sponsoring agencies with a view to coordinating and synergizing effort in the planning of relevant projects and programmes for such purposes, as well as channeling resources and aids into identified areas of gaps or needs.

2. Key Observations in 2024

2.1 Overview (courtesy of RSMC Tokyo – Typhoon Center)

Over the western North Pacific and the South China Sea, 26 named tropical cyclones formed in 2024, which was on par with the 30-year average of 25.1 (1991 – 2020). 13 of these reached typhoon intensity, which was almost the same as the 30-year average of 13.3. A total of four formed in July which was below the average of 7.8 and then 22 formed since August, which was higher than the average of 17.3. The El Niño event, which continued to the spring, suppressed convection in the tropical western North Pacific until the end of July, similar to past post-El Niño summers, and reduced the genesis of tropical cyclones. However, the number of named TC formation has increased since August, which was likely due to the weakening of the El Niño event and the enhancement of the convection from the Philippines to the southeast of Japan in August and September.

Based on the provisional best track analysis, the mean genesis point of named tropical cyclones was 18.4°N and 134.6°E, representing a north-westward deviation from the 30-year average (16.3°N and 135.9°E). The mean genesis point of named tropical cyclones in summer (June to August) was 21.9°N and 136.6°E, with a north-eastward deviation from the 30-year summer average (18.5°N and 134.2°E). The mean duration of tropical cyclones with tropical storm intensity or higher was 4.7 days, which was shorter than the 30-year average of 5.2 days.

The 2024 typhoon season started with Ewiniar (2401), which formed over the sea east of Mindanao on 23 May 2024. The last-named tropical cyclone in the year was Pabuk (2426). It formed in December 2024 over the South China Sea and weakened to tropical depression intensity over the same waters.

2.2 2024 – A year of regaining normalcy

Kicking started with the 56th Session held in Kuala Lumpur of Malaysia, the first face-to-face Session since the 51st Session, 2024 was a year of regaining normalcy for all the activities of the Typhoon Committee, including the 19th Integrated Workshop/AP-TCRC Forum and the training activities of different working groups. While Typhoon Committee Members continued to deliver professional services and developing various new initiatives during the intersession period, the potential of applying Artificial Intelligence (AI) in tropical cyclone and weather forecasting has attracted Members' attention. In this connection, the Committee organized the workshop on "Promoting Technical Exchange of AI Applications in Tropical Cyclone Analysis and Forecasting" and the Roving Seminar with the theme on "Artificial Intelligence for Enhanced Tropical Cyclone Prediction and Emergency Response" to facilitate in-depth discussions and technical sharing on the topic and pave the way for related future collaborations in the Typhoon Committee region. Moreover, the occurrence of the devastating Super Typhoon Yagi and its severe impacts to some of the Members further highlighted the urgent needs for enhancing collaborations in tropical cyclone monitoring/analysis, effective early warnings and climate risk assessment in the region.

2.3 Members' initiatives supporting the Priorities of the Typhoon Committee Strategic Plan (2022-2026)

The table below consolidates Members' key initiatives as reported in their respective Member reports submitted for the 19th IWS. The numbers of initiatives are an indication of which Priorities received relatively more emphasis from the initiatives reported by the Members.

WG	No.	Priorities	No. of initiatives
Integrated	1	Strengthen the cooperation between TRCG, WGM, WGH, and WGDRR to develop impact-based forecasts, decision-support and risk-based warning.	15
	2	Strengthen cross-cutting activities among working groups in the Committee.	7
	3	Enhance collaborative activities with other regional/international frameworks/organizations, including technical cooperation between	12

		TC/AP-TCRC and TC/PTC cooperation mechanism.	
Meteorology	4	Enhance the capacity to monitor and forecast typhoon activities particularly in genesis, intensity and structure change.	21
	5	Develop and enhance typhoon analysis and forecast techniques from nowcast to medium-range, and seasonal to long-range prediction.	22
	6	Enhance and provide typhoon forecast guidance based on NWP including ensembles, weather radar and satellite related products, such as QPE/QPF.	10
	7	Promote communication among typhoon operational forecast and research communities in Typhoon Committee region.	8
	8	Enhance training activities with TRCG, WGH, and WGD RR in accordance with Typhoon Committee forecast competency, knowledge sharing, and exchange of latest development and new techniques.	5
	9	Enhance RSMC capacity to provide regional guidance including storm surge, in response to Member's needs.	3
Hydrology	10	Improve typhoon-related flood (including riverine flood, flash flood, urban flood, and coastal flood) monitoring, data collection and archiving, quality control, transmission, processing, and sharing framework.	10
	11	Enhance capacity in typhoon-related flood risk management (including land-use management, dam operation, etc.) and integrated water resources management and flood-water utilization.	4
	12	Strengthen capacity in effective flood forecasting and impact-based early warning, including hazard mapping and anticipated risk based on methodological and hydrological modelling, and operation system development.	11
	13	Develop capacity in projecting the impacts of climate change, urbanization and other human activities on typhoon-related flood disaster vulnerability and water resource availability.	1
	14	Increase capacity in utilization of advanced science and technology for typhoon-related flood forecasting, early warning, and management.	3
DRR	15	Provide reliable statistics of mortality and direct disaster economic loss caused by typhoon-related disasters for monitoring the targets of the Typhoon Committee.	2
	16	Enhance Members' disaster risk reduction techniques and management strategies.	17
	17	Evaluate socio-economic benefits of disaster risk reduction for typhoon-related disasters.	1
	18	Promote international cooperation of DRR implementation project.	10
	19	Share experience/knowhow of DRR activities including legal and policy framework, community-based DRR activities, methodology to collect disaster-related information.	5

2.4 Members' activities related to the Early Warnings for All initiative

In echoing the Early Warnings for All (EW4All) initiative of the United Nations, Members are also invited to report the relevance of their activities with the four pillars of EW4All in the Member Report for the 19th IWS. The table below summarizes the number of initiatives addressing the four pillars of EW4All as reported in the Member Reports available for the 19th IWS.

Key Pillars of EW4All (https://public.wmo.int/en/earlywarningsforall)	No. of initiatives
Disaster risk knowledge and management	31
Detection, observation, monitoring, analysis, and forecasting	44
Warning dissemination and communication	32
Preparedness and response capabilities	26

3. Summary of Members' Reports

3.1 Cambodia

No member report was submitted by Cambodia for 2024.

3.2 China

In 2024, eight named tropical cyclones (TCs) made landfall in China, which was slightly higher than the climatological mean of around seven. The average landfall intensity of these TCs was significantly stronger than in previous years, reaching 38.6 m/s. Notably, Yagi was the strongest TC to hit China during the year, making landfall in Hainan and Guangdong with maximum sustained winds of 62 m/s, was the strongest typhoon that made landfall in China during autumn since meteorological records began.

Up to 25 October 2024, TC-related disasters had affected a total of around 6 million people across nine provinces in China, resulting in eight fatalities. Additionally, about 2.4 million people were urgently evacuated for safety, and 810,000 were relocated for emergency assistance. Over 1,400 buildings collapsed, while 49,000 buildings sustained varying degrees of damage. The area of crops affected totaled 351,800 hectares, with a complete loss of 30,600 hectares.

China highlighted eight major initiatives supporting the Typhoon Committee Priorities. These include the application and evaluation of AI weather models for TC forecasting, advancements in numerical modeling of TCs, the TC observation experiment, and a comprehensive collaborative observation experiment for typhoons in the South China Sea. Additionally, the initiatives encompass the use of Fengyun satellites in TC operation and research, advancements in TC scientific research, improvements in typhoon-related disaster management, and TC operational skill training by the China Meteorological Administration (CMA).

3.3 Democratic People's Republic of Korea (DPRK)

No member report was submitted by DPRK for 2024.

3.4 Hong Kong, China

In 2024, seven TCs, namely Maliksi, Prapiroon, Yagi, Trami, Yinxing, Toraji and Man-yi affected Hong Kong, China. Among these TCs, Yagi and Toraji necessitated the issuance of the No. 8 Gale or Storm Signal. The successive strikes of Yinxing, Toraji and Man-yi necessitated the issuance of TC warning signals in November 2024, the first time in November since 1946. The passage of Traji required the issuance of No. 8 Gale or Storm Signal on the night of 13 November, the latest issuance of No. 8 Gale or Storm Signal in a year since 1946.

Yagi attained its peak intensity with an estimated maximum sustained wind of 230 km/h

near its centre in the small hours on 6 September, making it the second strongest TC in the South China Sea since the Observatory's records began in 1950. The outer rainbands of Yagi brought heavy showers, violent gusts and thunderstorms to Hong Kong on the night of 5 September and the next two days. More than 100 mm of rainfall were recorded over most parts of Hong Kong on 5 – 7 September and rainfall even exceeded 200 mm over the northeastern part of the New Territories.

Hong Kong, China, undertook 12 key initiatives in support of Typhoon Committee priorities. Notable achievements include extended collaboration with CMA to utilize multiple aircraft platforms for coordinated observations in the Hong Kong and Sanya flight information regions, starting in July 2024, when warranted. Other significant efforts involve the trial operation of Artificial Intelligence (AI) weather forecasting models and the Delft3D FM model for storm surge forecasting. Additionally, other initiatives include enhancing risk-based storm surge forecast products, strengthening emergency communication regarding extreme weather, implementing a pilot Smart Flood Alert System at Shing Mun River, developing TC strike probability maps, advancing the AI-STORMVIS system and enhancing the Severe Weather Information Centre (SWIC) website. An English online video course on TCs, along with social media activities, aim to improve public understanding and awareness of TC hazards.

3.5 Japan

In 2024, 11 TCs of tropical storm intensity or higher, namely Ewiniar, Gaemi, Maria, Ampil, Jongdari, Shanshan, Bebinca, Pulasan, Cimaroon, Jebi, and Kong-Rey, had come within 300 km of the Japanese archipelago, with two making landfall. Shanshan caused heavy rainfall in western and central Japan, leading to inundation damage of 42 rivers and 133 landslides. Several rainfall stations reported the highest 72-hour precipitation on record, with total rainfall exceeding 900 mm in some areas – more than double the normal August monthly average.

Maria caused no casualties but resulted in housing damages and power outages affecting over 4,000 households. Ampil injured four people and caused property damage with power outages for about 13,800 households. Shanshan resulted in 8 fatalities and 133 injuries. More than 1,300 houses were damaged to varying degrees, and over 283,000 households' power supply was interrupted. Pulasan led to 16 fatalities, 47 injuries, extensive housing damage, and power outages for nearly 7,000 households.

Japan reported on eight major initiatives aligned with Typhoon Committee Priorities. These include the update of the RSMC Tokyo's Numerical Typhoon Prediction Website, attachment training in 2024, updates to JMA's numerical weather prediction system, and a flood risk assessment for companies. Additionally, the initiatives cover the 13th TC WGH Meeting in Nanjing, the Asian Conference on Disaster Reduction 2023, the Visiting Researchers Program, and the GLocal unique disaster IDentifier (GLIDE) system.

3.6 Lao PDR

No member report was submitted by Lao PDR for 2024.

3.7 Macao, China

Up to 7 November 2024, four TCs affected Macao, China, including Maliksi, Prapiroon, Yagi, and Trami. Maliksi brought winds of up to 65 km/h and heavy rainfall of approximately 50 mm in Macao, leading to the issuance of TC Signal No. 3. Prapiroon remained over 500 km away from Macao, resulting in minimal impact, with Signal No. 1 issued on 20 July. Yagi was the most impactful TC in 2024, prompting the issuance of TC Signal No. 8 and a blue storm surge warning, leading to the closure of schools and public transport. Despite its strength, only minor damages were reported, along with three injuries. Trami passed south of Macao, resulting in Signal No. 3, with winds of force 6 briefly recorded.

In support of Typhoon Committee Priorities, Macao, China reported eight major initiatives, including the launch of a personalized weather subscription service, enhancement of public weather service strategies, upgrades to forecast tools and systems, the development of AI technology forecasting tools, the Tropical Cyclone Interdepartmental Video Meeting, public activities to promote knowledge of meteorology and disaster risk reduction, an annual emergency exercise, and a new city information kiosk to display civil protection information.

3.8 Malaysia

From December 2023 to September 2024, seven TCs, namely Ewiniar, Gaemi, Yagi, Jelawat, Maliksi, Prapiroon, and Soulik, affected the area of responsibility of the Malaysian Meteorological Department (MET Malaysia). During the passage of Pulasan, fourteen strong wind and rough sea warning were issued, the highest number of warnings issued during this TC season.

They did not directly or indirectly cause significant loss of life or property within Malaysia. Their impacts on Malaysia's weather were minimal, with most TCs causing only distant impacts. Flooding primarily occurred due to heavy rainfall from other weather systems rather than the TCs themselves, except for Jelawat.

Malaysia reported on three major initiatives supporting Typhoon Committee Priorities, including the addition of new radar observation sites for monitoring severe weather, the National Disaster Risk Reduction Policy 2030, and improvements in the disaster information and warning dissemination process through the National Disaster Command Centre (NDCC).

3.9 The Philippines

In 2024, the Philippines was directly affected by sixteen TCs that entered the Philippine Area of Responsibility from May to November, resulting in flooding over different parts of the country.

In May, Typhoon Ewiniar caused flooding in six regions, with Calabarzon experiencing the highest 24-hour rainfall of 196.9 mm. In July, the passage of Prapiroon and Gaemi

affected 16 regions, with Metro Manila recording the highest rainfall of 323.9 mm. In August, Jongdari entered and exited the area without significant impact on the country. However, from September to October, flooding was reported in 16 regions due to Yagi and other TCs, with Luzon experiencing the highest 24-hour rainfall of 258.9 mm during Yagi's passage. In October and November, 12 regions were flooded during the passages of various TCs, with Trami bringing a notable 24-hour rainfall of 528.5 mm in Daet, Luzon.

Overall, a total of 3,681 flood bulletins, advisories, and information were issued during these events. These events also activated the Flood Forecasting and Warning System for Dam Operations in coordination with the four major dam operators in Luzon. In total, 327 flood bulletins and information regarding dam releases were issued.

3.10 Republic of Korea (ROK)

In 2024, two TCs, namely Jondari and Shanshan, affected the Korean Peninsula. Jongdri brought an accumulated rainfall of 169 mm and a peak gust of 29.9 m/s to Jeju Island. A trial special explanatory typhoon information for Jongdri was issued twice at 06 UTC on 19 and 20 August 2024. Shanshan caused an accumulated rainfall of 168 mm and a peak gust of 26.9 m/s in eastern and southeastern Korea.

ROK reported on 12 major initiatives to support Typhoon Committee Priorities, including the improvement of the algorithm for summer typhoon prediction (POP1), the deployment of drifting buoys for typhoon forecasts and analysis (AOP12), and the development of an AI-based TC automatic analysis system. Additional efforts include an experimental service for commentary on typhoon forecasts, the utilization of GEO-KOMPSAT-2A for TCs (AOP10), improvements to the hydrological data quality control system among Typhoon Committee members, enhancements in flood forecasts and information, and the launch of a flood warning alarm through navigation services. Other initiatives focus on capacity building and knowledge sharing in disaster risk reduction (DRR), the establishment of an early warning and alert system, and the hosting of the 19th Annual Meeting of the Typhoon Committee Working Group on DRR, along with the sharing of information related to DRR.

3.11 Singapore

A dry spell lasting 18 days occurred from July 13 to 30, 2024, largely due to the influence of TCs Gaemi and Prapiroon in the South China Sea. Their presence suppressed rainfall and brought dry air masses to Singapore, resulting in significantly below-average rainfall across many local areas during mid-July.

Singapore reported on six key initiatives supporting Typhoon Committee Priorities, including advancements in hydrological monitoring and flood management, development of data-driven probabilistic rainfall forecast guidance, participation in the ASEAN Climate Outlook Forum (ASEANCOF) and Southeast Asia Regional Climate Centre Network (SEA RCC-NETWORK) and hosting of ASMC-WMO Regional Forum 2024. Additionally, Singapore conducted a capability-building programme in subseasonal-to-seasonal predictions for Southeast Asia and released findings of the Third National Climate Change

Study.

3.12 Thailand

From 1 November 2023 to 31 October 2024, Thailand experienced direct impacts from one TC, named Soulik, which moved across the Northeastern region in September 2024. In addition, four other TCs, namely Maliksi, Prapiroon, Yagi, and Trami, indirectly influenced rainfall patterns across the country.

Yagi resulted in very heavy rain in many areas of upper Thailand, leading to overflow and flooding, particularly in economically important zone and tourist attractions. The combined effects of Soulik, the southwest monsoon, and the monsoon trough led to prolonged flooding in the northern and northeastern parts of the country from 20 to 22 September. During the 2024 rainy season, the active southwest monsoon, along with Yagi and Soulik, caused significant economic losses and social damages. The heavy rainfall resulted in overbank flow, flash floods from mountainous areas, and landslides, leading to 57 fatalities, 28 injuries, and affecting over 268,000 households.

Thailand highlighted nine initiatives supporting Typhoon Committee priorities. These initiatives include the establishment of a TC Monitoring Center, the development and exchange of radar composite data, and the development of a surface observation and GTS/WIS network. Additionally, efforts were made to strengthen cooperation among relevant agencies for impact-based forecasting and risk-based warnings, enhance capacity in TC-related flood risk management, integrate water resource management, and develop a central data platform called “National Thai Water.” Other initiatives involve the establishment of a Decision Support System (DSS) for local flood impact forecasting, the implementation of a Cell Broadcast Service (CBS) for disaster early warnings, and addressing flooding issues in Chiang Mai.

3.13 United States of America (USA)

No member report was submitted by USA for 2024.

3.14 Viet Nam

In 2024, Viet Nam was affected by four TCs and one tropical depression. Among them, Yagi made landfall in Viet Nam and broke many records of intensity over the past 50 years, leading to severe damage in the northern region.

Due to Yagi, followed by the influence of the inter-tropical convergence zone (ITCZ) connected to the circulation of the low-pressure area weakened from Yagi, extremely heavy rain occurred in the northern region, as well as in Thanh Hoa and Nghe An provinces, from the night of 6 to 12 September 2024. The maximum accumulated rainfall ranged from 200 to 450 mm, with some areas reporting over 550 mm. Flood peaks surpassed historical levels in various river systems in Northern Viet Nam. As a consequence of the severe flooding, many provinces and cities in the Red and Thai Binh Delta areas, as well as coastal regions, were flooded for the next two weeks. Yagi caused

329 fatalities and disrupted agricultural production, impacting economic growth for the year.

Viet Nam reported on three major initiatives to support Typhoon Committee Priorities, including the Central Data Hub, HPC and forecast supporting system, impact-based forecast and warning services, and the Short-range Regional Ensemble Prediction System (SREPS-32).