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SUMMARY OF MEMBERS' REPORTS 2020

(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 TC Members with respect to tropical cyclones and related hazards in 2020

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 21 Priorities detailed in the Typhoon Committee Strategic Plan 2017-2021; and

(b) Review the Summary of Members' Reports 2020 in APPENDIX B with the aim of adopting 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 2019

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 2020 highlighting the key tropical cyclone impacts on Members in 2020 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 21 Priorities identified in the TC Strategic Plan 2017-2021.*

Recommendations of AWG

3. *Consider the key tropical cyclone impacts on Members in 2020 and review the initiatives and activities to be pursued in support of the 21 TC Priorities to mitigate future impacts.*

4. *Adopt Section 2 of the Summary of Members' Reports 2016 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 2020

Raymond Tanabe (AWG Chair)

The summary is based on Members' Reports as submitted by Members of the Typhoon Committee for the 15th IWS hosted by Viet Nam and conducted by video conference on 1-2 December 2020. The full reports may be found in the Member Reports section of the 15th IWS website.

http://www.typhooncommittee.org/13IWS/Members13IWS.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 2020

2.1 Overview (courtesy RSMC Tokyo – Typhoon Center)

In the western North Pacific and the South China Sea, 23 named tropical cyclones formed in 2020, which was below the 30-year average, and 10 of them reached typhoon intensity, whose ratio was the below the 30-year average. The 2020 typhoon season started off slow before picking up in the last few months.

The 2020 typhoon season started in May with Vongfong (2001), which originally formed as a TD around the Palau Islands and hit the Philippines with TY intensity early on 14 May. Notably, only two named TCs had formed by July, which is far below the 30-year normal of 7.7. The third named TC formed at 00 UTC on 1 August, which is the second latest since related statistics began in 1951. This is attributed to high sea surface temperatures over the Indian Ocean and related convective activity in the region until July, which led to convective inactivity over the South China Sea and seas east of the Philippines, where TCs generally form.

The total of six named TCs forming in October was the second highest since statistics began. Analysis shows significantly enhanced convective activity from the South China Sea to the area east of the Philippines, which created favorable atmospheric and oceanic conditions for local TC formation. This is attributed to an active Madden-Julian Oscillation (MJO) phase in the area in addition to the emergence of the La Niña event.

2.2 Impacts of COVID-19 Pandemic

In late 2019 and the first 2 months of 2020, an emerging coronavirus outbreak transitioned into the global COVID-19 pandemic. For Members of the Typhoon Committee, this meant a radical and fundamental change in the way we operate, conduct business, interact, and go about our daily lives. All five Working Groups of the Typhoon Committee went above and beyond to ensure their work plans were carried out to the best of their ability given increasing restrictions. For the first time in its history, The 52nd Session of the Typhoon Committee and the 15th IWS was conducted virtually via video conference. Hosts Hong Kong, China, and Viet Nam, along with the entire Typhoon Committee Secretariat, are commended for their outstanding leadership and extreme flexibility in making these two events a success. In the face of very challenging conditions world-wide, Typhoon Committee Members have endured adversity to ensure their respective countries remained well informed and prepared for tropical cyclone related disasters. The AWG is pleased to present the Summary of Members' Reports for 2020.

2.3 Relative support for the 21 Priorities of the Typhoon Committee Strategic Plan 2017-2021. The table includes input only from 9 Members who self-reported in their respective country reports as submitted for the 15th IWS. The individual values are not important. The relative scores are an indication of which Priorities received the greatest emphasis from the major initiatives as reported my Members.

	Priorities	
1	Enhance activities to develop impact-based forecast and risk-based warning.	15
2	Strengthen cross-cutting activities among working groups in the Committee.	11
3	Enhance collaborative activities with other regional/international frameworks/organizations, including TC and PTC cooperation mechanism.	9
4	Enhance the capacity to monitor and forecast typhoon activities particularly in genesis, intensity and structure change.	19
5	Develop and enhance typhoon analysis and forecast technique from short- to long-term.	15
6	Enhance and provide typhoon forecast guidance based on NWP including ensembles and weather radar related products, such as QPE/QPF.	14
7	Promote communication among typhoon operational forecast and research communities in Typhoon Committee region.	9
8	Strengthen the cooperation with WGH and WGDRR to develop impact-based forecast and risk-based warning.	6
9	Enhance, in cooperation with TRCG, training activities in accordance with Typhoon Committee forecast competency, knowledge sharing, and exchange of latest development and new techniques.	8
10	Enhance RSMC capacity to provide regional guidance including storm surge, responding to Member's needs.	7
11	Improve typhoon-related flood (including river flood, urban flood, mountainous flood, flash flood and storm surge, etc the same below) monitoring data collection, quality control, transmission, and processing.	10
12	Enhance capacity in typhoon-related flood risk management (including dam operation), integrated water resources management and flood-water utilization.	11
13	Enhance capacity in impact-based and community-based operational flood forecasting and early warning, including methodology research, hydrological modeling, and operation system development.	13
14	Enhance capacity in flood risk (hazard, inundation) information, mapping, and its application.	10
15	Enhance capacity in assessment and dealing with the impacts of climate change, urbanization, and other human activities on typhoon-related flood disaster vulnerability and water resources availability.	10
16	Enhance capacity in advanced technology (including satellite data, GIS, RS, QPE/QPF, ensemble, parallel computing) utilization in typhoon-related flood forecasting and early warning, and hydrological modeling.	12
17	Provide reliable statistics of mortality and direct disaster economic loss caused by typhoon-related disasters for monitoring the targets of the Typhoon Committee.	1
18	Enhance Members' disaster reduction techniques and management strategies.	12
19	Evaluate socio-economic benefits of disaster risk reduction for typhoon-related disasters.	10
20	Promote international cooperation of DRR implementation project.	11
21	Share experience/know-how of DRR activities including legal and policy framework, community-based DRR activities, methodology to collect disaster-related information.	7

3. Summary of Members' Reports

3.1 Cambodia.

From January through October 2020, Cambodia experienced early drought, late season flooding, and one tropical cyclone. El Nino conditions persisting from January through May produced maximum temperatures of 34-41C across the country. A weak and late arriving southwest monsoon contributed to lower rainfall during the early rainy season. The monsoon trough strengthened over the final portion of the rainy season leading to above normal rainfall. In September and October, almost all provinces experienced daily rainfall accumulations. On 14 October, Tropical Storm Linfa made landfall on Viet Nam before moving over Cambodia, producing heavy rainfall and flooding in 19 of 25 provinces. By 21 October, over 150,000 households across 14 provinces were reported to be affected by flash floods. Infrastructure, schools, health centers, and agricultural lands were also inundated.

Cambodia reported on 2 major initiatives supporting Typhoon Committee Priorities. Cambodia made significant progress in strengthening their Climate Information and Early Warning System by integrating technology and placing communities as the heart of a people-centered early warning system. Cambodia also placed emphasis on increasing their institutional capacity to assimilate and forecast weather, hydrological and climate information through online training throughout the COVID-19 pandemic.

3.2 China

A lower-than-average five tropical cyclones (Nuri, Hagupit, Mekkhala, Higos, and Nangka) made landfall over coastal China through 20 October 2020. Nuri was notable as rainfall was generally seen as positive. The precipitation due to Nuri helped to alleviate the moderate to severe drought in southwest Guangdong, south Guangxi and Hainan Island lasting from the beginning of the flood season. Hagupit, Mekkhala, Higos, and Nangka all produced stronger winds and heavier rainfall leading to more significant and widespread damage.

The NE section of China was impacted by three tropical cyclones (Bavi, Maysak, and Haishen) in quick succession from 26 August to 8 September. These three tropical cyclones all made landfall first over the Korean Peninsula. This rare occurrence broke the record high set in 1949. Heavy rains associated with these three tropical cyclones also broke many daily and monthly rainfall records.

China reported on 8 major initiatives supporting Typhoon Committee Priorities. Of note were application of Machine Learning techniques for tropical cyclone intensity estimation, advances in typhoon forecasting techniques, advances in typhoon field observations, and a variety of tropical cyclone related research and applications. CMA also enhanced their support to provincial emergency management offices with improved disaster information management services.

3.3 Democratic People's Republic of Korea (DPRK).

DPRK was impacted by a total of five tropical cyclones (Hagapit, Jangmi, Bavi, Maysak, and Haishen) in 2020. These typhoons caused gales, heavy rain, torrential rain and storm surge, and caused significant damage in several sectors. Maysak and Haishen in particular, produced devastating floods in several areas nationwide. Tens of personal injuries were reported, thousands of houses collapsed, hundreds of public buildings were damaged, tens of hectares of crops were affected, and hundreds of kilometers of railroad and roads were destroyed. Direct economic losses are estimated in the hundreds of millions of Korean Won.

DPRK noted with thanks the numerical weather prediction suite of products from ECMWF, CMA, JMA, and NCEP for their role in assisting their forecasters in making accurate and timely warnings for typhoon related impacts in 2020. In support of Typhoon Committee Priorities, DPRK established a Dvorak-based typhoon analysis system and ensemble-based typhoon track forecasting technique, and incorporated these into operational use. The State Hydro-Meteorological Administration also made improvements in the delivery of typhoon related information to the public by working closely with the national government to ensure the safety of people and minimize damage to property and infrastructure.

3.4 Hong Kong, China.

Five tropical cyclones (Nuri, Sinlaku, Higos, Nangka, and Saudel) affected Hong Kong, China from 1 January to 31 October 2020. Higos necessitated the issuance of the Increasing Gale or Storm Signal, No. 9, for the first time since Super Typhoon Mangkhut hit Hong Kong in 2018. Nangka necessitated the issuance of No. 8 Gale or Storm Signal, while Nuri, Sinlaku and Saudel necessitated the issuance of No. 3 Strong Wind Signal. Higos produced the most significant damage across Hong Kong, toppling over 800 trees, breaking windows in an apartment building, producing coastal inundation, and diverting 14 flights from the Hong Kong International Airport.

Hong Kong, China reported on 15 major initiatives in support of Typhoon Committee Priorities. Notable achievements include the continued participation in the EXOTICCA project, continued aerial reconnaissance of tropical cyclones in the Hong Kong Flight Information Region, continuous development of the Severe Weather Information Centre website (SWIC 2.0), advances in nowcasting support and research activities, expanded use of Chatbot for delivery of tropical cyclone information, and improved guidance on rapid intensification.

3.5 Japan

In 2020, seven tropical cyclones (Hagapit, Jangmi, Bavi, Maysak, Haishen, Dolphin, and Chan-Hom) of tropical storm intensity or higher had come within 300 km of the Japanese archipelago as of 7 November 2020. The country was affected even by those that did not make landfall. Haishen produced the most significant damage, impacting the Nansei Islands and Kyushu on 5-7 September. Maximum sustained winds in excess of 40 m/s, open ocean wave heights above 10 meters and 24-hour rainfall totals in excess of 400mm resulted in 2 fatalities, 4 missing persons, and damage to over 800 homes. At one point nearly 70,000 residences were without power and over 4,600 residences without water supply. Aside from this typhoon related disaster,

unprecedented rainfall from July 3rd to 31st in Japan's Kumamoto Prefecture and elsewhere caused extensive flooding and levee breaches. At least 80 people died or remained unaccounted for, and around 14,000 houses were inundated.

Japan reported on 9 major initiatives in support of Typhoon Committee Priorities. A new initiative was the commencement of five-day forecasts for tropical depressions expected to reach tropical storm intensity within 24-hours. There were several new and/or improved products added to the Numerical Typhoon Prediction website along with upgrades to the JMA Global Spectral Model. Another notable contribution is MLIT's shift in focus to mainstream public disaster prevention and mitigation, working toward transition to River Basin Disaster Resilience and Sustainability by All. This innovative approach involves a new concept for flood management in collaboration with relevant parties around river basins based on the major considerations of disaster resilience, inclusiveness and sustainability. Japan, in similar fashion to all Members, responded to the emerging COVID-19 pandemic by taking advantage of video conferencing to host the 9th WGH Meeting virtually. Over 30 attendees from 10 Members participated in this meeting.

3.6 Lao PDR

Through October 2018, Lao PDR was directly impacted by seven tropical cyclones (Sinlaku, Noul, Linfa, Nagka, Saudel, Molave, and Vamco) and indirectly by one tropical cyclone (Goni). In terms of rainfall, Sinlaku was the wettest tropical storm affecting Lao PDR in 2020, producing over 400 mm of daily rainfall in the central part of Lao PDR. Overall, 5-day rainfall totals across the country due to Sinlaku ranged from 200-900 mm. Flooding of Mekong River tributaries lasted more than three weeks in some areas. Outside of tropical cyclone related impacts, local storms produced episodes of heavy rain, lightning, and gusty winds causing damage to infrastructure, loss of livestock, electrical outages, and property damage.

Throughout the disaster period, including pre- and post-event activities, the National Committee for Disaster Management (NDMC), headed by the Vice Prime Minister, has approached and directed the timely assistance to the affected people. NDMC also mobilized funds from the private sector and international organizations to provide assistance where needed.

3.7 Macao, China

Five tropical cyclones (Nuri, Sinlaku, Higos, Nangka, and Saudel) affected Macao, China between October 2019 and November 2020. The two most notable tropical cyclones were Higos and Nangka. The highest typhoon signal No.10 was issued for Higos. Higos produced a maximum wind gust of 215 km/h, storm surge just under 1 meter, and heavy rainfall. Nangka required a typhoon signal No.8 even though the center passed 400km from Macau.

Flash flooding of low lying areas from severe rainstorms continues to be one of the most severe threats to Macau. In recent years, the Macau SAR government has taken many measures to mitigate flooding and the damage caused by flooding has been reduced year by year.

Macau reported on 9 major initiatives in support of Typhoon Committee Priorities. In September 2020, the "New Rainstorm Warning Signal System" went into effect. This system, created by Executive Order, is divided into 3 levels to reflect the risk and impact brought by rainstorms of different intensities, allowing different social stakeholders to take appropriate contingency measures according to their own conditions and needs. Macau SMG launched a new website and mobile app, created short videos related to tropical cyclone and storm surge, and partnered with the Macau Science Center to organize a series of activities and competitions to promote meteorology. In combination, these efforts greatly increased the public awareness of tropical cyclone related impacts and how to prepare for them. Macau is continually improving their observation network, tropical cyclone analysis system, civil protections, and coordination with other government departments and organizations to prepare for severe weather.

3.8 Malaysia

For the period from 1 November 2019 through 31 October 2020, 8 tropical cyclones (Nakri, Kalmaegi, Kammuri, Phanfone, Vongfong, Noul, Molave, and Goni) entered the area of responsibility of the Malaysia Meteorology Department (MET Malaysia). While none of these tropical cyclones made landfall in Malaysia or had direct impacts, heavy rainfall associated with the tail effect and distant outer rainbands affected portions of Malaysia. The tropical cyclones also produced high surf and storm surges for Malaysian coastal areas facing the South China Sea. Strong winds and rough seas warnings for the Malaysian waters, South China Sea and Sulu Sea were issued during the passage of these tropical cyclones.

Flash floods in Malaysia represents more than 90% of total flood events. The two most notable flash flood events in 2020 occurred on 18 July in Kajang Town Centre and 10 September at the Kuala Lumpur City Centre. On the other side of the spectrum, portions of northern Malaysia experienced drought conditions leading to water rationing at the beginning of 2020. The drought was attributed to lower than normal rainfall associated with persistent weak El Nino conditions in the first half of the year.

Malaysia reported on 3 major initiatives in support of Typhoon Committee Priorities representing each of the three main Working Groups. MET Malaysia continues to refine the Radar Integrated Nowcasting System (RAiNS). In 2020 phase-correction was added to remove erroneous areas from NWP generated reflectivity fields. The Department of Irrigation and Drainage implemented a comprehensive hydrological quality control and data management system to ensure the integrity collected data. Finally, the Government of Malaysia continues its commitment towards the Sendai Framework for Disaster Risk Reduction to ensure the system, community or society exposed to hazards are able to resist, absorb, accommodate, adapt to, transform and recover from its effects.

3.9 Phillipines

In the last quarter of 2019, 6 tropical cyclones (Neoguri, Nakri, Kalmaegi, Fung Wong, Kammuri, and Phanfone) entered the Philippine Area of Responsibility (PAR), three of which made landfall and brought heavy rainfall in different parts of the country. These tropical cyclones did have a positive impact on drought conditions in the northern portion of the Philippines. Prior to these late season tropical cyclones, several of the

largest dams in the Philippines (Angat, Pantabangan, and San Roque) experienced record low water levels. In the 2020 Typhoon Season through the end of September, 10 tropical cyclones (Vongfong, Nuri, Carina, Hagupit, Jangmi, Ferdie, Gener, Haishen, Noul, and Dolphin) entered the PAR. Note this list included three depressions (Carina, Ferdie, and Gener) which were not officially named by RSMC Tokyo and thus adopted the local Philippine name. Vongfong and Nuri were the only tropical cyclones in 2020 to make landfall in the Philippines, bringing heavy rainfall and flooding to the central and northern Islands.

PAGASA reported on two major initiatives supporting Typhoon Committee priorities. These are the establishment of additional Flood Forecasting and Warning Systems within major river basis and the installation of new X-band radars.

3.10 Republic of Korea (ROK).

For the 2020 Western North Pacific Typhoon Season, there were 4 tropical cyclones (Jangmi, Bavi, Maysak, and Haishen) which impacted the Korean Peninsula through 26 November, with Jangmi, Maysak, and Haishen making landfall. Maysak and Haishen produced the most significant damage to ROK from heavy winds and floods. Over 1000 mm of rainfall fell on Jeju Island, where the 7th highest wind speed of 49.2 m/s was also recorded. Total damage estimates to Jeju Island, Busan, and the Gyeongbuk area of ROK were in excess of 100 billion KRW (~8.5 million USD). Haishen resulted in 2 missing persons and almost 1000 people evacuated. Over 5,000 households suffered from power outages and more than 300 airline flights were canceled.

Outside of tropical cyclone related impacts, a record breaking 54 straight days of rainfall produced widespread flooding, landslides, and over 30 deaths before the first tropical cyclone (Jangmi) impacts were seen.

ROK reported on 16 major initiatives supporting Typhoon Committee Priorities. Service improvements includes a new web-based portal to provide seasonal typhoon activity outlooks for Members, implementation of a new 5-day tropical depression forecast, development of typhoon analysis techniques based on weather radar, and preliminary observations of typhoons via aircraft reconnaissance. ROK continues to expand their flood forecasting and management program, by increasing the amount of flood warning and flood information points. Flood risk maps for all rivers in ROK will be completed in 2021.

Two notable initiatives supported each year by the National Disaster Management and Research Institute (NDMI) had to be postponed due to COVID-19 travel restrictions. The Expert Mission to the Republic of Palau and maintenance of the NDMI-supported Flood Alert System and Automatic Rainfall Warning Systems installed in the Philippines will be rescheduled to a future date.

3.11 Singapore.

Due to its geographic location close to the equator, Singapore is rarely impacted directly by tropical cyclones. During the 2020 Pacific Typhoon season, there were two occasions where tropical storms (Vongfong and Nuri) had an indirect influence on the weather in

Singapore. The presence of Vongfong indirectly led to the development of Sumatra squalls which brought widespread thundery showers and gusty winds to Singapore during the second week in May. On 13 June, widespread moderate to heavy thundery showers fell over Singapore between the predawn hours and morning, due to the convergence of winds over the region under the indirect influence of Tropical Storm Nuri. This contributed to the wettest June for Singapore in the last 10 years.

Singapore reported on 5 major initiatives supporting Typhoon Committee Priorities. Singapore, along with other Typhoon Committee Members and Indonesia, continues to strongly support the ASEANCOF and SEA RCC-Network. Internally, Meteorological Services Singapore (MSS) continues active collaboration with the National Water Agency to assist in water supply management. Singapore continuously reviews and upgrades drainage infrastructure to ensure an effective drainage network for flood alleviation and prevention.

3.12 Thailand.

From 1 October 2019 to 31 October 2020, there were three significant tropical cyclones (Sinlaku, Noul, and Molave) which directly affected Thailand. Nine other tropical cyclones (Matmo, Nakri, Nuri, Higos, Linfa, Nangka, Saudel, and two depressions) had indirect impacts on rainfall in Thailand over the same period. Sinlaku produced a maximum rainfall daily rainfall of 350.4 mm in Bueng Kan province on 2 August. Sinlaku also brought heavy rains and flash floods to many villages of Loei Province in northeast Thailand. Around 550 households were submerged large areas of farmland were damaged. Noul produced widespread rain and flooding across all regions in Thailand. The most severe rainfall and flooding occurred across a broad swath of provinces in upper Thailand. Under the influence of Molave, heavy rainfall was observed especially in the northeastern provinces, where the highest daily rainfall of 108.5 mm was recorded. In similar fashion to neighboring Members, Thailand experienced a drought in the first half of 2020 and tropical cyclone related rainfall provided welcome relief in many areas.

Thailand reported on two major initiatives supporting Typhoon Committee Priorities. The Thailand Meteorological Department (TMD) continues to upgrade their numerical weather prediction system based on the TMD-WRF model at 2km grid resolution. New for 2020 were 24 hour rainfall accumulation predictions for individual Tambons and mubans. Below the district and province level, Tambons are the third administrative subdivision in Thailand. There are over 7,000 Tambons, further subdivided into nearly 70,000 muban or villages. In October, innovative dam management operations in the northeast region of Thailand relied on radar rainfall forecasting from TMD to minimize downstream flooding.

3.13 United States of America.

The Hawaiian Islands were impacted by a single tropical cyclone during the 2020 Central Pacific Hurricane Season. In late July, Hurricane Douglas brought significant impacts to some of the islands across the state of Hawaii. These impacts included large and damaging surf to the east facing shores, which resulted in shoreline erosion, property damage and road closures. Heavy rainfall and the strong wind stayed just offshore, with only moderate rainfall and below tropical storm force winds observed over land.

For the Western North Pacific in the National Weather Service Guam Area of Responsibility, only 4 tropical cyclones (Phanfone, Kammuri, Bualoi, and Fenshen) threatened populated areas and warranted tropical cyclone watches and warnings. Despite periods of heavy rainfall and tropical storm force winds associated with these tropical cyclones, no significant damage or injuries were reported on the affected islands.

The USA reported on 5 major initiatives supporting Typhoon Committee Priorities. The USA continues to expand their Weather Ready Nation initiative by recruiting new WRN Ambassadors in their AOR. WRN Ambassadors act as message amplifiers for NWS products and services, watches, warnings, and advisories. Extensive outreach and education efforts include annual tropical cyclone exercises, tropical cyclone workshops, and StormReady/TsunamiReady programs.

3.14 Viet Nam.

From 1 January to 30 November 2020, 9 tropical cyclones (Sinlaku, Noul, Linfa, Nangka, Saudel, Molave, Goni, Etau, and Vamco) directly impacted the Vietnamese mainland. Molave was the most intense tropical cyclone to affect Viet Nam, making landfall with winds of force 11-12 and gusts to force 13-14. In October, 4 tropical cyclones (Linfa, Nangka, Saudel, and Molave) made landfall across the Central Provinces. The successive storms combined with cold air activity to produce heavy rains, big floods, flash flooding, and landslides. There was significant damage to property and infrastructure and large loss of lives. Outside of tropical cyclone related impacts, during the dry season of 2019-2020, saline intrusion in the Mekong Delta reached a historical duration. The most severe saline intrusion appeared in March and April together with prolonged heat wave. With the early forecasting and timely response, damage to agricultural production and people's livelihood was significantly reduced.

Viet Nam continues to support the WMO Severe Weather Forecasting Project (SWFP) for Southeast Asia (SeA) through the Hanoi Regional Forecasting Support Centre. In 2020, the Viet Nam Meteorological and Hydrological Administration (VNMHA) signed a cooperative agreement with CMA focusing on sharing of meteorological science and technology.

Viet Nam reported on 3 major initiatives supporting Typhoon Committee Priorities. By incorporating data assimilation for the WRF-ARW at 3km horizontal resolution, VNMHA developed new products to improve the short range forecasts for heavy rain and made these available through the SWFP for SeA portal for use by Members. VNMHA continues to move toward impact-based forecasts and risk-based warnings which changes the way of information design and delivery to the disaster risk management section, local governments and the public through traditional media (TV, printed papers) as well as social media and online papers.