# MEMBER REPORT

ESCAP/WMO Typhoon Committee

15th IWS

# SOCIALIST REPUBLIC OF VIET NAM

November 2020

# CONTENTS

**I. Overview of tropical cyclones which have affected/impacted Member's area since the last Typhoon Committee Session**

Since the beginning of 2020 until now, natural disasters have happened complicatedly and abnormally in many regions of Vietnam. There have been 16 types of natural disasters: 13 storms in the East Sea; 263 thunderstorm heavy rain events in 49 provinces / cities of which 09 events were on a large scale in 21 provinces in the North and Central part of Vietnam; 101 flood, flash flood, landslides events; especially the historical flood from October 6-22 in the Central region, especially in the provinces from Ha Tinh to Thua Thien Hue; droughts, severe saltwater intrusion, riverbank and coastal erosion, sea dyke subsidence in the Mekong Delta , ...

**1.1. Meteorological assessment**

From the beginning of the year to the end of November 2020, 13 storms and 01 tropical depression appeared in the East Sea. In which, there are 01 tropical low pressures and 08 storms that directly affect the Vietnamese mainland, specifically: Typhoon No. 2 (Sinlaku), typhoon No. 5 (Noul), typhoon No. 6 (Linfa), typhoon No. 7 (Nangka), Storm surge in October, typhoon No. 8 (Saudel), typhoon No. 9 (Molave), storm No. 10 (Goni), storm No. 12 (Etau) and storm No. 13 (Vamco). In addition, there are 03 storms that do not affect Vietnam: typhoon No. 1 (Nuri), typhoon No. 3 (Mekkhala), typhoon No. 4 (Higos) has landfall in China.

Most of the landfall storms in 2020 has moved west and northwest, typhoon 6 and typhoon No. 9 are the two fastest moving storms with a speed of 25-30km/h. Till the end of October, Typhoon No. 9 (Molave) was assessed to have the strongest intensity that directly affected Vietnam. The storm has maximum intensity of level 13, gust 15 over East Sea, when landing on the Vietnam coastal area, it caused strong winds of force 11-12, Binh Chau and Ly Son (Quang Ngai) stations recorded strong winds of force 11-12, gust 13-14; Other stations from Quang Tri to Binh Dinh are also observed strong wind of force 8, gust 10.

Notably, October is the month with the highest storm frequency in 2020, with 04 storms which all directly affect the Central provinces. The successive storms combined with the cold air activity caused heavy rains and big floods, flash floods and landslides, in the central regions of Vietnam causing great damage to life and assets.

Table 1. Statistics on tropical cyclones in 2020

| TS Name (International Name) | Maximum intensity (Beaufort scale) | Maximum observed windspeed | Total rainfall |
|---|---|---|---|
| TS. Number 2 (Sinlaku) | Wind force level 8, wind gusts level 10 | Hòn Dấu 21m/s (level 9) strong wind gusts 25 m/s, (level 10), Văn Lý 19m/s ( level 8), strong wind gusts (level 9) | From July 31st to Aug 03rd, Total rainfall in the provinces from Thanh Hoa to Quang Tri about: 200-400mm, some places up to higher 500mm; Central Highlands, Southeast and Mekong River Delta: 100-200mm, some places up to higher 250mm. |
| TS. Number 5 (Noul) | Wind force level 10, wind gusts level 12 | Cửa Tùng: 23m/s (level 9), strong wind gusts 26m/s (level 10), Hải Lăng: 20m/s (level 8), strong wind gusts 26m/s ( level 10) | On Sep 17-19, total rainfall in the provinces from Nghe An to Quang Ngai: 100-300mm, some places up to higher 300mm |
| TS. Number 6 (Linfa) | Wind force level 8, wind gusts level 10 | Lý Sơn : 18m/s (level 8) strong wind gusts 24m/s (level 9), Tam Thanh 15m/s (level 7), strong wind gusts 20m/s level 8 | On Oct 10-11, total rainfall in the provinces from Thua Thien Hue to Quang Ngai: 150-350mm, some places up to higher 350mm. |
| TS. Number 7 (Nangka) | Wind force level 10, wind gusts level 12 | Bạch Long Vỹ 23 m/s (level 9) strong wind gusts 29 m/s (level 11), Văn Lý 20 m/s (level 8) | On Oct 13-16, total rainfall in the Northeast and Red River Delta, Hoa Binh Province, South Son La Province, Yen Bai Province, Phu Tho Province, Vinh Phuc Province and North Center: 100-300mm. |

| TS Name (International Name) | Maximum intensity (Beaufort scale) | Maximum observed windspeed | Total rainfall |
|---|---|---|---|
| | | strong wind gusts 25 m/s (level 10) | |
| Tropical Depression – October | | ATNĐ wind speeds force level 6 (11m/s), strong wind gusts level 7 (14m/s) at Đông Hà station (Quảng Trị); wind speeds force level 7 (15m/s), strong wind gusts level 8 (19m/s) at Cồn Cỏ station. | On Oct 16-19, total rainfall in the provinces from South Nghe An to Quang Ngai: 400-700mm, Ha Tinh-Quang Binh – Quang Tri province up to higher 1000mm, especially some places have total rainfall in 24 hours got over history values like: Ba Don (Quang Binh): 756mm, Khe Sanh (Quang Tri): 582mm. |
| TS. Number 8 (Saudel) | Wind force level 12-13, wind gusts level 15 | Bạch Long Vỹ 12 m/s (level 6), Hoành Sơn: 12 m/s (level 6) | On Oct 24-26, total rainfall in the provinces from Nghe An to Thua Thien Hue about: 40-70mm. |
| TS. Number 9 - Molave | Wind force level 13, wind gusts level 15 | Lý Sơn: 31 m/s (level 11), strong wind gusts 41 m/s (level 13), Bình Châu :34 m/s (level 12), strong wind gusts 42 m/s (level 14) | On Oct 27-28, total rainfall in the provinces from Thua Thien Hue to Phuyen and North Central highlands: 150-400mm, some places up to higher 400mm. |
| TS. Number 10 (Goni) | Wind force level 17, | Lý Sơn 11 m/s | On Nov 04-6, total rainfall in |

| TS Name (International Name) | Maximum intensity (Beaufort scale) | Maximum observed windspeed | Total rainfall |
|---|---|---|---|
| | wind gusts level 17 | | the provinces from Thua Thien Hue to Binh Dinh, the east of Gia Lai: 150-300mm, especially Tra My (Quang Nam): 474mm. |
| TS. Number 13 (Vamco) | Wind force level 12, wind gusts level 14 | Tâm Mỹ 24m/s (level 9) | On Nov 14-15, total rainfall in the provinces from Ha Tinh to the north of Quang Ngai: 100-250mm; and 40-70mm in the Red River Delta, Thanh Hoa province, Nghe An province, and Hoa Binh province. |

### 1.2. Hydrological Assessment

In 2020, the prominent hydrological disaster situation in Vietnam can be listed as:

- Severe saline intrusion in the Mekong River Delta area;

- Historical and long-lasting floods in the Central of Vietnam;

- Flash floods and landslides in the Central Highlands and Central regions caused huge casualties and damages to infrastructures.

*Salinization*

During the dry season of 2019-2020, saline intrusion in the Mekong Delta was recorded a new historical recording of salinity duration as longer than in 2015-2016. The most severe saline intrusion appeared in March and April together with prolonged heat wave. With the early forecasting and timely response, the damages to agricultural production and people's livelihood was significantly reduced.
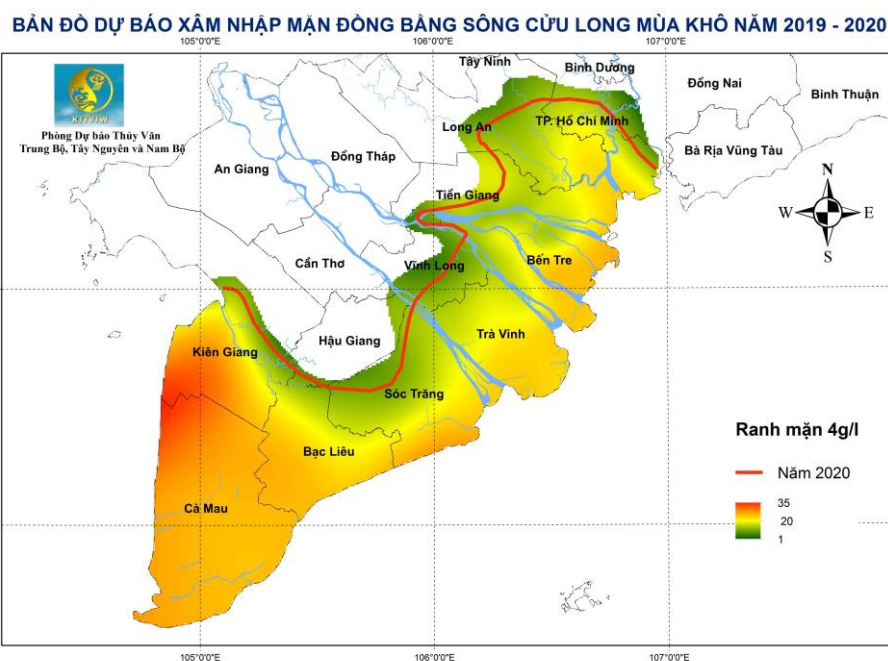
4

Figure 1.1. Saline intrusion map prediction in the Mekong delta, issued on February 2020



Figure 1.2. Agriculture was damaged by Saline intrusion in 2020

*Flood, flash flood and landslides situation*

In the 2020 flood season, there were 2 big flood events occurrences in the North of Vietnam, especially the heavy rainfall in Ha Giang from 20 to 21 July, 2020. The total rainfall was recorded of 347 mm at Ha Giang which is highest in the last 59 years, leading to a serious flooding in Ha Giang city, landslides in Hoang Su Phi and Vi Xuyen districts.

Figure 1.3. Inundation in Ha Giang city and flash flood in Hoang Su Phi district on 21st July 2020

The Central and the Highland areas were the most devastated areas of storms, floods and landslides in 2020. Among 05 big flood events, new historical flood peaks were recorded in a number of rivers in the Central of Viet Nam. Flash floods and landslides occurred in a large area as a result of continuous prolonged heavy rainfall in central of Vietnam during October and November 2020.

When typhoon Linfa landed in central of Viet Nam on 11th October (Fig. 1.4), a huge damages of human life, losing of houses, crops, poultries, castles. This is one of the biggest damage typhoons in 2020 in Vietnam.



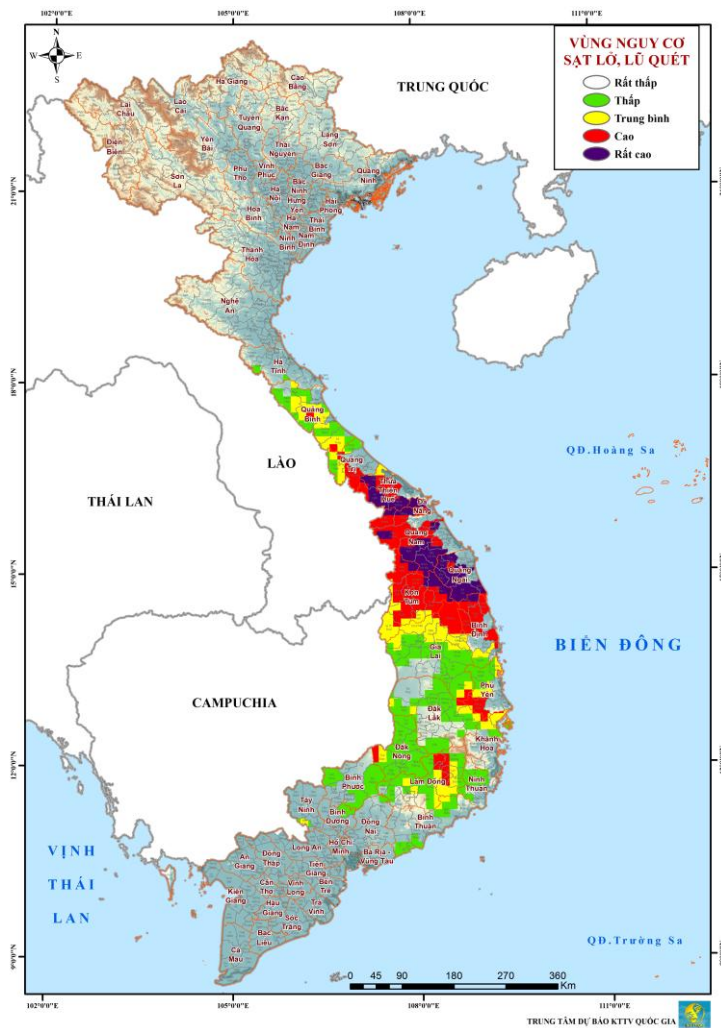Figure 1.4. Storm track of TY. Linfa

Figure 1.5. Flash flood and landslide risk map in 10<sup>th</sup> October, 2020
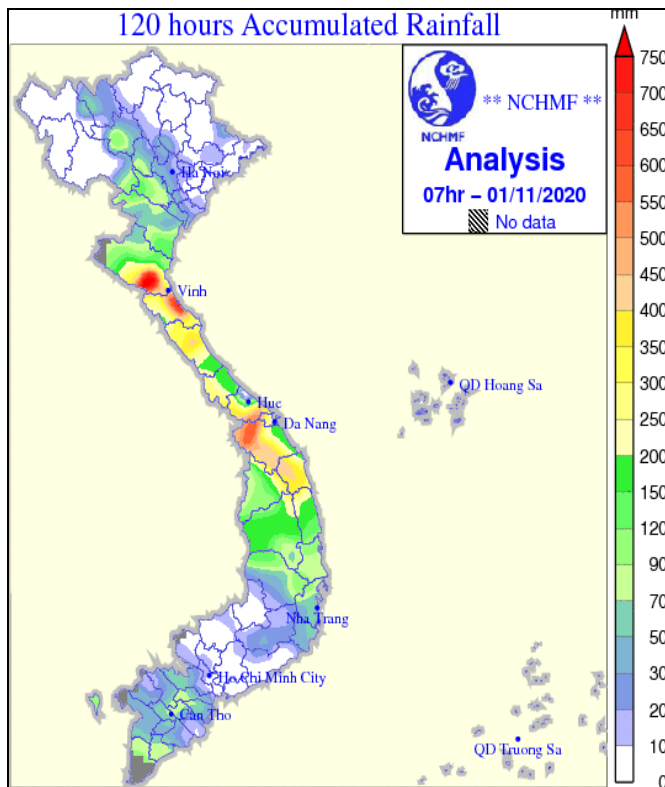(when TY. Linfa landing in Central of Viet Nam)

Figure 1.6. Before and after landslide occurrence in Nam Tra My district, Quang Nam province, 28 October 2020.



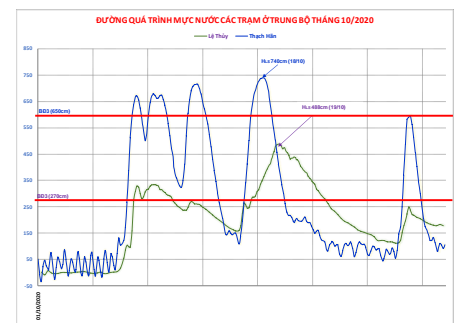Figure 1.7. Lanslide in Rao Trang, Thua Thien Hue province, 12 October 2020



Figure 1.8. Lanslide and mud flow in Huong Hoa, Quang Tri province, 18 October 2020.

(b)



(a)                                            (c)

Figure 1.9. (a) 120-hour total rainfall,  (b) Severe flooding situation and (c) water level time  series in Nghe An province caused by Typhoon GONI

### 1.3. Socio-Economic Assessment

Since the beginning of 2020, besides meteorological and hydrological natural disaster, there were also 82 earthquakes recorded in Vietnam, including 02 earthquakes with warning level 4 (in Muong Te, Lai Chau - 16/6/2020 - with magnitude of 4.9; in Moc Chau, Son La on 27/7/2020 with magnitude of 5.3 ); droughts, severe saltwater intrusion, riverbank and coastal erosion, sea dyke subsidence in the Mekong Delta , ...

Up to November 2020, the disaster caused:

**340 dead and missing** *( 2 7 5 dead, 6 5 missing , of which: storm 25 ; flood 97 ;   landslide 130 ; tornado, hail 54; other natural disasters 34)* and 819 people were injured; 3276 houses collapsed, 280766 houses were damaged, roof blown; 414451 houses were damaged; 171337 ha of rice and crops were damaged ; 49658 cattle swept away; 550km of embankment and canal were eroded and damaged; 115km of coastline and river were eroded; 881 km of roads were damaged

*Estimated economic damage: more than 33449 billion VNDong.*

9

**Especially in October 2020, a long lasting heavy rain and flood events in central Vietnam caused huge damage.** Tropical storm Linfa and associated heavy rainfall, flood and landslides caused 138 people died and 16 were missing; 6235 houses collapsed and damaged, 377556 houses, 16692 ha of rice and crops were flooded; 105,090 tons of food got wet, washed away; 2,683,553 dead cattle and poultry; 121 km of embankment and 264 km canal was damaged; 73.5 km of riverbank and coast were eroded; 576 km of roads were eroded, about 1.56 million cubic meters of soil and stones were eroded

**1.4. Regional Cooperation Assessment (highlighting regional cooperation success and challenges.**

*1.4.1 Hanoi Regional Forecasting Support Centre (RFSC) of the Severe Weather Forecasting Project (SWFP)*

As recommended by the Regional Subproject Management Team (RSMT) of SWFP-Southeast Asia in the meeting in 2015 (Ha Noi, Viet Nam, August 2015) and agreed during its meeting in November 2017 in Ha Noi, Viet Nam, a two-week training desk had been organized at RFSC Ha Noi from 7 to 18 May 2018 with attachment of two experts from NMHSs of Philippines and Thailand and forecasters from Viet Nam Meteorological and Hydrological Administration (VMHA). Two expert lecturers from Hong Kong Observatory (HKO), Hong Kong, China joined and gave lectures at the training desk.

Experts and forecasters from VNMHA has attended the Regional Training Workshop on Severe Weather and Impact based Forecasting and Warning Services in Vientiane, Lao PDR form 19 February - 1 March 2019. VNMHA experts have shared the current status of warning and information delivery, current challenges in impact-based forecasting and risk-based forecasting as well as exchanging these solutions to enhance the forecasting, alerting activities of Viet Nam.

For future plan, with the acceptation for Project Proposal "Training workshop based on the Severe weather Forecasting Project (SWFP) for the Southeast Asian Region" from ASEAN Committee on Science and Technology (COST), there will be a second two-week Training Desk was held organized at RFSC Ha Noi in December 2019. And in 2020, the third Training Desk will be organized via online platform hosted by Vietnam. The invitation has sent to participating countries.

*1.4.2. Other collaborations*

Severe weather consultation with CMA

In 2020, VNMHA and CMA keeps contacts following the cooperative agreement between the two parties in Meteorological Science and Technology. One of the cooperation focusing on China-Viet Nam

consultations workshop on severe weather events such as typhoons, rainstorms and other extreme weather-related events.

International and regional cooperation in natural disaster prevention and control have been promoted; responsibility of SENDAI action framework has been realized, AHA Center Agreement is signed, regional maneuvers on disaster responses took place in Indonesia; the participation of Vietnam in APEC, ARF, International Storm Committee etc. has been maintained;

- Bilateral cooperation with developed countries and regional countries have been promoted both in in-depth and practical manner. In late 2019 and 2020, Vietnam has signed new Collaboration Agreement with International Research Institute for Climate and Society (IRI) on developing climate services in Vietnam, including but not limited to building up the National Framework for Climate Service in Vietnam.

- Vietnam has also joined The Weather and Climate Science for Service Partnership (WCSSP) Southeast Asia which currently involving four partner countries: the Philippines, Malaysia, Indonesia and Vietnam. This project aims to jointly develop and improve underpinning capability in global and regional forecasting systems, and advance the understanding of high-impact weather events in order to provide better advice and mitigate their socio-economic impacts.

- Vietnam has been keeping close coordination with multilateral organizations such as the World Bank, Asian Development Bank, UN agencies, JICA, GIZ, etc. has been promoted to seek for technical assistances and financial supports as well as high quality human resources of disaster prevention and control;

Vietnam have faced huge damage caused by floods that lasted from in October 2020, the Disaster Prevention and Control Administration has promptly taken action to call for support from national organizations through the Disaster Risk Mitigation Partnership. On October 19, 2020, the Disaster Risk Mitigation Partnership shared updates on natural disasters and disaster impacts to 19 members of Partners (UNDP, UNICEF, FAO, UN Women, JICA, WB, ADB, USAID, GIZ, Asia Foundation, ADPC, Care International, CRS, Habitat for Humanity, Oxfam, Plan International, Save the Children, World Church Service, World Vision), Embassies of all countries in Vietnam, ASEAN Secretariat, USAID Bangkok and other international organizations. On October 22-24, 2020, the parties coordinated to establish and implement 03 rapid damage assessment teams in key provinces, including: (i) Quang Binh and Quang Tri, ( i i) Thua Thien Hue, (iii) Quang Nam and Quang Ngai. During the rapid assessment and subsequent evaluation missions, organizations have been updated and verified information, promptly contacted regional agencies and made decisions. As of November 6, 2020, the total funding to support the people in the Central region is 12,862,862 USD (details

are shown in Figure 1.10 - Map of support and commitments of international organizations for copper the Central region suffers from flood damage)
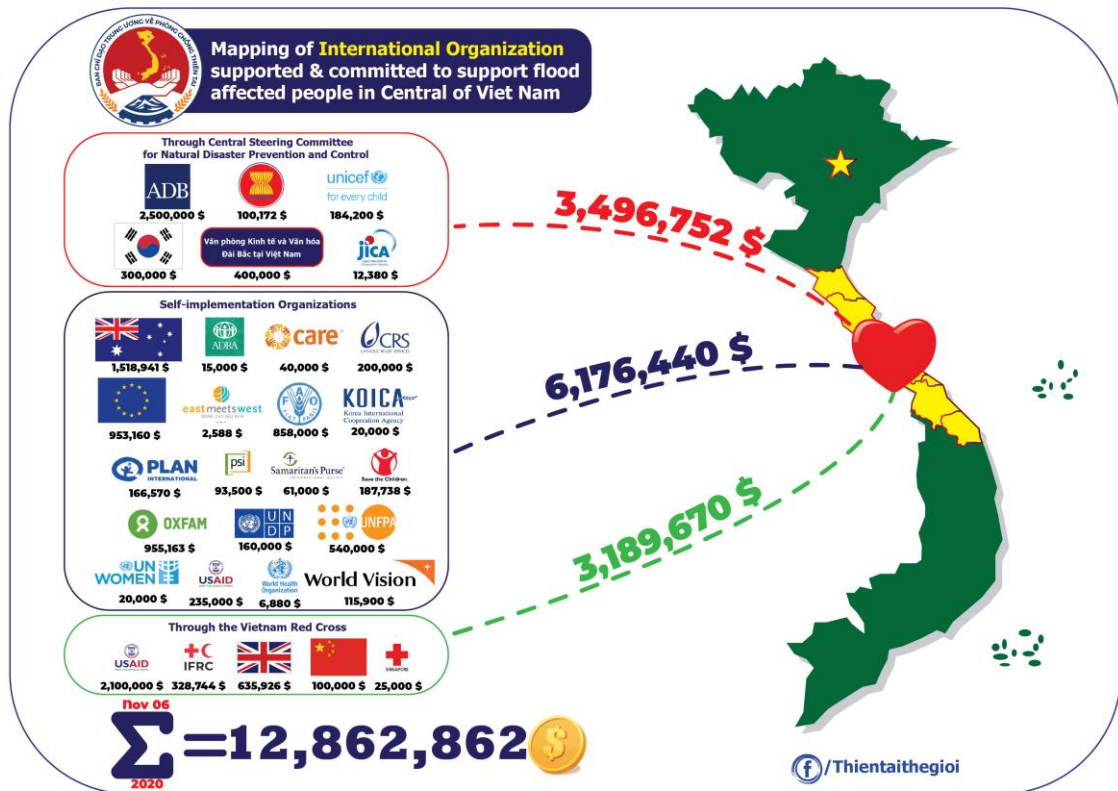


Figure 1.10. Map of support and commitments of international organizations for copper the Central region suffers from flood damage

## II. Summary of Progress in Priorities supporting Key Result Areas

### 2.1. Central Data Hub, HPC and forecast supporting system

Central Data Hub (CDH) is a part of the information integration system that provides the forecasting sub-systems access to all required data sources. The CDH will support and provide each separate forecasting sub-system the access to different data sources such as synoptic manual observation, automatic weather station, automatic rain-gauge, water level and sea level data, radar and satellite data will be also stored in CDH. The CDH and the forecasting sub-systems are independent systems but they are closely linked, with the CDH has a key role in collecting (near) real-time data from all required sources, so latest available data is always available from CDH, and for providing forecast data to the services, provided by VNMHA.

In 2020, VNMHA has been applying the data assimilation for WRF-ARW (at 3km horizontal resolution) using almost quality controlled observation data from NCEP (surface, upper, satellite…) and Vietnam's observation. The new data assimilation products, named as WRF3km-IFS-DA, has been sharing via SWFP for SeA portal for all members of the project.

An example of new products for improving short range forecast of heavy rain over the northern Vietnam is shown in Figure 2.1.
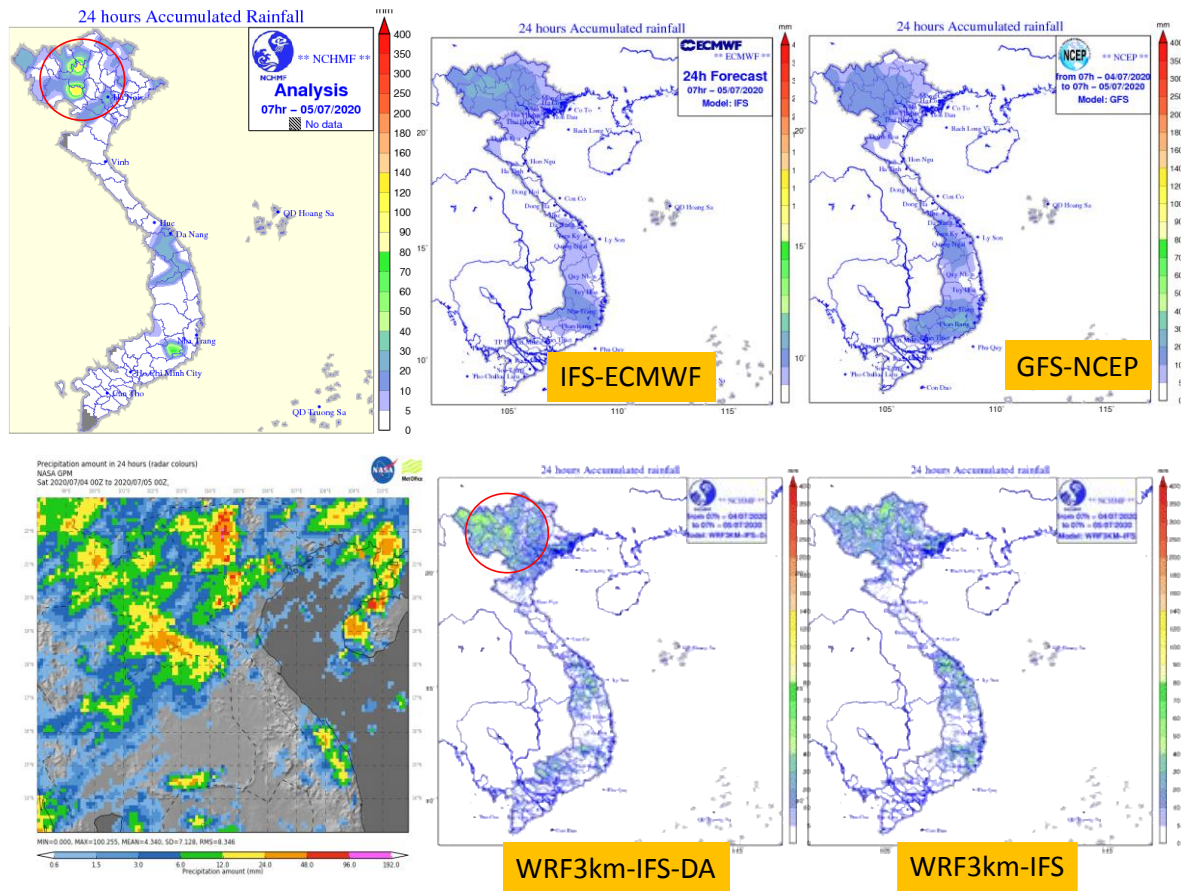


Figure 2.1. Comparison of observation (top-left from Vietnam's observation and bottom-left from NASA's precipitation estimation) and models: IFS-ECMWF, GFS-NCEP, WRF3km-IFS and new data assimilation product WRF3km-IFS-DA for heavy rainfall over the northern Vietnam on 05-Jun-2020.

Regarding the issue of providing information to members through the SWFP's portal of RFSC Hanoi, the Figure 2.2 shows access statistics from the members and also shows interesting information from Vietnamese forecasters, Laos and the Philippines in 2020.
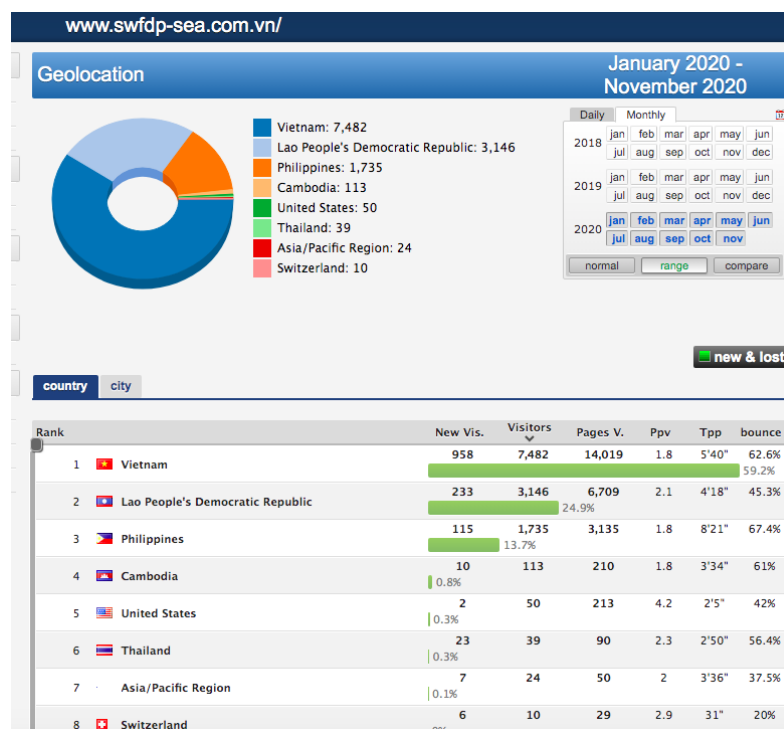
Figure 2.2. The statistics of website swfdp-sea.com.vn from Jan-Nov/2020

**Identified opportunities/challenges, if any, for further development or collaboration:**

VNMHA is providing the regional ensemble forecast products (SREP-32) and high-resolution products (WRF3km-IFS and WRF3km-IFS-DA) on SWFDP-SeA website for member countries to use in daily severe weather forecast and warning. Feedbacks and suggestions from members are welcome for a better information design and delivery.

*Priority Areas Addressed:*

KRA 1: To mitigate against the damaging impacts of typhoons and enhance the beneficial typhoon related effects for the betterment of quality of life through scientific research, technological development and operational enhancement.

KRA 4: To enhance capacity to generate and provide accurate, timely and understandable information on typhoon-related threats

**2.2 Impact-based forecast in Viet Nam**

Viet Nam Meteorology, Hydrology Administration (VNMHA) is moving toward an impact-based forecast and risk-based warning for meteorological and hydrological phenomena. Since 2017, VNMHA has been changing 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. The target of impact-based forecast and impact-based warning is to warn the risk of natural hazards for different regions, different users. It requires the

14

VNMHA an extra effort in understanding the possible impacts of severe weather phenomena, especially tropical cyclones.

In late 2019 and 2020, Vietnam received support from WMO Public Weather Services Delivery (PWSD) Programme of the DRR and Public Services Branches to set up a project named Viet Nam Public Weather Service Delivery Project on Impact-based Forecast and Warning (IBFWS) and Communication. Vietnam has collaborated with MSD, FFGS/HWR and SWFP under sponsor of CREWS-Canada.

The project expected outcomes are:

- Strengthened capacity of VNMHA to provide impact-based forecast and warning Services to stakeholders including the National Disaster Management Authority, Health, Media etc.;

- Enhanced capacity of VNMHA to issue severe weather and flash flood warnings;

- Strengthen disaster risk coordination between relevant institutions and increased efficiency of forecasts and warnings;

- Improved verification and integration of severe weather and flash flood warnings from different projects;

- Improved capacity of VNMHA to serve TV stations and social media through provision of severe weather and flash flood presentation videos;

- Improved quality of the VNMHA mobile weather App

- Staff trained on Competencies for PWS personnel and advisors

**Identified opportunities/challenges, if any, for further development or collaboration:**

VNMHA understands that to have a complete impact-based forecast system, VNMHA need to cooperate with different stakeholders in disaster risk management to have a common agreement on the possible impacts of severe weather in Viet Nam as well as the international cooperation and support with developed countries. With this additional support from WMO, especially the Public Service Branch, together with previous collaboration of VNMHA and Finland Meteorology Institute (FMI), UK Met Office and other international partners, Viet Nam will soon have an impact-based forecast system in near future. The cooperation projects PROMOSERV3 with FMI and WCSSP with UK Met Office are two ongoing projects that will support Viet Nam in those area. The PROMOSERV3 will provide a toolkit to produce and distribute the impact forecast of meteorological phenomena such as heavy rain, strong wind… and part of WCSSP project will guide VNMHA forecasters and staffs on how to build an impact matrix and step by step to get an impact-based forecast system.

*Priority Areas Addressed:*

KRA 1: To mitigate against the damaging impacts of typhoons and enhance the beneficial typhoon related effects for the betterment of quality of life through scientific research, technological development and operational enhancement.

KRA 2: To strengthen typhoon related disaster risk management in various sectors, including hydrological and aviation sectors, through strategic partnerships and collaboration.

KRA 3: To strengthen the resilience of communities to extreme weather and typhoon related disasters through the intelligent use of data, information and communication technology.

KRA 4: To enhance capacity to generate and provide accurate, timely and understandable information on typhoon-related threats

**Contact Information:**

**Member: Social Republic of Vietnam**

**Name of contact for this item: Dr. Hoang Phuc Lam**

**Telephone: +84968234682**

**Email: lamhpvn@gmail.com**

**2.3 Short-range Regional Ensemble Prediction System (SREP-32)**

With the new HPC system, since 2019, the regional NWP products have been significantly upgraded, especially of very high resolution of deterministic forecast (3km, Southeast Asia domain) with boundary conditions (from ECMWF) and the regional ensemble forecast was also upgraded by using the Weather Research and Forecasting Model with Advanced Research with ARW dynamical core (WRF-ARW) with various physical model configurations (generated from different typical cumulus, shortwave radiation, boundary layer and from simple to complex cloud micro-physic schemes). The resolution of 32 ensemble members is 9km and using GFS-NCEP as boundary conditions. Figure 2.3 to 2.5 are examples of 32-member SREPS and ECMWF's ensemble forecast for a heavy rainfall case in 2020 with probability map products at different thresholds.:
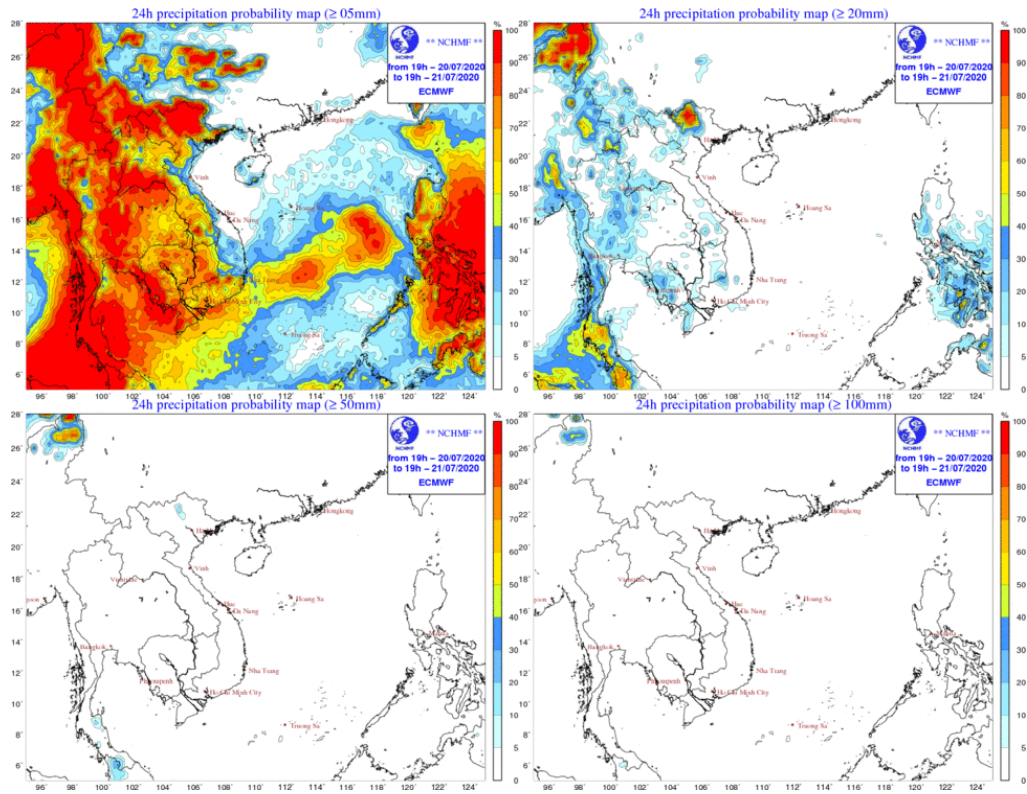
Figure 2.3. 24-hour rainfall ensemble forecast from ECMWF (51 members) at 12 UTC (19 LT) of 20 July 2020
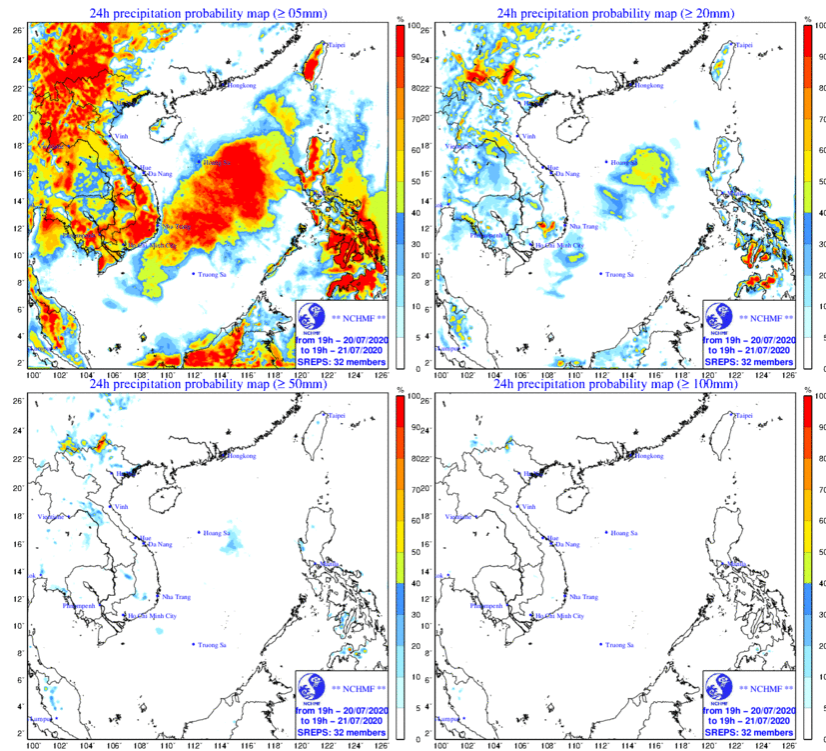


Figure 2.4. 24-hour rainfall ensemble forecast from SREPS-32 at 12UTC (19 LT) of 20 July 2020
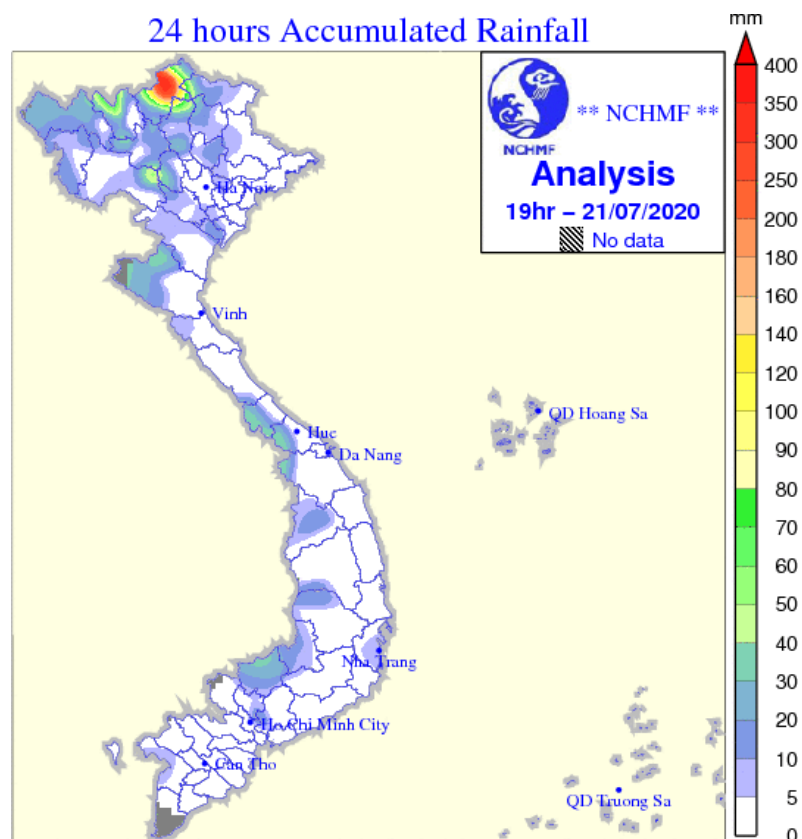
Figure 2.5. 24-hour Observation rainfall at 12 UTC (19 LT) of 21 July 2020

**Identified opportunities/challenges, if any, for further development or collaboration:**

VNMHA is providing the SREP-32 products on SWFDP-SeA website for member countries to use in daily severe weather forecast and warning. Feedbacks and suggestions from members are welcome for a better information design and delivery.

*Priority Areas Addressed:*

KRA 1: To mitigate against the damaging impacts of typhoons and enhance the beneficial typhoon related effects for the betterment of quality of life through scientific research, technological development and operational enhancement.

KRA 4: To enhance capacity to generate and provide accurate, timely and understandable information on typhoon-related threats

**Contact Information:**

**Member:  Social Republic of Vietnam**

**Name of contact for this item: Dr. Du Duc Tien**

**Telephone: +84936067015**

**Email: duductien@gmail.com**