

**MEMBER  
REPORT  
SOCIALIST REPUBLIC OF VIET NAM**

**ESCAP/WMO Typhoon Committee  
18<sup>th</sup> Integrated Workshop  
ESCAP - UN Conference Center, Bangkok, Thailand  
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## I. Overview of tropical cyclones which have affected/impacted Member’s area since the last Typhoon Committee Session

Since the beginning of 2023, there have been 05 tropical storms and 02 tropical depressions in the BienDong Sea, therein 01 tropical depression and 01 storm affected directly the mainland of Vietnam. There were also 15 widespread heavy rain events, mostly over the central of Vietnam causing floods, flash flood and landslide. Up to November 2023, natural disasters have caused 121 dead and missing, 114 people injured; 871 houses completely collapsed, 14,351 house, 16,920 hectares of crops and vegetables, 489 km of roads damaged, more than 53,148 cattles and poultry died and swept away; 81,848 meters of dikes, embankments, canal damaged or eroded. Economic damage due to natural disasters is estimated of about 5,959 billion VND, equivalent to 240 million USD.

### 1. Meteorological Assessment

Trajectories of 07 tropical cyclones including 05 tropical storms and 02 tropical depressions active in the Bien Dong are shown in Fig. 1.1.

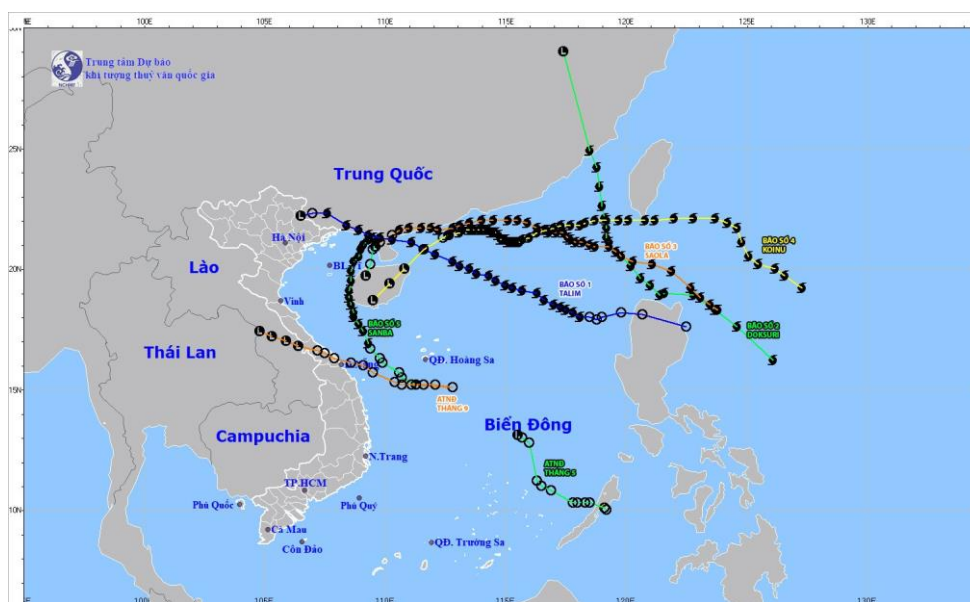


Figure 1.1. 2023 tropical cyclone tracks in the BienDong Sea.

The first tropical cyclone (TALIM) though made landfall over China, still caused wind strength of level 6, and gust up to level 8 of the Beaufort scale over the Quang Ninh – Hai Phong coastal area. The tropical cyclone in September brought wind strength of level 6-7, gust 8-9 over the offshore region of Quang Tri – Quang Ngai, then made landfall in Central Vietnam. Due to the effection of the ITCZ and this tropical cyclone, heavy rainfall happened over the Northern Delta, Northern Sub-mountainous, North Central and South Central Vietnam

regions during 24 – 28 September. Highest amount was observed at Hóa Thanh (Quảng Bình) 673mm, Dân Hóa 2 (Quảng Bình) 571mm, Hương Trạch 1 (Hà Tĩnh) 517mm Thác Muối (Nghệ An) 528mm, Yên Mỹ (Thanh Hóa) 673mm, Nam Định 433mm, Hương Sơn (Hà Nội) 436mm.

None of above mentioned tropical cyclones produced storm surge for coastal regions over Vietnam. Details of tropical durations, affected areas and landfall locations are presented in Table 1.

Table 1. Statistics on tropical cyclones in 2023 in Viet Nam.

<b>TS Name (International Name)</b>	<b>Duration</b>	<b>Affected Areas</b>	<b>Landfall Location</b>
Tropical Depression – July	05 – 07 July	The western parts of the Center and South BienDong Sea	
TS. Number 1 (TALIM)	15 – 18 July	North BienDong Sea and northern BacBo Gulf	Guangxi Zhuang, China
TS. Number 2 (DUKSURI)	24 – 28 July	The eastern part of the North BienDong Sea	Fujian, China
TS. Number 3 (SAOLA)	30 August – 03 September	The northern part of the North BienDong Sea	
Tropical Depression – September	24 – 26 September	The North BienDong Sea, South BienDong Sea, Quang Tri – Quang Ngai Sea.	Quang Tri – Thua Thien Hue, Vietnam
TS. Number 4 (KOINU)	5 – 10 October	The northern part of the North BienDong Sea	Hainan, China
TS. Number 5 (SANBA)	17 – 20 October	Quang Tri – Quang Ngai Sea and BacBo Gulf	Hainan, China

## 2. Hydrological Assessment

In 2023, the prominent disaster situation related hydrology in Vietnam can be mentioned as:

**River flooding:** there have been around 14 flood events on main rivers in Vietnam, mainly small and medium floods. Severe flood stage was recorded in a number of rivers in the upper parts in the Central and Highland regions. Due to the impact of both heavy rainfall and river flooding in small rives, many areas in Central Vietnam have been severely affected, especially in the provinces of Thua Thien Hue and Ha Tinh.

**Flash flood and landslide:** high frequency of flash flood, landslide occurrences concentrated in rainy seasons (June – October) with around 80 reported events. The most severe flash flood, landslide occurred in the Northern part and Highland provinces from 30 July to 8 August.

**Urban flooding:** As a result of mushrooming of urbanization, urban flooding due to heavy rainfall is a disaster occurred frequently, especially in urban areas of mountainous provinces.

### 2.1. Flash flood and landslide situation during rainy season

The flash floods and landslides in Vietnam is likely to occur at any time of the year when localized heavy rain patterns appear. In rainy season of 2023, the frequency of severe flashflood and landslide is higher than that of last year, 2022. Many events occurred in many different areas and in the same period of time.

As a result of ITCZ together with strong South-west monsoon activity, a series flash flood and landslide events appeared in 15 provinces concentrated in Northern part and Highland areas of Viet Nam from 30 July to 8 August. The consequences of this series of flash floods and landslides are: 1 person died, 1 person missing, hundreds of houses were destroyed or flooded.

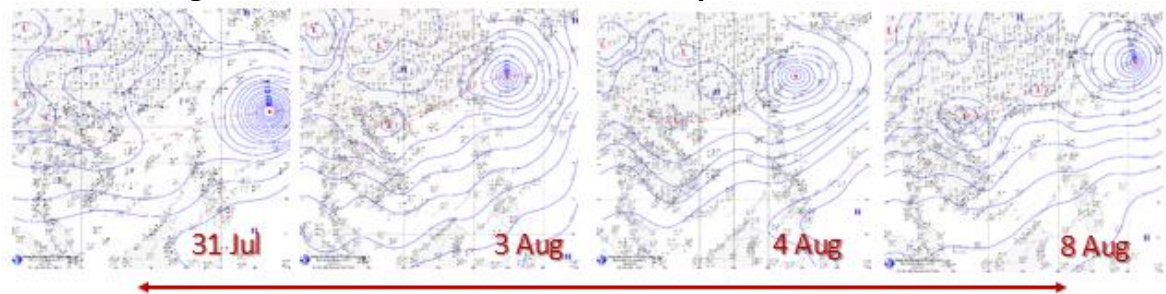


Figure 2.1. ITCZ + Strong SW Monsoon caused a series of flash flood and landslide

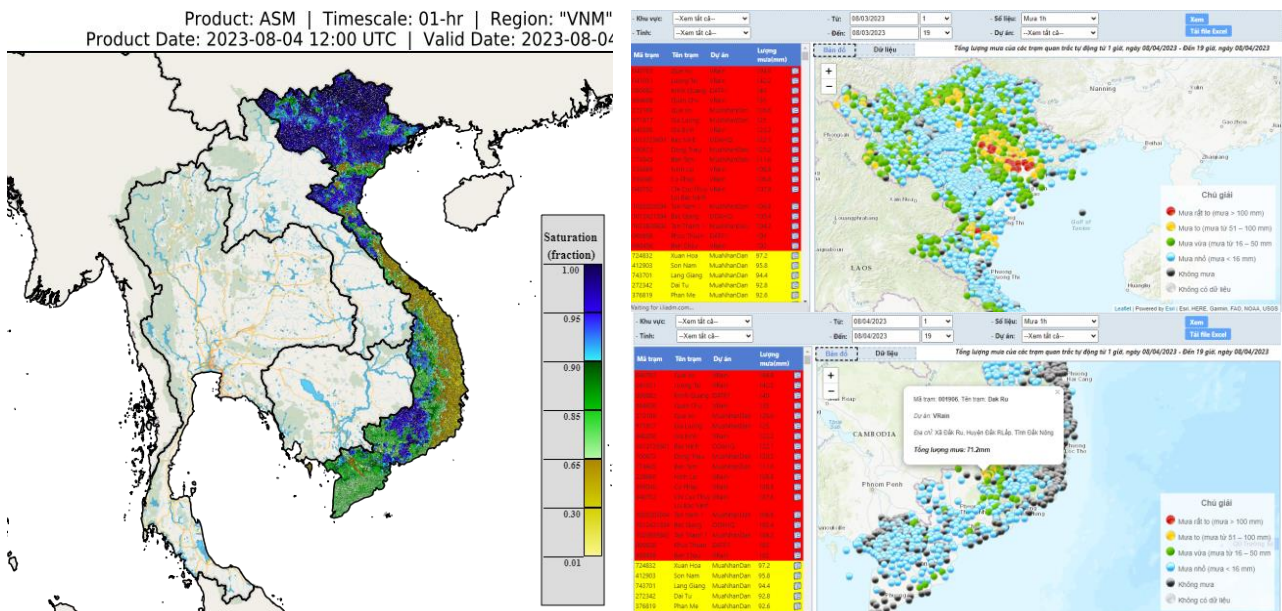


Figure 2.2. Rainfall distribution and soil moisture condition on the 4<sup>th</sup> August



Figure 2.3 Severe flash flood in Lien Minh commune, Sapa town, Lao Cai province on the evening 12<sup>th</sup> September caused 8 peoples dead and missing

Most flash floods are caused by local heavy rains which appeared during a short time, on a small area - local characteristics. This is a challenge in the operational warning and forecasting in Viet Nam.

## ***2.2. Severe flooding in the Central of Viet Nam***

The flood situation on Vietnam's major rivers in the 2023 rainy season has not yet reached the severe flood stage, however, as a result of heavy rainfall, many small rivers in the upper reaches and inland rivers have overbank flow, causing flooding and inundation in the Central region of Vietnam.

From the 11<sup>th</sup> to the 13<sup>th</sup> October 2023, the extreme heavy rainfall appeared in the Central region of Viet Nam (from Nghe An to Quang Ngai provinces). Thua Thien Hue province suffered the most severe flooding and

inundation due to heavy rainfall of 400 – 700mm in 03 days (11-13 October). The figure 2.4 shows the rainfall distribution in the Central Vietnam region as well as the heavy rainfall center located in Thua Thien Hue.

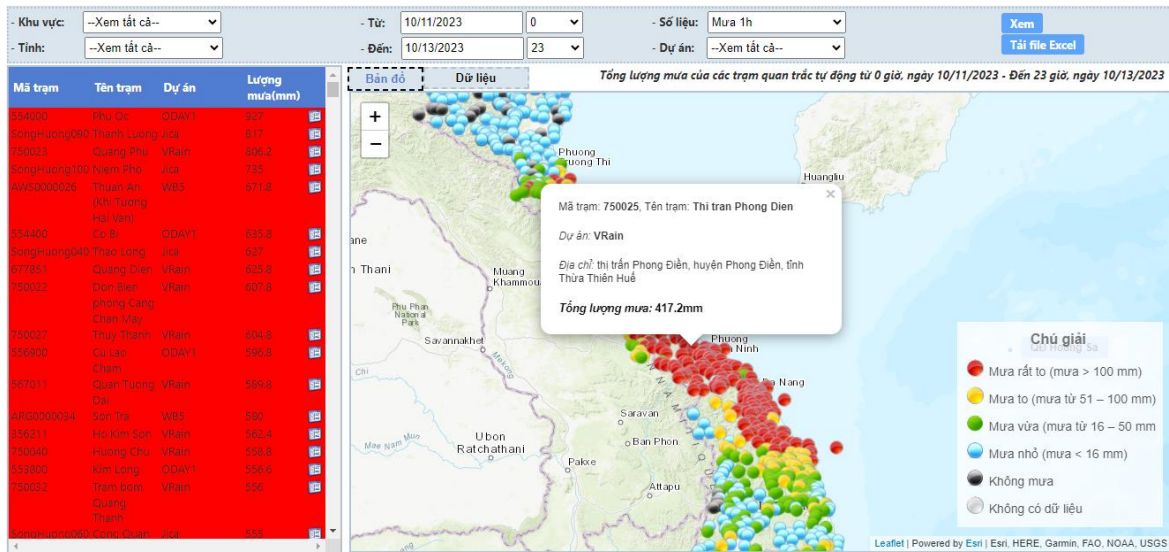


Figure 2.4. Observed rainfall distribution during the 11<sup>th</sup> and 13<sup>th</sup> October in the Central region of Viet Nam

As the result of extreme rainfall and flooding, Thua Thien Hue suffered a lot of human and property damage such as 2 deaths, hundreds of hectares of crops in flooding, coastal erosion, and many destroyed traffic roads.



**Coastal erosion.**

**Phu Vang district – Thua Thien Hue province, 13 October**



Figure 2.5. Flooding and coastal erosion in Thua Thien Hue provinces

From 29 to 31 October, due to the influence of cold mass air moving from East to the South, the Ha Tinh faced heavy rainfall leading severe flooding, especially in Huong Khe district.

As a result of this heavy rainfall and flooding, Huong Khe district suffered heavy damage with 3 people dead and missing, 1,868 households, 20.2 hectares of crops, 9 schools, 18 village halls and 1 post office under the water.

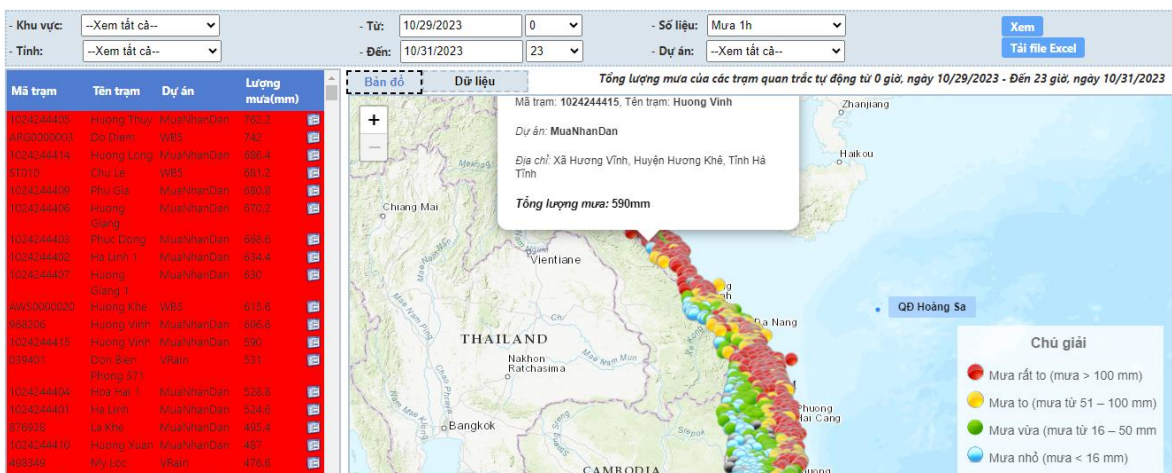


Figure 2.6. Observed rainfall distribution during the 29<sup>th</sup> and 31<sup>th</sup> October in the Central region of Viet Nam





Figure 2.7. Severe flooding in the Huong Khe district - Ha Tinh province

### ***2.3. Urban flooding situation***

Besides the flooding situation in large cities such as Hanoi and Ho Chi Minh, many cities and urban areas in Vietnam also have been facing urban flooding disasters more frequently when heavy rainfall, high tides, and increased river flood appearances.

The Figure 2.8 shows the flooding situation in mountainous cities as Lang Son and Dien Bien caused by heavy rainfall and sharp rising water level of small rivers.



Figure 2.8. Flooding in Lang Son and Dien Bien cities

### 3. Damage Assessment

From Jan.-Oct. of 2023, the whole country has been affected by 21 types of natural disasters, of which some have caused serious damages such as: landslides in Lam Dong Province; flash floods and landslides in the northern mountainous provinces; floods, widespread inundation in the Central region, riverbank and coastal landslides in the Mekong Delta.

Disasters across the country from the beginning of 2023 until now have caused the following damages:

- About people: 157 death tolls and missing, 124 people were injured.
- Regarding housing: 888 houses collapsed, 14,296 houses were damaged.
- Regarding agriculture, livestock, and fisheries: 147,192 hectares of rice and crops were flooded and damaged; 3,085 head of cattles; 66,156 poultry died or were swept away; 3,501 hectares of aquaculture and 103 cages were damaged.
- Regarding irrigation: 100 km of dykes, embankments, and canals collapsed, 650 irrigation works were damaged.
- Regarding traffic: Many traffic routes were effected related to landslides and 169 bridges were damaged.

**Total damage cost is estimated at over 6,810 billion VND**

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

##### ***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 from 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.

At the eighteenth World Meteorological Congress (Cg-18, June 2019) through its Resolution 15 (Cg-18) decided among others to remove the 'demonstration' designation of the SWFDP and renamed it as Severe Weather Forecasting programme (SWFP). Subsequently, the SWFDP-SeA became SWFP-SeA

With the acceptance 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), the second two-week Training Desk was organized at RFSC Ha Noi in December 2019. In 2020, the third Training Desk was organized via online platform hosted by Vietnam.

In 2021 and 2022, due to the Covid-19 epic, almost trainings were organized remotely: i) SWFP – South Asia and Southeast Asia - Training Workshop on Severe Weather and Impact Based Forecasting and Warning Services (1-12 February 2021), ii) CREWS / SWFP-Southeast Asia - Introductory Training on Nowcasting of Severe Weather (for Cambodia and Lao People's Democratic Republic) (14-16 November 2022) and iii) SWFP – South

Asia and Southeast Asia - Training Workshop on Severe Weather and Impact Based Forecasting and Warning Services (28 February -10 March 2022).

In 2023, CREWS / SWFP-Southeast Asia - In-country Training on Severe Weather and Impact-based Forecast and Warning Services (IBFWS) were held in Phnom Penh, Cambodia, 23 October - 3 November 2023.

#### ***4.2. Development of Southeast Asian Flash Flood Guidance System (SeAFFGS)***

The SeAFFGS is a system under Global Flash Flood Guidance System of WMO which have been developed by Hydrologic Research Center - USA. The purpose of the SeAFFGS project is the development and implementation of FFGS specifically for Cambodia, Lao PDR, Thailand, Viet Nam. The SEAFFGS is now on going in development.

The Southeast Asia Flash Flood Guidance System (SeAFFGS) has been providing products with good reliability, useful for reference in flash floods and landslides warning in Vietnam. Current challenges existing are mentioned as below:

- Still development on structure of Regional Center.
- No coordination and cooperation mechanism among member countries in sharing information and data, especially telemetry rainfall, radar and warning information exchanges.

Second Flash Flood Guidance System (FFGS) Global Workshop was held from 19-23 June 2023 in Republic of North Macedonia to share experiences, showcase accomplishments, determine challenges and identify gaps towards establishing recommended practices, and provide training to further understanding the new capabilities of FFGS.

The SeAFFGS Refresher & Hands-on Training was held from 4-10 October 2023 for Lao PDR and Cambodia forecasters (two trainers from Viet Nam).





Figure 4.1 . The second GFFGS Workshop and SEAFFGS Hand-on Training in Lao and Cambodia

### ***4.3. Other collaborations***

In 2023, VNMHA keeps posting our discussion and questions on tropical cyclone analysis and forecast in RSMC Tokyo forum at [https://my.redmine.jp/tc\\_communication/login](https://my.redmine.jp/tc_communication/login)

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. This cooperation has been renewed in early 2023 and re-named as WISER (Weather and climate Information SERvices).

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

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

### **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.

Regarding the issue of providing information to Members through the new interface for SWFP’s portal of RFSC Hanoi (the Figure 5.1) and its access statistics from Members including Viet Nam, Laos, the Philippines and Cambodia forecasters in 2022 and 2023 (Figure 5.2).

### Products of the Severe Weather Forecasting Programme for Southeast Asia (SWFP-SeA) from RFSC Hanoi

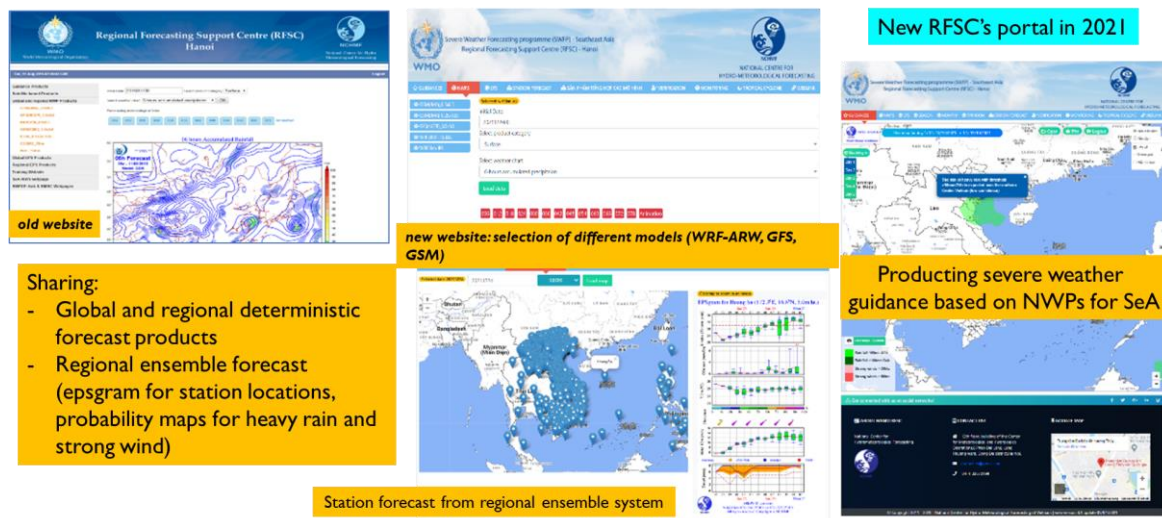


Figure 5.1. The new interface for SWFP’s portal of RFSC Hanoi

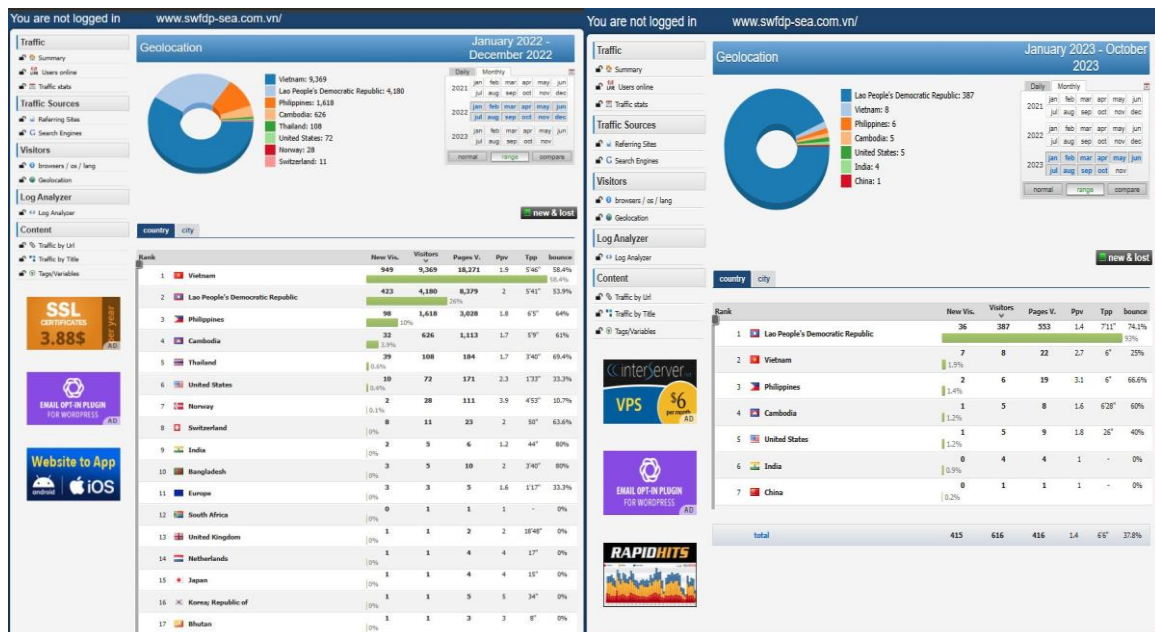


Figure 5.2. The statistics of website swfdp-sea.com.vn in 2022 and 2023

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

VNMHA is providing severe weather warning for short-range and medium range everyday and NWP 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. Impact-based forecast and warning services in Viet Nam**

Viet Nam Meteorology, Hydrology Administration (VNMHA) keeps 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 for tropical cyclone situations. For better user communication, especially in tropical cyclone situation, VNMHA has been operating a TV studio so that VNMHA forecasters can produce weather forecast presenting videos to broadcast on VNMHA's social media channels.

The cooperation projects PROMOSERV3 with FMI also help VNMHA can now produce CAP format warning for tropical cyclone, strong wind and heavy rainfall to publish in NCHMF/VNMHA website and will be soon integrated to WMO GMAS portal.

### **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. VNMHA will cooperate with local stakeholders (i.e agriculture, fishery...) to build the 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

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

With the new HPC system (CrayXC40) at VNMHA, 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).

VNMHA has been applying the data assimilation for WRF-ARW at 3km horizontal resolution using almost quality controlled observation data from NCEP and Vietnam's local observation since 2020. The 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 high resolution products for improving short range forecast of heavy rain over the northern Vietnam is shown in Figure 5.3.

Regarding the regional ensemble system, the resolution of 32 ensemble members is 9km and using GFS-NCEP as boundary conditions. Figure 5.4 shows 10m wind probability and 24h precipitation probability maps related to Koinu TC from the SREPS-32 system.



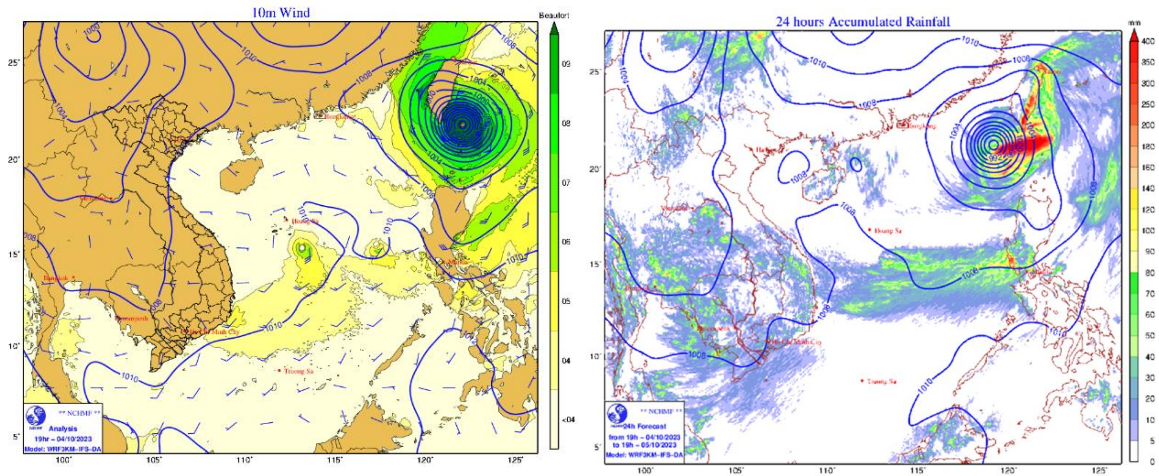


Figure 5.3. The 10m wind and 24h accumulated rainfall maps of WRF3km-IFS-DA related to Koinu TC

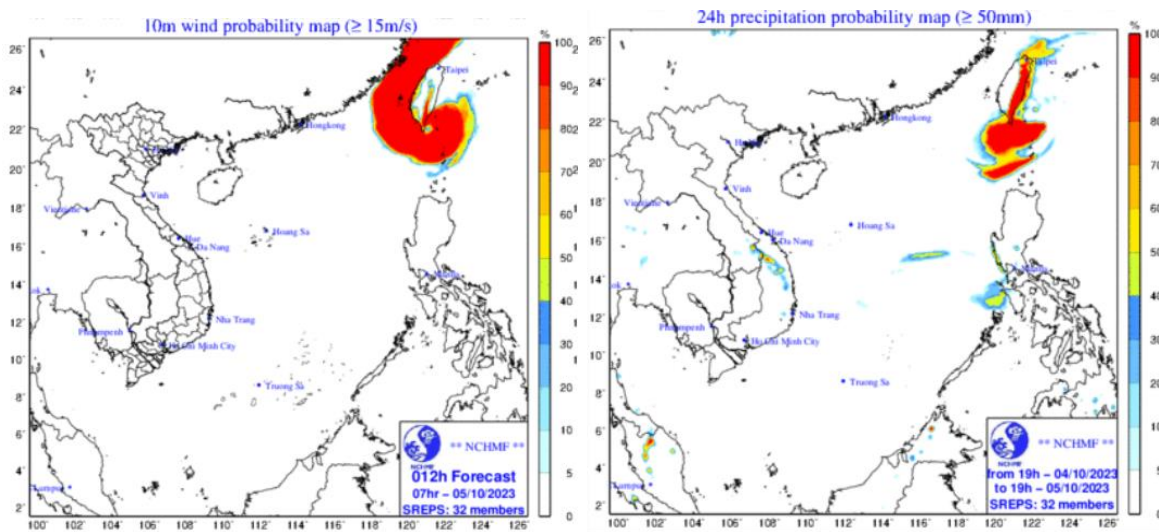


Figure 5.4. 10m wind probability map at 00UTC/05/10/2023 and 24h precipitation probability map from 12UTC/04/10/2023 to 12UTC/05/10/2023 from the SREPS-32system.

In 2021, the radar data (10 radar stations of Vietnam) was also assimilated experimently for improving the short-range heavy rainfall forecast (upto 24h). The rainfall forecast from NWP from 0-6 hours were blended with nowcasting products of SWIRLS system of Hong Kong Observatory (Figure 5.5).

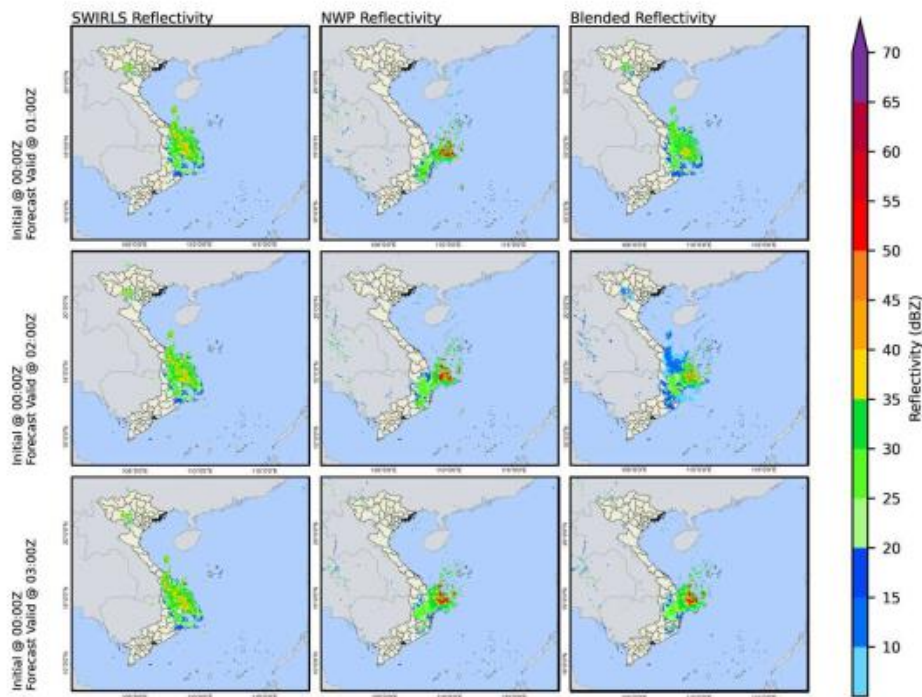


Figure 5.5 An example of the performance of blending NWP and nowcasting products: Forecast reflectivity (in dBZ) from SWIRLS (left column), NWP forecast from WRF-ARW (middle column), and blended product (right column) for +1 h (first row), +2 h (second row), and +3 h (third row) forecast ranges for TC DIANMU in forecast cycle 00Z 23 September 2021 (reference: <https://doi.org/10.3390/atmos14081201>).

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

VNMHA is providing high resolution NwPs (WRF3kmIFS, WRF3kmIFS-DA) and the regional ensemble SREPS-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

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