

MEMBER REPORT

ESCAP/WMO Typhoon Committee
10th IWS

SOCIALIST REPUBLIC OF VIET NAM

October 2015

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

1. Meteorological assessment

In 2015, the numbers of TCs and tropical depressions (TDs) over the Northwest Pacific Ocean are greater than normal. Up to early October, there have been 23 (compared to 20, annually), some were super typhoons.

However, the numbers of TCs, TDs over the Southeast Asian Sea (SEAS) and hitting Vietnam are less than normal and less than those in 2014. So far, there were 04 TCs and 02 TDs in the SEAS which 02 TCs landed in Vietnam: KUJIRA (June 2015) and VAMCO (September 2015). Their tracks are shown in Fig. 1 and Fig. 2.

1.1. Tropical Storm Kujira (1508)

On the afternoon of 19 June, a low pressure had developed into a Tropical Depression in the South of Paracel Islands about 450km east south east of Da Nang city, it then had strengthened into a Tropical Storm on June 21, named Kujira which is the first Tropical Storm of 2015 in the East Sea.

Kujira entered the Gulf of Tonkin on the morning of 23 June, moving West North West about 10 to 15km per hour and made landfall on Quang Ninh province on June 24 and then weakened into a Tropical Depression gradually. Kujira dissipated over the northern mountainous area in the morning of June 25.

A peak gust of 26m/s was recorded at Cua Ong station (48836) and Bai Chay station (48833). Minimum sea level pressure at Bach Long Vi station (48839) was 984.2mb. Total rainfall amount over the mountainous areas of Vietnam during the time of Kujira was 100 – 200mm.

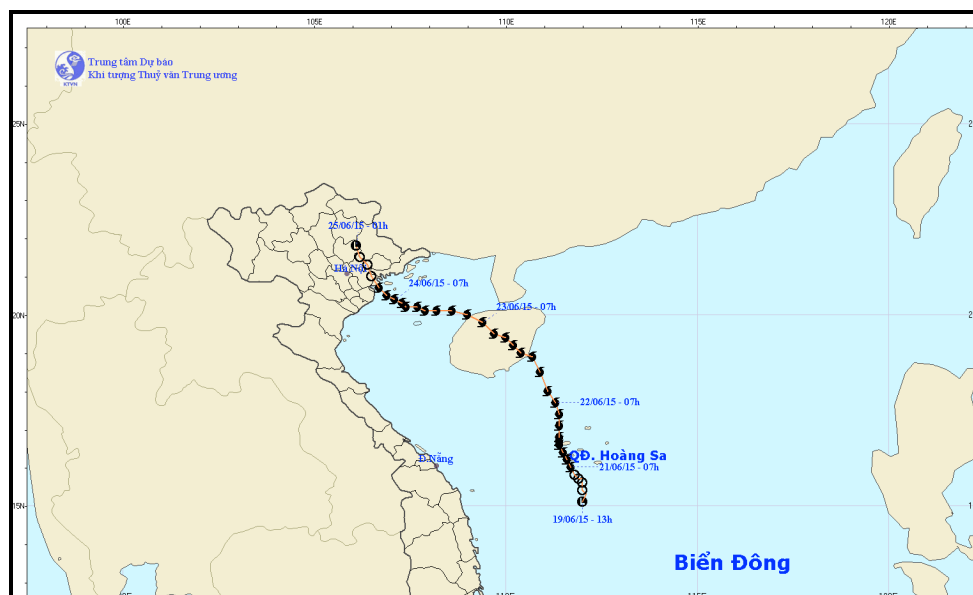


Figure 1. The best track of Kujira (NHMS of Viet Nam).

1.2. Tropical Storm Vamco (1519)

On September 10, a tropical disturbance formed within the monsoon 750 km East of Da nang city over the East Sea. The disturbance meandered for a few days and developed into a tropical depression on September 13 and then a Tropical Storm on September 14, named Vamco. Vamco moved Westward about 15km per hour and finally made landfall on Quang Nam - Quang Ngai Province on late afternoon September 14. The remnants of Vamco continued to move in a westward direction inland and dissipated the next few days.

A peak gust of 27m/s was recorded at Ly Son station (48/85). Minimum sea level pressure at Ly Son station (48/85) was 992.8mb. Total rainfall amount over the Central of Vietnam during the time of Vamco was 150 – 350mm.



Figure 2: The best track of Vamco (NHMS of Viet Nam).

1.3 Extreme Meteorological events reviews from January to September 2015

The latest SST in the NINO 3.4 region shows that the SST anomaly in September 2015 has been increasing, about 2°C higher than the annual. Most of models predict the raise of SST from 2.2 °C to 2.4°C above annual during the autumn and winter 2015. This El Niño is assumed, at least, as strong as the one in 1997, the strongest El Niño event ever.

1.3.1 Cold surges

In the first nine months of this year, thirteen (13) cold surges are observed, whereas three (03) of them from May. These are lower than normal and are lower than those in 2014.

During the winter-spring 2014-2015 season, northern provinces observed four (04) cold surges, they were lasted in short period of time, the longest cold surge episode existed in seven (07) days (09-15/01/2015). On 9 January, hail and snow was recorded in Sapa (a northern mountainous city), its lowest temperature went down to 1.6°C; in Sin-Ho (Lai-Chau province) it was -0.3°C; Dong-Van (Ha-Giang province) 1.8°C. ... Even though the winter 2014-2015 still was a warm winter with less cold temperatures.

1.3.2 Tropical cyclone and tropical depression

In 2015, the numbers of TCs and tropical depressions (TDs) over the Northwest Pacific Ocean are greater than normal. Up to early October, there have been 23 (compared to 20, annually), some were super typhoons.

However, the numbers of TCs, TDs over the Southeast Asian Sea (SEAS) and hitting Vietnam are less than normal and less than those in 2014. So far, there were 04 TCs and 02 TDs in the SEAS which 02 TCs landed in Vietnam: KUJIRA (June 2015) and VAMCO (September 2015).

1.3.3 Temperatures and heat spells

From January to September 2015, the country temperatures were generally above normal, especially the March and May temperatures showed a much higher (1-2°C) than the normal, some region even higher (3-4°C).

Temperatures in the Southern Central, Central Highland, and South in January-April were about normal; from May to October were well above normal.

There were 14 heat spells recorded in the whole country from April. Many daily historical records in the North and the Central were broken during May-July 2015. The longest heat spell was observed in 14 May - 21 June from Nghe-An to Phu-Yen province (approximately 1100km north-south). The highest temperature records during those days were 39-42°C, some well above 42°C in late of May.

1.3.4 Rainfall and heavy rainfall episodes

The total amount of rainfall in the country from January to September was below the normal, except some cities in the western North and the Northeast region where the amount of rainfall were much higher than the normal.

In the first four months of 2015, many cities in the southern Central, the Central Highland, and the South witnessed small rainfall, causing extreme severe droughts, specifically the ones in the southern Central region. Rainy season in the Central Highland and the South has started from the last week of May; however droughts still occupied in the Central. Till the middle of September, due to the VAMCO typhoon's effect, a heavy rainfall episode was happened in the Central, the drought here was almost terminated.

Although the small amount of rainfall was observed in the country, there had two torrential rainfall episodes setting new historic records:

-From 23-28 March, 2015, there was an unusual torrential rainfall in Hue-Quang Ngai provinces (the middle part of the country) with the average amount of rainfall 100-200mm, some cities well above 300mm such as Tra My (QuangNam province): 390mm, Ba To (Quang Ngai province): 500mm. These set new records in March.

-From 23 July to 04 August, there was an extreme rainfall event in the Northeast region, with new rainfall records occurred in Quang-Ninh city. The total amount of rainfall there was observed generally 1000-1300 mm; especially the rainfall in Cua Ong station was above 1600mm.

2. Hydrological Assessment

2.1. General behavior of flood situation in the North of Viet Nam

The 2015 flood season started more or less the same as previous flood years, however, abnormal flood situation occurred during reporting period:

- In January 2015, unseasonal flood appeared on the Da and Gam river in which inflow of Son La reservoir on the Da increased sharply and reached the peak of 2170 m³/s in 10th Jan (repeating the historical record in 1978). The monthly water volume on the Red river system, in general, as higher than the long-term average of 5-30%, especially inflow of Hoa Binh reservoir (88%) and inflow of Son La reservoir (37%) as a result of increasing hydro-electric power generation of multi-reservoir. However, river flow on the Thao was lower 20 % in comparison with the long-term average.

As a result of late coming of rainy season in 2015 together with non widespread rainfall in the North, water volume on most river was lack of 20 – 75 % in comparison with the long-term average during March and August. In among 5 flood events in flood season, the largest occurred from the 22nd Jul. to the 4th Aug. on the Red, Thai Binh, Ky Cung and Bang Giang rivers in which the flood amplitudes were estimated from 3 to 9m at upstream stations and from 2 to 3m at downstream stations. Table 1 and 2 summarized information of flood characteristics on the river systems as well as large increasing of reservoir inflow in the North of Viet Nam during the 22nd July to and 4th August when the appearance time of high peaks of flood which some of flood peaks were recorded above Alarm level 3 (AL 3). Figure 3 illustrated the flood on the main rivers Thuong and Luc Nam belong Thai Binh river system with the peaks was recorded over AL. 3.

Table 1. The characteristics of flood events for main stations on the river in the North of Viet Nam from the 22nd Jul to the 5th Aug.

No	Station	River	Peak of flood event(cm)	Appearance time of flood peak	Flood Amplitude (cm)	Alarm Level (m)
1	Mường Tè	Đà	28690	22h 1/8	438	< AL 2: 60 cm
2	Xã Là	Mã	28316	22h 02/8	385	> AL 3: 1.65m
3	Yên Bái	Thao	3117	13h 3/8	567	> AL 2: 17 cm
4	Đáp Cầu	Cầu	537	14h 5/8	506	> AL 2: 7cm
5	Phủ Lạng Thương	Thương	652	11h 4/8	631	> AL 3: 22 cm
6	Chũ	Lục Nam	1363	2h 3/8	922	
7	Lục Nam	Lục Nam	636	13h 3/8	502	> AL 3: 6 cm
8	Phả Lại	Thái Bình	410	7h 4/8	402	> AL 1: 402 cm
9	Lạng Sơn	Kỳ Cùng	25490	3h 3/8	736	< AL 2: 10 cm
10	Băng Giang	Băng Giang	18121	5h 5/8	409	< AL 2: 29cm

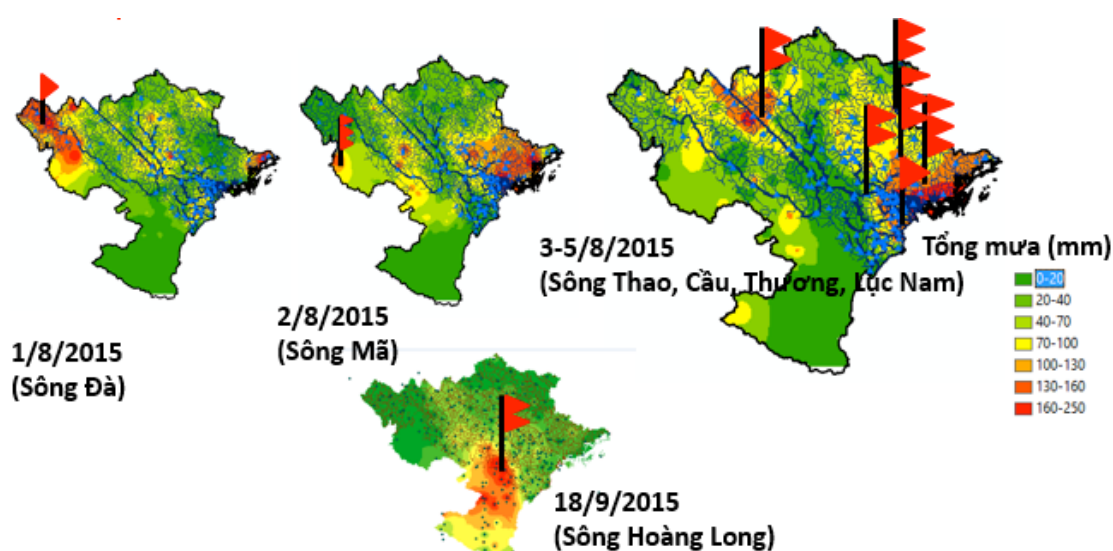


Table 2. The increasing of reservoir inflow on the Da and Gam rivers from the 22nd Jul to the 5th Aug.

No	Reservoir	River	Beginning of flood event		Peak of flood event		Flood Amplitude (m ³ /s)	Alarm Level (m ³ /s)
			Time	Q (m ³ /s)	Time	Q (m ³ /s)		
1	Lai Châu	Đà	7h 23/7	850	1h 25/7	2930	2080	
2			13h 31/7	1010	22 h 1/8	3980	2970	
3	Son La	Đà	13h 22/7	1500	7h 25/7	6200	4700	< AL 1: 1800 m ³ /s
4			19h 30/7	1050	13 h 1/8	7250	6200	< AL 1: 750 m ³ /s
5	Hòa Bình	Đà	19h 22/7	480	5h 3/8	5770	5290	< AL 1: 3230 m ³ /s
6	Tuyên Quang	Gâm	1h 23/7	205	13h 2/8	2100	1895	

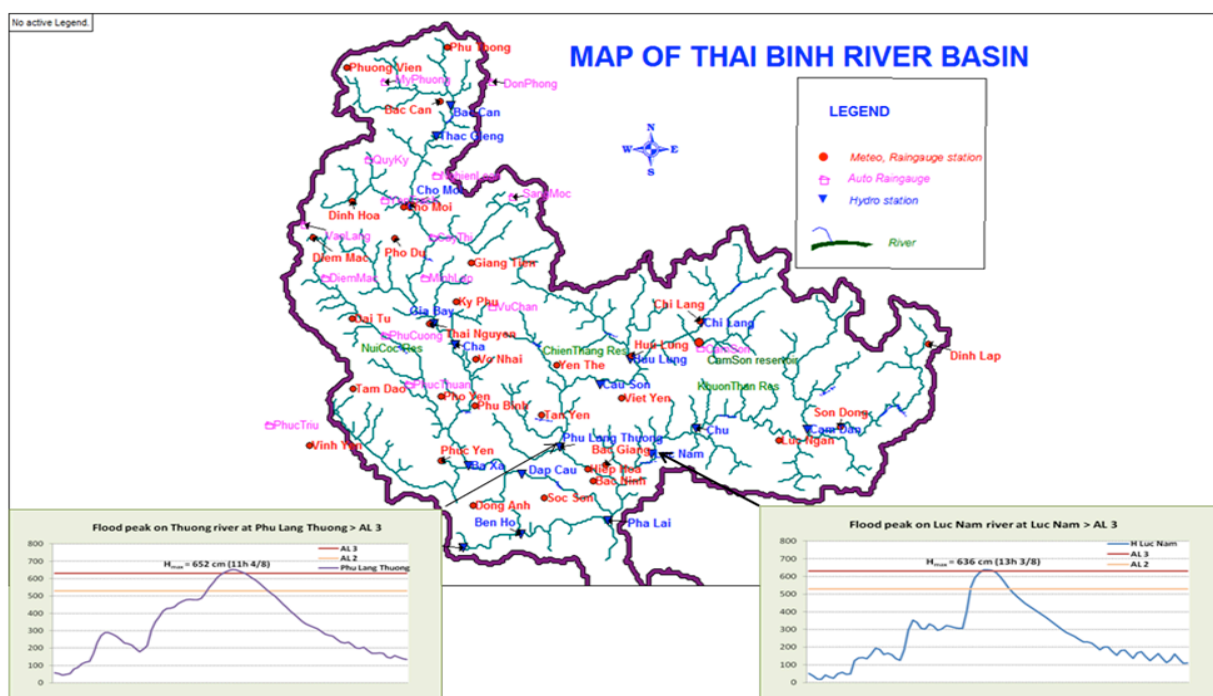


Figure 3: Flood peaks of the year on rivers: Thuong river at Phu Lang Thuong and Luc Nam river at Luc Nam

As a result of historical rainfall during 23 Jul. and 4 Aug. covered whole Northern part of Viet Nam, flash floods and landslides appeared in provinces of Quang Ninh, Lai Chau, Son La, Dien Bien, Lao Cai, Yen Bai, Ha Giang, Tuyen Quang, Bac Kan, Thai Nguyen and Cao Bang. Severe flooding resulted in the separation of residential areas in provinces of Quang Ninh, Hai Phong, Bac Giang, Dien Bien; cities of Thai Binh, Nam Dinh, Hai Duong. Table 3 and Figure 4 present the new record of rainfall and rainfall distribution from 23 Jul. to 4 Aug in the North of Viet Nam as a illustration of severe disaster appearance.

Table 3. Amount of rainfall during the period of 23Jul – 4Aug, 2015

Station	Among of rainfall during the period of 23Jul – 4Aug		
	Historical record (mm)	Appearance time (year)	Observed in 2015 (mm)
Bãi Cháy	415.8	2013	1041.1
Cửa Ông	447.4	1966	1599.9
Tiên Yên	563.6	2006	682.7
Quảng Hà	621.4	2006	991.7
Móng Cái	686.1	1965	1213.4
Cô Tô	477.9	2013	1268.7

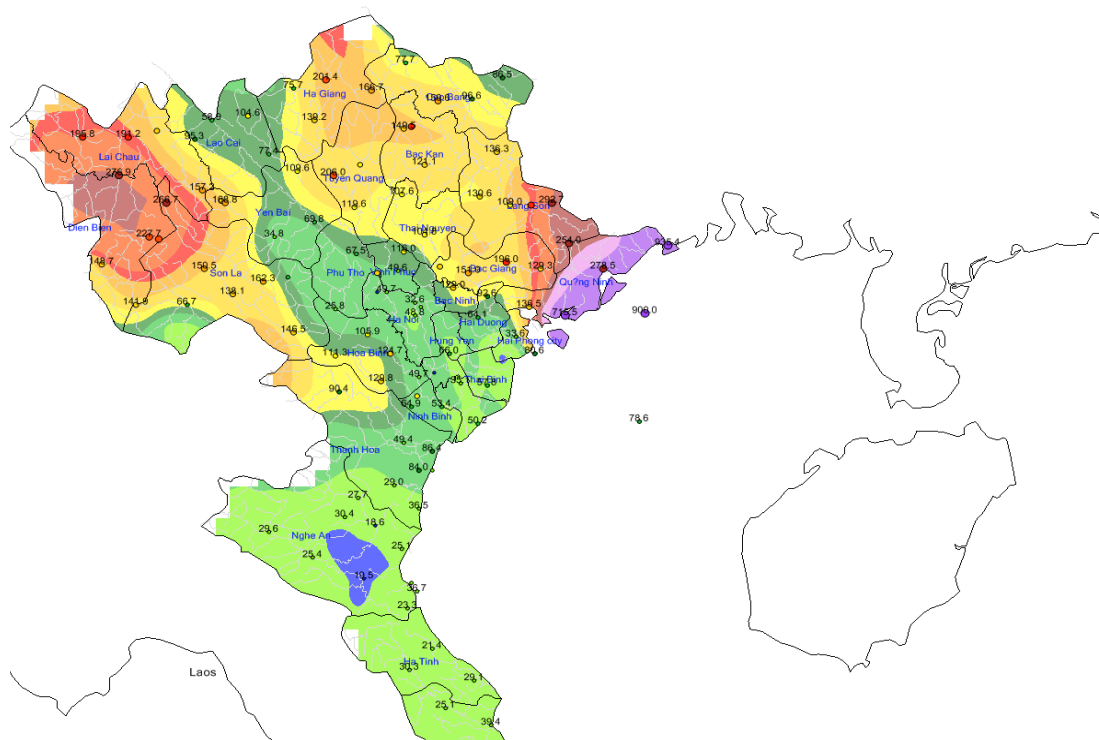


Figure 4. Rainfall distribution in the North of Viet Nam from 23Jul – 4Aug, 2015

2.2. Flood situations by Tropical cyclone in the Central and Highland area

From the beginning of the year to the mid of October, there is no severe floods on rivers along of those areas is observed.

From January to May: Unseasonal flood was appeared on the river from Thua Thien Hue to Quang Ngai on March 2015. The flood peak on the river reached a historical as the same period. From 23-27/3, flood occurred in rivers in ở Thua Thien Hue, Quang Nam, Quang Ngai. The flood amplitude were estimated from 3 to 5m at upstream stations and from 2-4m at downstream stations. Flood peak were recorded above Alarm level 1 in there rivers and especially above Alarm level 3 at Song Ve station (Quang Ngai province).

The flow on the popular river from 20 to 60% shortfall compared with an average years, somewhere over 80% shortfall such as Nghe An and Khanh Hoa. In many rivers, the water level has decreased to the lowest level historical or the lowest as the same period. From January to April 2015, the drought situation and water shortages have occurred in the wide areas from Phu Yen to Ninh Thuan, the Highland and Southern Eastern, after that the drought situation gradually improved on May. However, the drought situation and locally water shortage still continues happening in the provinces of Phu Yen, Khanh Hoa and Ninh Thuan.

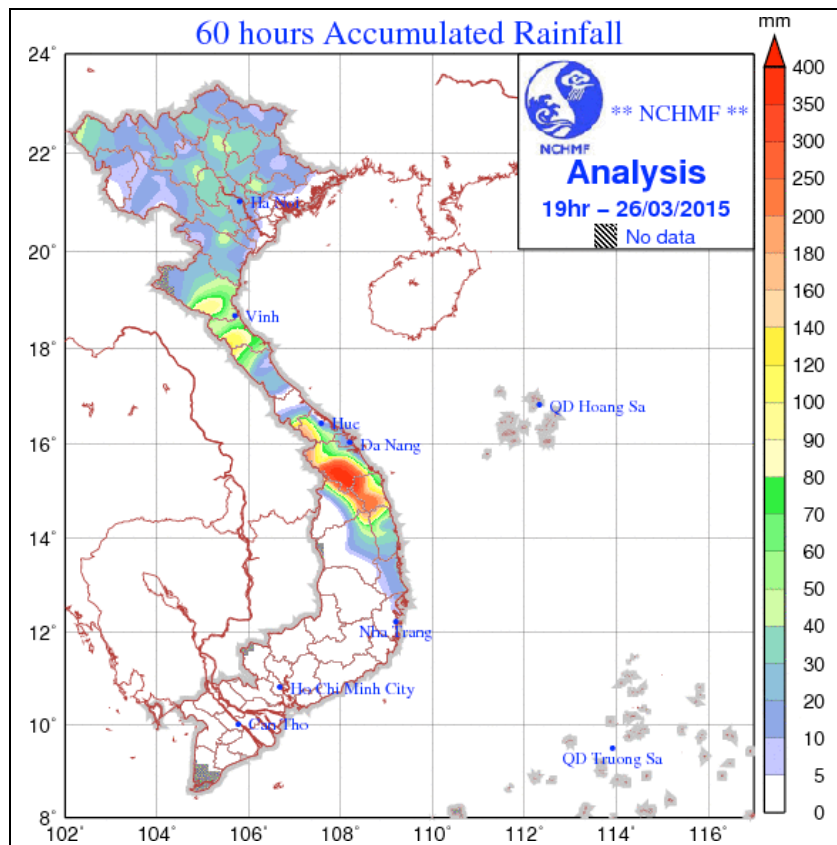


Figure 5. Rainfal distribution in the Central of Viet Nam from 23-27 March, 2015

At the river in Southern appeared the salinity intrusion situation on January 2015, salinity concentration at the most stations greater levels than the same period in 2014 and average years. The highest salinity concentration in the Mekong estuaries appeared on the first half of April 2015.

From June to October 15: In the Central rivers and Highland region appeared 2-3 fluctuations and small flood on June and July. The water level on some rivers was decrease to the historic lowest level such as: Tra Khuc River at Tra Khuc decrease to 0.07m (June 30), Cai Nha Trang River at Dong Trang decrease to 3.10m (July 20).

On the river in Thanh Hoa, Nghe An, Binh Thuan and Highland region appeared three small floods, the flood amplitude on the upstream arrange from 1.5 to 6.0m, the flood peaks on the river at BD1 on August.

From September 13-18, on the river from Thanh Hoa to Quang Ngai and North Highland region have appeared a flood with the flood amplitude on the upstream from 5 to 10m, 2 to 5m on the downstream, the flood peak on the Buoï river (Thanh Hoa) at Alarm level 3; La river upstream (Ha Tinh), the river in Quang Binh, Quang Tri at Alarm level 2; other river in Thanh Hoa, Nghe An, Ha Tinh, Thua Thien Hue, Quang Nam, Quang Ngai and North Highland Alarm level 1.

In Southern River, the water level in the Mekong River watershed was gradually increasing. The highest water level account to the date on October 05 at

Tan Chau is 2.51m (September 30), Chau Doc: 2.35m (September 30), lower than the same period from 1.1 to 1.4m an average years is the lowest level historical as the same period. The last day of September, at the end of Mekong River source and Sai Gon River affected by a hurricane tide, the water level at the main stations on the downstream Mekong region at Alarm level 2 and over Alarm level 2; Phu An at Alarm level 3.

2.3 Flash Floods: 5 flash floods events occurred in 11 provinces in the North Vietnam as follows:

- Son La, Lai Chau, Lao Cai province from June 24 to June 25
- Lai Chau, Son La, Dien Bien, Lao Cai, Yen Bai, Ha Giang, Tuyen Quang, Bac Can, Thai Nguyen, Cao Bang from July 23 to August 4.
- Son La: September 4 .
- Son La: August 21.
- Ha Giang: September 7.

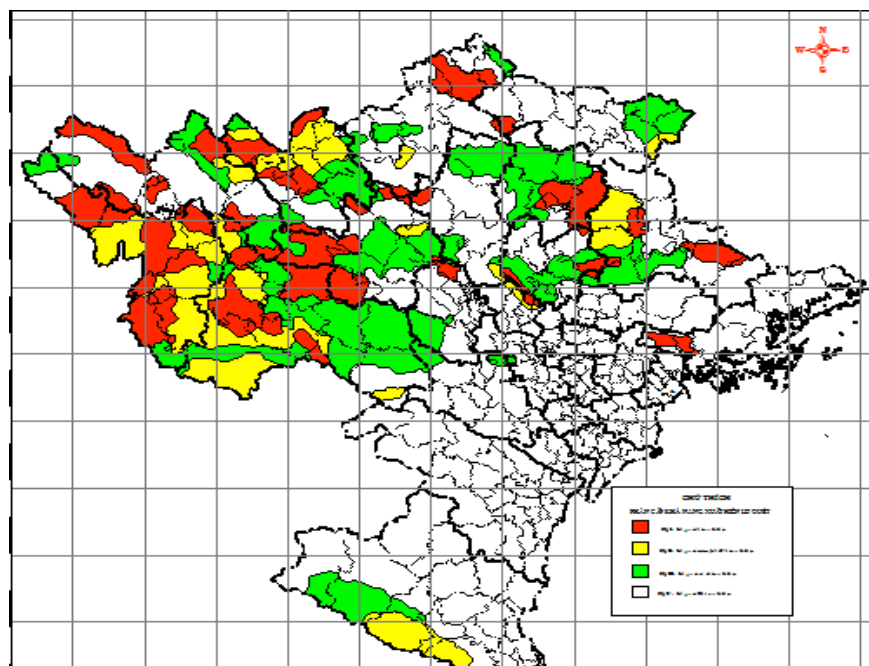


Figure 6. Flash flood and landslide in the North of Viet Nam from 23July – 4 August, 2015

3. Socio-Economic Assessment

3.1. Damage Situation in 2014

In 2014, natural disaster happen less in both intensity and quantity when compared with the average number of years: there were 05 typhoons, 03 tropical depressions happened in the East Coast, in which 03 typhoons (typhoon no.2,

no.3, and no.4) directly affected Vietnam, however the measurement of influence is not large; there were about 170 lightning cyclones and hails, 30 flash floods and landslides (particularly the landslide at Tam Duong district, Lai Chau province is affected by typhoon no.02); 17 heatwaves; 25 cold air streams; many large tidal waves happened in Ho Chi Minh City and Tien Giang, Vinh Long, Can Tho, An Giang provinces caused many low-lying areas were flooded, traffic jams, affected people, producing process and business.

Synthesis from local reports, natural disasters in 2014 caused 133 deaths and missing (no deaths in typhoon); 145 people were injured; 1,985 houses collapsed, drifted; 42,758 houses were flooded, damaged or unroofed; 230 086 hectares of paddy and crop damage; millions of cubic meters of rock in roads, irrigations eroded and sedimentation etc .. The estimated total damages of about 2,830 billion dong.

3.2. Damage Situation in 2015

Since early 2015, drought, floods, flash floods, landslides, typhoons and lightning has caused heavy losses of lives and property on a large scale, as follows:

a) People: 110 deaths, 19 people missing, 116 wounded (particularly because of rainfall and floods from 26/7 to 06/8 in Quang Ninh province)

b) House: Houses collapsed and washed away: 1141; Houses affected, roofs, dilapidated: 13 896; Houses were flooded: 19 094.

c) Agriculture: Area drought in Winter – Spring season: 128.978ha; Area drought in Summer – Autumn season: 62 343 ha; rice area were flooded, damaged: 55 886 ha; area of crops were flooded, damaged: 23 466 ha; area industrial plants, fruit trees damaged: 4057 ha; Cattle deaths: 2,574; Poultry deaths: 66 416.

d) Irrigation: Length dike were damaged: 3.026m; Length of embankment damaged: 9.512m; canals damaged: 105.639m; irrigation works were damaged: 179 females.

e) Transportation: highway, provincial highway eroded: 1,147,663 m³; the volume of earth and rock rural roads eroded: 805.444m³; bridges, culverts damaged: 86 culverts.

f) Aquaculture: aquaculture area affected: 5599 ha; aquaculture cages damaged: 2,583 cages.

g) Industry: Coal drifted, lost 300,000 tonnes.

Total losses on assets range: 5,763 billion.

II. Summary of progress in Key Result Areas

Title of item: Progress in interpreting Regional Forecasting Support Center - Ha Noi in SWFDP of WMO at South-East Asia

The SWFDP-SeA webpage is developed and taken into operationally since June 2012 under the link of <http://www.swfdp-sea.com.vn> (username: swfdp-sea and password: RA2 - in case sensitive) for NHMSs of Lao PDR, Cambodia, Thailand and Philippine (Myanmar as an observer) to access and use available products (see Fig. 1 and 2). At present, the following products are operationally provided through the SWFDP-SeA portal:

- Short range (1-2 days) and Medium range (3-5 days) Guidance products: the guidance includes warning maps related to severe weather such as heavy rainfall, strong wind for responsible areas and categorical warning table for all given locations of relevant countries. ***The guidance has been providing operationally from Monday to Friday since 4/2015 for short range guidance and since 8/2015 for medium range. In near future, all guidance will be provided 24/7.***

- Updated MTSAT-2 images to Himawari-8 satellite on Jul-2015.

- Global Satellite Mapping of Precipitation (GSMAP) is global rainfall estimates by the retrieval algorithm for brightness temperatures from satellite-born microwave radiometers. The horizontal resolution is 0.25 x 0.25 deg, 24 pictures per day, update every 1 hour. The delayed time is about 4 hours

- The new precipitation products have been developed and made available to SWFDP regional projects, under the framework of the Sustained, Co-Ordinated Processing of Environmental Satellite Data for Nowcasting (SCOPE-NWC): <http://sigma.cptec.inpe.br/scope>

- Storm tracks: this product is developed by NHMS of Vietnam in order to issue warning the direction and speed of the movements of deep convective systems of up to 3 hours. The algorithms are based on 3 steps: motion vector fields are derived two successive images using multi-scale variational method; deep convective clouds are simply recognized by multi-threshold method from MTSAT-2 data (infrared channels); and convective systems are separated by deep first searching (DFS) algorithm

- ASCAT: this product provides a measure of wind speed and direction near the sea surface. The measurements are obtained through the processing of scatterometer data originating from the ASCAT instrument on EUMETSAT's Metop-A satellite.

- Global deterministic NWP products from GSM model of JMA, GFS of NCEP and ICON (updated of GME) of DWD. The products of GSM and GFS have resolution of 0.5 x 0.5 deg, ICON product has resolution of 0.125 x 0.125 deg. All of global

model products is updated every 6 hours at 00UTC, 06UTC, 12UTC and 18UTC. The available surface forecasting products include charts for precipitation, pressure of mean sea level, temperature at 2 meters, wind at 10 meters, 1000-500mb thickness. For upper levels (850, 700, 500 and 300mb), the forecasting charts of wind and geo-potential height, relative humidity, relative vorticity and vertical velocity is also provided.

- Regional deterministic NWP products from WRF and COSMO have been updated (twice per day for WRF at 15km resolution and once per day for COSMO at 7km resolution)

- Global Ensemble Prediction Products based on 21 ensemble members of GFS ensemble system (NAEPS) for forecasting 5-10 day ahead: these products have resolution of 1.0 x 1.0 deg and are updated every 12 hours at 00UTC and 12UTC. The available EPS products include charts for ensemble mean (i.e. pressure of mean sea level, wind and geo-potential height at 850mb and temperature at 850mb), stamp map of 24-hours accumulated precipitation, and probabilistic maps (i.e. 24-hours precipitation quartile, 24-hours precipitation probability, 24-hours maximum wind-gust probability, 24-hours maximum CAPE probability, etc). In addition, the EPS-diagram for the 22 locations of Cambodia, 17 locations of Lao PDR and 16 locations of Thailand are also provided.

- Regional Ensemble Prediction Products based on two operational EPS of NHMS of Vietnam, namely is SREPS and LEPS. The SREPS (Short Range Ensemble Prediction System) is multi-model multi analysis EPS in which running HRM (High resolution Regional Model of DWD) and WRF (with two dynamic cores ARW and NMM) with initial and boundary conditions separately from 5 global models including GSM, GEM, GFS, GEM and NOGAPS. The SREPS has 15 members with resolution of 0.15 x 0.15 deg and is updated every 6 hours at 00UTC, 06UTC, 12UTC and 18UTC. The main aim of SREPS is in order to provide ensemble products for forecasting 1-3 days ahead. The LEPS is developed to provide ensemble products from 3 to 5 days ahead by running HRM model with initial and boundary conditions separately from 21 members of global EPS of GFS model. The LEPS has 15 members with resolution of 0.2 x 0.2 deg and is updated every 12 hours at 00UTC, and 12UTC. All available ensemble mean and probabilistic products of SREPS and LEPS is the same as with NAEFS.

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

Based on the Meeting of the Regional Subproject Management Team (RSMT) of the Severe Weather Forecasting Demonstration Project (SWFDP) for Southeast Asia from 11-14 August 2015 in Ha Noi, NHMS has some future activities:

- + Starting the third phase - demonstration phase, (tentatively Jan 2016) in which the guidance will be provided 24/7 and all participating members have to evaluate the guidance based on their observation system. Now, Ha Noi RFSC is in the second phase (Pilot Phase).
- + Expanding guidance domain for covering Myanmar.
- + Collaborating with RMSC Tokyo to release the guidance in case of having tropical storm (TS) or tropical cyclone (TC) over the Southeast Asia domain.

Summary Table of relevant KRAs and components:

KRA =	1	2	3	4	5	6	7
Meteorology	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Hydrology	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
DRR	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Training and research	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Resource mobilization or regional collaboration	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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