MEMBER REPORT

ESCAP/WMO Typhoon Committee
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SOCIALIST REPUBLIC OF VIET NAM

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CONTENTS

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

1. Meteorological assessment (highlighting forecasting issues/impacts)

There were 8 tropical storms and 1 tropical depression that entered or developed over Bien Dong Sea (BDS), the Vietnam Area of Responsibility (VAR) from January to 10 November 2012. Six of them affected to Vietnam, they were Severe Tropical Storm Pakhar (1201), Tropical Storm Doksuri (1206), Typhoon Vicente (1208), Typhoon Kaitak (1213), Severe Tropical Storm Gaemi (1220), Typhoon Sontinh (1223).

Table 1.1 below shows the details of TCs and TDs over Bien Dong Sea (BDS) up to 10 November in 2012. There were totally 9 Tropical Cyclones (TCs) during that time, including 1 Tropical Depression, 1 Tropical Storm, 3 Severe Tropical Storms and 4 Typhoons. There were 5 cases out of 9 TCs had entered to BDS and the rest had developed over BDS.

Table I.1. The monthly distribution of TCs and TDs over BDS in 2012

Month	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Total
TD		1											**1**
Tropical Storm						1							**1**
Severe Tropical Storm			1			1			1				**3**
Typhoon							1	2		1			**4**
Total		**1**	**1**			**2**	**1**	**2**	**1**	**1**			**9**

Figure 1 shows the tracks of these TCs up to 10 November, 2012. Details of TCs affected to Vietnam are given in the following paragraphs:

Figure 1. NCHMF tracks of TCs and TDs over BDS in 2012

1.. TC #1 (Pakhar - 1201)

Severe Tropical Storm Pakhar developed from a low pressure system in Bien Dong Sea (BDS) early morning on March 29 promoting the National Center for Hydro-Megeorological Forecasting of Vietnam (NCHMF) named it as TC #1 in 2012. The TS has been characterized as an abnormal storm, the first tropical storm to occur over the BDS before April in 40 years according to the typhoon database at the NCHMF. Pakhar moved westward slowly on March 29 and intensified into a severe tropical storm on March 30. Due to interaction with land and the cooler sea surface temperatures (SST) when getting close to the coastline, Pakhar weakened into a tropical storm early on March 31. On April 1, Pakhar made landfall near Vung Tau Province as a tropical depression and dissipated over land later in the day. Figure 2 shows the track of TC #1 that affected to Vietnam.

TC #1 had formed over Bien Dong Sea (BDS) and reached Category 9 - 10 intensity, gust Category 11 – 12 intensity (Beaufort wind scale). The half-hourly observations along the coastline showed that there had 6 – 7 Category wind, (gust 8 – 9 Category) over the seasides from Ninh Thuận to Bà Rịa Vũng Tàu Province when it made landfall. The table below shows the wind record of TC #1:

	Station	Max wind	Local time and date	Gustiness
1	Phú Quý (Bình Thuận)	11 m/s (Cat. 6)	16h18'/31/3	20 m/s (Cat. 8)
2	Cam Ranh (Khánh Hòa)	7 m/s (Cat. 5)	22h37'/31/3	14 m/s (Cat. 6)
3	Phan Rang (Ninh Thuận)	13 m/s (Cat. 6)	22h27'/31/3	17 m/s (Cat. 7)
4	Phan Thiết (Bình Thuận)	15 m/s (Cat. 7)	12h32'/1/4	22 m/s (Cat. 9)
5	Hàm Tân (Bình Thuận)	13 m/s (Cat. 6)	11h48'/1/4	21 m/s (Cat. 9)
6	Vũng Tàu (Bà Rịa - Vũng Tàu)	9 m/s (Cat. 5)	15h03'/1/4	18 m/s (Cat. 8)

The minimum surface pressure in Vũng Tàu station was 1002,6 hPa at 15h00 (local time) on April 1. TC #1 brought moderate to heavy rains for the areas including Bình Định to Bình Thuận Province, the southern High Land, and the Southeast part of Vietnam. The total precipitation from March 31 to April 2 was 60 – 120mm at the High Land, 150 – 200 mm over Bình Định to Bình Thuận and 100 – 200 mm for the Southeast part of Vietnam. Some places had particular rainfall amount such as Đồng Phú (Bình Phước Province) 234 mm, Vạn Ninh (Khánh Hòa Province) 234 mm, Đồng Trăng (Khánh Hòa Province) 248 mm, Nha Trang city 255 mm and Khánh Vĩnh (Khánh Hòa Province) 427mm.

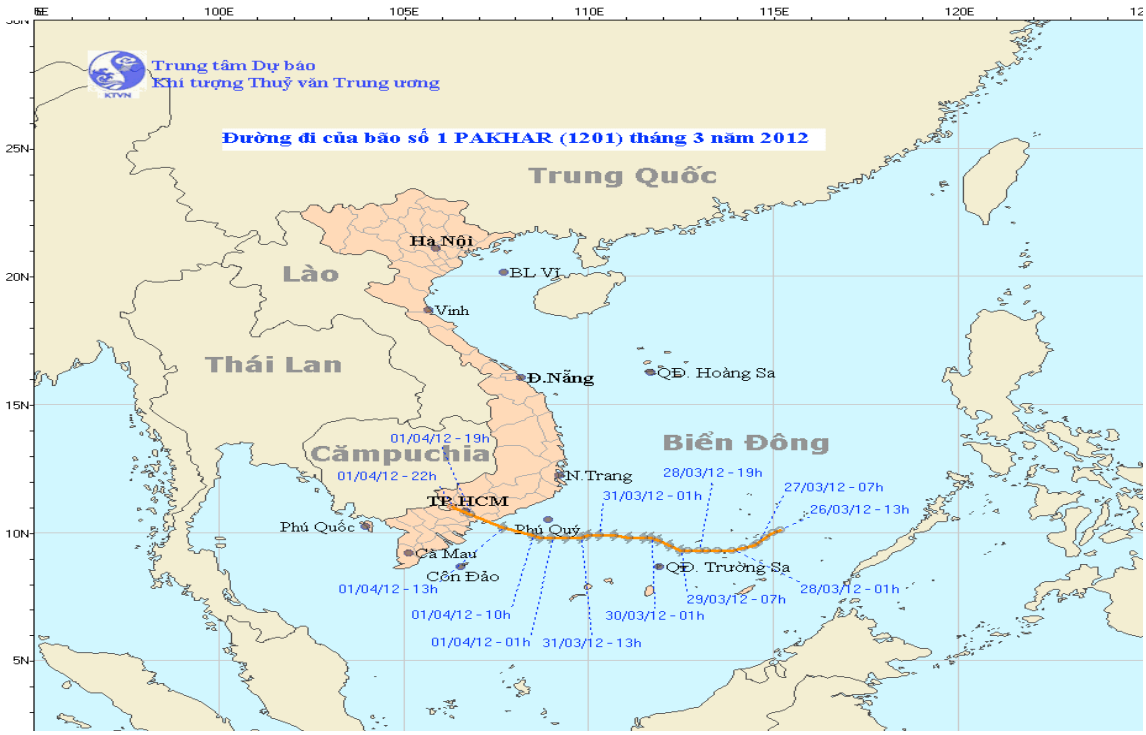


Figure 2. The track of TC #1 that affected to Vietnam.

2.. TC #3 (Doksuri-1206)

Early on June 27, the National Center for Hydro-Meteorological Forecasting (NCHMF) reported that a tropical storm (TS) had formed about 600 km to the southeast of Luzon Island (Phillippines). On June 29, Doksuri crossed Luzon and entered the Bien Dong Sea promoting the NCHMF named it as TC #3. During that day, it moved northwestwards quickly about 25 to 30 km/h. Late on June 29, TC #3 made landfall over Guangdong, China. During June 30, TC #3 weakened into a tropical depression then dissipated later that day over south-western area of Guangdong. Figure 3 shows the track of TC #3 that affected indirectly to Vietnam.

TC #3 reached 9 – 10 Category intensity, gust 10 – 11 Category strength when entered the Bien Dong Sea (BDS). This TC brought moderate to heavy rains indirectly to the areas of Tonkin and Thanh Hóa Province. The total precipitation from June 30 to July 1 over Tonkin was 40 – 90 mm and over Thanh Hóa Province was 20 – 50 mm. Some places had particular rainfall amount were Hòa Bình city 110 mm, Bắc Quang (Hà Giang Province) 115 mm, Tuyên Quang city 122 mm, Phủ Liễn (Hải Phòng Province) 135 mm.

Figure 3. The track of TC #3 that affected indirectly to Vietnam.

3.. TC #4 (Vicente-1208)

On July 20, a tropical depression had developed, about 300 km to the East of Luzon (Phillippines). A day later on July 21, the depression entered the North of Bien Dong Sea (BDS) and NCHMF upgraded this depression to a tropical storm (TS) and named it as TC #4 late on the same day. From July 21, tropical depression then became TC #4 moved westwards primarily about 15 to 20 km/h. From 00Z July 22, the TS moved slowly to the south then

veered to the north early on 23. On July 23, it had undergone an explosive intensification promoting the NCHMF upgraded the TS to a typhoon with 12 – 13 Category intensity (Beaufort wind scale) early on July 24. This typhoon made landfall over southeast area of Guangdong, China several hours after it reached its maximum intensity. After making landfall the typhoon moved northwestwards about 15 to 20 km/h and the NCHMF downgraded it to TS. Late on July 24, the TS moved southwestwards and then weakened to a tropical depression. Early on July 25, after moved into the mountainous area of the North of Vietnam this system continued to weak and dissipated late on the same day. Figure 4 shows the track of TC #4 that affected to Vietnam.

TC #4 had formed over the East of Philipppines. It reached 12 – 13 Category intensity, gust 14 – 15 Category strength after entered the Bien Dong Sea (BDS). The remnant of the system moved into the northeast part of Vietnam caused heavy rains for this area. The total precipitation from July 24 to July 26 over mountainous area was 80 – 160 mm, some places had particular rainfall amount such as Bảo Yên (Lào Cai Province) 225 mm, Đoan Hùng (Phú Thọ Province) 247 mm, Tuyên Quang city 363 mm. The Red river delta and Thanh Hóa Province had less much precipitation, around 20 – 30 mm, somewhere 40 – 80 mm.

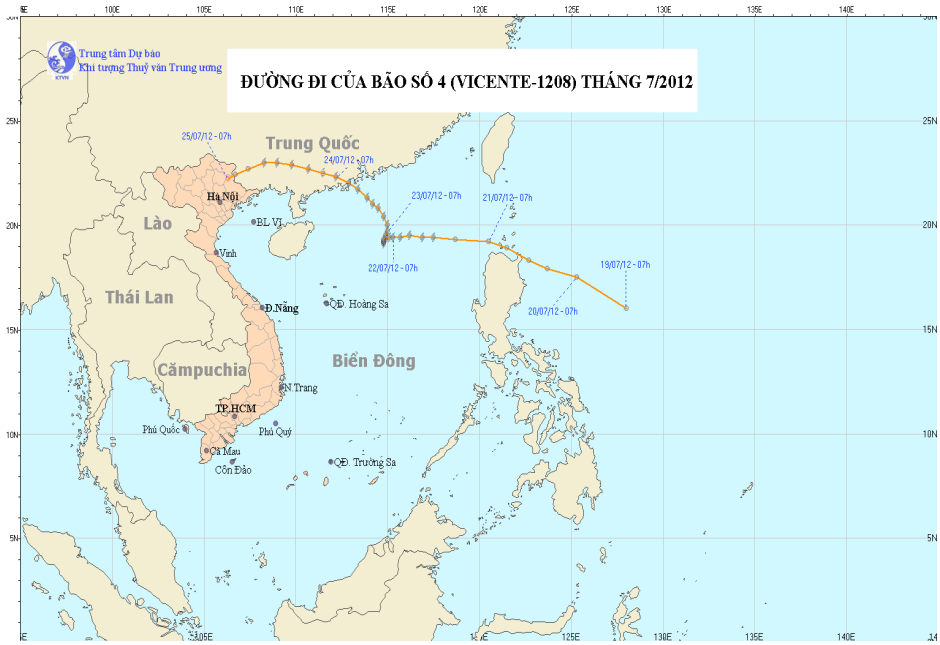


Figure 4. The track of TC #4 that affected to Vietnam.

4. TC #5 (Kaitak-1213)

At 06Z on August 14, the NCHMF issued the initial bulletin about Tropical Storm Kaitak when it was about 330 km to the northeast of Luzon (Phillippines). On the late afternoon of August 15, the TS entered the

northeast of Bien Dong Sea (BDS) promoting the NCHMF named it as TC #5 in 2012 and classified it as a Severe Tropical Storm. During the next 24 hours, this STS moved westwards about 20 km/h and the NCHMF declared as a Typhoon. From August 16, this Typhoon moved quickly to the direction between West and Northwest about 25 km/h. At 06Z on July 17, it crossed the north of Leizhou Peninsula then entered the Tonkin gulf. About 6 hours later at 12Z the same day, the Typhoon weakened quickly to a Tropical Storm before making landfall at Quảng Ninh Province, Vietnam. After that, it continued to move further inland and weakened quickly into an area of low pressure in the Northeast part of Vietnam. Figure 5 shows the track of TC #5 that affected to Vietnam.

TC #5 had formed over the East of Phillippine and reached 11 – 12 Category intensity, gust 13 – 14 Category strength after entered the Bien Dong Sea (BDS). The half-hourly observations along the coastline showed that there had 7 – 8 Category intensity, gust 9 – 10 Category intensity over Tonkin gulf and Quảng Ninh Province.. The table below shows the wind record of TC #5:

	Station	**Max wind**	**Local time and date**	**Gustiness**
1	Móng Cái (Quảng Ninh Province)	17 m/s(cat. 7)	18h13'/17/8	25 m/s (cat. 10)
2	Quảng Hà(Quảng Ninh Province)	18 m/s(cat. 8)	19h40'/17/8	22 m/s (cat. 9)
3	Tiên Yên(Quảng Ninh Province)	12 m/s(cat. 6)	21h21'/17/8	20 m/s (cat. 8)
4	Cửa Ông (Quảng Ninh Province)	14 m/s(cat. 7)	21h20'/17/8	20 m/s (cat. 8)
5	Bãi Cháy(Quảng Ninh Province)	13 m/s(cat. 6)	13h43'/17/8	19 m/s (cat. 8)
6	Uông Bí (Quảng Ninh)	18 m/s(cat. 8)	21h10'/17/8	23 m/s (cat. 9)
7	Cô Tô Island (Quảng Ninh Province)	18 m/s(cat. 8)	19h17'/17/8	25 m/s (cat. 10)
8	Bạch Long Vĩ Island (Hải Phòng City)	19 m/s(cat. 8)	21h40'/17/8	24 m/s (cat. 9)
9	Hòn Dấu Island (Hải Phòng City)	7 m/s(cat. 4)	19h28'/17/8	15 m/s (cat. 7)
10	Phủ Liễn (Hải Phòng City)	12 m/s(cat. 6)	22h02'/17/8	21 m/s (cat. 9)
11	Lạng Sơn (Lạng Sơn Province)	12 m/s(cat. 6)	22h45'/17/8	20 m/s (cat. 8)

The minimum surface pressure was 983.0 hPa at 21h00 (local time) on August 17. The table below shows the lowest pressure recorded of the 5th TS:

	Station	Lowest Pressure	Local time
1	Móng Cái (Quảng Ninh Province)	983,1 mb	18h50'/17/Aug/2012
2	Tiên Yên(Quảng Ninh Province)	983,0 mb	21h00'/17/Aug/2012
3	Cửa Ông (Quảng Ninh Province)	987,2 mb	20h17'/17/Aug/2012
4	Bãi Cháy(Quảng Ninh Province)	989,4 mb	22h32'/17/Aug/2012
5	Đảo Cô Tô (Quảng Ninh Province)	985,1 mb	19h12'/17/Aug/2012
6	Bạch Long Vĩ (Hải Phòng Province)	992,0 mb	17h30'/17/Aug/2012
7	Hòn Dấu (Hải Phòng Province)	992,4 mb	18h12'/17/Aug/2012
8	Phủ Liễn (Hải Phòng Province)	992,5 mb	17h35'/17/Aug/2012
9	Lạng Sơn (Lạng Sơn Province)	991,7 mb	24h32'/17/Aug/2012

TC #5 contributed extreme heavy rains for the whole Tonkin area. The total precipitation from 12Z August 16 to 12Z August 19 was 100 – 200 mm, some places had particular amount such as Hạ Hòa (Phú Thọ Province) 320 mm, Tam Đảo (Vĩnh Phúc Province 283 mm), Móng Cái (Quảng Ninh Province) 298 mm, Láng (Hà Nội city) 280 mm.

Figure 5. The track of TC #5 that affected to Vietnam.

6. TC # 7 (Gaemi-1220)

On September 29, a tropical depression had formed, about 450 km to the northeast of Nha Trang (Vietnam). During the next two days, the depression moved slowly to the Northeast, about 5 km/h. At 12Z on October 1, the depression had developed to be a tropical storm promoting the NCHMF raised the standby signal and named it as TC #7 in 2012. From early October

2, TC #7 moved slowly to the Southeast and had intensified to be Severe Tropical Storm. When the STS was about 200 km to the Southwest of Luzon (Phillippines) on October 4, it started to veer to the West. During the following days, it moved to the directions between West and Southwest. On the afternoon of October 6, after entered the inshore areas from Bình Định to Phú Yên Province, TC #7 weakened quickly to be a tropical depression. At 11Z the same day, the depression made landfall over Phú Yên Province then moved further inland and passed through Cambodia and Thailand the next days. Figure 6 shows the track of TC #7 that affected to Vietnam.

TC #7 had formed over Bien Dong Sea (BDS) and reached 9 - 10 Category intensity, gust 11 – 12 Category strength. It made landfall at Quy Nhơn city as a tropical depression. The half-hourly observations along the coastline showed that the areas from Đà Nẵng to Bình Thuận and the High Land had strong winds of 6 – 7 Category intensity, gust 8 Category. The table below showed the wind record of TC #7:

	Station	**Max wind**	**Local time and date**	**Gustiness**
1	Đà Nẵng City			13 m/s (cat.6)
2	Đảo Lý Sơn (Quảng Ngãi Province)	17 m/s (cat. 7)	17h5' /6/Oct	21 m/s (cat.9)
3	Tam Kỳ (Quảng Nam Province)			13 m/s (cat.6)
4	Ba Tơ (Quảng Ngãi Province)	9 m/s (cat.5)	18h18' /6/Oct	13 m/s (cat.6)
5	Hoài Nhơn (Bình Định Province)	9 m/s (cat.5)	16h50' /6/Oct	16 m/s (cat.7)
6	An Nhơn (Bình Định Province)	14 m/s (cat.7)	14h54' /6/Oct	18 m/s (cat.8)
7	Quy Nhơn (Bình Định v)	13 m/s (cat.6)	20h06' /6/Oct	16 m/s (cat.7)
8	Tuy Hòa (Phú Yên Province)			12 m/s (cat.6)
9	Phú Quý (Bình Thuận Province)	10 m/s (cat.5)	16h53' /6/Oct	12 m/s (cat.6)
10	An Khê (Gia Lai Province)	10 m/s (cat.5)	10h30' /6/Oct	
11	Buôn Hồ (Đắc Nông Province)	9 m/s (cat.5)	15h10' /6/Oct	
12	Ea Hleo (Đắc Nông Province)	13 m/s (cat.6)	16h23' /6/Oct	

The minimum surface pressure was 1003.1 hPa at 14h38' (local time) on October 6 at Tuy Hòa station (Phú Yên Province). The table below shows the lowest pressure of TC #7:

	Station	Lowest Pressure	Local time
1	Lý Sơn Island (Quảng Ngãi Province)	1006,9 mb	12h17'/6/Oct/2012
2	Hoài Nhơn (Bình Định Province)	1004,6 mb	16h30'/6/Oct/2012
3	Quy Nhơn (Bình Định Province)	1003,3 mb	14h30'/6/Oct/2012
4	Tuy Hòa (Phú Yên Province)	1003,1 mb	14h38'/6/Oct/2012
5	Nha Trang (Khánh Hòa Province)	1005,4 mb	14h46'/6/Oct/2012
6	Cam Ranh (Khánh Hòa Province)	1005,1 mb	15h45'/6/Oct/2012
7	Phú Quý Island (Bình Thuận Province)	1005,7 mb	15h00'/6/Oct/2012
8	Pleicu (Gia Lai Province)	1006,5 mb	17h12'/6/Oct/2012

The TS contributed extreme heavy rains for the areas from Quảng Bình to Bình Thuận Province and the high Land. The total precipitation from October 5 to October 8 was 100 – 200 mm, some places had particular amount such as Gia Vòng (Quảng Trị Province) 300 mm, Phong Mỹ and Phú Ốc (Huế Province) 393 mm and 364 mm respectively, Minh Long (Quảng Ngãi Province) 366 mm.

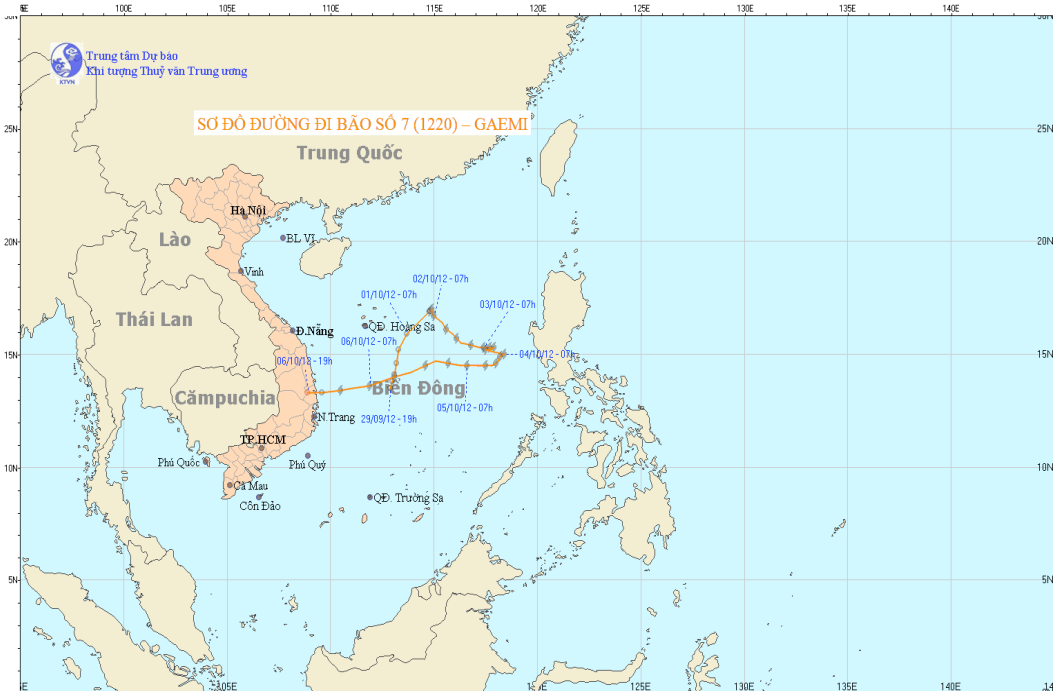


Figure 6. The track of TC #7 that affected to Vietnam.

TC # 8 (Sontinh-1223)

At night on October 23, a tropical depression had developed to be a Tropical Storm, about 180 km to the East of Mindanao Island (Phillippine). The JMA named it as Sontinh. During the next two days, Sontinh almost

moved quickly to northwestwards about 30 to 35 km/h. At noon on October 25, Sontinh entered the Bien Dong Sea (BDS) and the NCHMF named it as TC #8 in 2012. TC #8 had an explosive intensification reaching 13 – 14 Category intensity on October 27. During its entire lifespan Sontinh almost moved to northwestwards and finally made landfall over Nam Định – Thái Bình Province at night on October 28 at 11 – 12 Category strength. After that, it moved along the coastline of the northeast part of Vietnam then weakened quickly to be a low pressure system early on October 29 before dissipated later the same day. Figure 7 shows the track of TC #8 that affected to Vietnam.

The half-hourly observations along the coastline showed that when hit to Vietnam, Sontinh had reached 11 – 12 Category intensity, gust 13 – 14 Category intensity. The table below shows wind records of this Typhoon:

	Station	**Max wind**	**Local time and date**	**Gustiness**
1	Cửa Ông (Quảng Ninh Province)	17 m/s (cat. 7)	20h52'/28/Oct	25 m/s (cat.10)
2	Bãi Cháy (Quảng Ninh Province)	21 m/s (cat.9)	18h11'/28/Oct	27 m/s (cat.10)
3	Cô Tô Island (Quảng Ninh Province)	20 m/s (cat.8)	20h00'/28/Oct	26 m/s (cat.10)
4	Bạch Long Vĩ Island (Hải Phòng City)	24 m/s (cat.9)	16h42'/28/Oct	30 m/s (cat.11)
5	Phủ Liễn (Hải Phòng City)	20 m/s (cat.8)	4h02'/29/Oct	30 m/s (cat.11)
6	Hòn Dấu (Hải Phòng City)	36 m/s cat.12)	00h40'/29/Oct	40 m/s (cat.13)
7	Thái Bình city	31 m/s cat.11)	22h37'/28/Oct	45 m/s (cat.14)
8	Văn Lý (Nam Định Province)	30m/s (cat.11)	22h04'/28/Oct	43 m/s (cat.14)
9	Nam Định City	17 m/s (cat.7)	20h23'/28/Oct	29 m/s (cat.11)
10	Hưng Yên Province	18 m/s (cat.8)	21h10'/28/Oct	25 m/s (cat.10)
11	Ninh Bình Province	15 m/s (cat.7)	17h08'/28/Oct	27 m/s (cat.10)
12	Hòn Ngư Island (Nghệ An Province)	20 m/s (cat.8)	09h17'/28/Oct	25 m/s (cat.10)

The minimum surface pressure was 998.0 hPa at 4h02' (local time) on October 29 at Phủ Liễn Station (Hải Phòng City). The table below shows the lowest pressure of TC #8:

	Station	Lowest Pressure	Local time
1	Bãi Cháy (Quảng Ninh Province)	1001,9mb	04h00'/29/Oct
2	Phủ Liễn (Hải Phòng City)	988,0mb	04h02'/29/Oct
3	Hòn Dấu Island (Hải Phòng City)	991,1mb	02h10'/29/Oct
4	Thái Bình City	989,3mb	23h24'/28/Oct
5	Nam Định City	997,9mb	22h15'/28/Oct
6	Văn Lý (Nam Định Province)	990,5mb	18h25'/28/Oct

TC #8 brought extreme heavy rains for the areas of Northeast part of Tonkin, Thanh Hóa to Quảng Ngãi Province. The total precipitation from 19Z on October 26 to 19Z on October 29 was 100 – 200 mm, some places had particular amount such as Quảng Hà (Quảng Ninh Province) 375 mm, Cửa Cấm (Hải Phòng City) 334 mm and Thái Bình City 404mm.

Figure 7. The track of TC #8 that affected to Vietnam.

2. Hydrological Assessment (highlighting water-related issues/impact)

During the period from 1 January to 20 November 2012, the medium and small floods occurred in main of the rivers in the northern Vietnam. Due to the affects of some tropical cyclones, some serious floods were occurred in main rivers in central Vietnam. Flows in the downstream of river Mekong system in southern Vietnam were lower than yearly average in compare to the same period.

2.1 In the North:

In red river system have occurred about 8 -9 flood events, In Thai Binh river system have occurred about 5-6 flood events, and most of them were medium and small floods.

Tieu Man flood (early flood) occurred in most of river with altitude from 1 to 3 m and flood peak was lower and later compared to the yearly average.

The flood peaks in 2012 in upstream Hong-ThaiBinh river systems appeared in July and August. The flood peaks higher than the alert level two occurred in Thao river (at YenBai station), in Lo river (at TuyenQuang station) and in Cau river (at DapCau station). In other stations in Hong-ThaiBinh systems, It was higher than the alert level 1 except downstream of red river system that were lower than the alert level 1

From from 24/6 to 2/8, due to affect of heavy rainfall in typhoon No. 4, a medium flood event occurred in most of rivers in the North Vietnam with flood amplitude from 2 to 5 m. In Da river, The maximum inflow to SonLa reservoir reached 7300m^3/s (5h 26/7); to HoaBinh reservoir reached 7100m^3/s(1h 31/7). In Gam River, maximum inflow into TuyenQuang reservoir reached 3910m^3/s (9h 27/7). The flood peak in Thao river at Lao Cai station was 80,38m (7h 26/7), exceeding the alert level 1 by 0.38m; at YenBai station reached 31,04m (1h 27/7), exceeding the alert level 2 by 0.04m; In Lo river at TuyenQuang station reached 24,08m (6h 31/7), exceeding the alert level 2 by 0.08m. In Chay river at BaoYen station reached 75,26m (19h 26/7 exceeding the alert level 2 by 0.26m. In red river at HaNoi station reached 8,48m (3h 2/8), lower than the alert level by 1.02m. In Thuong river at PhuLangThuong station reached 4,2m (5h 31/7), lower than the alert level by 0.1m. In ThaiBinh river at PhaLai station reached 3,80m (23h 1/8), the alert level 0.2m. Son La reservoir had to open 2 bottom gate on 29-31/7, Tuye Quang reservoir had to open 4 bottom on 27-30/7.

Heavy rainfall by typhoon No. 5 was made a flood event in most of rivers in northern Vietnam. Maximum value and amplitude of floods at main stations as follows:

The maximum inflow to HoaBinh reservoir in Da river reached 6050m^3/s (19h 18/8), to Tuyen Quang reservoir in Lo river reached 1750m3/s (1h 19/8).

The flood peak in Thao river at LaoCai station reached 79,83m (3h 19/8), lower than alert level 1 by 0,17m with flood amplitude of 2,58m; at

YenBai reached 31,53m (10h 19/8), higher than alert level 2 by 0,53m with flood amplitude of 3,62m; In Chay river at BaoYen station reached 73,44m (20h 19/8), higher than alert level 2 by 1,44m with flood amplitude of 3,57m; In Thuong river at PhuLangThuong station reached 5,12m (16h 19/8) lower than alert level 2 by 0,18m, with flood amplitude of 2,86m; In Cau river at DapCau station reached 5,31m (1h 20/8) higher than alert level 2 by 0,01m, with flood amplitude of 3,02m; In LucNam river at LucNam station: 5,08m (3h 19/8) lower than alert level 2 by 0,22m, with flood amplitude of 3,04m; In Hong river at HaNoi station:: 7,92 m (1h 20/8); In ThaiBinh river at PhaLai station: 4,22m (3h 20/8) higher than alert level 1 by 0,22m.

2.2 In the central and Highland region

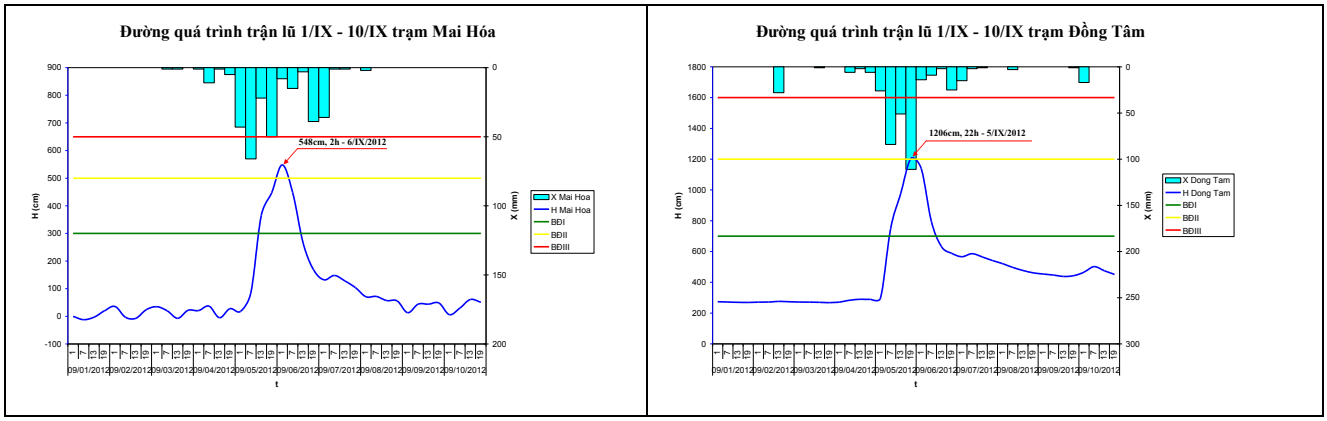
During the period from 1 January to 20 November 2012, in rivers in Central Vietnam and the Highland, it is occurred 9 flood events. The highest flood are described hereinafter

From 5 to 8 Bovember 2012, due to affect of typhoon No.7 one flood events occurred on rivers from Quang Binh to Khanh Hoa and Tay Nguyen area.

Flood peak in most of rivers in the area was at the alert level 1 and 2, some place exceed the alarm level 2 such as in Tra Khuc river at TraKhuc bridge reached 5.12 m (7h/7/10), higher than the alert level 2 by 0.12 m; in the Ba river at Ayunpa station reached 155.86 m (6h/7/10), lower than the alert level 3 by 0.14 m, at CungSon station reached 32.11 m (18h/6/10), higher than the alert level 2 by 0, 61m, at Phu Lam station: 2.97 m (1h/7/10), higher than the alert level 2 by 0.27 m; in Srepok river at Ban Don station: 173.55 m (10h/7/10), more than the alert level 2 by 0.55 m. Detailed flood characteristics in rivers from Quang Binh to Phu Yen and the Highlands region are shown in table 1

Table 2.1 : Characteristic of floods in the rivers from Quang Binh to Phu Yen and the Highland region from 5 to 8 October 2012

No	River	Station	Flood peak		Flood amplitude	Compare with Alert levels
			Time	WL (cm)	(cm)	(m)
1	Kiến Giang	Kiến Giang	19h/07	1078	449	
2		Lệ Thủy	22h/07	220	158	Alert levels 2
3	Quảng Trị	Đăkrông	10h/07	2715	556	
4	-	Thạch Hãn	20h/07	318	235	> Alert levels 1: 0.68m
5	Bồ	Phú Ốc	19h/07	144	86	Alert levels 1
6	Hương	Thượng Nhật	19h/06	5919	176	
7		Nam Đông	07h/07	4912	191	
8		Kim Long	07h/07	107	57	> Alert levels 1: 0.07m
9	Vu Gia	Thành Mỹ	03h/07	1623	444	
10	-	Aí Nghĩa	13h/07	722	451	> Alert levels 1: 0.72m
11	Thu Bồn	Nông Sơn	07h/07	1039	562	
12	-	Giao Thủy	12h/07	516	365	
13	Trà Khúc	Sơn Giang	02h/07	3396	574	
14		Trà Khúc	07h/07	512	387	> Alert levels 2: 0.12m
15	Sông Vệ	An Chỉ	04h/07	668	290	
16		Sông Vệ	07h/07	323	229	< Alert levels 2: 0.27m
17	Ba	An Khê	23h/06	40320	183	
18	Ba	Pơ mơ rê	24h/06	67541	418	
19	Ba	Ayun Pa	06h/07	15585	462	< Alert levels 3: 0.15m
20	Ba	Củng Sơn	18h/06	3211	379	> Alert levels 2: 0.11m
21	Ba	Phú Lâm	1h/07	297	261	> Alert levels 2: 0.27m
22	Pô Kô	ĐăkMôd	7h/07	58389	95	< Alert levels 1
23	ĐăkBla	KonPlong	2h/07	59383	213	< Alert levels 3: 0,17m
24		KonTum	8h/07	51849	253	> Alert levels 1: 0,49m
25	Ayun	Pơmơrê	0h/07	67541	418	< Alert levels 1
26	Ba	An Khê	23h/06	40320	183	< Alert levels 1
27		Ayunpa	6h/07	15586	463	< Alert levels 3: 0,14m
28	Krông Knô	Đức Xuyên	7h/07	42815	183	> Alert levels 1: 0,65m
29	EaKrông	Cầu 14	5h/07	30101	64	< Alert levels 2: 0,49m
30	Srêpôk	Bản Đôn	10h/07	17355	289	> Alert levels 2: 0,55m



2.3 Drought: Serious drought have occurred on large extend and lasted from January up to now in provinces belong to North and central Vietnam. Presently, water level on some rivers in North Vietnam was lowest in historical data observed.

2.4 Flash Floods: 6 flash floods occurred in 4 provinces in the North Vietnam such as Yen Chau District – Son La Province (7th Aug., 29-30 July., 2 Aug.); Muong La Disstict, Son La Province (7th Aug); Muong Cha – Dien Bien province (30th July, 06th Aug.), Bac Ha- Lao cai province (31th Aug). The flash floods caused extreme damages on human lives and properties to these provinces.

3. Socio-Economic Assessment (highlighting socio-economic and DPP issues/impacts)

In 2011, natural disasters made 295 people dead and missing; 274 people were injured, 449,694 houses were collapsed and flooded; 350,367 hectares of rice fields damaged… Estimated damage was about 635 million USD.

In 2012, natural disasters made 236 people dead and missing; 395 people were injured, 121.813 houses were collapsed and flooded; 375.396 hectares of rice fields damaged… Estimated damage was about 757 million USD.

4. Regional Cooperation Assessment (highlighting regional cooperation successes and challenges)

- Existing Contract for Network Improvement of Data Transfer from the National Center for Hydrometeorological Forecasting of Viet Nam NCHMF) to the Regional Flood Management and Mitigation Center between The Mekong River Commission Secretariat (MRCS) and NCHMF. The objective of this contract is to upgrade and improve the network coverage of the rainfall stations of the NCHMF and to secure proper delivery to the MRCS timely, accurate and reliable real-time water level and rainfall data, which was used for the operational flood forecasting.

- Existing agreements between Mekong committee and NCHMF for exchanging the hydrological data from China, Thailand, Laos and Cambodia and for flood forecasting and warning agency and disaster management agency of Viet Nam.

- On going the Project "Applying Remote Sensing Technology in River Basin Management". The Asian Development Bank (ADB), in collaboration with Japan Aerospace Exploration Agency (JAXA), is proposing a regional

capacity development technical assistance (the TA) to support countries in Asia and the Pacific apply space based technologies (SBT) and information communication technology (ICT) for improved river basin management. The present collaboration in the context of the TA is expected to include preparation of demonstration projects to mitigate water-related disaster in three countries (Viet Nam, Bangladesh, and Philippines) with application of SBT and ICT. Capacity development of agencies and stakeholders that can be replicated in the region will also be implemented under the TA.

- On going project "Building technology of real-time inundation warning for Hanoi city". The aim of project is enhance capability of NHMS in field the inundation warning and forecasting, main focus on technology hydrological forecasting, especially urban hydrology.

II. Summary of progress in Key Result Areas

1. Progress on Key Result Area 1: Reduced Loss of Life from Typhoon-related Disasters

1.1. Meteorological Achievements/Results

Nill

1.2. Hydrological Achievements/Results

Nill

1.3. Disaster Prevention and Preparedness Achievements/Results

Nill

1.4. Research, Training, and Other Achievements/Results

Nill

1.5. Regional Cooperation Achievements/Results

Nill

1.6. Identified Opportunities/Challenges for Future Achievements/Results

Nill

2. Progress on Key Result Area 2: Minimized Typhoon-related Social and Economic Impacts

2.1. Meteorological Achievements/Results

Nill

2.2. Hydrological Achievements/Results

Nill

2.3. Disaster Prevention and Preparedness Achievements/Results

Nill

2.4. Research, Training, and Other Achievements/Results

Nill

2.5. Regional Cooperation Achievements/Results

Nill

2.6. Identified Opportunities/Challenges for Future Achievements/Results

Nill

3. Progress on Key Result Area 3: Enhanced Beneficial Typhoon-related Effects for the Betterment of Quality of life

3.1. Meteorological Achievements/Results

Nill

3.2. Hydrological Achievements/Results

Nill

3.3. Disaster Prevention and Preparedness Achievements/Results

Nill

3.4. Research, Training, and Other Achievements/Results

Nill

3.5. Regional Cooperation Achievements/Results

Nill

3.6. Identified Opportunities/Challenges for Future Achievements/Results

Nill

4. Progress on Key Result Area 4: Improved Typhoon-related Disaster Risk Management in Various Sectors

4.1. Meteorological Achievements/Results

Nill

4.2. Hydrological Achievements/Results

Nill

4.3. Disaster Prevention and Preparedness Achievements/Results

Nill

4.4. Research, Training, and Other Achievements/Results

Nill

4.5. Regional Cooperation Achievements/Results

Nill

4.6. Identified Opportunities/Challenges for Future Achievements/Results

Nill

5. Progress on Key Result Area 5: Strengthened Resilience of Communities to Typhoon-related Disasters

5.1. Meteorological Achievements/Results

Nill

5.2. Hydrological Achievements/Results

Nill

5.3. Disaster Prevention and Preparedness Achievements/Results

In 2009, the Vietnamese Government has approved the scheme for raising public awareness and management of community-based disaster risk as a basis for capacity-building activities, community awareness and warning early and active prevention of natural disasters. Proposals have focused approach based disaster risk management community in accordance with the conditions, traditional experience and the specific capacity of each community, especially in the context of global climate change.

5.4. Research, Training, and Other Achievements/Results

Nill

5.5. Regional Cooperation Achievements/Results

Vietnam joined ASEAN Agreement on Disaster Management and Emergency Response (ADDMER). Agreement ADDMER create a legal framework for Vietnam to participate in emergency response activities in the region as well as countries in the ASEAN region involved in Vietnam when disaster relief requirements.

Forum established disaster risk reduction and adaptation to climate change with the support of the organizations of the United Nations and other international organizations is one of the top requirements of the Hyogo Framework for Action to Reduce UN Disaster that Vietnam is one of the member states have signed commitment. Forum was established to serve as a mechanism to open and multilateral cooperation, interdisciplinary for disaster risk reduction activities.

In recent years, Vietnam has actively mobilizing ODA for building infrastructure, capacity building and institutional agencies.

5.6. Identified Opportunities/Challenges for Future Achievements/Results

Nill

6. Progress on Key Result Area 6: Improved Capacity to Generate and Provide Accurate, Timely, and understandable Information on Typhoon-related Threats

6.1. Meteorological Achievements/Results

- The High Resolution Model (HRM) is operationally running 4 times per day with the increased horizontal resolution of 14km x 14km with different initial and boundary conditions interpolated not only from the DWD's global model GME, but also from the Japanese GSM model
- The ETA model has been put into the operational running twice per day for the Vietnamese region.
- The storm surge model adopted from Japanese version has been used semi-operationally when a typhoon is predicted to affect our region. The input data are taken from either the forecast fields from Japanese GSM model, HRM outputs or the predicted tracks. Additionally, the wave model (WAM) has been studied for running on the parallel computer.
- Short-range ensemble forecast system (SREFS) with 20 members from 5 global models (GEM, GFS, GME, GSM and NOGAPS) for 4 regional models (BoLAM, ETA, HRM, WRF-NMM) was developed and under testing for operational application.

6.2. Hydrological Achievements/Results

• *Improvements of software in data processing and analysis:* Continued to develop the software for the preservation of hydro-meteorological database, for hydrological data collection, processing and timely transmitting hydrological information and forecasts to end-users.

• Employ the MARINE and FIRR models to forecast flow in upstream area of Da, Thao, Lo rivers, *Reservoir Flood Routing* model for reservoir's regulation in Da river and create the input for the Hydraulic model TL2 in lower stream of Red river.

• Developing MIKE-11 Model for flow forecasting with lead time 48h in the lower Red river.

• Developing the TANK Model for flood forecasting with lead time 120h and time step of 6h since flood season of 2005.

• Develop software to identify big flood for downstream of Red river at

Hanoi.

- Developing the distributed hydrologic model WETSPA and hydraulic model HECRAS for flood forecasting with lead time 24 – 36 hours in Vu Gia – Thu Bon river system
- Assessing impacts of reservoir systems in Da and Lo rivers on dry season flow in downstream of Hong river system and proposing solutions for ensuring water resources for the downstream.

6.3. Disaster Prevention and Preparedness Achievements/Results

Nill

6.4. Research, Training, and Other Achievements/Results

- On-going Ministry Project: Development of flood prediction and inundation warning technology in Ba river system.
- On-going Ministry Project: Development of flood prediction and inundation warning technology in main rivers in Quang Binh – Quang tri provinces.
- On-going Ministry Project: Research and Applicastion of Sattilite data, Numerical forecasting rainfall and observed data in Flood forecasting in Hong- Thai Binh River system

6.5. Regional Cooperation Achievements/Results

Nill

6.6. Identified Opportunities/Challenges for Future Achievements/Results

Nill

7. Progress on Key Result Area 7: Enhanced Typhoon Committee's Effectiveness and International Collaboration

7.1. Meteorological Achievements/Results

Nill

7.2. Hydrological Achievements/Results

Nill

7.3. Disaster Prevention and Preparedness Achievements/Results

Nill

7.4. Research, Training, and Other Achievements/Results

Nill

7.5. Regional Cooperation Achievements/Results

Nill

7.6. Identified Opportunities/Challenges for Future Achievements/Results

Nill

III. Resource Mobilization Activities

Nill

IV. Update of Members' Working Groups representatives

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5. Resource Mobilization Group

Nill