MEMBER REPORT

ESCAP/WMO Typhoon Committee
43th Session

17-22 January 2011
Korea

VIET NAM

CONTENTS

I. Overview of tropical cyclones which have affected/impacted Member's area in 2010

1. Meteorological Assessment

There was another year of complicated and severe weather in 2010 in which many opposite weather phenomena have been observed over Vietnam. From the beginning of the year, water level in many rivers all over the country were historical low; early hot weather accompanied with many severe events and above average temperature and historical maximum temperature in Tĩnh Gia (42.2^0C), Con Cuông (42.2^0C), Quỳnh Nhai (42.0^0C), Hà Nội ($40,4^0$C)…

Tropical cyclones season started late and less than normal with first named Tropical Cyclone (TC) (Conson) in July, 2010. There were six (6) tropical cyclones of tropical storm (TS) intensity or higher and four (4) tropical depressions (TDs) had been active in East Vietnam Sea. Two of six tropical cyclones (Bão số 1 – Conson and Bão số 3 - Mindulle) affected Vietnam directly and one tropical cyclone affected indirectly (Chanthu). Moreover, two out of four TDs caused heavy rainfall for Central Vietnam. Specifically, Conson in July and Mindulle brought torrential rainfall which caused heavy flood and damage for North and central part of Vietnam. The details and tracks of the three TCs and two TDs that affected the country are described below.

(1) TY Conson (1002)

Typhoon Conson, developed into a tropical depression early on July 11 before rapidly developing into the first tropical storm of the season over East Vietnam Sea and named as Conson during the next day. Conson moved to East Vietnam Sea in 14th July after crossing Philippines. During that day Conson weakened further under the influence of high vertical wind shear. In 15th July, the vertical wind shear weakened slightly so that Conson intensified over the East Vietnam Sea and became a typhoon early on July 16, with peak sustained wind speeds of 130 km/h. After passing close to Hainan island, Conson moved into an area with high levels of vertical wind shear and as a result it rapidly weakened into a tropical storm, before making landfall in Vietnam during July 17.

Table 1: Observed Wind Speed for TY. Conson

No	Station	Maximum sustained wind speed	Gust
1	Cửa Ông (Quảng Ninh)	22 m/s	32 m/s
2	Bãy Cháy (Quảng Ninh)	22 m/s	32 m/s
3	Bạch Long Vĩ (Hải Phòng)	47 m/s	57 m/s
4	Cô Tô (Quảng Ninh)	23 m/s	33 m/s
5	Hòn Dấu (Hải Phòng)	24 m/s	41 m/s

6	Phủ Liễn (Hải Phòng)	22 m/s	26 m/s

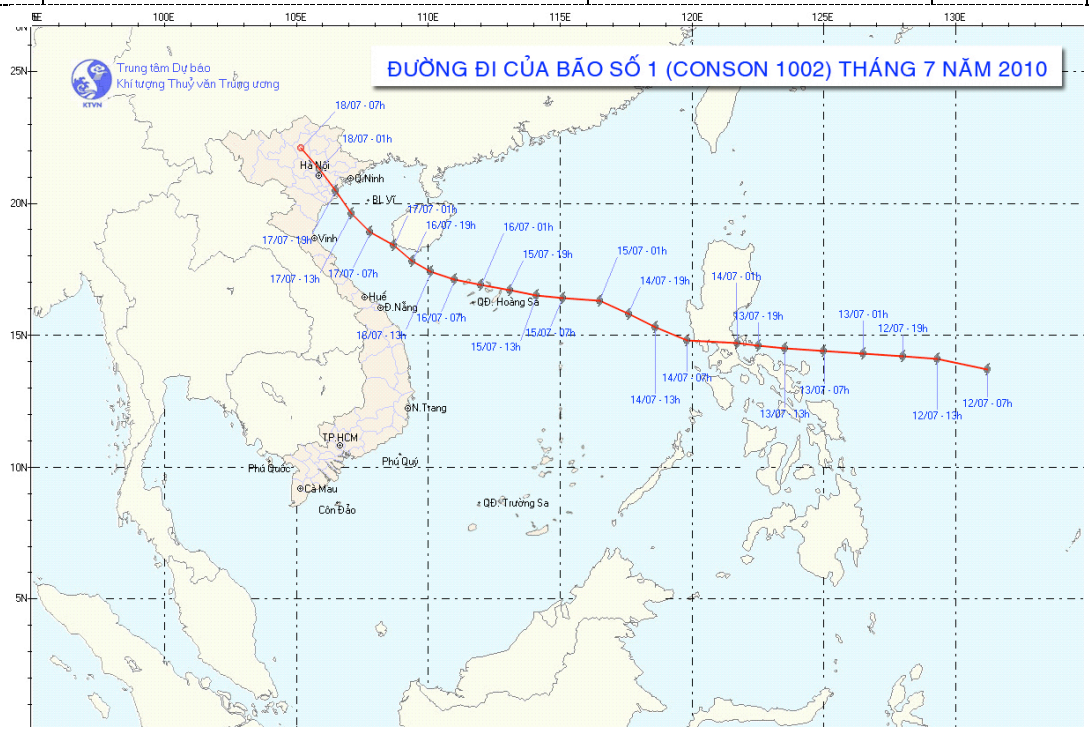


Fig 1: TY Conson best track

(2) TY Chanthu (1003)

TY Chanthu did not effect Vietnam directly but after making landfall in Guangdong (China), it weakened dramatically into low pressure area which formed a trough of low pressure and caused moderate to heavy rainfall for the North of Vietnam while the wind was not so high.

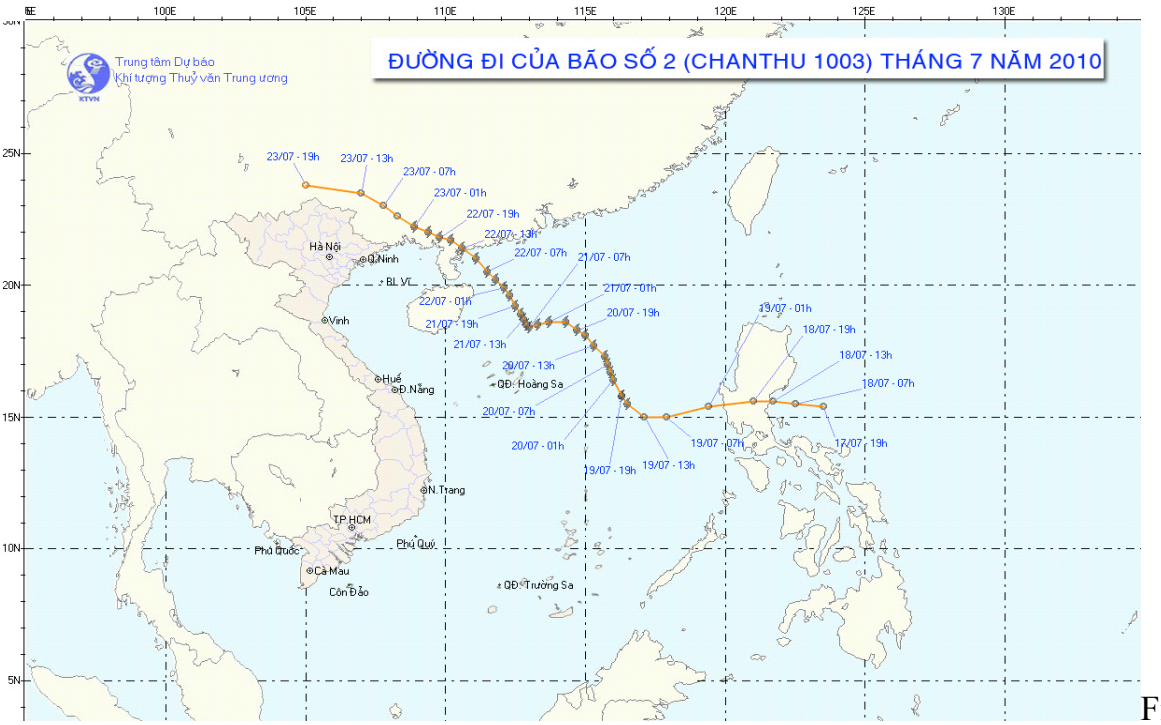


Fig 2: Best track of TY Chanthu

(3) TS Mindulle (1005)

Early on August 17th, an area of low pressure formed in the East of Philippines and moved westward. After crossing Philippines, it intensified to Tropical Depression and then Tropical Storms on August 20th over Hoàng Sa (Paracel Islands) and named Mindulle. As the storm approached Vietnam, thousands of fishermen were urged to return to port. In 24th August, TS Mindulle made landfall over Thanh Hóa – Nghệ An area and downgraded to TD and then low pressure area. TS Mindulle is generated right inside East Vietnam Sea with the maximum sustained wind observed in coastal station of Vietnam of 25m/s and gust wind of 33m/s

TS Mindulle caused moderate to heavy rainfall over Red River delta and torrential rainfall and floods for provinces from Thanh Hóa to Thừa Thiên Huế. The common total rainfall from 22nd to 25th August over Red River Delta was 50 – 100mm, particularly Nho Quan (Ninh Bình) 174mm, Văn Lý (Nam Định) 155mm… while 150 – 300mm for 4 days (from 21st to 24th August) for area from Thanh Hóa to Thừa Thiên Huế. Many stations observed record rainfall of more than 400mm such as Vinh (Nghệ An) 427mm, Cửa Hội (Hà Tĩnh) 463mm, Minh Hóa (Quảng Bình) 424mm…

Table 2: Observed Wind Speed for TS. Mindulle

No	Station	Maximum sustained wind speed	Gust
1	Bạch Long Vĩ (Hải Phòng)	19 m/s	27 m/s
2	Văn Lý (Nam Định)	16 m/s	23 m/s
3	Quỳnh Lưu(Nghệ An)	25 m/s	33 m/s
4	Hòn Ngư (Nghệ An)	28 m/s	37 m/s
5	Cồn Cỏ (Quảng Bình)	18 m/s	34 m/s
6	Lý Sơn (Quảng Ngãi)	15 m/s	19 m/s

Fig 3: Best track of TS Mindulle

(4) Tropical Depression 02 (TD02) – November 2010

At 0900UTC of November 3rd, the Vietnam Hydro-Meteorological Services (VHMS) had issued the Tropical Depression warning after serveral warnings for active low pressure area in monsoon trough. After forming, TD02 move West South West before recurving to the North on November 4th. Late on November 05th, TD02 downgraded into low pressure area before crossing area from Quảng Ngãi to Phú Yên and then dissipated completely.

TD02 did not cause strong wind of above 12m/s over coastal area but its circulation combined with strong North East monsoon and Easterly wave caused very heavy rainfall for Thừa Thiên Huế - Khánh Hòa and High-land areas. The common total rainfall from 3rd to 5th November is from 60 – 200mm, especially of 418mm in Tuy Hòa, 453mm in Phú Lâm (Phú Yên).

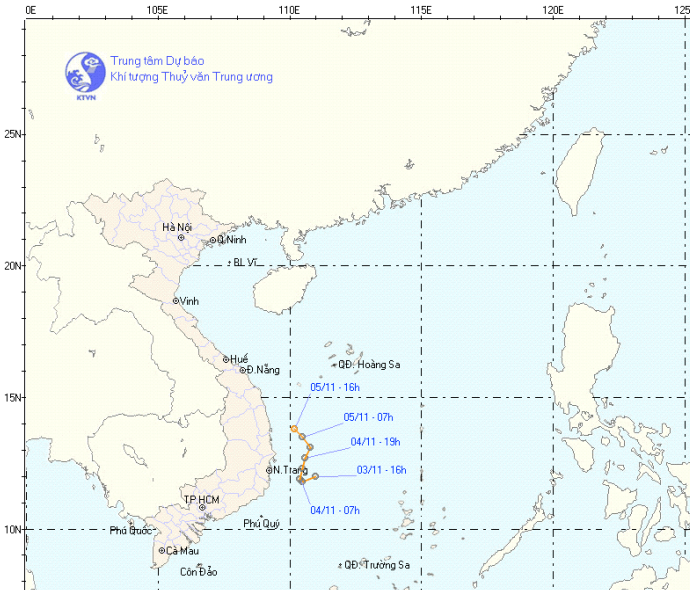


Fig 4: Best track for TD02 (November 2010)

(5) Tropical Depression 03 (TD03) – November 2010

On November 12th, a low pressure area over Trường Sa area (Spratly Islands) had intensified into a Tropical Depression (TD03). After forming, TD03 move forward to Vietnam and finally made landfall over Quảng Ngãi – Bình Thuận area in November 14th before dissipated over Quảng Ngãi, Quảng Nam and Kon Tum provinces.

TD03 did not cause strong wind of above 12m/s over coastal area but its circulation combined with strong North East monsoon and Easterly wave caused very heavy rainfall for Quảng Trị - Quảng Ngãi areas. The common total rainfall from 12th to 15th November is from 100 – 200mm, particularly, in Tà Lương (Thừa Thiên Huế) is 392 mm, 346 mm in Tam Kỳ (Quảng Ngãi), 398 mm in Châu Ổ (Quảng Ngãi), 431 mm in Lý Sơn (Quảng Ngãi)….

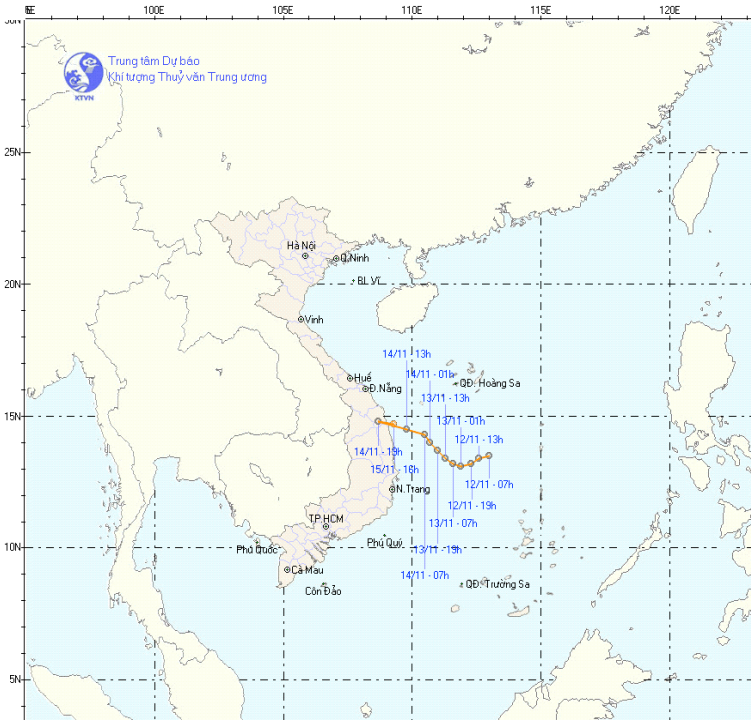


Fig 5: Best track for TD03 (November 2010)

2. Hydrological Assessment

a) In the North: During flood season of 2010, There are not any big flood in North VietNam.

- *At the end of May (26-31),* due to the low pressure track through the northern shaft associated with the southwest wind convergence over the northern, the heavy rains over 20-50mm were recorded in areas of the North Vietnam. Rainfall in some places were higher such as Tuyên Quang: 124mm (26/5), Chợ Mới 165 mm (26/5), Việt Yên 205 mm (27/5), Lào Cai 169mm (29/5). Tiểu Mãn flood (early flood) occurred in most of river with altitude from 1,8 to 2 m and flood peak was shorter and later compared to the yearly average. The flood peak in Thao river at Yên Bái station was 27,33m with flood amplitude of 2.01m; in Đà river at Sơn La reservoir the peak flow was 1550 m3/s with flood amplitude of 1000 m3/s; in Lô river at Tuyên Quang station was 18,09 m with flood amplitude of 2,25m; and dowstream of Hồng river at Hanoi station was 2,6m with flood amplitude of 1,14m.

- *At the end of July*, due to affect of influence of typhoon circulation number 2, the heavy rains over 80-200mm were recorded in areas of the North Vietnam. Total Rainfall (21-24/7) in some places were higher than 200mm such as Yên Bái: 288mm; Hà Giang: 219mm; Vĩnh Yên: 382mm. The small flood occurred in some of rivers in the North Vietnam. The flood peak in Thao river at Yên Bái station was 30,49m with flood amplitude of 4.93m, exceeded the alarm level 1; In

Lục Nam river at Lục Nam station was 30,49m with flood amplitude of 4.79m, exceeded the alarm level 2.

- *At the end of August*, due to affect of influence of typhoon circulation number 3, the heavy rains over 100-200mm were recorded in areas of the North Vietnam. Total Rainfall (24-27/8) in some places were higher than 200mm such as Trung Hà: 236mm; Hà Giang: 219mm; Hưng Thi: 224mm; Quảng Hà: 344mm. The small flood occurred in some of rivers in the North Vietnam. The flood peak in river at Hà Nội station was 6,46m with flood amplitude of 2.06m, under the alarm level 1; In Hoàng Long river (dowstream of Hồng river) at Bến Đế station was 4,32m with flood amplitude of 3.68m, exceeded the alarm level 3.

-*The maximum inflow to Hoa Binh reservoir was 4500 m3/s*. The maximum inflow to Tuyên Quang reservoir was 3300 m3/s. All flood is very small. The second cascade in Đà river is Sơn La reservoir (after Hoà Bình reservoir) has just operated and generated electric (N01. Unit).

b) In the Central*:* During flood season of 2010, rivers in Central Vietnam and the Highland, it is occurred 3 large floods and two medium and a small floods. Three highest flood are described hereinafter

- *From 30 September to 5 October*, the heavy rains occurred from south Nghệ An to Quảng Nam province. The total rainfall (*from 1-5 October*) over 200-500 mm were recorded in south Nghệ An, Quảng Nam provinces, over 500 to 700mm were recorded in provinces from Hà Tĩnh to Thừa Thiên Huế, in some places was extreme heavy such as Đồng Tâm: 1117,2mm, Mai Hoá: 1193,7 mm, Minh Hoá: 1490,6 mm; Trường Sơn: 1114 mm... Maximum daily rainfall in some places were higher than 500 mm such as Minh Hoá: 699,9mm, Đồng Tâm: 537 mm, Mai Hoá: 675 mm, Ba Đồn: 537 mm. Maximum rainfall in 6 hour in some place such as Đồng Tâm: 243 mm, Minh Hoá: 379 mm, Tân Mỹ: 228mm, ...

- *From 02-05 October*, flood occurred on rivers from Hà Tĩnh to Thừa Thiên Huế provinces. Historical flood and extreme floods occurred on rivers from Hà Tĩnh to Quảng Trị provinces, flood peak in most of rivers in the area exceed the alarm level 3 from 0,3 to 1,5m, except Nhật Lệ river occurred historical flood; rivers of Thừa Thiên Huế exceed the alarm level 2 from 0,4 to 0,9m. The flood amplitude was from 5,14 to 14,87m in upstream and from 2,0 to 7,5m downstream.

Table 3: Flood peak on some rivers in Central and highland provinces

No	Province	River	Station	Flood peak		Compare to
				Time	Water Level (cm)	The alam level (m
1	Hà Tĩnh	Ngàn Sâu	Hoà Duyệt	9h/5/10	**1139**	>BĐIII (0,89m)
		Ngàn Phố	Sơn Diệm	8h/3/10	**1118**	<BĐII (0,32m)
		La	Linh Cảm	18h/5/10	**514**	<BĐII (0,36m)
2	Quảng Bình	Gianh	Đồng Tâm	18h/3/10	**1774**	>BĐIII (1,74m)
	-	Gianh	Mai Hóa	24h/3/10	**770**	>BĐIII (1,2m)
	-	Kiến Giang	Lệ Thủy	2h/5/10	**381**	>BĐIII (1,11m)
	-	Nhật Lệ	Đồng Hới	19h/4/10	**205**	>BĐIII (0,55m)
3	Quảng Trị	Thạch Hãn	Thạch Hãn	15h/4/10	**585**	>BĐIII (0,35m)
4	Thừa Thiên Huế	Bồ	Phú Ốc	7h/4/10	**397**	<BĐIII (0,53m)
	-	Hương	Kim Long	11h/3/10	**200**	~BĐII
	-		-	4h/4/10	**243**	>BĐII (0,43m)

Note: - BĐIII: The alarm level 3; - BĐII: The alarm level 2

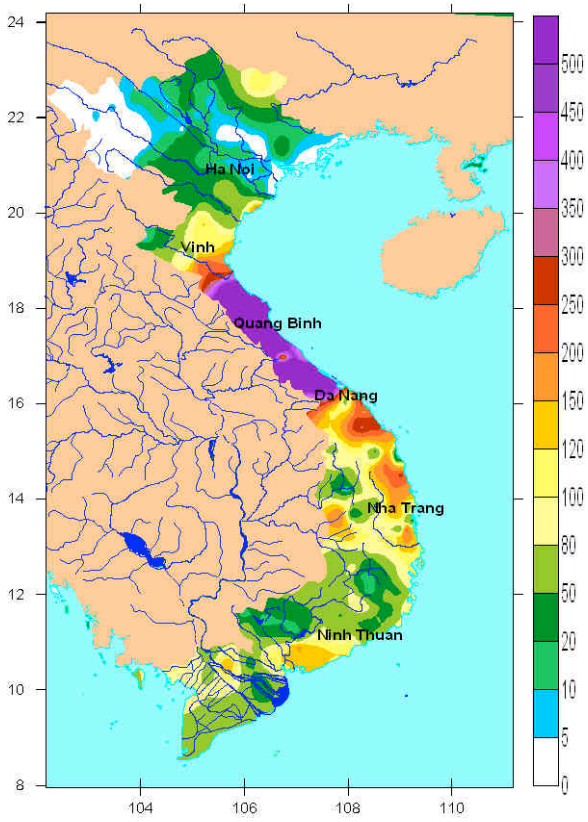


Fig 6. Accumulated rainfall from 30th September to 5th October

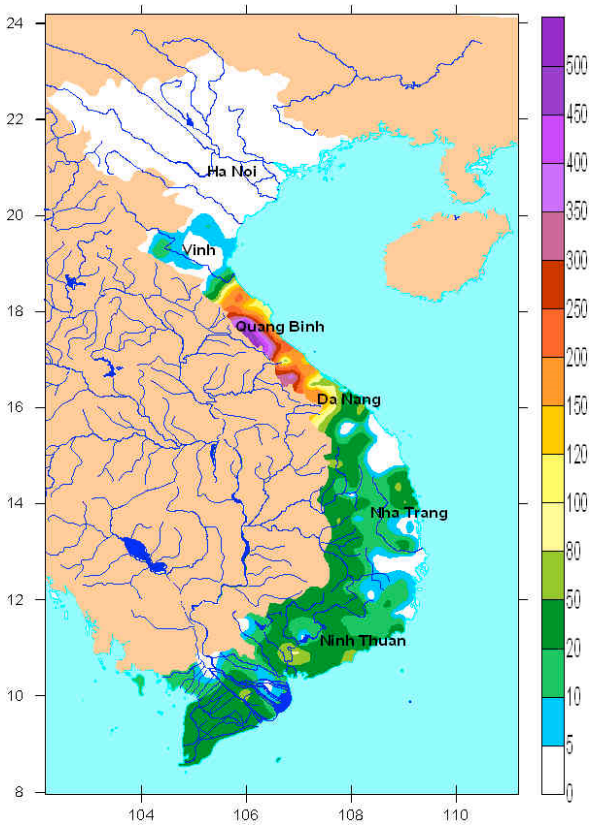


Fig 7. Total rainfall in 24 hours (4th October)

Fig 8. Inundation in Minh Hoá – Quảng Bình province in 5/10/2010

- *From 14 to 19 October 2010*, due to the heavy rains, flood occurred on rivers from Nghệ An to Quảng Bình provinces. From 14 to 19 October 2010, the heavy rains occurred from Thanh Hoá to Quảng Nam provinces. The total

rainfall (from 14-19 October) over 200-500mm were recorded in Thanh Hoá, Quảng Trị to Quảng Nam provinces, over 500 to 900mm were recorded in provinces from Nghệ An to Quảng Bình, particularly in some places were more such as Cửa Hội: 1098mm, Hòn Ngư: 1048mm, Chu Lễ: 1087,9mm, Hoà Duyệt: 1049,1mm, Hà Tĩnh: 1187,7mm, Cẩm Nhượng: 1200,5mm. Maximum daily rainfall in some places were more than 500 mm such as Nam Đàn: 557mm, Hòn Ngư: 523mm, Hoà Duyệt: 502,5mm. Maximum rainfall in 6 hour in some place such as Vinh: 310mm, Hòn Ngư: 301,6mm, Hương Khê: 301,3mm, Hà Tĩnh: 282,6mm, Chu Lễ: 283,6mm, Tân Mỹ: 324mm, ...

Due to the heavy rain, flood occurred on rivers from Nghệ An to Thừa Thiên Huế provinces. Historical flood and extreme floods occurred on rivers from Hà Tĩnh to Quảng Bình provinces, flood peak in most of rivers in the area exceed the alarm level 3 from 0,5 to 1,1m, except Ngàn Sâu river occurred historical flood; Cả river exceed the alarm level 2: 0,54m. The flood amplitude was from 4,0 to 12,0m in upstream and from 2,0 to 7,0m downstream.

Table 4: Flood peak on some rivers in central and highland provinces

			Flood Peak		**Compare to**
No	**River**	**Station**	**Time**	**Water level (cm)**	**The alarm level (m)**
1	Hiếu	Nghĩa Khánh	20h/18/10	**3878**	
2	Cả	Dừa	15h/19/10	**2089**	>BĐIII (0,39m)
3	-	Yên Thượng	5h/19/10	**884**	
4	-	Nam Đàn	4h/19/10	**744**	<BĐIII (0,46m)
5	Ngàn Sâu	Chu Lễ	19h/16/10	**1656**	>BĐIII (3,06m)
6	-	Hoà Duyệt	9h/16/10	**1283**	>BĐIII (2,33m)
7	Ngàn Phố	Sơn Diệm	8h/17/10	**1299**	~BĐIII
8	La	Linh Cảm	23h/17/10	**728**	>BĐIII (0,78m)
9	Gianh	Mai Hoá	21h/16/10	**761**	>BĐIII (1,11m)
10	Kiến Giang	Lệ Thủy	3h/17/10	**316**	>BĐIII (0,46m)
11	Thạch Hãn	Thạch Hãn	7h/16/10	**346**	<BĐII (0,54m)
12	Bồ	Phú Ốc	2h/16/10	**345**	>BĐII (0,45m)
13	Hương	Kim Long	20h/15/10	**178**	<BĐII (0,22m)
14	Vu Gia	Ái Nghĩa	22h/15/10	**831**	>BĐII (0,31m)
15	Thu Bồn	Câu Lâu	2h/16/10	**217**	>BĐI (0,17m)

Note: - BĐIII: The alarm level 3; - BĐII: The alarm level 2

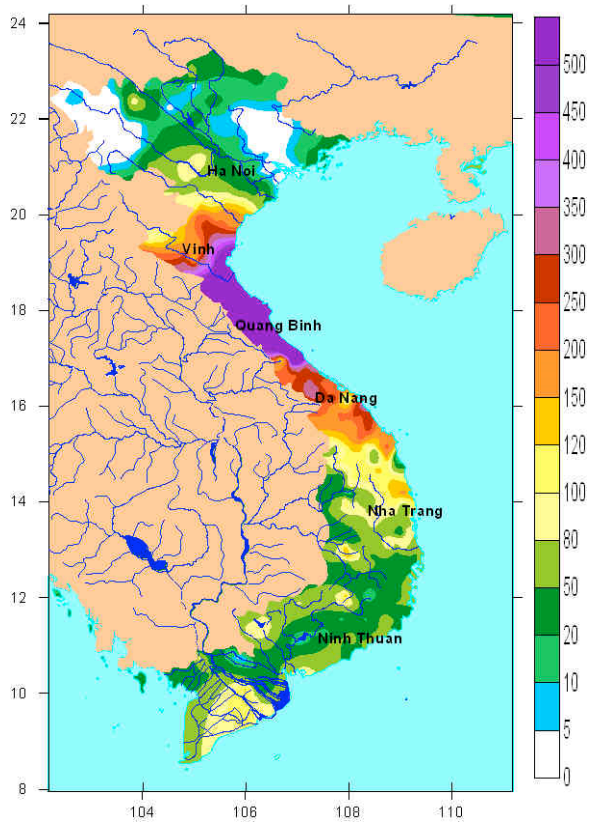


Fig 9. Accumulated rainfall from 13 to 19 October

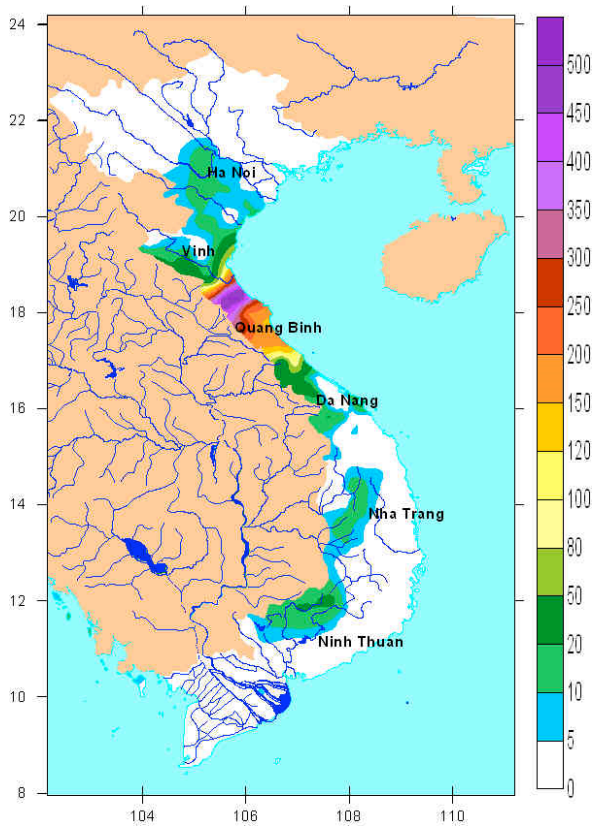


Fig 10. Total rainfall in 24 hours (30 September)

Fig 11 . Inundation in Hà Tĩnh (left) and Quảng Bình (right) province in 17 October 2010

- *From 28 October to 5 November 2010*, due to the heavy rains, flood occurred on rivers from Quảng Trị to Ninh Thuận and Dak Lak provinces .

Historical flood and extreme floods occurred on rivers from Bình Định to Ninh Thuận provinces, flood peak in most of rivers in the area exceed the alarm level 3, except Cái Phan Rang river occurred historical flood; rivers from Thừa Thiên Huế to Quảng Ngãi and Dak Lak provinces exceed the alarm level 1 to alarm level 2.

Table 5. Flood peak on some rivers in central and highland provinces

			Flood Peak		**Compare to**
No	**River**	**Station**	**Time**	**Water Level (cm)**	**the alarm level (m)**
1	An Lão	An Hoà	4h/2/11	2227	>BĐI (0,27m)
2	Lai Giang	Bồng Sơn	19h/2/11	596	<BĐ1
3	Kôn	Bình Tường	1h/3/11	2258	<BĐII (0,42m)
4	-	Thanh Hoá	18h/2/11	773	<BĐIII (0,27m)
5	Kỳ Lộ	Ha Bang	11h/2/11	969	>BĐIII (0,19m)
6	Ba	Ayunpa	20h/2/11	15459	>BĐII (0,09m)
7	-	Củng Sơn	20h/2/11	3485	>BĐIII (0,35m)
8			15h/4/11	3318	>BĐIII (1,18m)
9	Đà Rằng	Phú Lâm	1h/3/11	380	>BĐIII (0,10m)
10			19h/4/11	313	>BĐII (0,43m)
11	Cái Ninh Hoà	Ninh Hoà	15h/2/11	599	>BĐIII (0,49m)
12	Cái Nha Trang	Đồng Trăng	21h/1/11	1157	>BĐIII (0,57m)
13	"	"	15h/2/11	1266	>BĐIII (1,66m)
14	Cái Phan Rang	Tân Mỹ	16h/1/11	3941	>BĐIII (1,41m)
15	"	Phan Rang	16h/1/11	538	>BĐIII (0,88m)
16		KrongBuk	11h/2/11	45644	<BĐIII (0,06m)
			9h/4/11	45505	<BĐII (0,45m)

Note: - BĐIII: The alarm level 3; - BĐII: The alarm level 2

Fig 12. Inundation in Phú Yên province in 2 November 2010

Fig 13: The points with flood peaks higher than level III alert in 2010

***c) Drought*:** Serious drought have occurred on large extend and lasted from August up to now in provinces belong to North and central Vietnam. Presently, water level on some rivers in North and central Vietnam was lowest in historical data observed and was lower than the yearly average value in comparison with the same period such as Mã, Cả, La, Trà Khúc, Ba, Cái Nha Trang rivers.

d) Flash Floods: 07 flash floods occurred in 6 provinces in the North and Central Vietnam such as Hà Giang (27th April, 26th July), Sơn La (23th May), Nghệ An (20th June), Bắc Kạn (31th July), Lào Cai (06th September), Bình Thuận (23th October). The flash floods caused extreme damages on human lives and properties to these provinces.

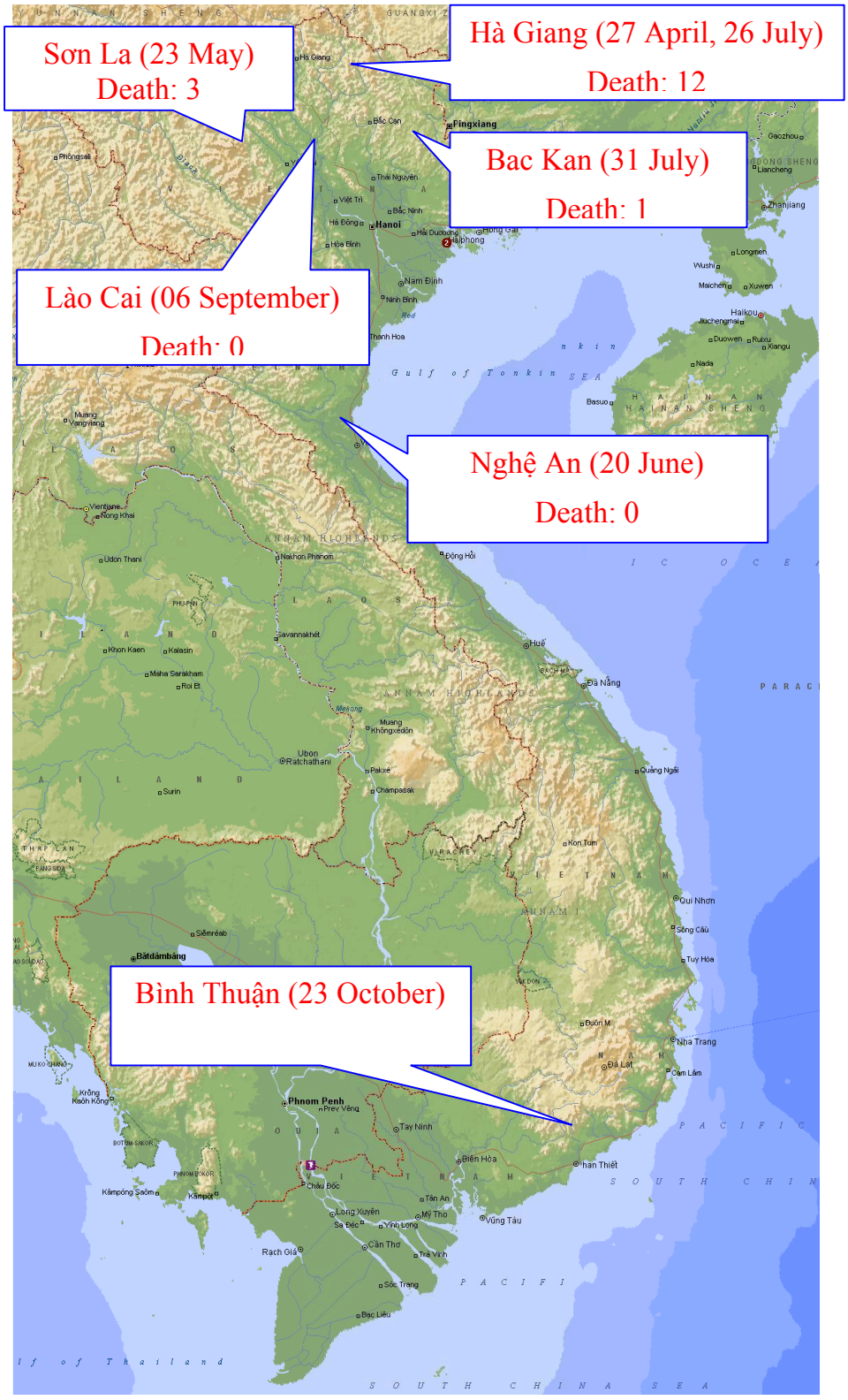


Fig 14. The provinces where flash floods occurred in 2010

3. Socio-Economic Assessment

Table 3: Summary report on damage caused by disaster in Vietnam in 2010

Category	Item damaged	Unit	Flood	Tropical cyclones	Others	Total
People	Killed	No	238	21	7	**26**
	Injured	No	384	107	0	**49**
	Missing	No	33	15	48	**9**
Housing	Houses collapsed, drifted	No	5,398	636	0	**6,03**
	Houses submerged and damaged	No	424,623	47,367	0	**471,99**
School	School collapsed	Room	286	48	0	**33**
	School submerged and damaged	Room	5,439	143	0	**5,58**
Hospital, clinics	Clinics collapsed	No	0	0	0	****
	Clinics submerged and damaged	No	160	8	0	**16**
Agriculture	Rice fields submerged	Ha	40,073	117,623	0	**157,69**
	Farms submerged, damaged	Ha	127,200	23,320	0	**150,52**
	Food damaged by water	Ton	48,557	1	0	**48,55**
Water Resources	Land washed away	m3	2,217,108	367,600	0	**2,584,70**
	Stone drifted	m3	280,157	7,050	0	**287,20**
	Dykes slumped	m	218,776	0	0	**218,77**
	Small hydraulic structures collapsed	Unit	77	1	44	**12**
	Small hydraulic structures damaged	Unit	2,410	11	9	**2,43**
Transportation	Land drifted	m3	153,329,859	409,377	20,600	**153,759,83**
	Rock drifted	m3	51,647	5,230	0	**56,87**
	Bridge, sewer collapsed	Unit	401	11	8	**42**
	Bridge, sewer damaged	Unit	563	116	0	**67**
	Roads damaged	Km	1,183	50	11	**1,24**

Aquatic product	Shrimp, fish poll broken	Ha	21,964	6,502	15	**28,48**
	Ships sunk, lost	Unit	51	84	29	**16**
	Ships sunk, damaged	Unit	206	25	126	**35**
Communication	Telephone poles collapsed	Unit	0	6	3	
	Telephone wire broken	m	38,000	0	350	**38,35**
Energy	High voltage electric towers broken	Unit	4	9,542	16	**9,56**
	Electric distribution poles broken	Unit	613	178	151	**94**
	Electric wire broken	m	331,730	287,490	1,923	**621,14**
	Total damage	Bil VND	**14,306,548**	**1,529,291**	**226,451**	**16,062,29**
		USD	**752,976**	**80,489.0**	**11,918.5**	**845,383.**

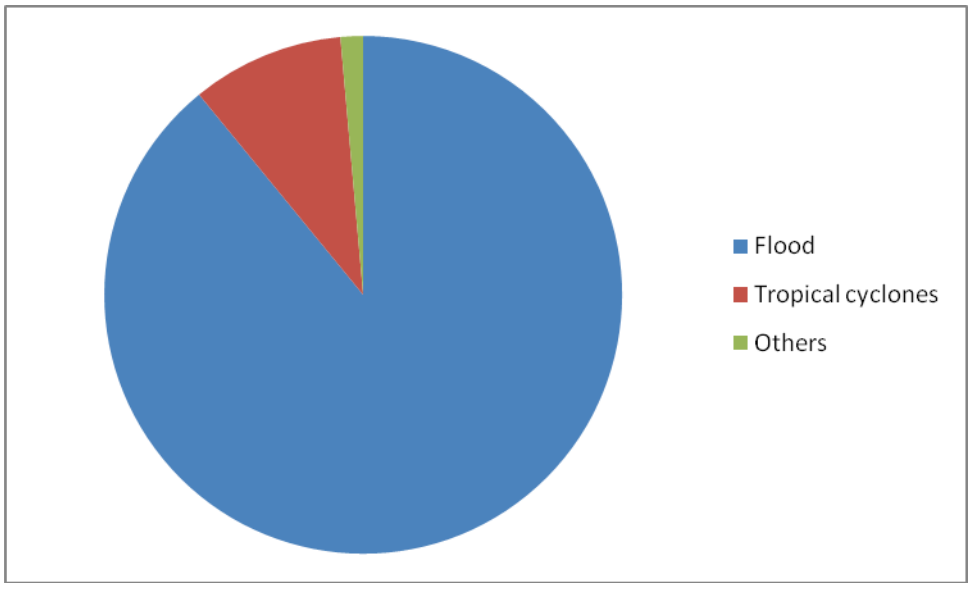


Figure 15. Human loss and Socio-economic impacts by disasters in Vietnam in 2010

4. Regional Cooperation Assessment

II. Summary of progress in Key Result Areas

(For achievements/results which apply to more than one Key Result Area, please describe them under the most applicable Key Result Area. Then, at the end of the description, place in parentheses ( ) the other applicable Key Result Areas)

1. Progress on Key Result Area 1:

Reduced Loss of Life from Typhoon-related Disasters. (List progress on the Strategic Goals and Associated Activities in the Strategic Plan and progress on the 2009 Typhoon Committee Annual Operating Plan goals)

a. Meteorological Achievements/Results

Nil.

b. Hydrological Achievements/Results

Nil.

c. Disaster Prevention and Preparedness Achievements/Results

Nil.

d. Regional Cooperation Achievements/Results

Nil.

e. Identified Opportunities/Challenges for Future Achievements/Results

Nil.

2. Progress on Key Result Area 2:

Minimized Typhoon-related Social and Economic Impacts. (List progress on the Strategic Goals and Associated Activities in the Strategic Plan and progress on the 2009 Typhoon Committee Annual Operating Plan goals)

a. Meteorological Achievements/Results

Nil.

b. Hydrological Achievements/Results

Nil.

c. Disaster Prevention and Preparedness Achievements/Results

Nil.

d. Research, Training, and Other Achievements/Results

Nil.

e. Regional Cooperation Achievements/Results

Nil.

f. Identified Opportunities/Challenges for Future Achievements/Results

Nil.

3. Progress on Key Result Area 3:

Enhanced Beneficial Typhoon-related Effects for the Betterment of Quality of life. (List progress on the Strategic Goals and Associated Activities in the Strategic Plan and progress on the 2009 Typhoon Committee Annual Operating Plan goals)

a. Meteorological Achievements/Results

Nil.

b. Hydrological Achievements/Results

Nil.

c. Disaster Prevention and Preparedness Achievements/Results

Nil.

d. Research, Training, and Other Achievements/Results

Nil.

e. Regional Cooperation Achievements/Results

Nil.

f. Identified Opportunities/Challenges for Future Achievements/Results

Nil.

4. Progress on Key Result Area 4:

Improved Typhoon-related Disaster Risk Management in Various Sectors. (List progress on the Strategic Goals and Associated Activities in the Strategic Plan and progress on the 2009 Typhoon Committee Annual Operating Plan goals)

a. Meteorological Achievements/Results

b. Hydrological Achievements/Results

c. Disaster Prevention and Preparedness Achievements/Results

d. Research, Training, and Other Achievements/Results

e. Regional Cooperation Achievements/Results

f. Identified Opportunities/Challenges for Future Achievements/Results

5. Progress on Key Result Area 5:

Strengthened Resilience of Communities to Typhoon-related Disasters. (List progress on the Strategic Goals and Associated Activities in the Strategic Plan and progress on the 2008 Typhoon Committee Annual Operating Plan goals)

a. Meteorological Achievements/Results

b. Hydrological Achievements/Results

c. Disaster Prevention and Preparedness Achievements/Results

d. Research, Training, and Other Achievements/Results

e. Regional Cooperation Achievements/Results

f. Identified Opportunities/Challenges for Future Achievements/Results

6. Progress on Key Result Area 6:

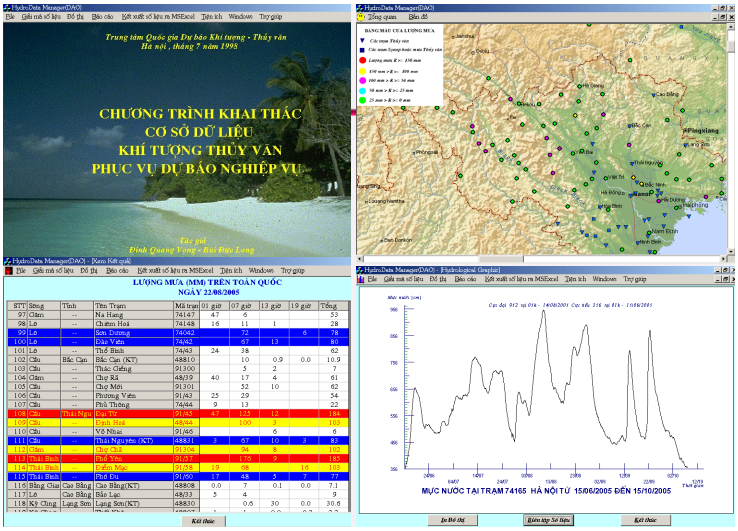
Improved Capacity to Generate and Provide Accurate, Timely, and understandable Information on Typhoon-related Threats. (List progress on the Strategic Goals and Associated Activities in the Strategic Plan and progress on the 2008 Typhoon Committee Annual Operating Plan goals)

a. Meteorological Achievements/Results

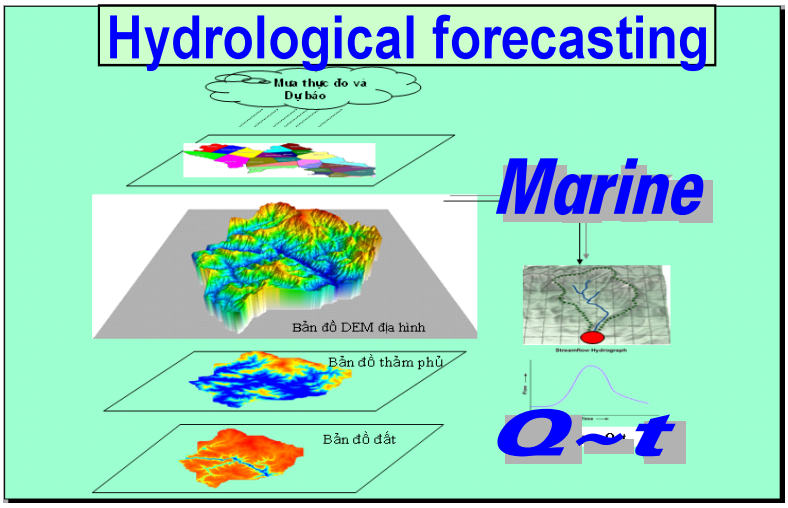
- 15 automatic rainfall station in Ha Noi city was set up and operated from October 2010.

b. Hydrological Achievements/Results

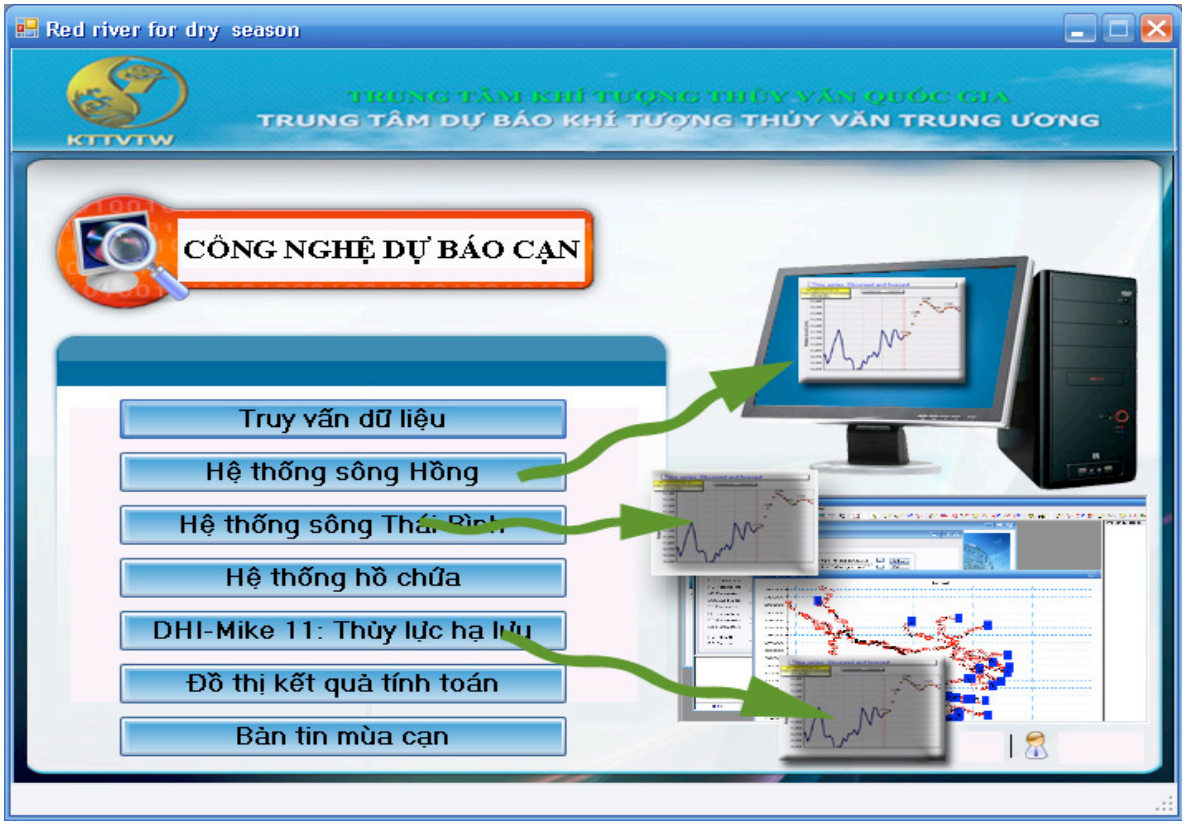
- *Improvements of software in data processing and analysis:* Continued to develop the software for the preservation of hydro-meteorological database, for hydrological data collection, processing and timely transmitting hydrological information and forecasts to end-users.



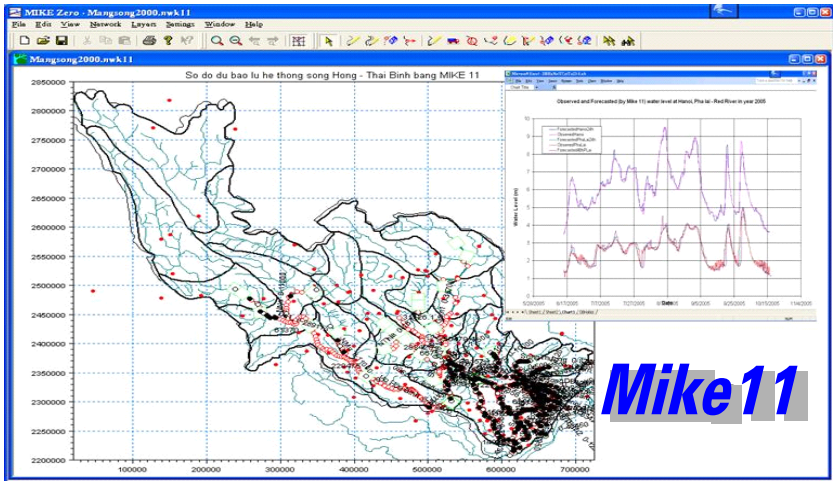
- Employ the MARINE and FIRR models to forecast flow in upstream area of Da, Thao, Lo rivers, *Reservoir Flood Routing* model for reservoir's regulation in Da river and create the input for the Hydraulic model TL2 in lower stream of Red river.



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



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



c. Disaster Prevention and Preparedness Achievements/Results

d. Research, Training, and Other Achievements/Results

- Flash flood mapping Project with purposes: drawing up of flash flood map and establishing flash flood warning system in the North Viet Nam.
- Research applying satellite data, numerical rainfall forecast, combining with ground data in flood forecasting on the Hong-Thai Binh River system.
- Sub-project "Building up real time inundation forecasting technology for Hanoi downtown" in-line with technical assistance from the Typhoon Committee "Urban Flood Risk Management Project".

Proposal project: **BUILDING THE RAINFAL AND FLOOD EARLY WARINNING SYSTEMS, FORECASTING AND WARNING DETAIL HANOI INUNDATION from 2011-2013.**

- The Integrated Workshop on "Urban Flood Risk Management in a Changing Climate: Sustainable and Adaptation Challenges" in Macao, China from 6 to 10 September 2010.
- 1-month TANK model Training by EXCEL sheets in Malaysia "Configuring operation flood forecasting system based on the Tank model"
- 2-week training on small hydropower in China
- IFAS training in the Space Application Workshop to Reduce Water-related Disaster Risk in Asia, in Bangkok on 7-9 December 2010
- International Workshop on Hue Water Research, January 11-12, 2010, University of Tokyo, Japan
- The 6th International Coordination Group (ICG) Meeting, GEOSS Asian Water Cycle Initiative (AWCI), Bali, Indonesia, 10-13 March 2010
- The 7th meeting of the GEOSS Asian Water Cycle Initiative (AWCI), International Coordination Group (ICG) in Tokyo, Japan on 5 – 6th October 2010
- The meeting of the RA II (Asia) Working Group on Hydrology, 23-26 November 2010 in Seoul, Republic of Korea
- The Training Workshop on Mesoscale Numerical Weather Prediction - Phase I for all ASEAN member States in Seoul, Korea, from 27 September to 08 October 2010.
- The Research with topic TIPS Development in National Meteorological Center, China from October to December.
- The Study on Improvement of Typhoon analysis and forecast system with KMA's typhoon analysis and prediction system (TAPS) in Korea Meteorological Administration from September to November.
- The Seventh WMO International Workshop on Tropical Cyclones (IWTC-VII) will be held in St. Denis, La Reunion, France from 15 to 20 November 2010.
- The Roving Seminar in Ubon Ratchathani, Thailand, from 30 November to 03 December 2010.

e. Regional Cooperation Achievements/Results

- Participate actively the Project on Urban Flood Risk Management.(UFRM). With the strong support and kind arrangement of the National Hydro-Meteorological Service of Viet Nam, from 18 to 19 December 2010, the UFRM Task Force Mission implemented the survey successfully in Ha Noi, Viet Nam

- Participate actively the Severe Weather Forecasting Demonstration Project (SWFDP) Development for Southeast Asia (Viet Nam. Lao PDR, Cambodia and Thailand): In cooperation with the World Meteorological Organization, the NHMS of Viet Nam organized successfully the Workshop on Severe Weather Forecasting Demonstration Project (SWFDP) Development for Southeast Asia from 02 to 05 January 2010 in Ha Noi, Viet Nam; Attending the meeting to develop a strategy for preparing an Implementation Plan for a SWFDP in Southeast Asia, Tokyo, Japan, 17-18 September 2010.

(Nill)

f. Identified Opportunities/Challenges for Future Achievements/Results

(Nill)

7. Progress on Key Result Area 7:

Enhanced Typhoon Committee's Effectiveness and International Collaboration. (List progress on the Strategic Goals and Associated Activities in the Strategic Plan and progress on the 2009 Typhoon Committee Annual Operating Plan goals)

a. Meteorological Achievements/Results

(Nill)

b. Hydrological Achievements/Results

(Nill)

c. Disaster Prevention and Preparedness Achievements/Results

(Nill)

d. Research, Training, and Other Achievements/Results

(Nill)

e. Regional Cooperation Achievements/Results

(Nill)

f. Identified Opportunities/Challenges for Future Achievements/Results

(Nill)

III. Resource Mobilization Activities

(Nill)

IV. Update of Members' Working Groups representatives

(Nill)

1. Working Group on Meteorology
2. Working Group on Hydrology
3. Working Group on Disaster Prevention and Preparedness
4. Training and Research Coordinating Group
5. Resource Mobilization Group