

Country report

Some candidate river basin that could be involved in the demonstration project of the AWCI

Name: Tran Van Sap

Country: Vietnam

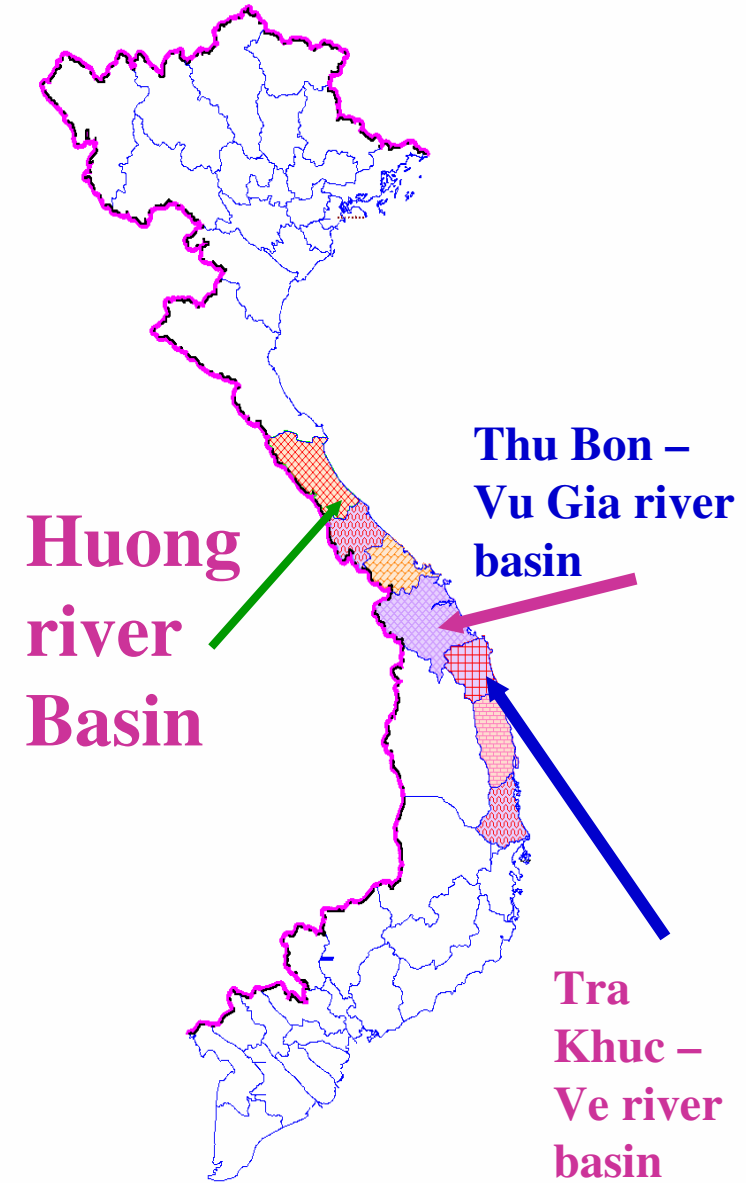
1. The candidate river basin in my country that is involved in the demonstration project of the AW

1-THU BON-VU gia river basin.

2-TRA KHUC-VE RB.

3-HUONG RB.

Study areas



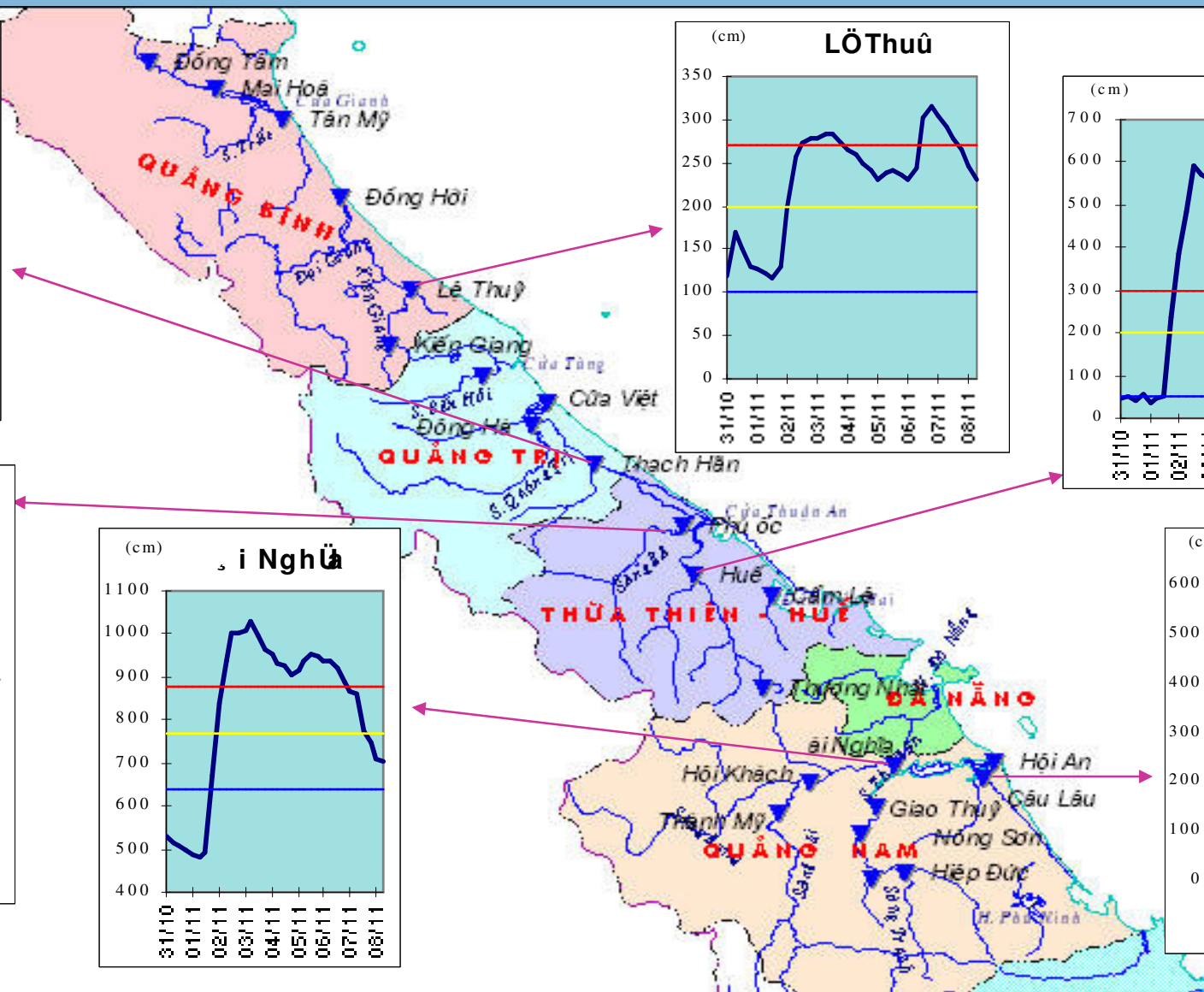
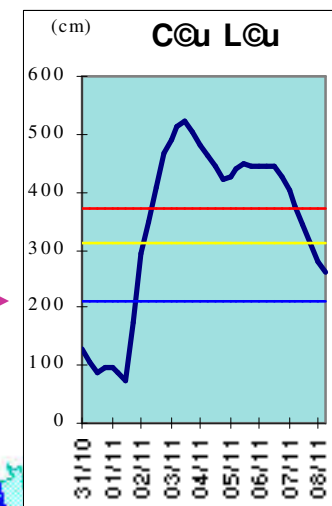
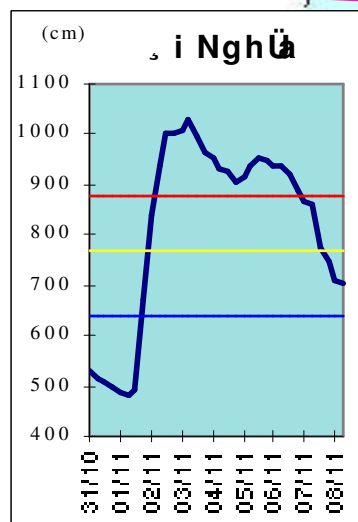
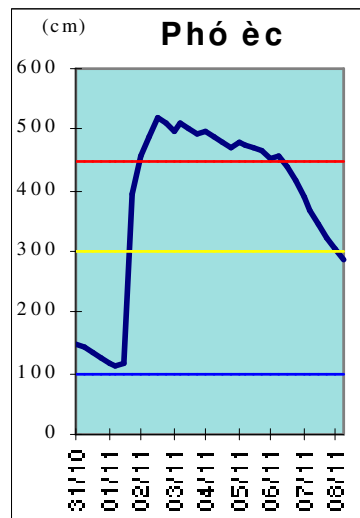
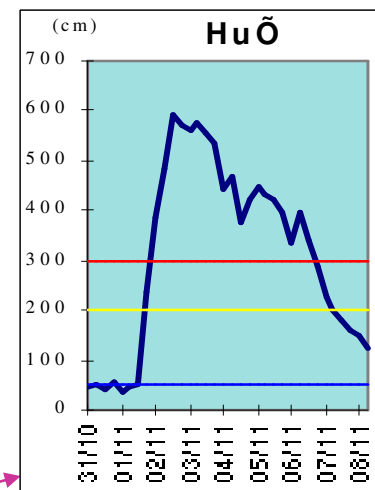
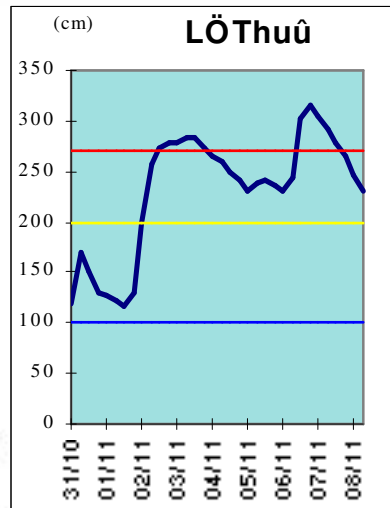
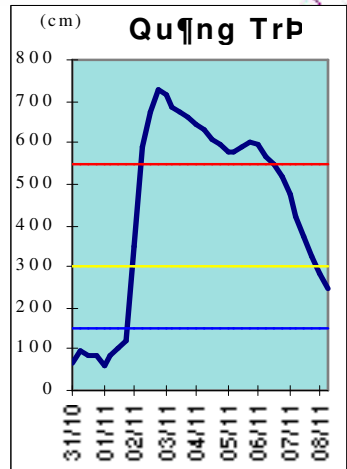
Flood Affected Area in the central of Vietnam

Mainly characteristics of river basins in the central of Vietnam

- ✓ River basins in the central Vietnam are small, short and steep slope.
- ✓ Time of concentration is short and river basins have low storage capacity.
- ✓ Floods and inundation often occur very quickly and severely.
- ✓ Flood monitoring and warning with 24 hours lead time in central Vietnam is still a challenge to hydrologists.

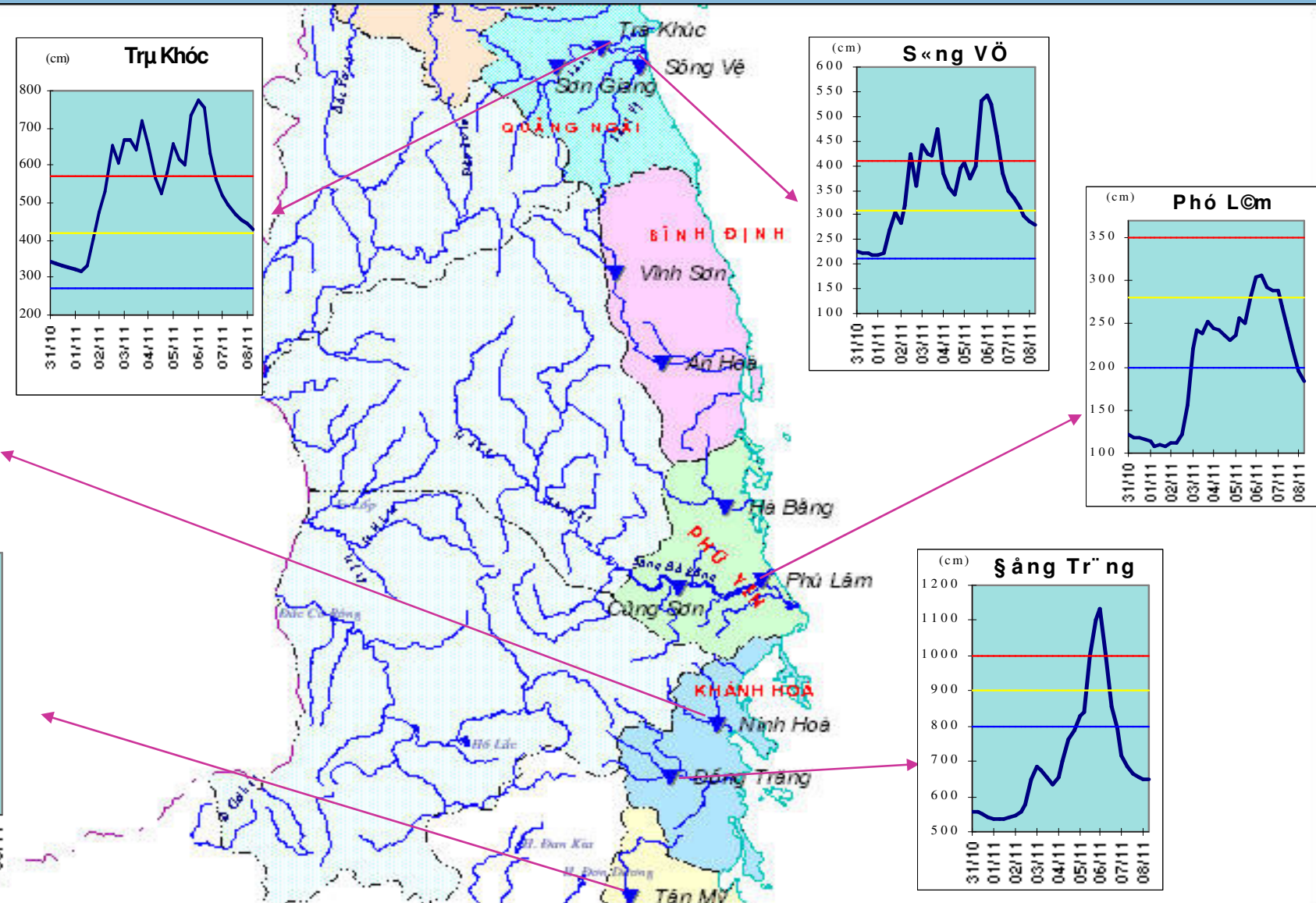
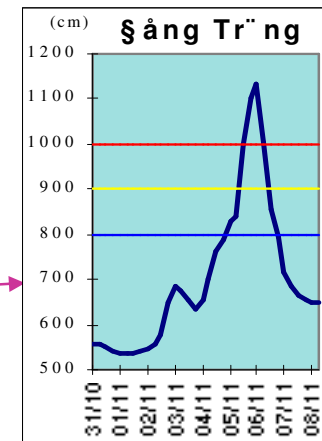
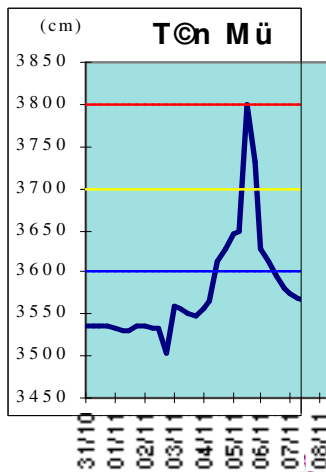
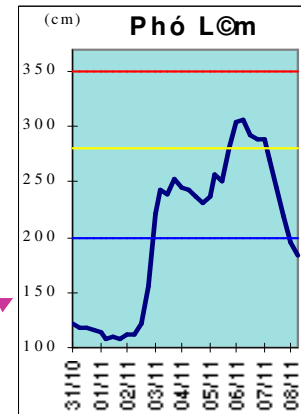
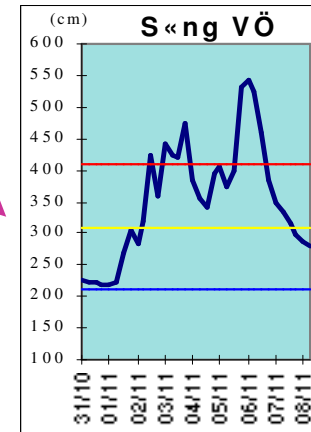
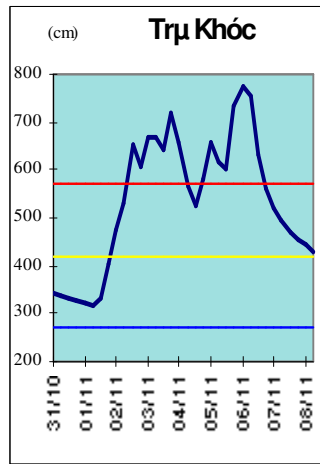
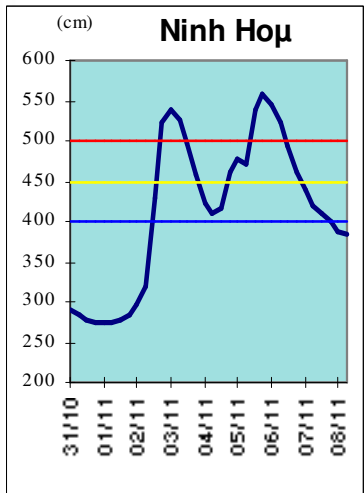
FLOOD

(EXAMPLES OF HIGH FLOOD IN 1999)



FLOOD

(EXAMPLES OF HIGH FLOOD 1999)

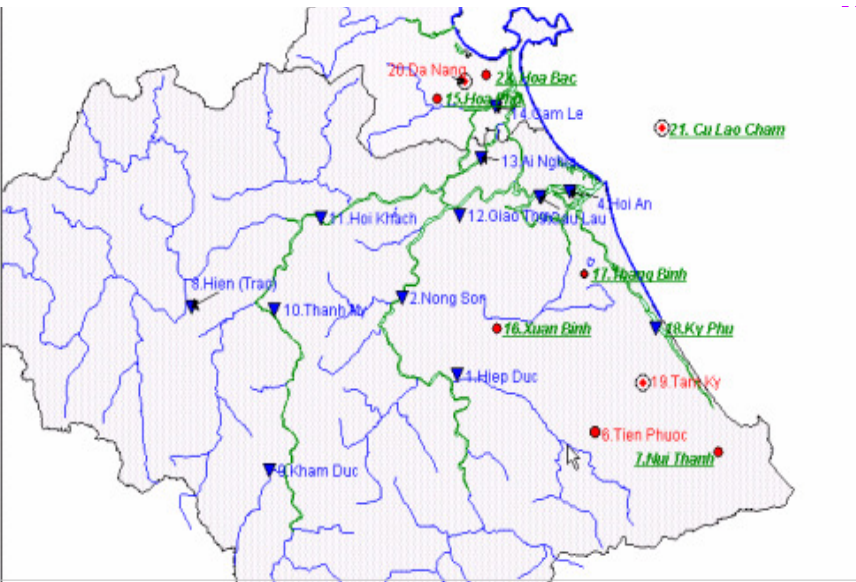


Thu Bon - vu gia River basin **(Central Viet Nam)**

Thu Bon-Vu Gia river basin belong to Quang Nam province in coastal of the Central Viet Nam.

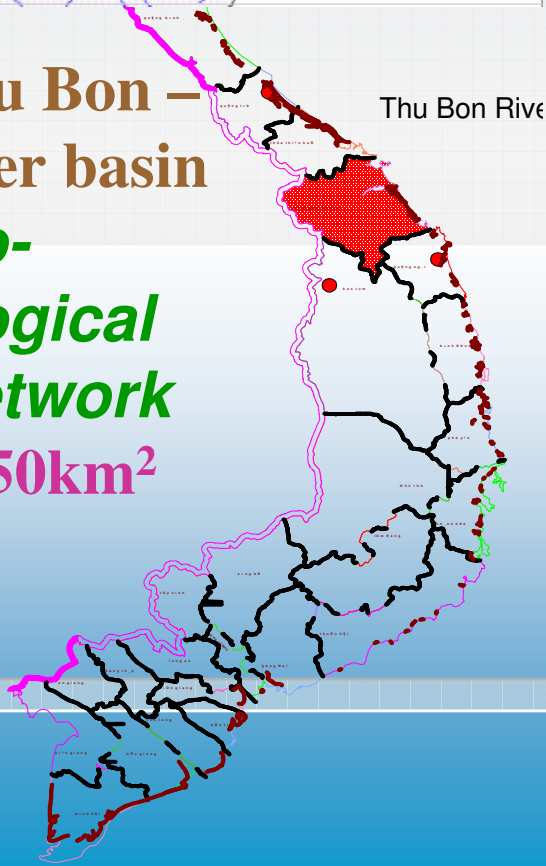
It is located in latitude 14.57'.07''-16⁰.04'.03''N, longitude 107.12'.40''-108⁰.44'.18''NE.

Thu Bon-VuGia river basin cover Da Nang, Quang Nam province and small part of Kon Tum provice.



**Map of Thu Bon –
Vu Gia river basin
and hydro-
meteorological
station network**

Area: 10,350km²



Thu Bon – Vu Gia river basin

Thu Bon – Vu gia river basin in the central Vietnam are small, short and steep slopes.

Time of concentration of flood is short and river basin has low storage capacity. Therefore, floods and inundation often occur very quickly and severely.

Flood monitoring and warning with 24 hours lead time in central Vietnam is still a challenge to hydrologists.

Characteristic of Thu Bon - Vu Gia-river basins in table below

Characteristic of Thu Bon river basins

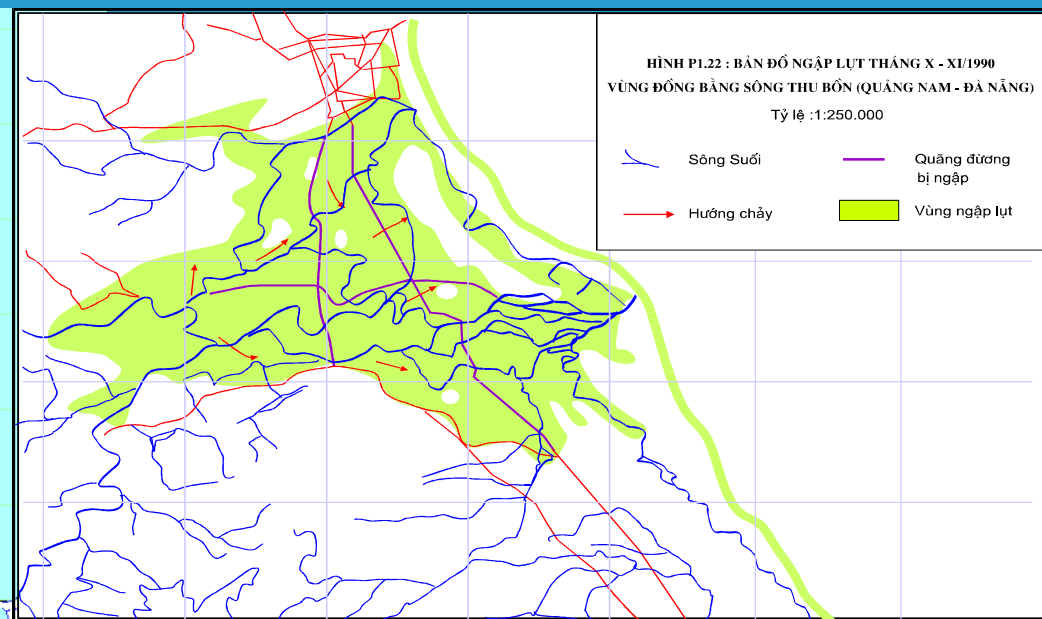
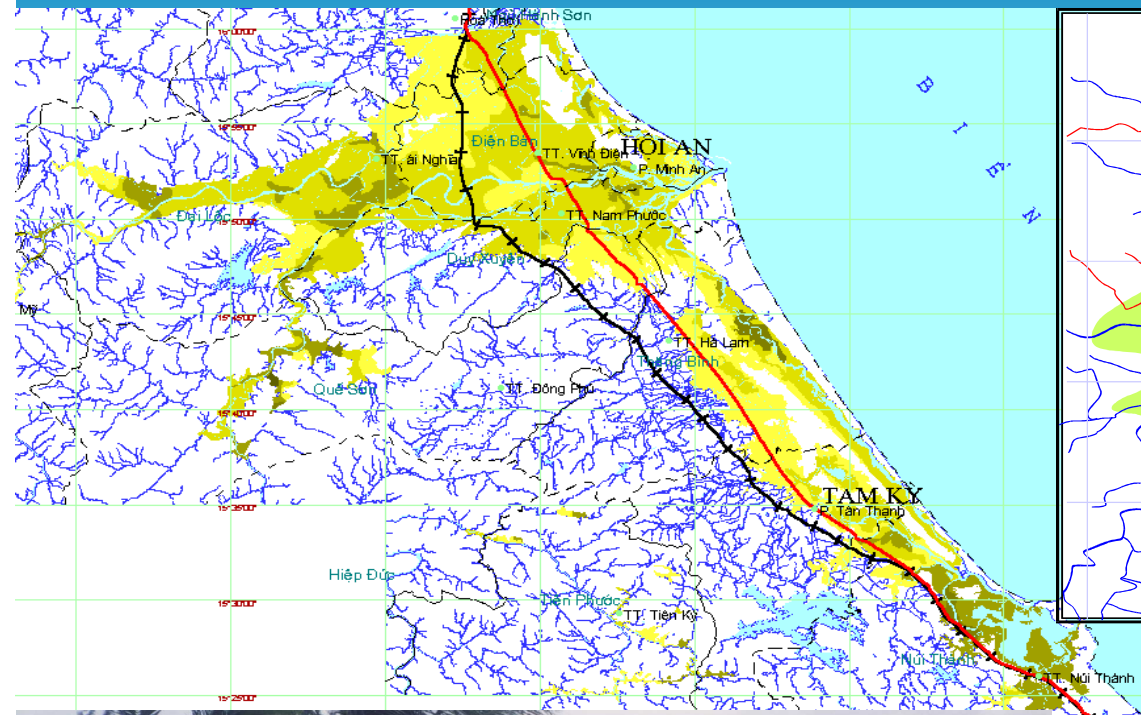
river basin	Area, km ²		Annual rainfall	Annual flow	Month flow, Billion m ³	
	Total	In Việ Nam	mm	Billion m ³	Max	Min
Vu Gia- Thu Bãn	10000	10000	2800	15.8	0.6	0.4

Meteorological station network in Quangr Nam Province (Thu Bon –Vu Gia RB.)

N.	Station	Position	Lat.	Long.	Class Station			
					I	II	III	IV
1	Tam Ky	Tam An, Tam Ky	15.34'	108.28'	X			
2	Tra My	Tra My, Tra My	15.20'	108.15'		X		
3	Trao	PRao, Hien	15.55'	107.39'				X
4	Kham Duc	Kham Duc, Phuoc Son	15.26	107.47				X
5	Tien Phuoc	Tien Ky, Tien Phuoc	15.29	108.18				X
6	Que Son	Dong Phu, Que Son						X

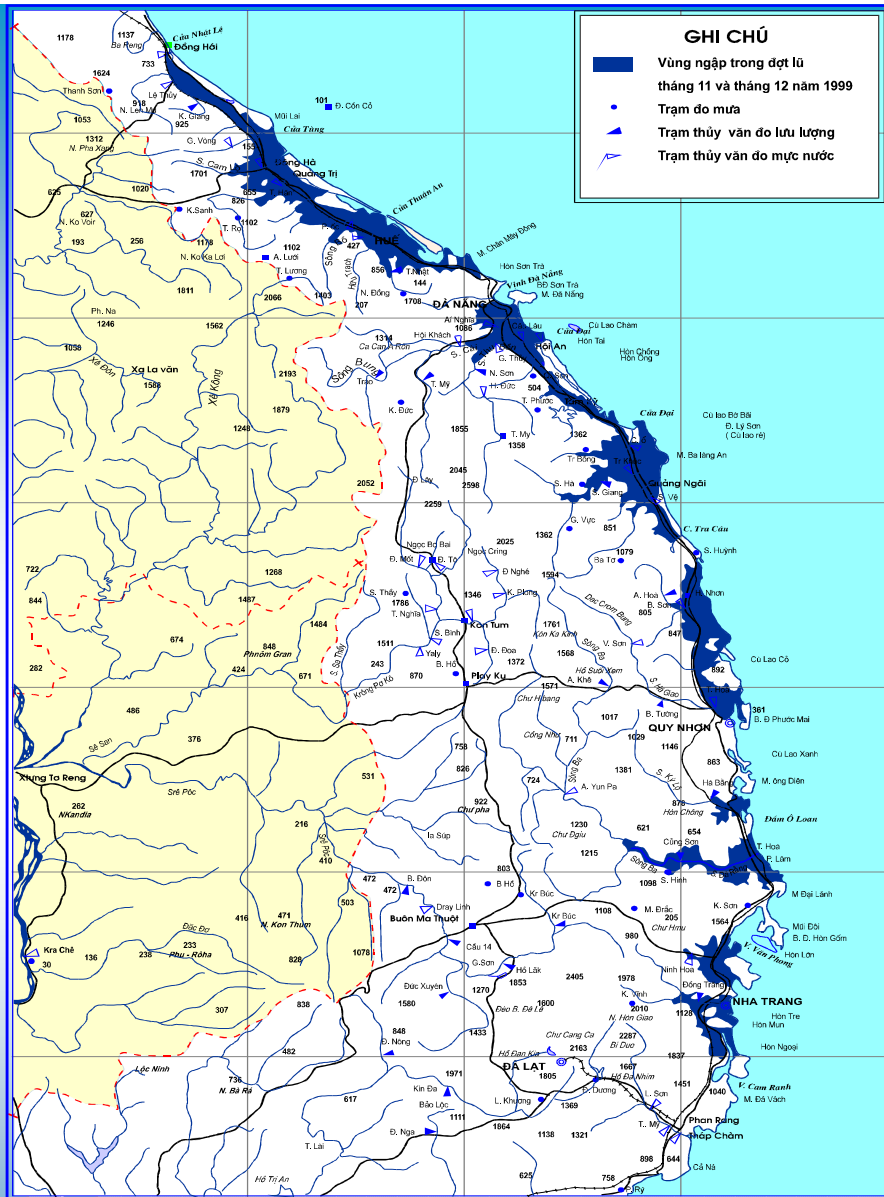
Hydrological station network in Thu Bon – Vu Gia river basin

N.	Station	Position	Rver	Lat.	Long.	Class Station		
						I	II	III
1	Nong Son	Que Ninh, Que Son	Thu Bon	15.42'	108.03'	X		
2	Hiep Duc	Tan An, Hiep Duc	Thu Bon	15.35'	108.07'			X
3	Giao Thuy	Duy Chaau, Duy Xuyen	Thu Bon	15.46	108.01'			X
4	Cau Lau	Tien Ruou, Duy Xuyen	Thu Bon	15.51'	108.17'	X		
5	Thanh My	Thanh My, Giang	Cai	15.46	107.50	X		
6	Ai Nghia	Dai Phuoc, Dai Loc	Yen	15.53	108.07			X
7	Hoi An	Son Phong, Hoi An	Hoi An	15.52	108.20			
8	Hoi Khach	Dai Hong, Dai Loc	Vu Gia	15.49	107.49		X	
9	Tam Ky	An Phu, Tam Ky	Tam Ky	15.35	108.30			X

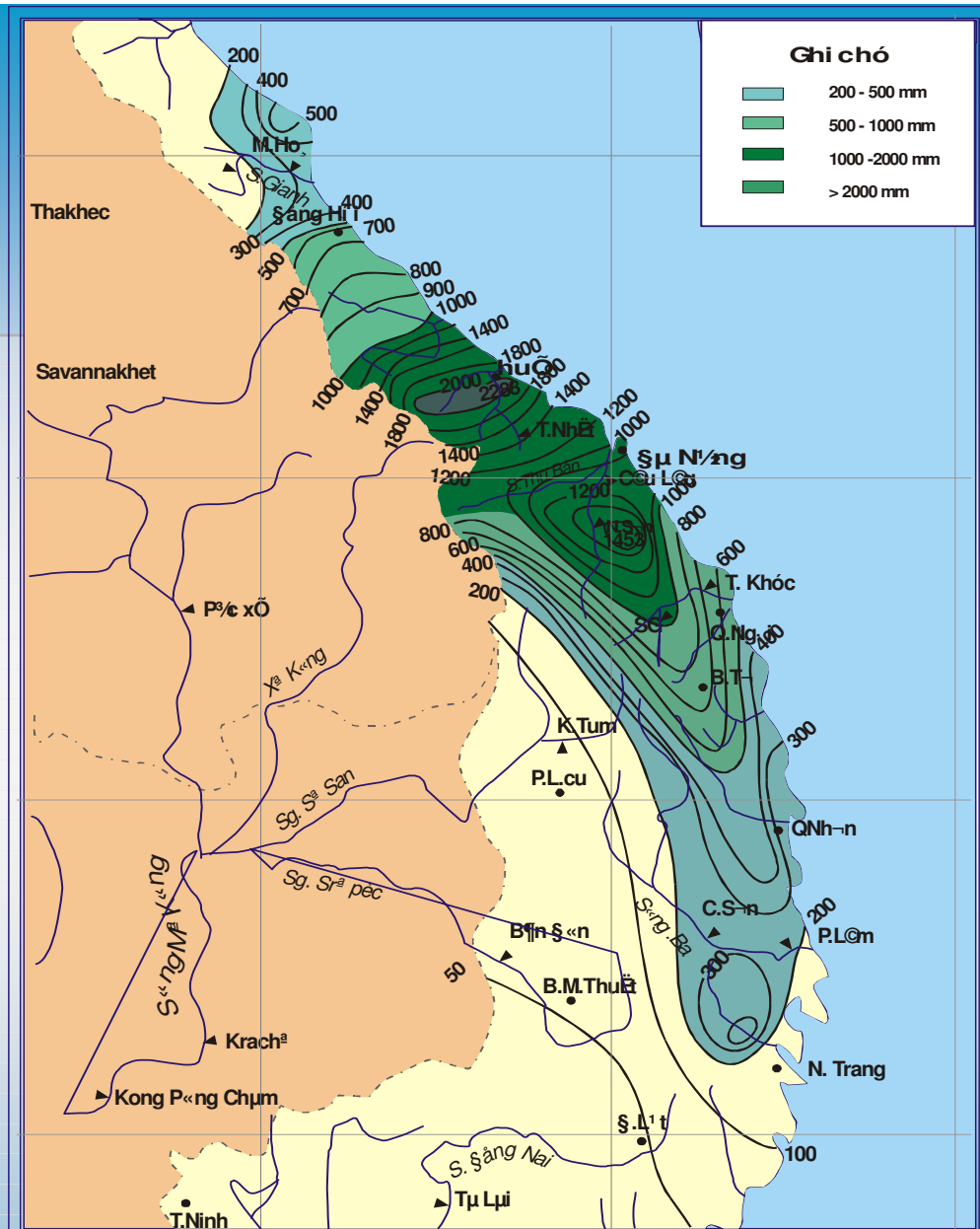


Inundation Map X-XI.1983 flood in Thu Bon River Plain (Quang Nam Province)



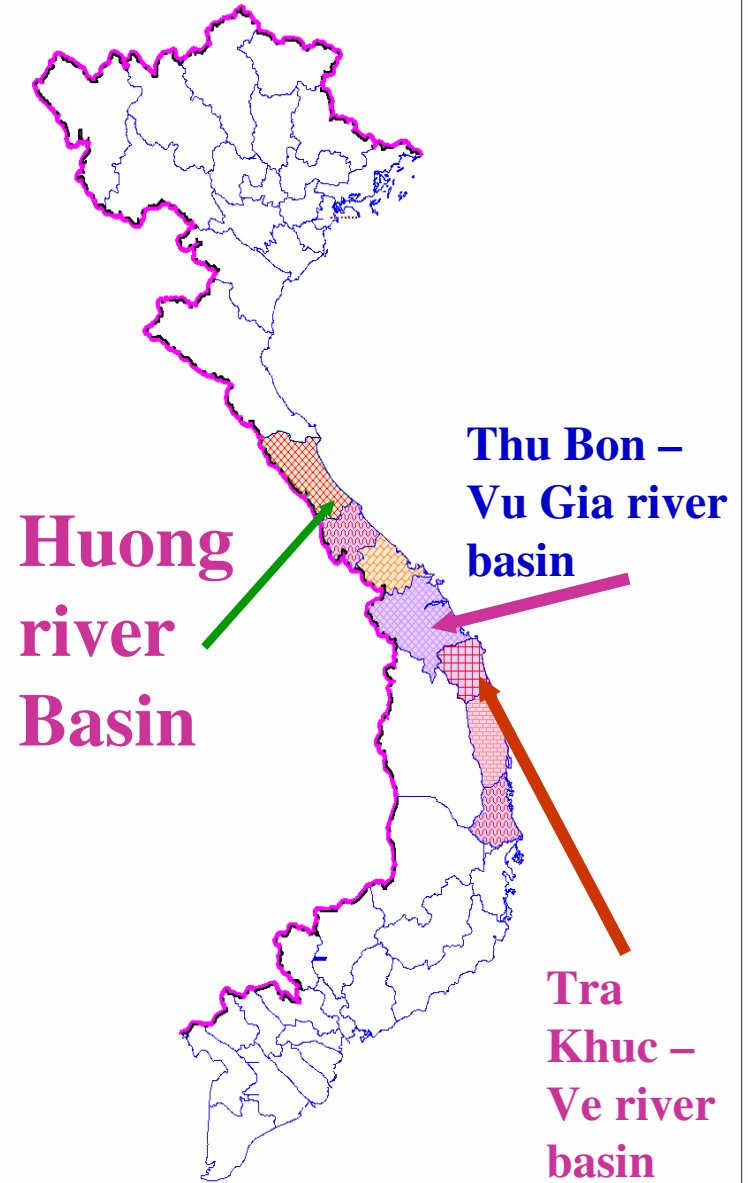


Inundation in historical floods in 1999 in the Central Vietnam



Rainfall isohyetal map (from 19h 30.X to 7h 6.XI.1999)

2 - Tra Khuc–Ve river basin



Tra Khuc–Ve river basin

hydro-meteorological station
network



*Area: Tra Khuc: 3,240km²;
Ve river: 1,250km²*

The Tra Khuc River originates from Dakrobao mountain (2 299m) in the eastern slope of Ngoc Linh mountain range.

Dakselo is the largest tributary of Tra Khuc River. The latter has upper part of Dak Drinh and discharges to the sea at Co Luy mouth. From Kahok (Son Giang) to upper reaches there are three significant tributaries such as Nuoc Ong, Se Le and Re.

Tra Khuc River has 135 km length, 3240 km² catchment area. The lower part of the river has small slope and widening channel.

The average annual rainfall varies strongly in Tra Khuc River basin. Somewhere it reaches highest value of 3 600 mm, the other place has the minimum value of 1800 mm.

Rainy season starts late from September and lasts to December. Rainfall amount of 4 months in rainy season makes 65 - 85 % of, total amount precipitation.

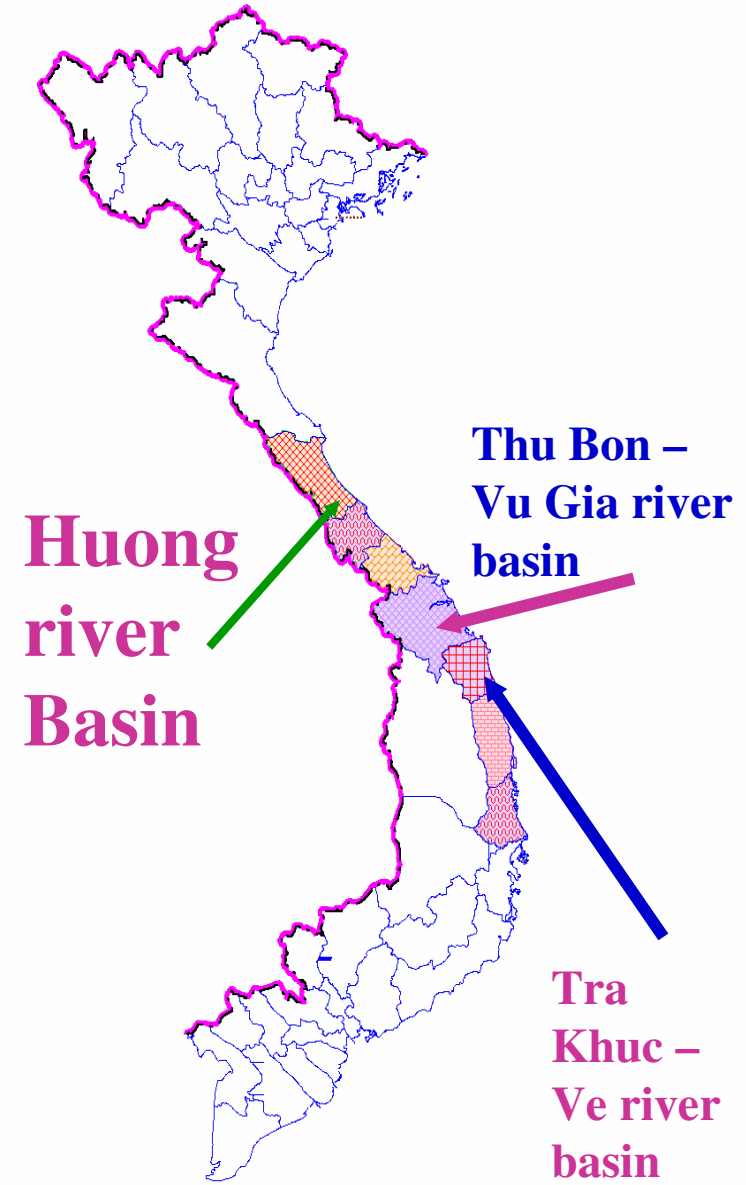
The hydraulic structures are rather developed in Quang Ngai province to reduce and protect from floods and droughts.

Characteristics of River and Main Tributaries

No.	Name of river	Length [km] Catchment area [km ²]	Highest peak [m] Lowest point[m]	Cities Population	Land use [%]
1	Tra Khuc (Main river)	135 3 240	900	Quang Ngai	A (46.1) F (38.2)
2	Dac Se Lo (Tributary)	63 1 760	1 050		G (0.7) P (15.0)
3	Giang (Tributary)	16 100	300		
4	Dac Leng (Tributary)	19 96	1 100		
5	Nuoc Lac (Tributary)	16 93	450		
6	Tam Dinh (Tributary)	18 67	600		
7	Tam Rao (Tributary)	20 64	900		
8	Xa Dieu (Tributary)	13 63	500		
9	Phuoc (Tributary)	20 45	500		

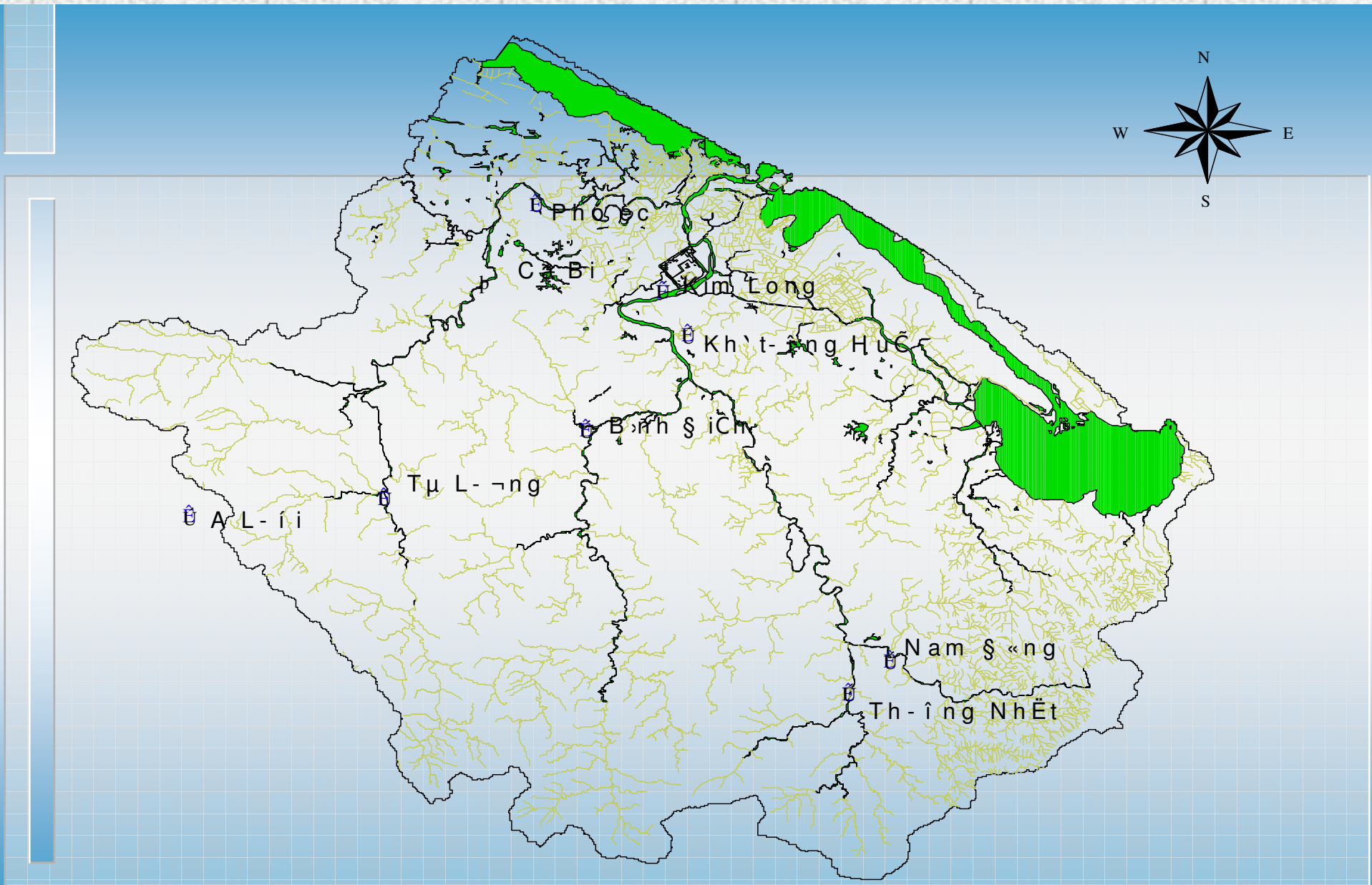
3 - HUONG River Basin

Study areas



Huong river basin.

Area: 2.830km²



Some natural geographical characteristics of Huong river basin

Huong river basin belong to Thua Thien Hue province in coastal of the Central Viet Nam. It is located in latitude $16-17^{\circ}\text{N}$, longitude $107-108^{\circ}\text{E}$.

There are Truong Son mountain range and Bach Ma with tops about of 1000m in the West and the South-West, East Sea in the East. This is transitional climate region.

The cold air moving from the North to the South combines with typhoons and tropical low pressure to cause heavy rainfall in the area. Specially, Bach Ma mountain range in the South of the basin blocks the cold air to create heavy rain-storms of 4-5 days, even 7-10 days.

Huong River is short and steep, runs from mountain ranges with altitude of 500 – 1000m to the low plain area. The basin is covered by erodible laterite soil, and forests had been destroyed. Therefore, water flow regulation capacity of the basin is reduced, floods concentrate fastly.

The history of old capital Hue wrote that between 1801 and 1888, Hue and its surrounding were hit strongly with 40 high floods.

- The annual rainfall of Huong Rives basin ranges from 3000mm to 3500mm, bigger than in Ta Trach upstream. It steady increases from downstream to upstream and from Bo River to Ta Trach River basin. The rainy and flood season is from September to December, makes up 66-75% of the annual rainfall, and mainly concentrates in October – November.
- Heavy rain-storms and high floods occurred in 1953 (from 21st to 25th September), 1975 (from 16th to 20th October), 1983 (from 28th October to 1st November), 1999 (from 1st to 6th November).
- The observed rainfall data during 1973-1999 showed that 75% of yearly heavy storms occur in October and November.

There were 4 high floods in Hue to be recorded in the end half of last 20th century:

Year occurring floods	1999	1953	1975	1983
Maximum water level in Hue (m)	5.81	5.50	> 5.32	> 4.90

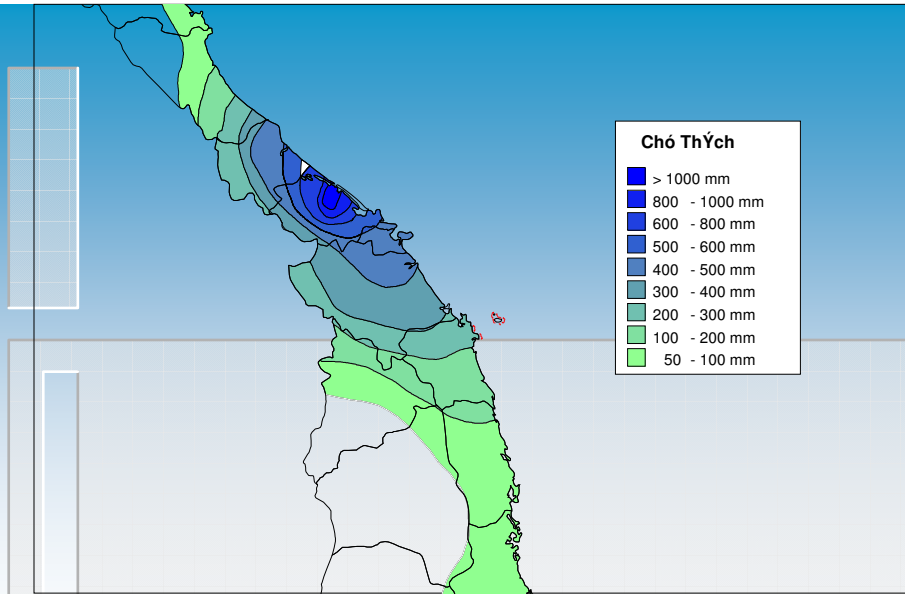
Water level measured at Kim Long hydrological station (Hue) shows that there were floods over the warning III (+3.0m) during 23 years (1977-1999). Every year, there were about 1.4 flood events. During the last 23, there were 18, 10 and 5 floods with the peak water level exceeding +3.5m, +4.0m and +4.5m respectively.

the annual rainfall in upstream of Bach Ma and Ta Trach River is 8340mm (observed data 5 years: 1932-1935 and 1980), maximum 1 day-rainfall: 753.2 mm, maximum 3 day-rainfall: 1672.8 mm, maximum 5-day-rainfall: 2008.3 mm (Ngo Dinh Tuan, Ha Noi Water Resource University).

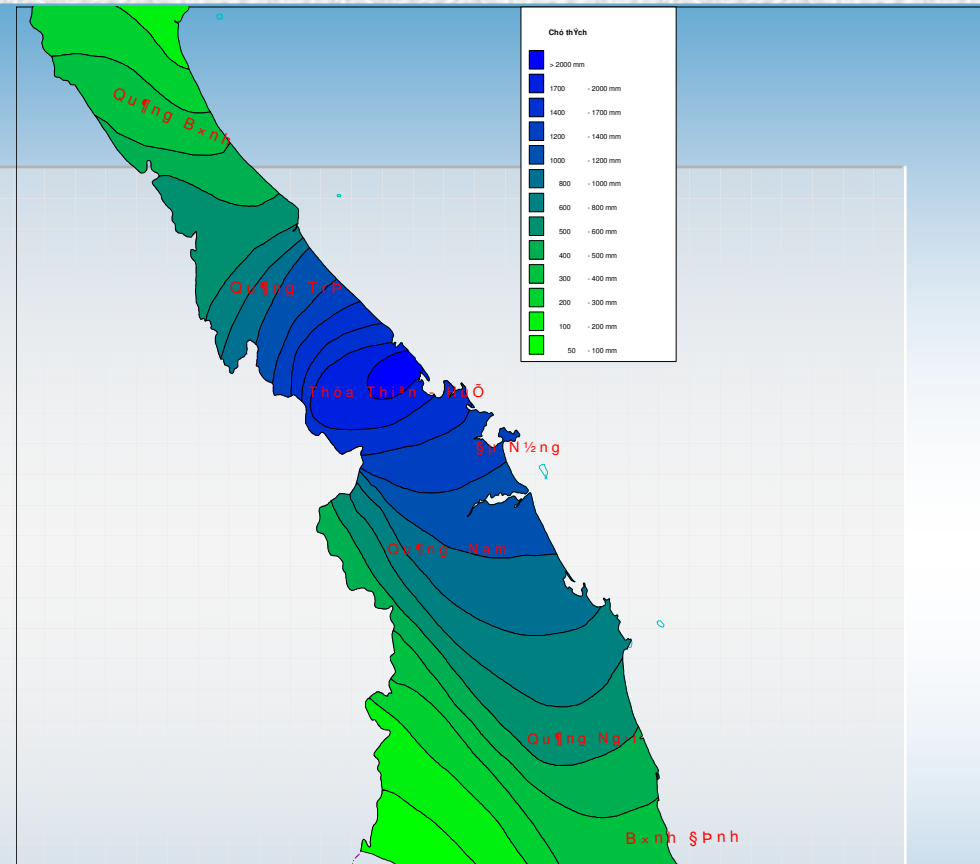
Water discharge data measured in 4 years (1993-1996) at Truoi hydrological station, neighbouring Ta Trach River with the drainage area of 75.3km², also shown that the annual runoff was 4838 mm. There were 2 high floods, one of them occurred in 26 October 1995 with maximum water discharge of 1260 m³/s, the other did in 23 October 1996 with maximum water discharge of 1271 m³/s.

Maximum 5 day-rainstorms exceeding 1000 mm in Huong Rives basin is not occasional, and their return period is about 10 years. The heavy rainfall in early Novenber 1999 (from 1st to 5th) had 5 day-rainstorms of 2320.6 mm at Hue, 2610.2 mm at Truoi, 1866 mm at Nam Dong, 2116 mm at Aluoi. Some maximum rain-storms in short durations here were not recorded in other places in Viet Nam

Rainfall and flood occur in the Huong River basin in 11/1999



Rainfall 7 hr 2nd to 7 h 3rd /11/1999



Rainfall 19 hr 31st /10 to 19 hr 4th /11/1999

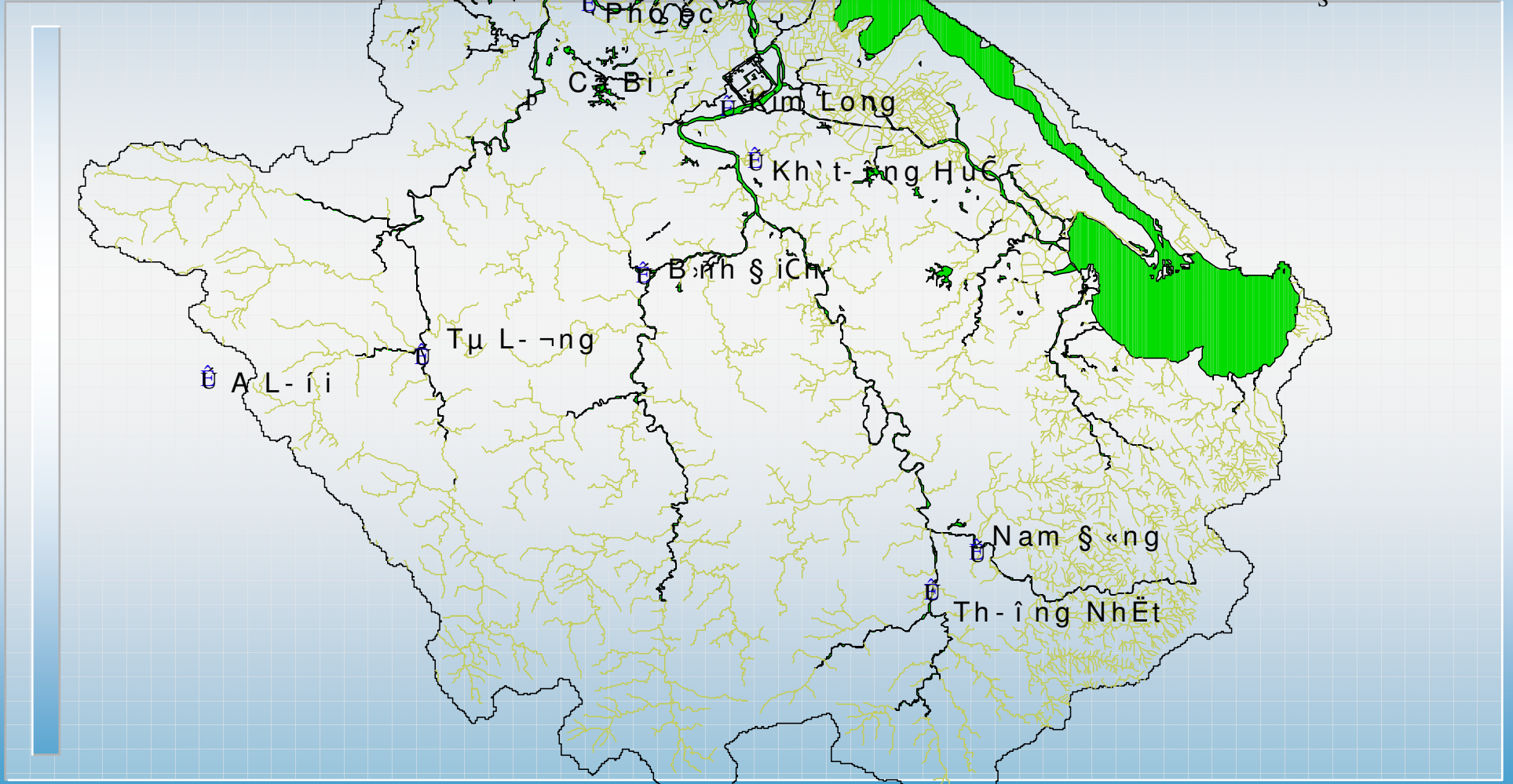
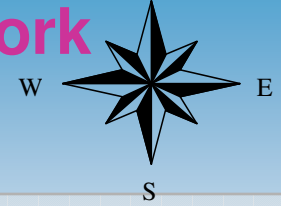


Some maximum rainstorms in short durations recorded in Huong

Rives basin (unit: mm)

Interval rainfall Location	Max. 24 hour-rain-storm		Max. 2 day-rain-sorm		Max. 3 day-rain-storm	
	$X_{\max 24}$	Time	$X_{\max 2 \text{ day}}$	Time	$X_{\max 3 \text{ day}}$	Time
Hue	1422	From 6h/2 to 6h/3 XI/ 1999	1841.6	2-3 XI/ 1999	2113.9	2-4 XI/ 1999
Truoi	1630	From 17h/1 to 17h/2 XI/1999	2200	2-3 XI/1999	2320	2-4 XI/1999

hydro-meteorological station network



Hydro – Meteorological station network in Huong Rives basin

Hydro-Meteorological station network in Huong Rives basin consist of:

- 3 meteorological stations with long history are Hue (1915 up to now), Nam Dong (1973 up to now). Aluoi (1976 up to now).
- 4 hydrological stations in upstream, measuring rainfall (X), water stage (H) and water discharge (Q) are Thuong Nhat on Ta Trach River (1979 up to now) with the drainage area of 208 km², Binh Dien on Huu Trach River with the drainage area of 570 km² and Co Bi on Bo River with the drainage area of 720 km² (1979-1985), Duong Hoa with the drainage area of 686 km² (1986-1987).
- 2 hydrological stations in downstream, observing X, H are Kim Long (Hue) on Huong Rives and Phu Oc on Bo River (1979 up to now).
- Some hydrological investigation and rainfall points in downstream.

*Hydro – Meteorological station network
in Huong Rives basin*

N.	Hydro-Meteorological station	observed Parameters	obser. method	
			Water level	Rainfall
1	Th-âng Nhậ	H,Q, R	Automatic	manual
2	Kim Lang	H,R	Automatic	manual
3	Phó ềc	H,R	giống từ ghi	manual
4	Bxnh Sĩ Ôn	H	Automatic	
5	Cæ Bi	H	manual	
6	Nam Sảng	Met.		Automatic
7	Hu Ồ	Met.		Automatic
8	AL-í i	Met.		Automatic

3. Major issues and needs related to the water cycle and water resources management in the candidate river basins

- Real time observation and warning system;
- Techniacal transfer and implementation or improving the aproppriate regional weater and river basin hydrological numerical forecasting modelings;
- Well trained NHMS's staff members for implementation and management of this system

4. The available observations and exiting data sets in the candidate river basins (type of observation, the number of station,...)

Name of river basin	N.	Hydrological station	Meteorological station
Huong River basin	1	Th- i ng Nh ̃t	Nam § ̃ng
	2	Kim Long	Hu ̃
	3	Phó èc	A L- í i
	4	B ̃nh § i ̃n	Binh Dien (R)
	5	C ̃Bi	Ta Luong (R)
	6	Nam § ̃ng	Bach Ma (R)
	7	Hu ̃	
	8	A L- í i	
Thu Bon-Vu Gia River basin	1	Thanh My	Tam Ky
	2	Nong Son	Trao (R)
	3	Hiep Duc	Kham Duc (R)
	4	Ai Nghia	Tien Phuoc (R)
	5	Giao Thuy	Que Son (R)
	6	Cau Lau	Xuan Binh (R)
	7	Hoi An	
	8	Hoi Khach	
Tra Khuc – Ve River basin	1	Son Giang	Quang Ngai
	2	Tra Khuc	Ba To
	3	An Chi	Ly Son
	4	Chau O	Tra Bong (R)
	5		Son Ha (R)
	6		Mo Duc (R)
	7		Minh LOng (R)
	8		Gia Vuc (R)
	9		Duc Pho (R)
	10		Sa Huynh (R)
	11		Son Tay (R)

(R): Rainfall station

type of observation:

- 6 hourly or 12 hourly accumulated rainfall and water level measurement;

- obser. method of : Water level and Rainfall: manual and automatic equipment

Data policy

- Vietnam is member of WMO;
- Comply with WMO resolution 40 and resolution 25
- ✓ Free and unrestricted data exchanged
- ✓ No commercial use and exploitation
- ✓ No data transfer to 3th parties unless special agreement
- ✓ Timing for data release (6 month for collection and quality checking.)

The comment on the CEOP data policy

It is very necessary for Asian countries to consult with neighbour countries of their strategic economically development, from which the proposal program will have a strength performance of the project to it's effective;

To combine the action in management, exchange of information, measured data of International river basin from upper stream to lower stream for forecasting purpose and the aim of reduction of the loss by flood caused;

To strengthen the capacity of station network (quality, quantity equipments, data transmission system, computer software in processing and conservation of data, training course, combine exchange opinion of participation countries (kinds of equipment, calibration of equipment, software, hardware) for network station

**Thank you for your
attention**

