

Vietnam presentation

**Somes problemes for nominated river basins
involved in the demonstration project
of the AWCI**

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Floods in Viet Nam represent a regular threat that occur throughout the year in different areas of the Country, affect the safety and well-being of the population and cause enormous economic loss, which in turn hamper the social development.

To minimize the loss of lives and properties by reducing flood vulnerability, that is the main target of all Vietnamese institutions concerned and especially the Ministry of Natural Resources and Environment (MONRE), HMS of Vietnam.



Fig.5 A flood inundation caused by a heavy rainfall in the central city Aug. 2001



Tanhangsaubao



Fig.6 A flood inundation caused by a heavy rainfall in the city Jul. 2004



Nha Trang lúc 13h sáng

Bà c? Lưu Th?
Minh tìm đi 2ab
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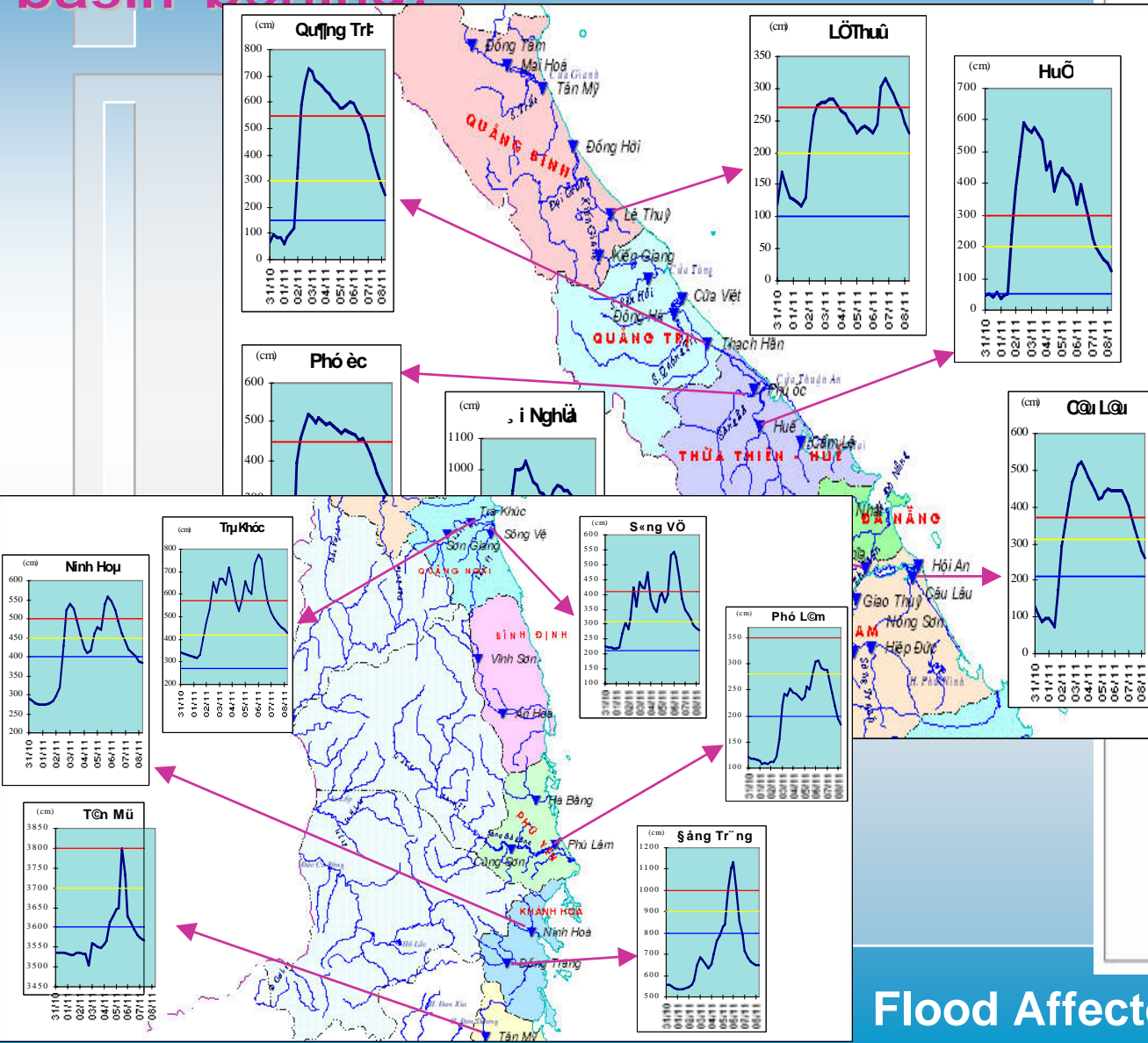
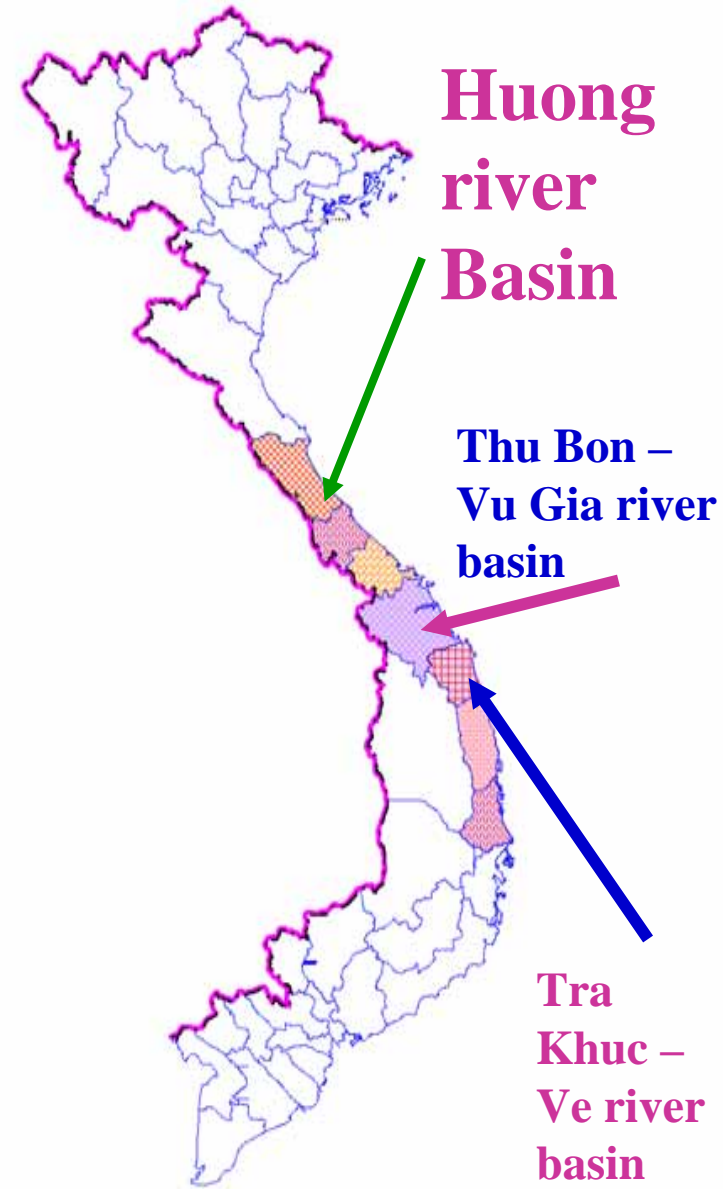




Theo Reuters, da co 42 ngu?i thi?t m?ng Sa? tru?

With cooperation for AWCI, Vietnam nominated 3 river basin behind:

Study areas



Flood Affected Area in the central of Vietnam

Mainly characteristics of river basin in the central of Vietnam

- ✓ River basin in the central Vietnam are small, short and steep slopes.
- ✓ Time of concentration is short and river basin has 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.

Some

Natural

geographical

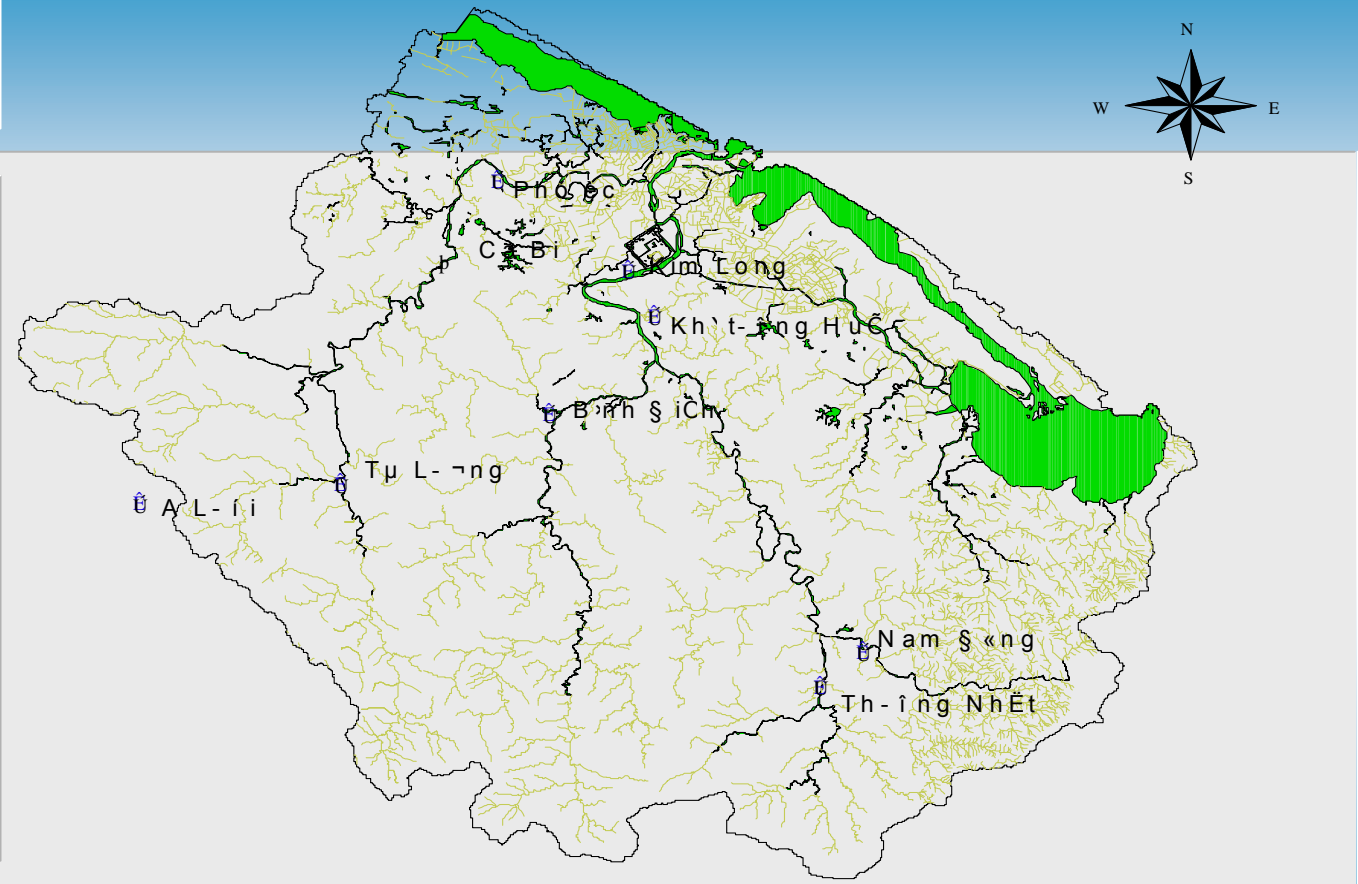
characteristics

of Huong

river basin

Huong river basin.

Area: 2.830km²



Huong river basin is located in latitude 16-17°N, longitude 107-108°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.

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

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

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 ranges from 3000mm to 3500mm, The rainy and flood season is from September to December, makes up 66-75% of the annual rainfall, and mainly concentrates in October – November.

▪The observed rainfall data during 1973-1999 showed that 75% of yearly heavy storms occur in October and November.

▪Heavy rain-storms and 4 high floods occurred in Hue 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)).

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).

Hydrological station	Terms	Peak water level exceeding (m)
Kim Long Water level warning III: +3.0m	during 23 years (1977-1999)	18 floods : +3.5m 10 floods: +4.0m 5 floods: +4.5m

2 high floods at Truoi hydrological station

Hydrological station	Peak discharge (m ³ /s)	Time
Truoi (Ta Trach river basin)	1260	26/10/1995
	1271	23/10/1996

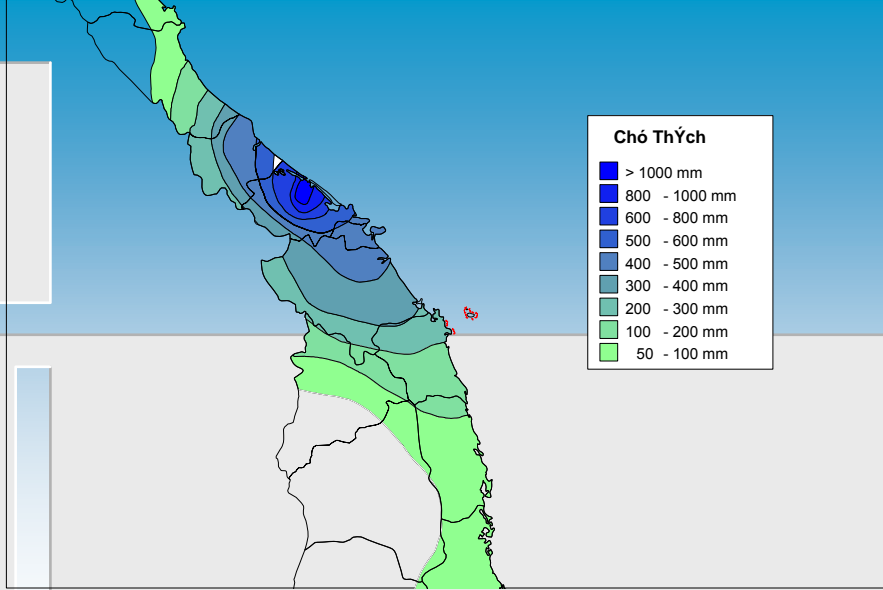
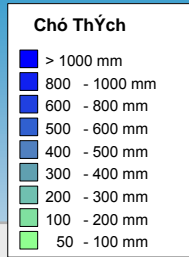
The annual rainfall in upstream of Bach Ma and Ta Trach River (observed data 5 years: 1932-1935 and 1980)

At hydrological station	Peak discharge (m³/s)	Time
Bach Ma	1260	26/10/1995
Ta Trach	1271	23/10/1996

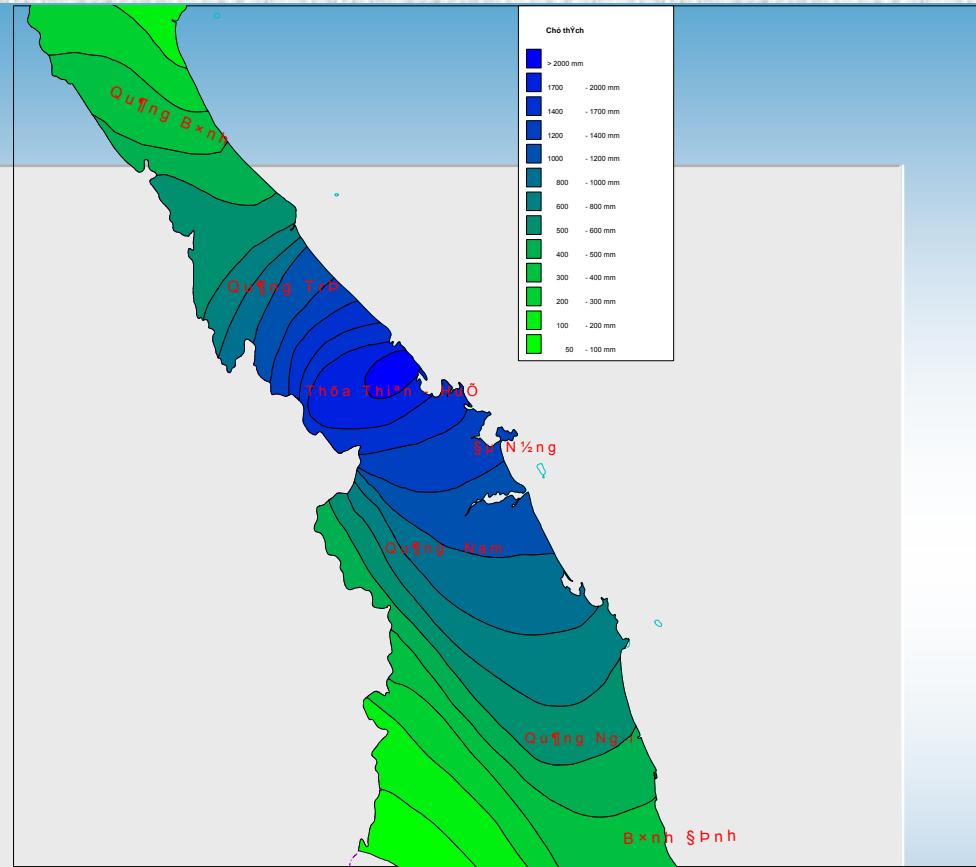
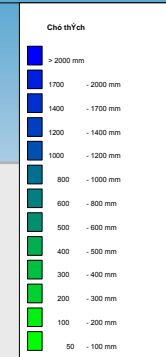
Maximum 5 day-rainstorms in Huong Rives basin from 1st to 5th November, 1999

Hydrological station	Maximum 5 day-rainstorms (mm)
Hue	2330,6
Truoi	2610
Nam Dong	1860
A luoi	2116

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

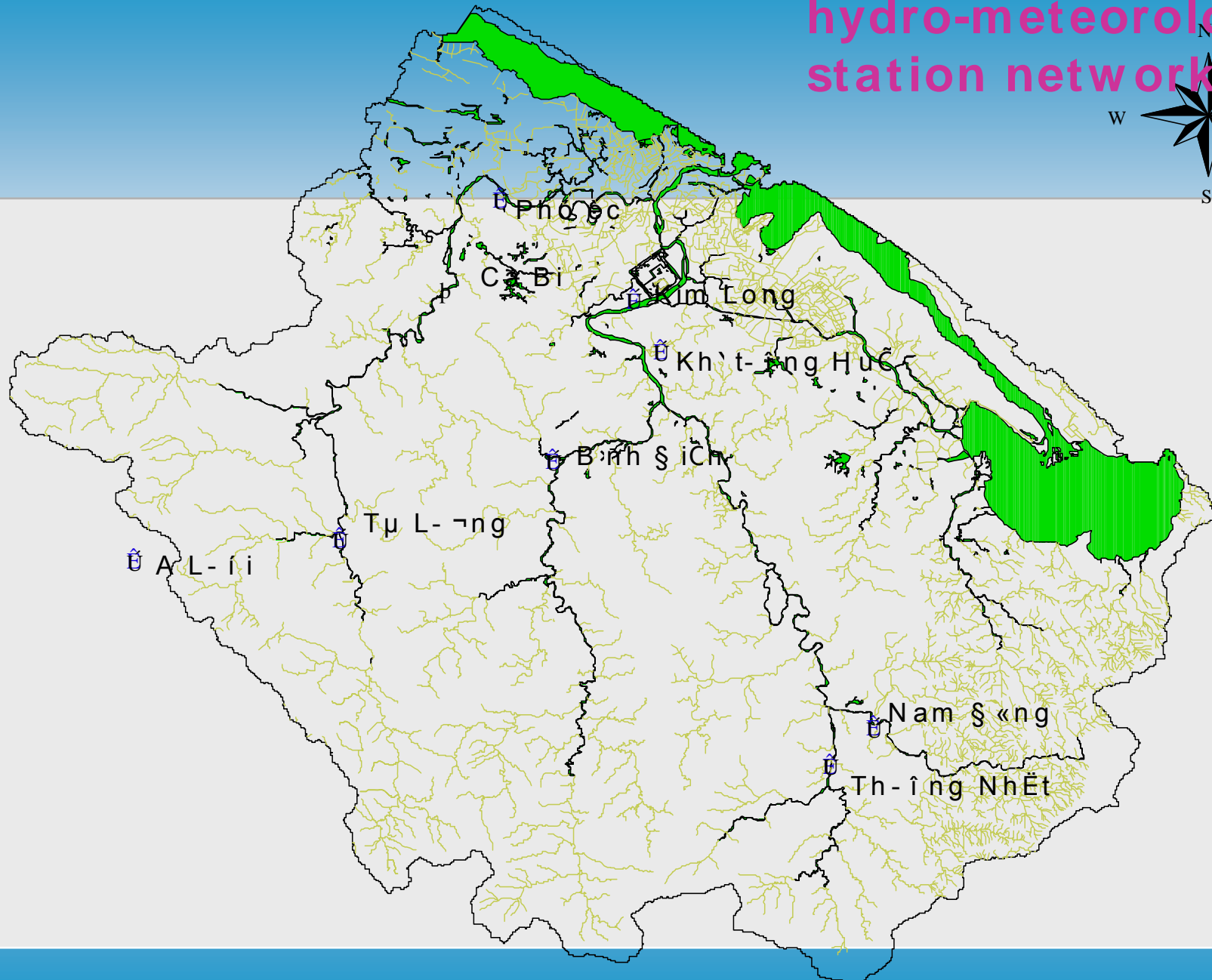
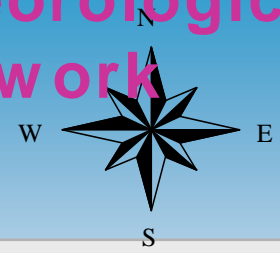


Some maximum rainstorms in short durations recorded in Huong Rives basin

(unit: mm)

Interval rainfall Location Station	Max. 24 hour-rain- storm		Max. 2 day-rain- sorm		Max. 3 day-rain- storm	
	$X_{\max 24}$	Time	$X_{\max 2}$ day	Time	$X_{\max 3}$ day	Time
Hue	1422	From 6h/2 to 6h/3 XI/ 1999	1842	2-3 XI/ 1999	2114	2-4 XI/ 1999
Truoi	1630	From 17h/1 to 17h/2 XI/1999	2200	2-3 XI/1999	2320	2-4 XI/1999

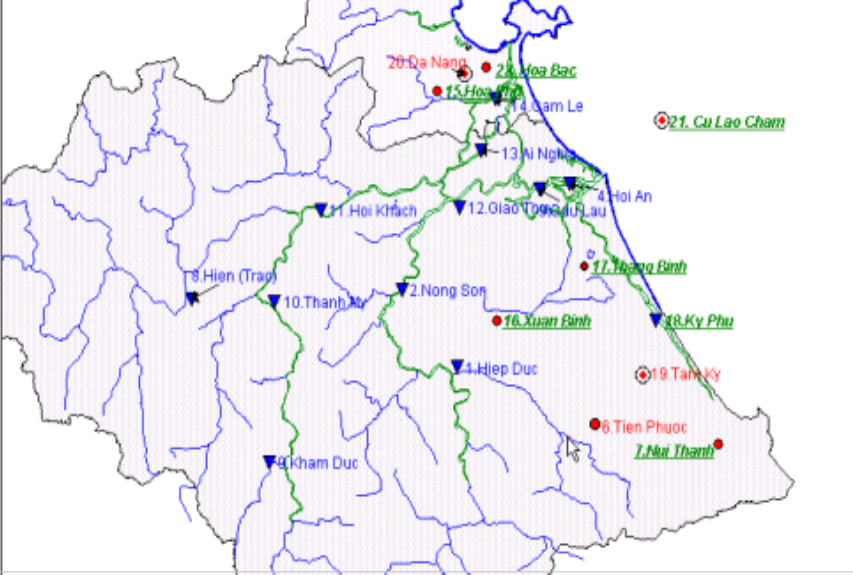
hydro-meteorological station network



Hydro – Meteorological station network in Huong Rives basin

N.	HydroMeteorological station	observed Parameters	obser. method		I equipment
			Water level	Rainfall	
1	Thuong Nhat (78 H, 81 Q)	H, Q, R	Automatic	Manual	Automatic
2	Kim Long (1976)	H,R	Automatic	Manual	Automatic
3	Binh Thanh (99)	H,R	Manual	Manual	Manual
4	Ta Luong (84)	R		Manual	
5	Nam § ong (73 to now)	Meteo.		Automatic	Manual
6	Binh § ien (78 - 85; 2000)	H	Automatic		Automatic
7	Phu Oc (1976- 93)	H,R	Automatic	Manual	Automatic
8	Co Bi (79 -85)	H	Manual	Automatic	Manual
9	Hue	Meteo.			
10	A Luoi	Meteo.		Automatic	Manual

Thu Bon River basin



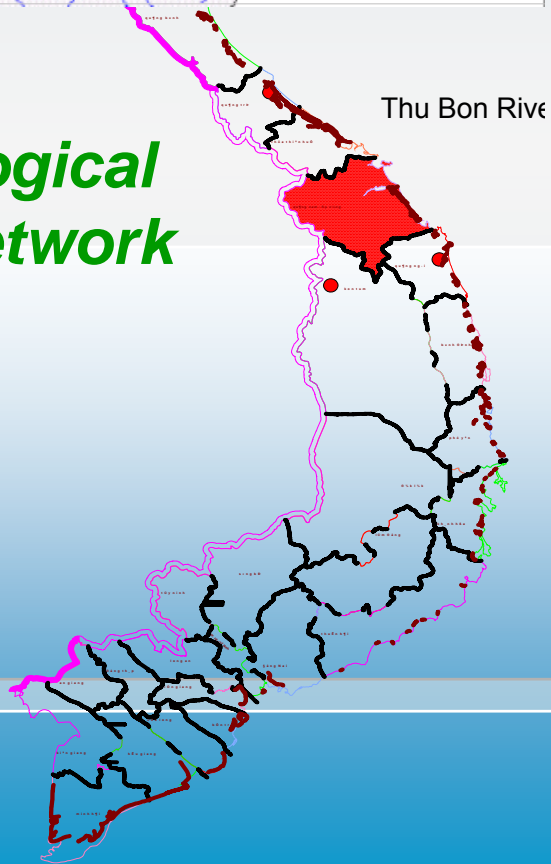
**Vu Gia-Thu Bon river basin is located in
latitude $14.57^{\circ}.07''$ - $16^{\circ}.04^{\circ}.03''$ N,
longitude $107.12^{\circ}.40''$ - $108^{\circ}.44^{\circ}.18''$ NE.**

Area: $10,350\text{km}^2$

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

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

**Hydro-
meteorological
station network**



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

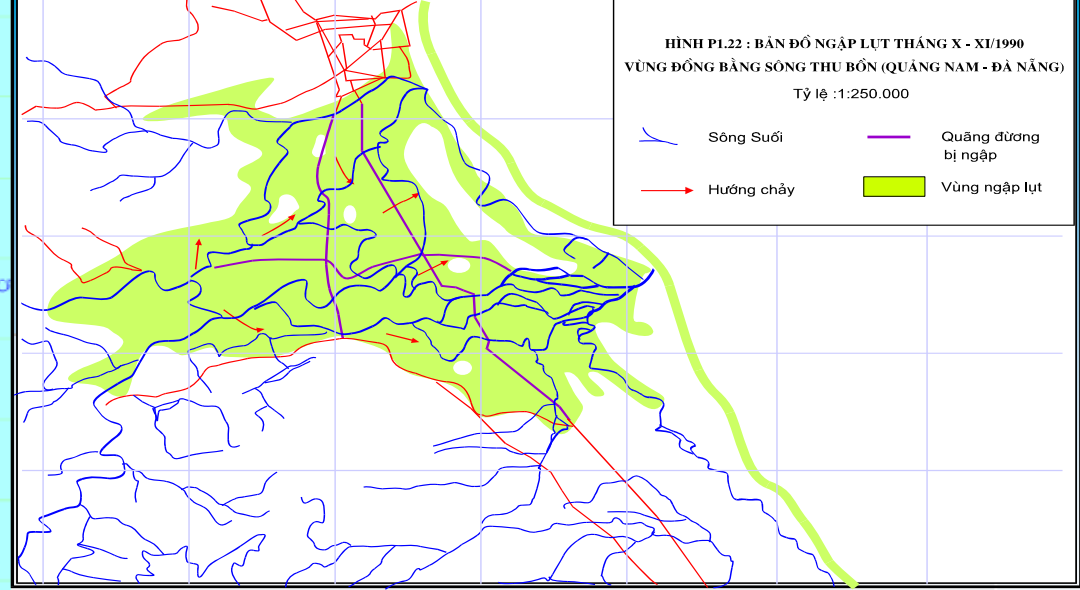
river basin	Area, km ²		Annual rainfall	Annual Flow	Month flow, Billion ³ m	
	Total	In Viet Nam	mm	Billion ³ m	Max	Min
Vu GiaThu Bon	10000	10000	2800	15.8	0.6	0.4

Meteorological station network in Quang Nam Province

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

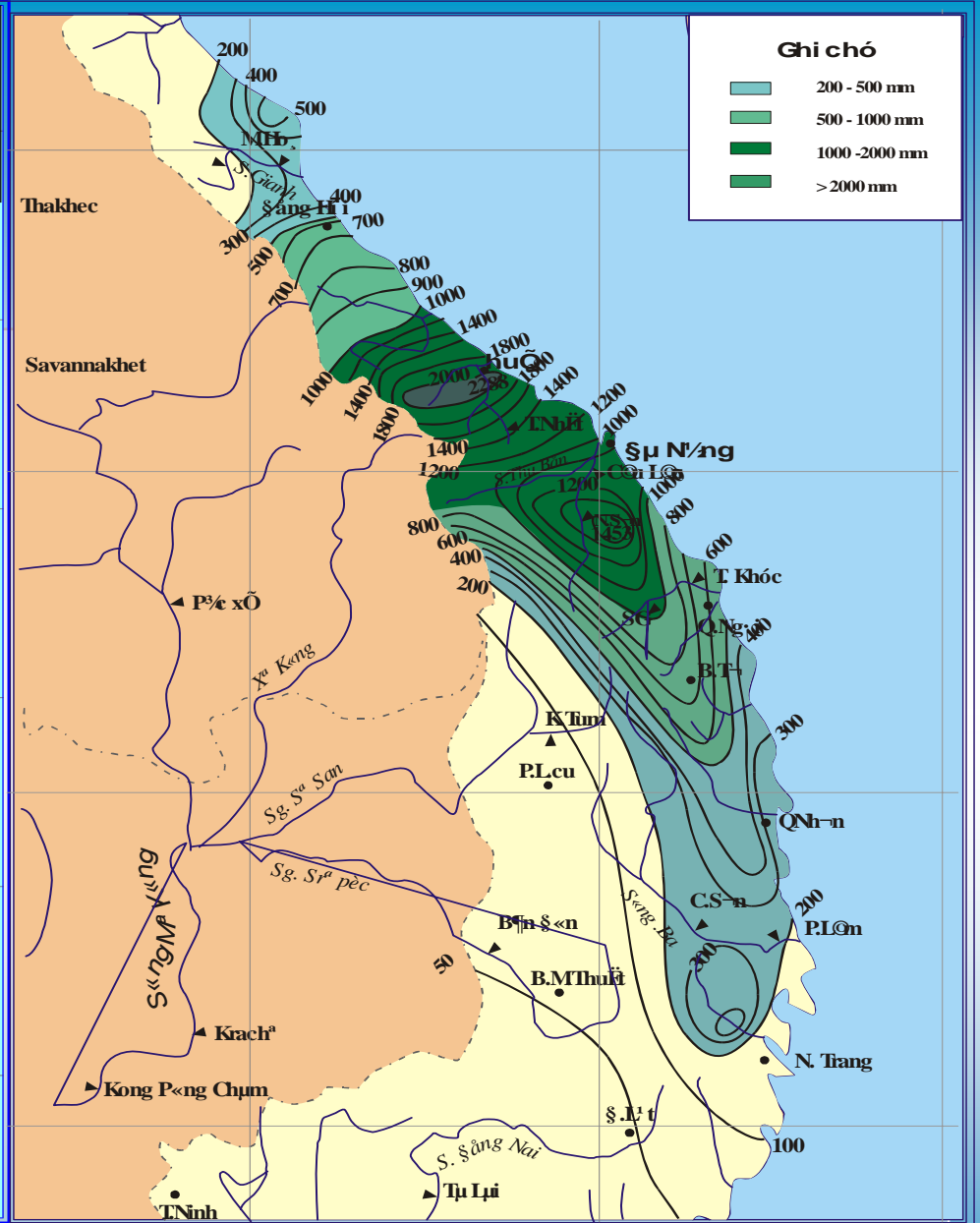
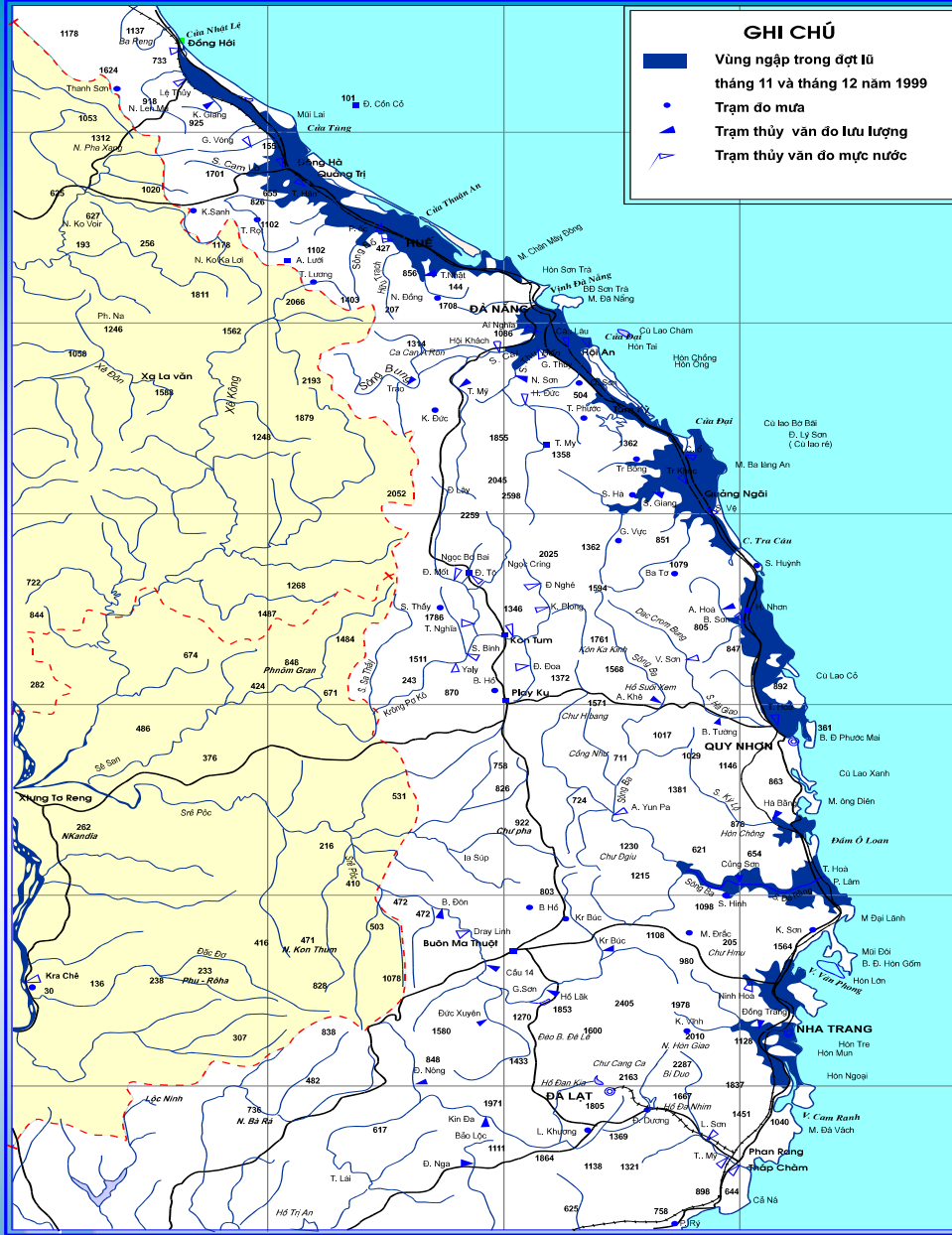
Hydrological station network in Thu Bon river basin

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 Chau, 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)

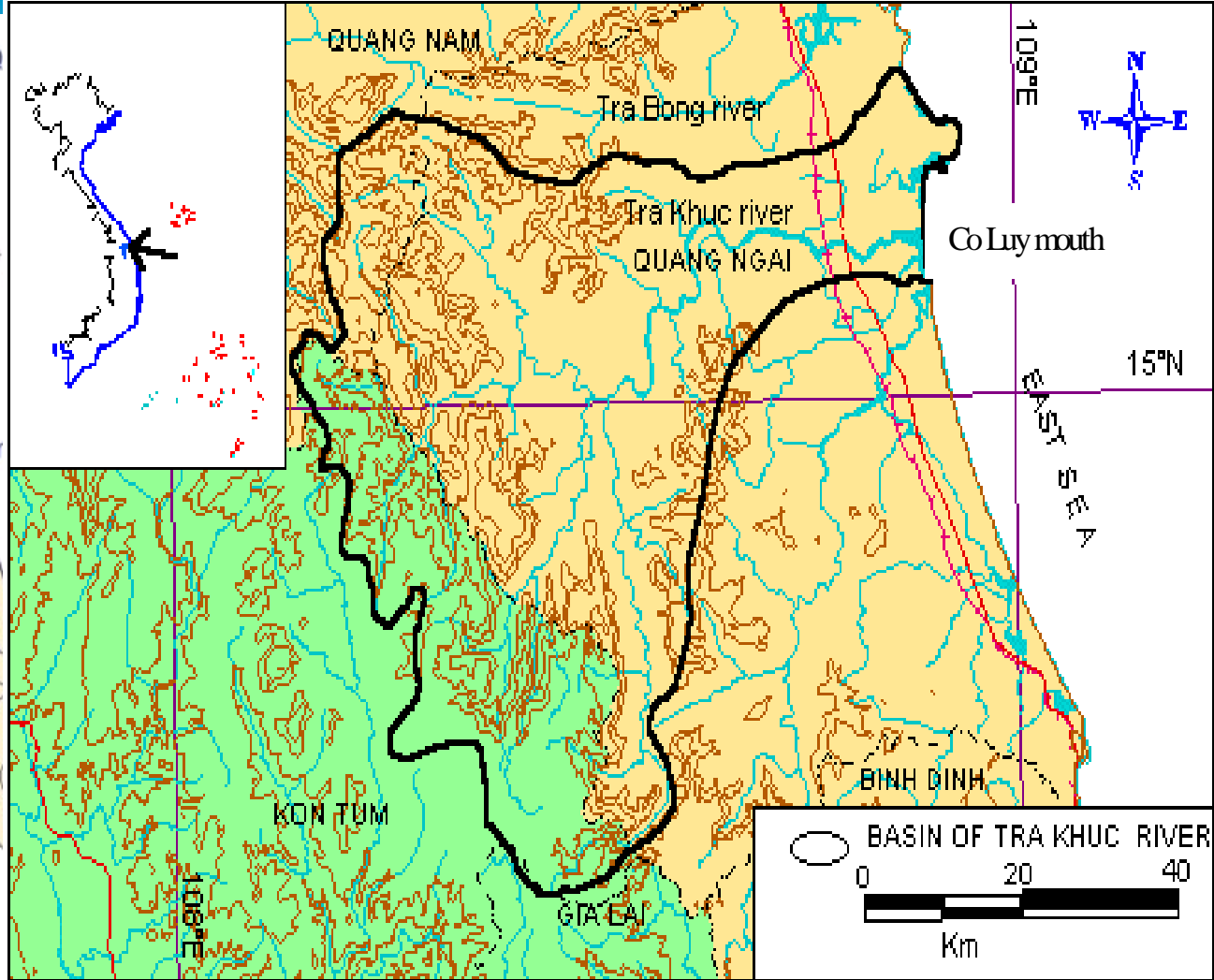
hydro-meteorological station network



Tra khuc – Ve river basin

108°07'30''-108°51'30''

14°33'-15°15'



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.

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.

Maximum value: 3 600 mm, minimum value of 1800 mm.

Rainy season starts from September to December. Rainfall amount of 4 months in rainy season: 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 Tra Khuc river and main tributaries

No.	Name of river	Length [km] 2	Highest peak [m]	Catchment Area [km2]
1	Tra Khuc (Main river)	135	1000	3 240
2	Dac Se Lo (Tributary)	63	1 050	1 760
3	Giang (Tributary)	16	300	100
4	Dac Leng (Tributary)	19	1 100	96
5	Nuoc Lac (Tributary)	16	450	93
6	Tam Dinh (Tributary)	18	600	67
7	Tam Rao (Tributary)	20	900	64
8	Xa Dieu (Tributary)	13	500	63
9	Phuoc (Tributary)	20	500	45

Characteristics of Ve river and main tributaries

N.	River name	Length river (km)	Catchment area (km ²)	highest point (m)
1	Ve	91.0	1260	1000
2	Tra No	17.0	147	200
3	Ne	17.0	104	450
4	La Chau	42.0	288	400

Hydro-meteorological station network in Tra Khuc, Ve river basin

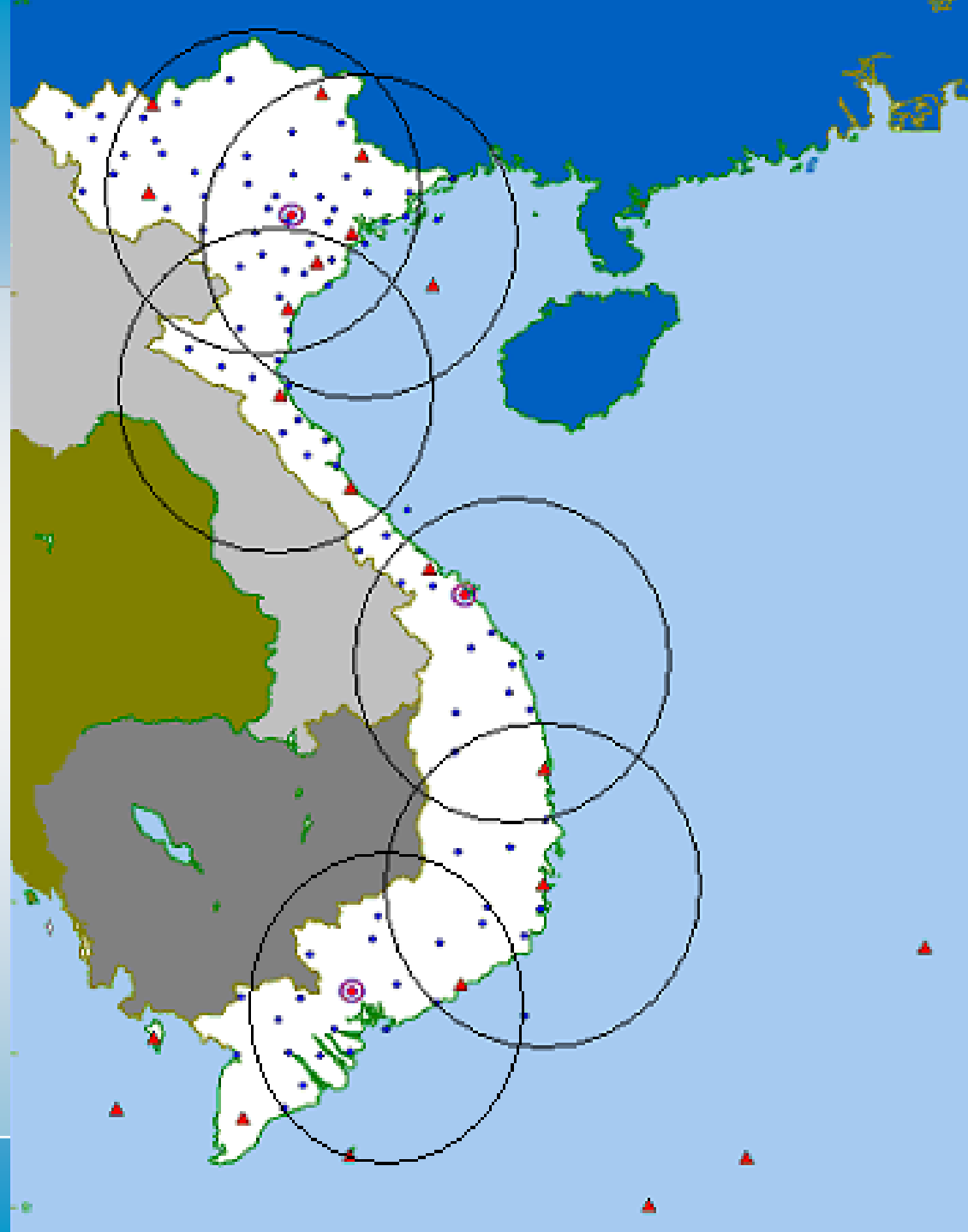
Station name	Station type	River	Catchment area (km ²)	Position		Stated year activity	Observed elements			
				Lon.	Lat.		Rainfall	Water level	Discharge	other
Quang Ngai	Meteo.	Tra Khuc		108.47	15.08	1907	X			Meteo
Son Giang	Hydro.	Tra Khuc	2440	108.34	15.02	1976	X	X	X	sediment
Son Ha	Rainfall	Tra Khuc		108.34	15.05	1976	X			
Tra Khuc	Hydro.	Tra Khuc		108.47	15.08	1976	X	X		
Gia Vuc	Rainfall	Tra Khuc		108.30	14.42	1978	X			
Co Luy	Rainfall	Tra Khuc		108.53	15.10	1978	X			
Ba To	Meteo.	Ve	814	108.43	14.46	1930	X			Meteo.
An Chi	Hydro.	Ve		108.48	14.58	1976	X	X	X	Sediment
Song Ve	Hydro.	Ve		108.51	15.04	1978	X	X		
Minh Long	Rainfall	Ve		108.43	14.56	1984	X			

Hydro-meteorological observing network

In which contain of:

Aero- Meteorological Observation:

- Radiosonde stations: 3
- Wind-gauge by theodolite (Pilot): 7
- Ozone and UV : 3
- Weather radars: 7



Information network at NCHMF

Web Server Mail Server SQL Server File Server FireWall



DMZ (Dimilitarized Zone)

THVN

VBI-TV

9 Đài KTTV KV

- PCLB Trung ương
- Đài truyền hình

Các nguồn số liệu

GTS

- Nhận số liệu quan trắc quốc tế (Synop, ship, cao không, pilot, ...)
- Các bản tin cảnh báo và dự báo
- Một số sản phẩm dự báo
- Phát báo quốc tế (Synop, Temp)

GTS Terminal

WAN

- Nhận số liệu từ 9 Đài KTTV Khu vực.
- Truyền số liệu (quan trắc, ảnh mây vệ tinh, sản phẩm NWP, các bản tin) cho 9 Đài KTTV KV và một số đơn vị khác

Modem

INTERNET

- Ảnh vệ tinh kênh phổ IR1 (MTSAT)
- Số liệu phân tích và dự báo của các mô hình (GME, GFS, GSM, TLAPS)
- Số liệu từ UNIDATA cho hệ NAWIPS qua IDD

Router

SATELLITES

- Ảnh mây MTSAT (IR1, IR2, WV, VIS, IR4)
- Ảnh mây NOAA (5 kênh)

Trạm thu

LAN-Ethernet

Các hệ thống máy tính

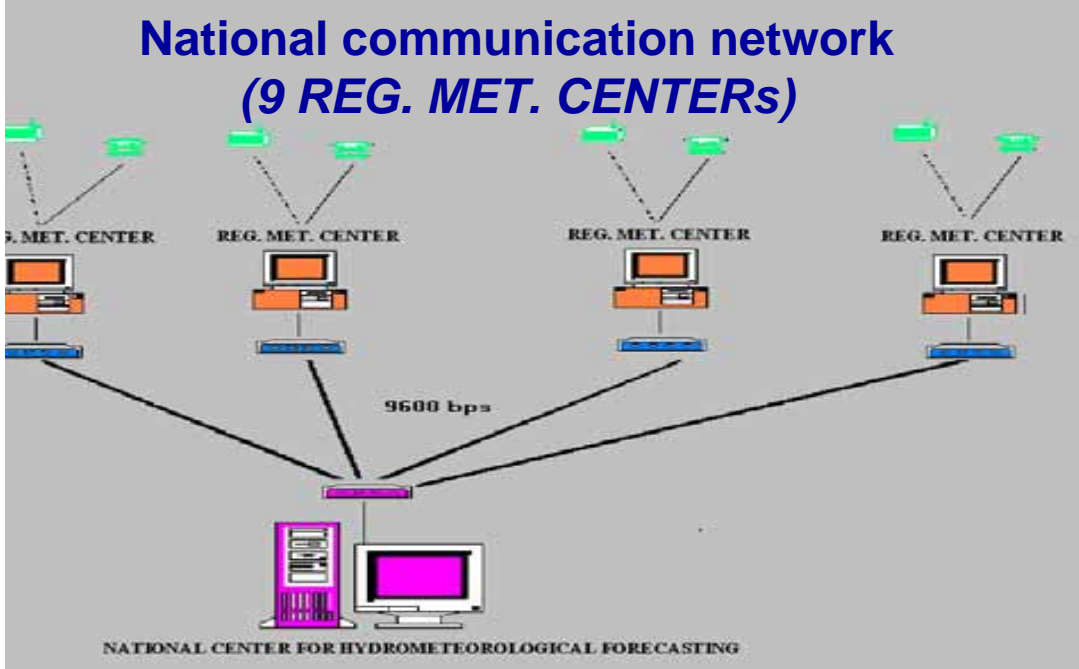
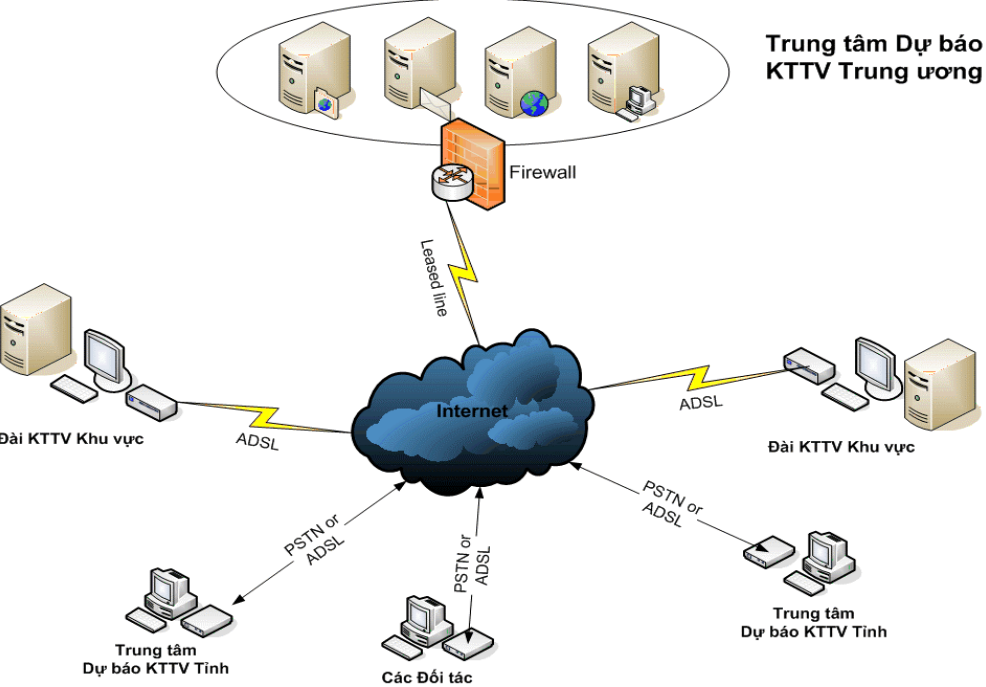
Hệ thống PC-Windows
Hệ thống điều độ tự động (CTDPS)

Hệ thống CSDL và lưu trữ số liệu

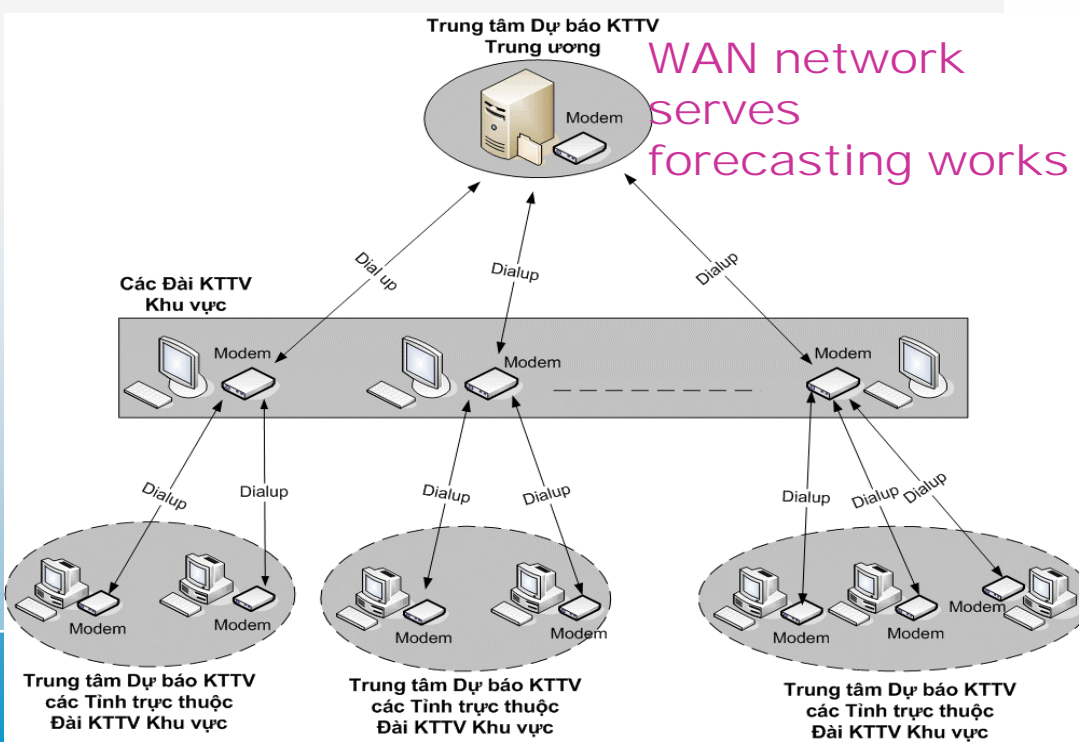
Hệ thống máy tính bó song song hiệu năng cao

Hệ thống NAWIPS-Linux

Hệ thống PC-Linux,
Máy trạm Workstation-Unix



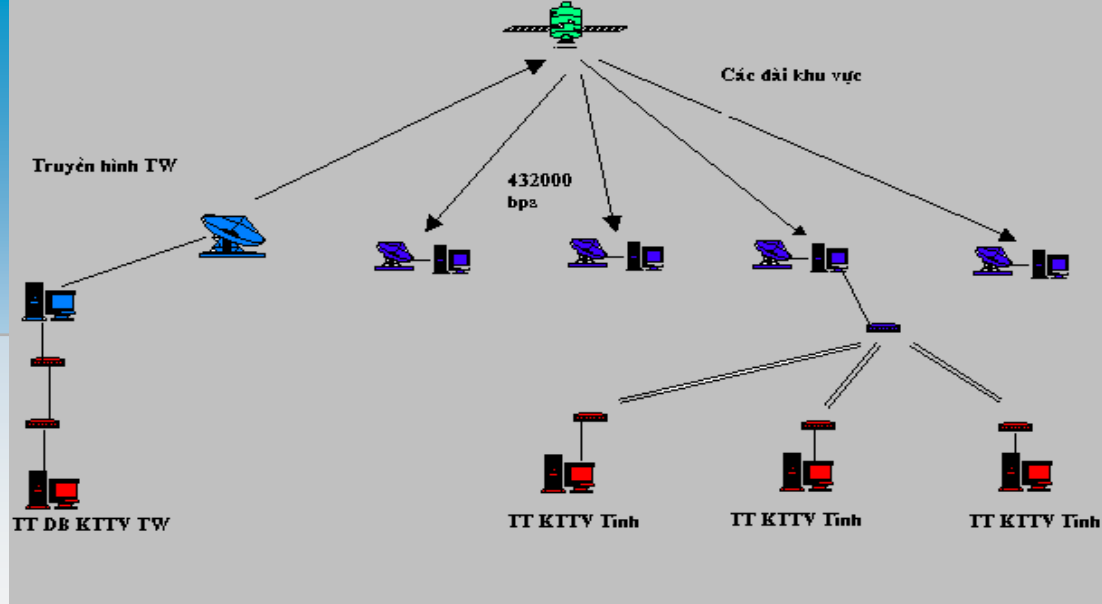
Information system via Internet



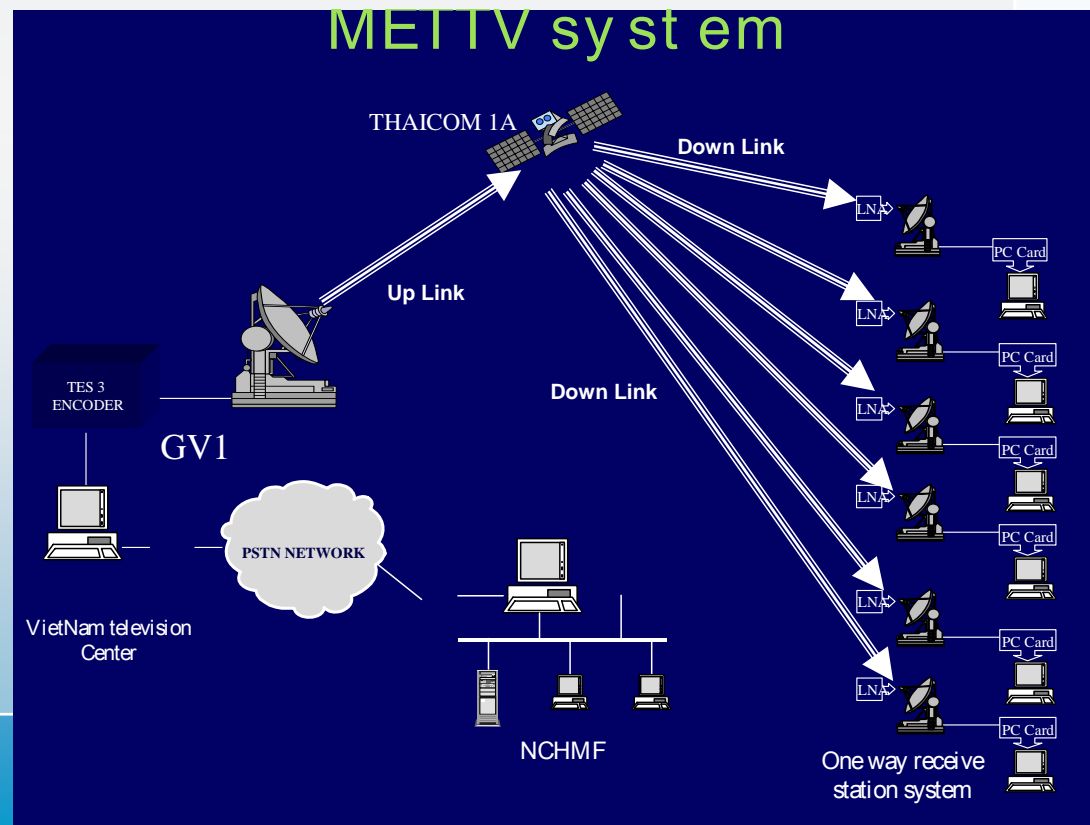
communication

3 channels connected to GTS:

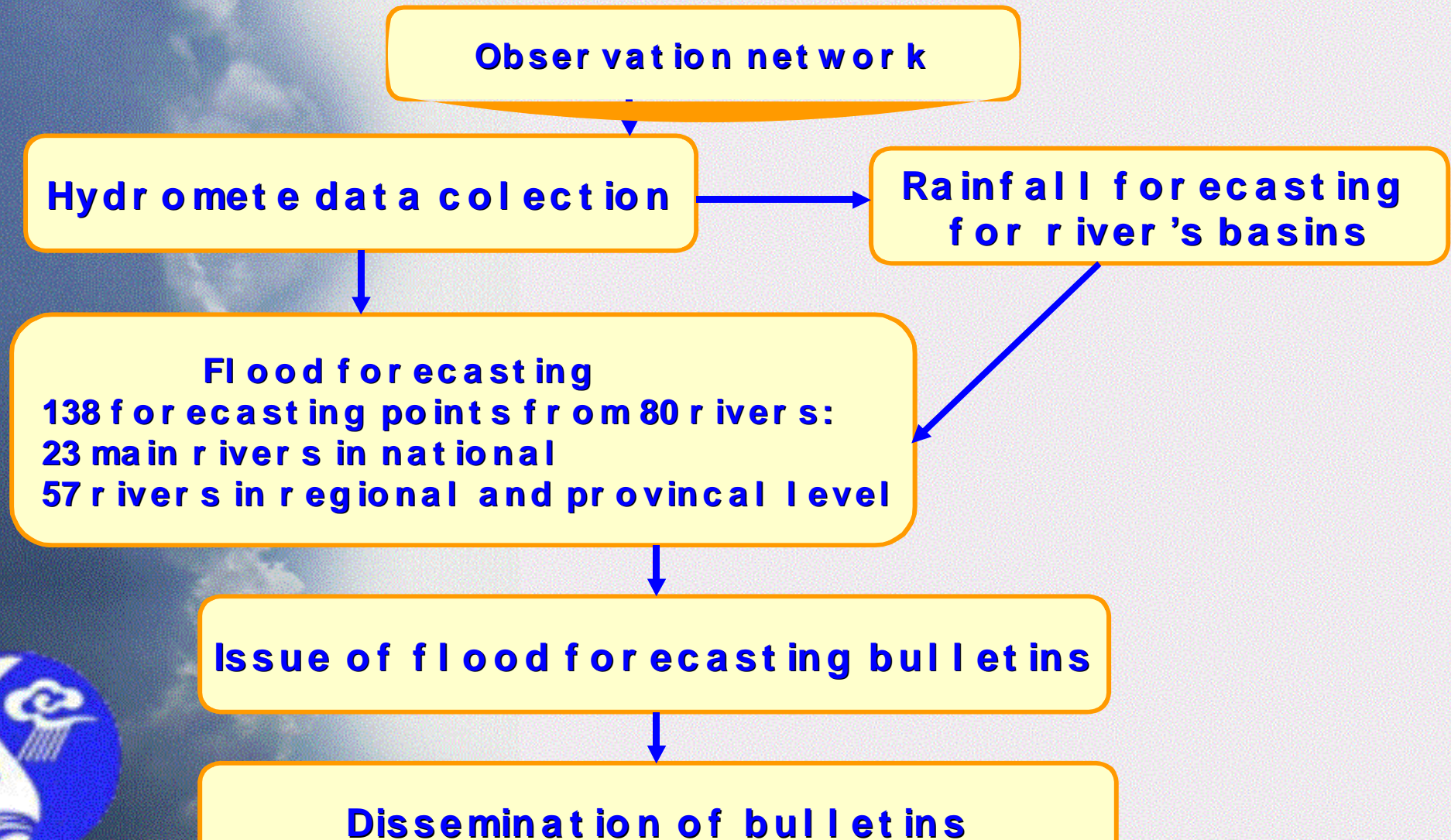
- > Hanoi - Moscow: 100 baups
- > Hanoi - Beijing: 75 baups
- > Hanoi - Bangkok: 1200bps
- > PCVSAT: Hanoi - Beijing: 9600bps



Inserting Hydro-meteorological data into TV Satellite



Flood forecasting system



Hydrological bulletins

- During flood season: 1 time/day
- Flood summary: According typhoon-flood alert regulation
- Medium-term flood forecast: 1 time/5 day (during flood season), 1 time/10days (during dry season)
- Monthly and seasonal forecasts
- Drought forecast

3 years ago to now, we are continuously implementing 2 the project for 3 nominated river basin:

Huong river basin: VIE 97-002 project;

Thu Bon, Tra Khuc river basins: Italy ODA project.

The main goal of the project is the strengthening (improving) of timeliness and accuracy of the forecasts related to flood conditions at provinces in Central part of Viet Nam to the degree necessary to allow for an efficient flooding warning system and for effective natural disaster preparedness, prevention measures and reduce the losses of properties and human lives

Development goal

- to minimize the loss of lives and properties by reducing flood vulnerability in the nominated River Basin, through strengthening the capability of flood, inundation warnings, forecasts serve disaster.

Implemented Activities.

- Establish a near-real time basin wide hydro-met information system.
- Improving the national hydrological networks and river basin monitoring/forecasting capacities.
- Improve RB monitoring and forecasting system; upgrade national data processing and archiving systems;
- Provide and disseminate the hydrological information to the users;
- build the necessary capacity in O&M of the system in the long run;
- Studies, assessments on potentials of natural disaster affecting social economies.
- Build and perform Flood forecasting and warning models for main river basins
- Establish of distributed regional databases and telecommunication networks;

Some Proposal

Technical assistances, technology transfer, exchange hydro-meteorological data, experiences and training:

- ❑ Assistance, provide of software, sophisticated hydrological models to compute and forecast flood for 3 nominated river basins (these models can get input data from the sources: satellite-based rainfall product, radar products, numerical weather prediction model products and hydro-meteorological data); Satellite - based rainfall data are very useful for ungauged or poorly gauged river basins, for real or near real time flood forecasting and warning in a river also to alarm extremely heavy rainfall events what can cause flash flood in mountain area of river basin.
- ❑ To share the skill and knowledge in combination of the data from the raingauge with radar information in order to increase the accuracy of rainfall estimates for flood forecasting.

❑ Assure provide and exchange satellite based rainfall data permanently and continuously.

❑ Improvement of cooperation for real time data exchange and transmission among nations and region.

❑ Strengthening the help Vietnam in training the capability of application, exploitation sophisticated models for real flood forecasting and warning in a river.

❑ Need the Assistance to improve data acquisition and storage, to obtain access to the Internet, and to build capacity to develop databases.

□ Viet Nam is a member of WMO since 1955 and participates in Regional Association II (Asia) NHMS cooperates with global and regional organizations: WMO, MRCs, UNDP, UNEP, UNESCO, ESCAP, ADB, IHP, ASEAN..., In the context of cooperation for AWCI, Vietnam is ready to exchange experience and provide hydro-meteorological data of 3 nominated river basin to serve the Earth Observations in the service of Water Management.

The comment on the CEOP data policy

- It is very necessary for Asian countries to consult with neighbour countries of strategic economically development of them, 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 at international river.
- To strengthen the capacity of station network (equipments, data tranmission system, computer software in processing and conservation of data, training course, exchange experiences, knowledge) for network station

Thank you!

