

FLOOD HAZARD MAPPING TRAINING COURSE

CONCLUDING REPORT

**"Action Plan toward Effective
Flood Hazard Mapping in
Vietnam"**

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INTRODUCTION ABOUT DISASTER AND FLOOD STATUS IN VIETNAM

Vietnam is stretch of land strengthening along Indochinese peninsula which is located in South-east Asia. Vietnam's mainland stretches from 23⁰23' to 08⁰02' north latitude and widens from 102⁰08' to 109⁰28' east longitude. Length counted in straight line from north to south stays at about 1,650km, width from west to east maximizes at 600km and minimize at 50km. Entire territory of Vietnam includes 329.241 km² of mainland and 1 million square kilometers of territorial sea. Currently, Vietnam enjoys 64 provinces, central cities with 622 administrative units of district and district and 10,511 administrative units of communes and wards.

Vietnam covers relatively complicated terrain: countless mountains, numerous rivers, stretching and meandering coastline, percentage relation between mountain and plains in mainland area indifferent among regions.



Fig 1. Vietnam

for million years.

Central part is sloping and narrow, its plains are closing to its coastline. The part divided by rivers originating from western ranges flowing into the South China Sea. coastline are small plains. Between mountainsides are narrow and deep

Southern part's topography is even and Long delta is a low-lying region with height of about 5m above the sea surface.

Vietnam territory covers 14 basin include and large rivers with total flow of about m³ per year. They often flow swiftly erode the terrain, carry a large amount of and estimated about 300 million ton per

The Red and Mekong rivers are two major important of all. The Red River originates

Northern part's topography is like En'eventail. Three sides of the west, east and north are mountains and hills, south side is coastline and the middle is plain, mainly as the Red and Thai Binh River

being consolidated

mountains, is cut and mountain Along the sloping valleys.

flat, Cuu average

2,860 small 867 billion therefore mud away, year.



Fig 2. Topography of Vietnam

and the most from Chinese

province of Yun Nam with length 1,140km with catchments area of 61.627 km², including 500 km passing Vietnam with catchments area of 21.787 km². Total flow of the Red River stay at about 150 billion m³ per year, its water is always turbid red since carrying about 80 million m³ of alluvial per year, there fore it is called “The Red River”

Mekong River is one of 10 largest rivers in the world originating form Tay Tang (China) with length of 1,140 km flowing through Myanmar, Laos, Thailand and Cambodia and into Vietnam. Mekong River covers length of 4,222km with catchments area of 1 million km² including 220 km passing Vietnam and 4,900km² of catchments area. Its total flowing quantity stays at 500 billion m³ and carries away about 1 billion of alluvial per year.



Fig 3. The river system in Vietnam

Vietnam lies in tropical region, which is meeting place of many atmosphere blocks resulting from continent and Equator Ocean therefore tropical climate of Vietnam deeply suffers from Asia monsoon regime, mainly as northeast and southeast monsoon. However northeast monsoon is only strong in northern and north central parts so Vietnam enjoys two different climate regions. The north enjoys two typical seasons: hot season is from May to October and cold season is from November to coming April. The South is mainly affected by southeast monsoon with heat and wetness round year. Both parts of the country all enjoy different climate sub-region depending on its features of geography and topography position. There is about 100 rainy days with total amount of rainfall of 1500 – 2000 mm per year in Vietnam.

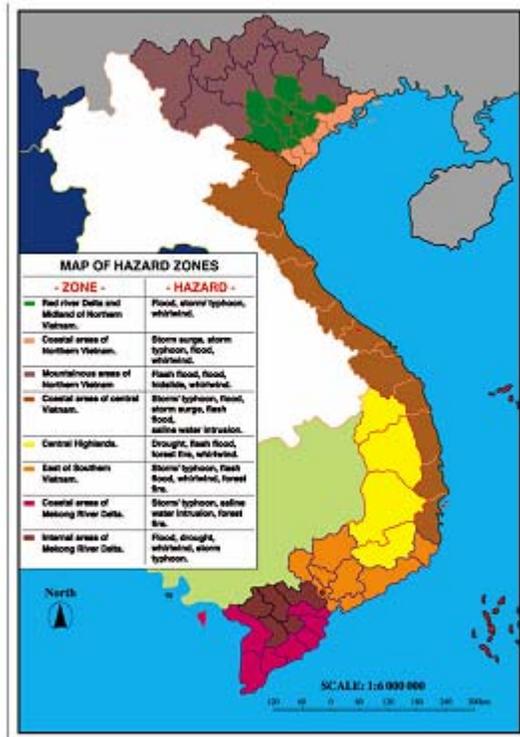
Natural disaster occurs almost round year in Vietnam, there are typical disasters in each season and particular characters in each region. Vietnam suffers from many kinds of disasters, such as: flood, storm, tropical depression, storm surge, inundation, whirlwind, flash flood, river bank and coastline erosion, hail rain, drought, landslide, forest fire,... The country is divided into 8 hazard.

Table 1. Disaster relative frequency in Vietnam can be classified as follows:

High	Medium	Low
Flood, Inundation	Hail rain	Earthquake
Typhoon, tropical depression	Landslide	Accident (technology)
Flash flood	Forest fire	Frost
Tornado	Salt water intrusion	
Drought		

Table 2. Assessment of Disaster Severity in Different Geographic Areas and in the Coastal Economic Zone of Vietnam

Disaster	Geographic Areas and Economic Zones							
	North east and north west	Red River Delta	North central coast	South central coast	Central highlands	North east south	Mekong River Delta	Coastal Economic Zone
Storm	+++	++++	++++	++++	++	+++	+++	++++
Flood	-	++++	++++	+++	+++	+++	+++++	++++
Flashflood	+++	-	+++	+++	+++	+++	+	+++
Whirlwind	++	++	++	++	+	++	++	++
Drought	+++	+	++	+++	++	+++	+	+++
Desertification	-	-	+	++	++	++	+	++
Saline intrusion	-	+	++	++	+	++	+++	++
Inundation	-	+++	++	++	-	++	+++	+++
Landslide	++	++	++	++	+	++	+++	++
Storm surge	-	++	++	++	++	++	+++	++
Fire	++	+	++	+++	-	+++	+++	+++
Industrial and environmental hazard	-	++	++	++	+++	+++	++	+++



Flooding in small rivers rises and falls quickly, from 1-5 m³/s/km² to over 20 m³/s/km². Flashfloods in mid-size and small rivers often occurs in some mountainous provinces in the central region. High and extreme floods resulted in a high loss of life and extensive property damage by inundation in downstream lowlands in the Red River in 1945 and 1971, in the central littorals in 1964 and 1999, in the Dong Nai River in 1952, and in the Cuu Long River delta in 1961, 1966, 1978, 1994, 1996, 2000, 2001, 2002.

Fig 4 . Map of hazard zones in Vietnam

Table 3. Flood duration time of the river in Vietnam

No.	Region	River system	Duration time								
			6	7	8	9	10	11	12		
1	Provinces in the North	Bang Giang - Ky Cung Red River North east									
2	Thanh Hoa	Ma river									
3	Nghe An - Ha Tinh	Ca river La river									
4	Quang Binh	Gianh river Nhat Le river									
5	Quang Tri	Thach Han river									
6	Hue	Huong river									
7	Đà Nẵng - Quang Nam	Thu Bon river									
8	Quang Ngai-Binh Dinh	Tra Khuc river Kone river									
9	Phu Khanh	Da Rang river Nha Trang river									
10	Ninh Thuan	Phan Rang river									
11	High land	Sesan, Srepok river									
12	South east	Dong Nai river									
13	South west	Mekong river									

The flood in August 1945 in the Red river:



Fig 5. The flood inundation map in Red river in 1945

As the report in 1946, it was estimated that the loss was 2 billion Indochina dongs (equivalent to 4.3 million tons of rice or 2.2 billion USD). If the dikes had not broken, the water level in Hanoi could have reached 14.1m.

The flood in August 1971 in the Red river:

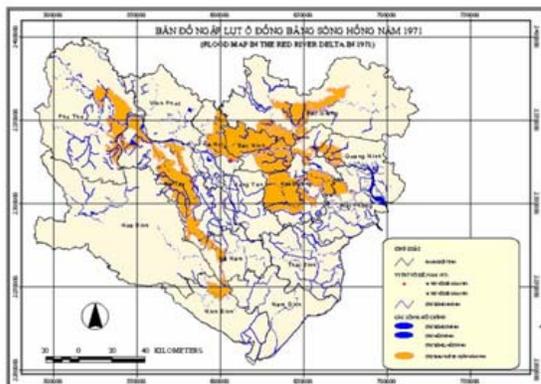


Fig 5. The flood inundation map in Red river in 1971

The monitoring maximum discharge in Son Tay station in Red river is 33.500 m³/s (Aug 20, 1945). When water level in Hanoi reached 11.45 m, the dike broke and when it reached 12.68m, 52 parts of the main and branch river's dikes broke which flooded 11 provinces, except hilly and mountainous provinces. The total flooded area was 312,000 ha and more than 2 million people were influenced by this flood. The in fact loss was not fully estimated.

This was the most serious flood in this century. The monitoring maximum discharge in Son Tay station in Red river is 37.800 m³/s (Aug 21, 1971) and total volume water is 19,6 billion m³. Water level in Hanoi reached 14.13 m and if the dikes had not broken and the flood had not been distributed, water level would have reached 14.8 m. This flood caused devolution of 648 parts of dike of 74 km length, overflowed and nearly overflowed

other 307 parts. The total flooded area was 250,139 ha; 2,71 million people was affected. Loss was estimated at about 7 million tons of rice or 1 billion USD.

The flood in Mekong river in 1978:

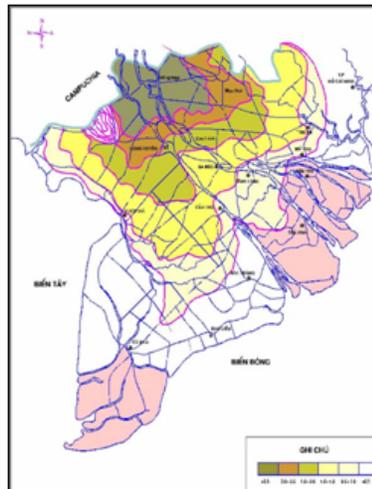
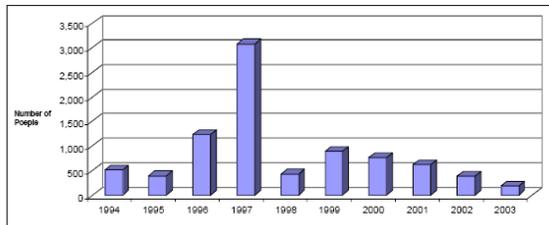


Fig 6. The flood inundation map in Mekong river in 1978 equivalent to 0.56% of total GDP of the country.

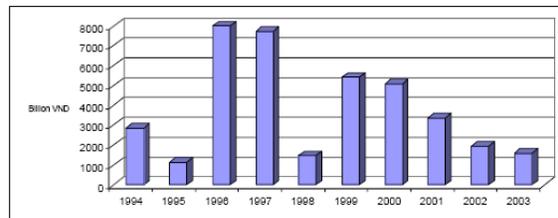
For instance, the 120 day flood in 1978 in Kratie reached a total discharge of 424 billion of cubic meters, the daily average discharge in 120 days was 41,000m³/s.

Annually, water-related disasters caused serious damages on both human and properties. According to the official statistics, in 2000, total damages was estimated about 350 millions USD, equivalent to 1.13% of total GDP of the country; while in 2004, total damages was estimated about 250 millions USD,

Graph of people killed by natural disaster from 1994-2003



Graph of damaged cost caused by natural disaster from 1994-2003



THE PRESENT COUNTERMEASURES

Strategic for countermeasures in 3 region of Vietnam.

Strategy of disaster mitigation for the regions of Red river Delta and the North Midland is to execute structural measures associated with nonstructural solutions, and measures of strengthening dyke systems, of diverging flood courses and of improving safety standards of disaster mitigation works.

Strategy of disaster mitigation for Central Viet Nam is to promote flood and storm prevention measures with the policy: "pro-active prevention, mitigation and adaptation". Management and mitigation measures include construction of upstream reservoirs, of dyke systems. These works should be combined with irrigation systems for stabilizing agricultural production.

Strategy of disaster mitigation for the Mekong River Delta is “living with flood and flood control” with specific solutions such as planning of residential clusters, construction of irrigation systems for supplying clean water and preventing salt invasion, construction of low embankment system for preventing salt invasion.

Organization framework:

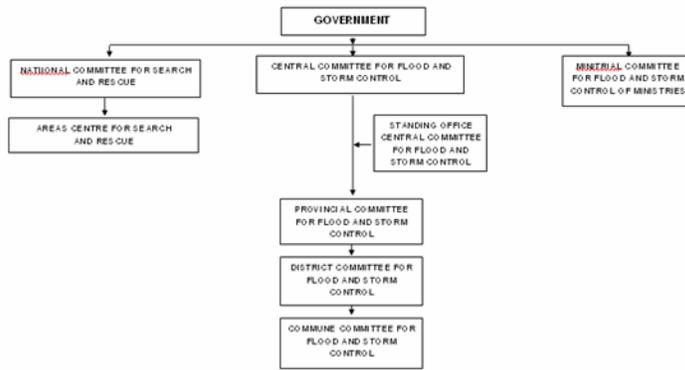


Fig 10. Organization on Disaster Management in Vietnam

The organization framework in Vietnam is a system from National to commune. The top of organization framework is Government. Under Government is two committee: Central committee for Flood and Storm control and National committee for search and rescue. Also each Ministry have own committee.

Figure 10 and 11 presents the relationship between the central and the local authority (province, district and commune), reporting line and decision making power. The system is chaired by the head of the Government, the Prime Minister. However, the management and technical power is held by a chairman (equivalent to a minister) of the CCFSC, while the search and rescue activity is held by the CCFSR. Currently, the Minister of MARD is the chairman of the CCFSC. In reality, the CCFSC operates based on an ad hoc basis and active in case of a flood or storm. The daily management responsibility is held by the director of the Standing Office of the CCFSC who is also the director of the Department of Dyke Management, Flood and Storm Control (DDMFSC) under MARD.

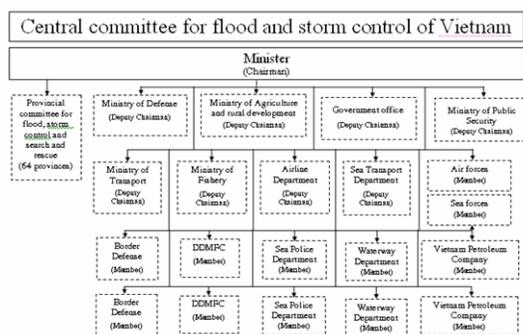


Fig 11. Organization on Central committee for Flood and Storm control

From the provincial level down to the commune level, the People’s Committee (PC) is fully in charge of the flood and storm control plus search and rescue activity. At provincial level, the CFSC is chaired by the chairman of the provincial People’s Committee (PC) while the management and technical responsibility is held by the director of the provincial CFSC who is also the director of the provincial sub-department of dyke management and flood and storm control. At district level, the CFSC is also chaired by the chairman of the district PC while the management and technical responsibility is held by the director of the district sub-department of agriculture and rural development. At commune level, the CFSC is also chaired by the chairman of the commune PC, with one assigned staff in charge of flood and storm control plus search and rescue activity. At all

levels, in the CFSC there are representatives from all concerned sectors and organizations, including Red Cross Chapter.

Policies:

- Land policy and land use management with the Land Law.
- Policies for forest planting, protecting and forest management and exploitation with the Law on forest protection.
- Policy on managing natural resources and exploitation management
- Water resources management policy with the Water Resource Law.
- Policy on environmental protection, sustainable development, and environmental management.
- Policies for flood diversion and retention and dredging riverbed for flood release.
- Policy for disaster aftermath overcoming in disaster-prone areas.
- Policies for living-with-flood areas.

Hydro and Meteorology forecast:

Hydro-meteorological forecast is presently taken by the National Centre for Hydro-meteorological forecast, Ministry of Natural resource and Environment. Its information system is currently including domestic and international network that has been enhanced and applied new achievements from informatics and telecommunication technology.

There is a hydro-meteorological observation network including: 162 surface meteorological stations, 232 hydrological stations, 788 rain gauging station and other station.

Specific measures of National Strategy and Action Plan for disaster mitigation and management in Vietnam

Water-related mitigation measures for the Red River Delta:

- Strengthening of dyke systems
- Dredging of river channels for quick flood drainage
- Construction flood cutting reservoirs in upstream of big rivers.
- Diversion and slowing down of flood speed.
- A forestation and protection of watershed forests.
- Improvement of dyke management and rescue.

Water-related mitigation measures for Central Region of Vietnam

- Reinforce the river dyke systems and the salt water resistant embankment systems to protect agricultural production and prevent early floods and flood tide,
- Train river banks and sea borders; prevent erosion, protect densely populated areas and important manufacture zones; gradually stabilize big river mouths; facilitate flood discharge, etc.
- Build and improve the canal systems and upstream reservoirs,

- Search and rescue works have been implemented efficiently when an affected area is in a severe disaster.
- Rearrange crop patterns and animal-breeding patterns to suit topographical and production conditions in disaster-prone areas in order to avoid floods in the main cropping season.
- Forest plantation in upstream watersheds and along coastal areas,
- New residential areas are being planned and built away from flashflood-prone, inundation-prone, storm surge-prone and erosion-prone areas.
- Shelters for fishing ships and local fishermen are built along the coastline of Central.

Water-related mitigation measures for the Mekong River Delta of Vietnam

Guidelines, solutions, and plans for flood control and disaster mitigation in the Mekong Delta of Vietnam are the following:

- Sustainable development in this flood-prone environment, and coexistence and accommodation to flooding.
- Programs that prevent salt water intrusion resulting from tides and storm surges are given priority, to better consolidate conditions for sustainable development in the Mekong River Delta.
- Flooding is an important issue in general, and flood control in the Mekong River Delta is even a more difficult and complicated task,
- Similarly cooperation with the upstream riparian countries in the Mekong River Basin must be followed to be able to mitigate and to manage floods in the Mekong Delta region of Vietnam.

FLOOD HAZARD MAPPING IN VIETNAM

Flood is a main disaster in Vietnam. Every year flood occurs in 3 regions (North, Middle and South). Flood hazard map is a very important tool. It is a non-structure measure for flood damage mitigation. In the future, Flood hazard map will be developed in all flood plain area.

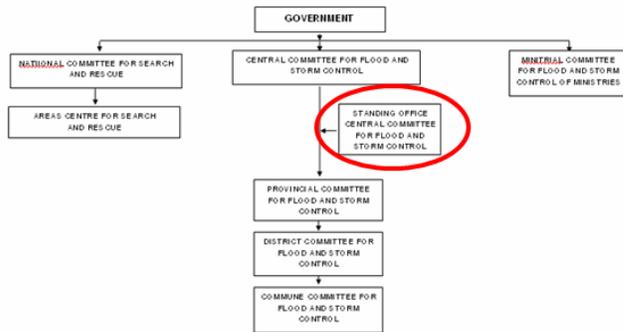
The North of VN has the complex dike system, but the dike breaking risk is very realizable on the big flood. In addition, there is a division area in the design flood. The flood hazard map will be built with scenario dike breaking and design flood.

In the middle of VN, there isn't complex dike system. Besides, dike system only protects land in the early flood season for field. In the main flood season, water overtops the dike. Flood makes inundation area. The flood hazard map will be built with scenario of every flood year .

In the part of mekong river in Vietnam, flood from river comes to flood plain every year. Every year, there are flood plains in some areas in 4 - 5 months. Flood Hazard map is a tool for evacuation and establishment of land use plan.

With the country which is very influenced by food like Vietnam, making Flood hazard mapping will be developed in near future. The map will help save life and properties of people in flood plain and contribute to suitable development process.

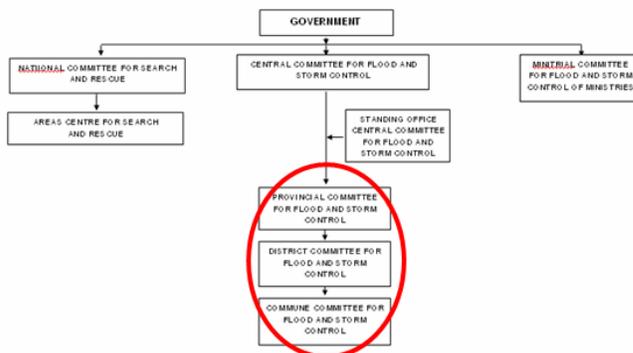
THE MAIN ORGANIZATION RESPONSIBILITY FOR MAKING ANTICIPATED INUNDATION AREA MAP:



Standing office of Central committee for Flood and storm control that is also is Department of Dyke management flood and Storm control is main organization responsibility for making anticipated inundation area map. The organization will combine with related organization, local government and people in the flood area to making the map.

Fig 12. The main organization to responsibility

THE MAIN ORGANIZATION RESPONSIBILITY FOR MAKING AND DISSEMINATING ANTICIPATED INUNDATION AREA MAP:



Local government in province, district and commune that is provincial, district, commune committee for flood and storm control will be the main organization responsibility for disseminating anticipated inundation map.

Fig 13. The main organization to disseminate

THE "ACTION PLAN" OF MAKING FLOOD HAZARD MAPS IN YOUR COUNTRY.

Target river basin area is Thach Han river basin, in Quang Tri province.

Thach Han river originated from Truong Son mountain is 150km long. Main river called Dakrong flows from upstream throuth Da Ban mountain to Ba Long, changes direction to North-east and come to sea in Cua Viet river mouth. The area basin is 2500 km².

Thach Han river has 3 main branches such as: Rao Quan (251 km²), Vinh Phuoc (293 km²), Cam Lo (539 km²). The basin average altitude is 301m, average slope is 20%, average width is 38.6km, river density is 0.92m.

From survey and monitoring, there are some big floods occurring in Thach Han river such as in oct 1923, oct 1983, oct 1985, oct 1990, oct 1992 and oct 1999. The biggest flood occur in oct 1989. Rainfall in one day is 609 mm. Maximum of water lever in Thach Han station is 7.11m (31 October 1983). Maximum discharge in Thach Han is 7590 m³/s.

Necessity to make flood hazard map in Thach Han, Quang Tri.

- There are many floods in the river.
- Quang Tri city which is a famous and tourism place in Vietnam locates in the downstream. The city is developing.
- The Thach Han basin has simple river system, there isn't so many diversion river, easy to apply HEC RAS for making flood hazard map.

The effect of flood hazard map in Thach Han river.

- The FHM is a tool to plan residential area, land use.
- The FHM is basic data to make evacuation planning.
- The FHM help people in flood plain area to improve capacity, decrease vulnerability and give more information for evacuation.
- The FHM will decrease damage in life and property.

The data and related problem to make flood hazard map in Thach Han river.

- Rain fall data
- Discharge data
- Topographic data
- Administration map
- Land use.
- Irrigation and drainage system, reservoirs.
- Transportation system.
- Inundation area in 1983 and 1999.

Action plan on making and disseminating FHM

Content	2007	2008	2009	2010	2011
Reviewing the existing inundation map in Thach Han, Quang Binh					
Collecting data related to making FHM in Thach Han, Quang Binh.					
Implementing FHM to Thach Han, Quang Binh with participation of local government and people in the flood plain region.					
Getting more comments about the FHM, completing and disseminating FHM.					
Applying to other region in Vietnam.					

Problems in making FHM in Vietnam.

- FHM is a new field with people and local government in Vietnam.
- Rainfall, discharge data are not enough to make FHM (Almost rainfall data are 6 hour data, some rainfall stations can monitor hour data.)
- Inundation area data are not exact, so it is very difficult to verify between simulation and in fact.
- Quang Binh is a coastal province, effected by tide so that the simulation for this area is more difficult
- The limit budget for non-structure measure for damage mitigation of disaster.
- Awareness of people in this area is limited.

The solution for the problem mentioned above.

- Choosing small pilot location with small complicate river system .
- The location is usually inundated in many years and a famous place in Vietnam.
- Use the existing data in Office and from other project.
- Combining with other organizations, local government and people in the flood plain area.

The improvement from FHM on Ise city currently.

- We try to add more information about evacuation route. Adding more temporary centres in the inundation area. But we have not checked the place which can be the temporary centre yet.
- Make FHM in English version

CONCLUSION

- Flood hazard map is a very important tool for mitigating flood damage.
- Flood hazard map is useful for evacuation work, land use planning and improving awareness of flood situation for people in the flood plain.