

SOCIALIST REPUBLIC OF VIETNAM

**NATIONAL REPORT ON
DISASTER REDUCTION
IN VIETNAM**

*(For the World Conference on Disaster Reduction,
Kobe-Hyogo, Japan, 18-22 January 2005)*

HANOI, SEPTEMBER 2004

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FOREWORD

The Yokohama strategy and plan of action was adopted at the World Conference on Natural Disaster held in 1994 as a mid-review of the progress during the international Decade on Natural Disaster Reduction (IDNDR, 1990-1999)

As the successor of the IDNDR, the Secretariat of the International Strategy for Disaster Reduction (UN/ISDR) coordinated a global review of disaster reduction initiative, "Living with Risk", published in 2002.

National authorities and platform on disaster reduction are invited to provide information for the preparatory process for the World Conference on Disaster Reduction in 2005. This information will be used to identify needs and future policy recommendations to be adopted at the Conference.

The preparation of this information provides an opportunity to bring together nation stakeholders from Government, academic and other sectors dealing with disaster risk reduction.

PART I

GENERAL BACKGROUND

A. GEOGRAPHICAL, TOPOGRAPHICAL AND CLIMATIC CONDITIONS

1. Geographical position

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 has inland border of about 3,730 km, shares its border with people republic of China in the north with border length of 1,150 km, people's democratic of Laos with length of 1,650 km and United Kingdom of Cambodia with length of 930 km in the west. Vietnam has sea border in the east, south and southeast, over the China Sea and Thailand gulf is the republic of Philippines, Indonesia, Singapore, Brunei and United State of Malaysia.

Map of Vietnam in region



2. Topography

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.

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 for million years.

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

Southern part's topography is even and flat, Cuu Long delta is a low-lying region with average height of about 5m above the sea surface. Some regions of this delta as Long Xuyen

quadrangle, Dong Thap Muoi and western Hau River are lower than average sea surface level, therefore this area enjoys about 1 million hectares being covered by flood water for 2-4 months per year.

Map of Vietnam's topography



Vietnam territory covers 2,860 small and large rivers with total flow of about 867 billion m³ per year. They often flow swiftly therefore erode the terrain, carry a large amount of mud away, and estimated about 300 million ton per year.

The Red and Mekong rivers are two major and the most important of all. The Red River originates from Chinese province of Yun Nam with length 1,140km with catchman area of 61.627 km², including 500 km passing Vietnam with catchman 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 catchman area of 1 million km² including 220 km passing Vietnam and 4,900 square km² of catchman area. Its total flowing quantity stays at 500 billion m³ and carries away about 1 billion of alluvial per year.

3. Climate

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 little large difference among regions if temperature is counted averagely as follows Hanoi 24⁰C, Hue 25⁰C, Hochiminh City 27⁰C, Dalat 17,6⁰C. However, there is large difference among months between the north and the south, different temperature in the north is about 10 to 15⁰C and it is about 2 to 3⁰C in the south. There is about 100 rainy days with total amount of rainfall of 1500 – 2000 mm per year in Vietnam.

Every year, Vietnam suffers directly from 6-10 storms and tropical depressions which causing heavy rain and flood after that. Storms and tropical depressions often occur from June to November but mainly in September and October. It often occurs in central and northern parts of Vietnam but once appeared in Southern part.

Vietnam's climate is favorable for tropical agricultural development but negatively influences on economic development in general and agriculture in particularly due to regular threats of storm, tropical low pressures, flood and other disasters.

B. DEMOGRAPHICAL AND ECONOMIC SITUATIONS

1. Background:

The population of Vietnam is 80.9 million (statistics as of June 30, 2004). The proportion of male and female populations is 49% and 51% respectively. 20% of the population lives in urban areas.

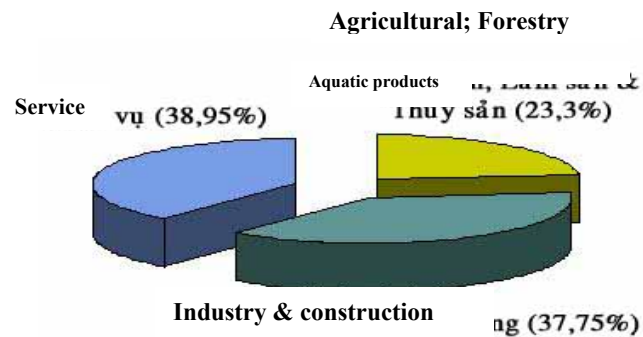


Figure – GDP structure of Vietnam in year 2003

2. Social statistics:

- Rate of children at lower secondary school age attending school: 80%.
- Rate of children at high school age attending school: to be reaching 45% by year 2005.

- Decrease in annual birth rate: 0.5‰.
- Rate of population increase: to be reaching 1.16% by year 2005.
- Number of job opportunities to be created by year 2005: 7.5 million (1.5 million/year).
- Increase in the rate of well trained employees: to be reaching 30% by year 2005.
- Rate of poor and hunger households: to be decreased to 10% (in accordance with contemporary standards) by year 2005.
- Rate of malnourished children: to be decreased to 22-25% by year 2005.
- 40% of the domestic supply of medicine will be covered by domestic companies.
- Average life expectancy will be increased to 70 years by year 2005.
- 60% of the rural population will get access to clean water.

Though frequently affected by natural disasters, the production of agriculture, forestry and aquaculture still grows stably at a rate of 3.5-4%.

The share of agriculture, forestry and aquaculture production in GDP is the smallest; however, has a very important impact on social security, particularly on the livelihood of more than 70% of the national workforce.

Agriculture pays a remarkable contribution to export turnover. The export value of rice, aquatic products, coffee, cashew and other forest products surmounts up to 3 billion USD, making up 30% of the entire export turnover and over 50% of the share of agricultural production in GDP.

3. National policy and legislation for social and economic development related to disaster reduction strategy

Natural disaster situation and social-economic development context require that Vietnam Government has to set up National policy and legislation for social and economic development related to its disaster reduction strategy.

3.1. Agriculture and Forestry sector development orientation

- To speed up agricultural and rural industrialisation and modernisation, apply scientific and technological advances to agricultural production. To enhance the scientific and technology potential in agriculture.
- To restructure production and population plan to adapt to natural conditions, to change crop plants mechanism.
- To protect and develop forest resources, to increase the forest coverage ratio to 43%. To complete stable and long-term assignment of forest and land gear towards social mobilisation for forestry development and adoption of policies ensuring the forest based livelihood of forest workers.
- To combine forestry and agriculture and issue policies to benefiting settled cultivation and residence to help stabilise and improve the life of mountain inhabitants

3.2. Regional development orientations:

- Central region: developing agriculture adaptive to the harsh natural conditions, rapidly develop industrial crops, fruit trees, combined with processing industrial, and promoting afforestation. To take measures to mitigate losses caused by natural disasters such as flood and drought combined with production and population restructures. To associate socio-economic development with environmental protection and improvement along the coastal line. To build reservoir up stream for flood control and hydropower production in the western side.
- Northern midland and mountain area: To vigorously develop industrial crops in association with processing industrial. To create upstream protective forest areas, and forest for industrial raw materials. To speed up the research and construction of Son La hydropower plant. To implement properly policies on sustainable settled cultivation and residence.
- Mekong River Delta: To plan and reconstruct residential area and infrastructure adaptable to annual flood control and counter-salinization conditions.

3.3. Socio-economic development

- **Hunger eradication and poverty alleviation** by mobilizing from the State and the whole society, to increase investments in building infrastructure, provide loans, financing vocational training, supplying information, transferring technology,... To take proactive measures to reallocate a part of population without arable land and productive conditions to resettle in potential areas. The State is to create an enabling environment for all people to strive for legitimate wealth and help the poor. To provide social benefits to people under special circumstances, unable to work by themselves and without any support
- **Development of health care and protection for the people:** by improving health care service quality at all levels, completing the planing, consolidating and upgrading grassroots healthcare network.

3.4. Reform of executive measures:

- To renew basically the planning along the line of forecast enhancement, in close combination with the use of economic and legal policy instruments in order to ensure Strategy's objectives.
- To improve quality of plans. To increase monitoring and examination implementing at all levels, and to promote the role of the people's oversight and comments

3.5. Expansion and improvement of foreign relation efficiency

- To continue expanding foreign economic relations along the line of multilateralization and diversification of relations.
- To continue mobilizing financial assistance from other governments, international financial institutions and non-government organizations.

PART II

**NATURAL DISASTER AND
DAMAGE CAUSED BY
DISASTER IN RECENT YEARS**

I. General introduction of natural disaster in Vietnam

Geographic position and topographic condition form special climate characteristic resulting to serious and diversified disasters 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,...

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	-	++	++	++	+++	+++	++	+++

The Table shows the assessment of disaster severity in each zone:

Very severe (++++)

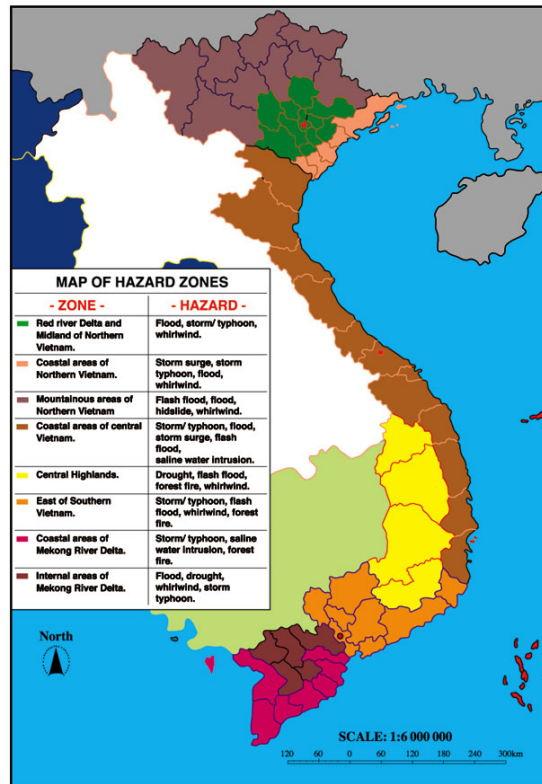
Severe (++++)

Medium (++)

Light (+)

None (-)

Map of hazard zones in Vietnam



In the late 1990s and in the early 2000s, global climatic change has brought about a remarkable increase in disaster events. Like many countries in the world, Vietnam has been faced with tremendous losses in human lives and properties as a result of devastating natural hazards. In the past 10 years, big disaster events continuously occurred in Vietnam, badly affecting all regions in the country.

II. Disaster events and damage in the last 10 years

1. Northern delta and midland

In the last 10 years, the northern delta and midland were subjected to big floods and storms in year 1996 and year 2002. In September 2003, torrential rains caused serious inundation in Thai Binh, Ninh Binh and Nam Dinh Province.

Year 1996: In August 1996, the biggest flood in 100 years in the Da River combined with big rate-10 flood in the Lo River, making the flood water level of the Red River increase to nearly the designed water level of the dyke system in Hanoi area. Heavy rains caused serious inundation in many provinces in the northern delta and midland regions. The unprecedented combination of tropical storms and increasing flood water levels (nearly 1 meter higher than

the Alarm Levels) brought about great difficulties to the protection of river dyke systems. Over 390 sections along the dyke systems were eroded (the aggregated length of dyke being eroded was 142 kilometres, of which 119 were embankments and 23 were revetments). However, major dykes have been protected safely.

Year 2002: The flood in year 2002 was the fourth biggest flood ever since the flood in year 1971 in the Red River. The flood caused 250 dyke problems to the dyke systems of the Red River and the Thai Binh River, seriously threatening dyke security in the region.

Year 2003: Early September, highly concentrated torrential rains caused severe inundation to almost the rice cultivation area of Thai Binh Province. Other provinces such as Ninh Binh and Nam Dinh also endured serious inundation. The total area of rice cultivation of the three provinces being affected by inundation exceeded 120,000ha; of which 60,000ha was in Thai Binh Province (half of this area was totally destroyed). The damage caused to aquatic production was also large.

2. Central coastal provinces

Because the region is separated and has a sloping topography, floods in the region are often severe and occur in consecutive times throughout the year. Each year, the region is subjected to huge losses in human lives and properties which require much time and effort to be overcome.

Year 1996: 5 tropical storms and 4 tropical depressions directly affected the region, causing 14 spells of torrential rains on a large extent. In the township of Quang Ngai, the total rainfall from September to December was the second largest in 80 years (the first was in year 1917). The entire central region was affected by flooding, especially the flood event between 1st and 7th November that inundated almost all central provinces and the Central Highlands. The flood water level on the Buoi River was recorded at 13.39 meters at the Thach Thanh gauging station in Thanh Hoa Province, causing breaches to the Buoi dyke system. The flood water level on the Luy River was recorded at a historical high level of 29.16 meters at the Luy gauging station in Binh Thuan Province. Flashfloods also occurred in a number of places such as the upstream area of Ngan Sau River, Huong River, Thu Bon River, Luy River, Ca Ty River, Dinh River, Cai Nha Trang River, Se San River, Dakbla River, etc. The tropical depression in August 1996 killed 124 people.

Disaster events in 1996 affected 17 out of 18 central provinces, killed 570 people, made 55 people missing, endangered the livelihoods of 353,600 households, swept away 13,800 houses, 1,352 classrooms, and 117 health clinics, damaged 509,000 houses, inundated 323,000 ha of rice, washed away 6.9 million m³ of soil related to hydraulic structures and 4.9 million m³ of soil related to transportation infrastructure, and sank 298 boats and ships. Total damage was estimated at over 2,200 billion *dong*.

Year 1998: Rainfall kept falling under the average amount from year start to September. However, in the last two months, storms and tropical depression repeatedly affected the region (one tropical depression and storms no. 4, 5, 6, 7, 8), causing severe flooding in the region. Particularly, in a very short period from 11th to 26th November, three tropical storms (storms no. 4, 5, and 6) landed in the southern part of Central Vietnam and combined with a spreading cold front, causing heavy rains in a large extent and flooding in almost all rivers in the region.

Floods and storms in 1998 killed approximately 336 people; swept away 10,560 houses and 144 classrooms; damaged 490,600 houses; inundated 110,200 ha of rice; washed away 5.2 million m³ of soil related to hydraulic structures and 3.2 million m³ of soil related to

transportation infrastructure; and sank 224 boats and ships. Total damage was estimated at nearly 1,700 billion *dong*.

Year 1999: In April, tropical storm No. 1 caused torrential rains in provinces from Ha Tinh to Quang Ngai. Particularly, within a month from 1st November to 6th December, almost all provinces in the central and southern parts of Central Vietnam were exposed to two spells of torrential rains, which caused two big floods in a vast area from Quang Binh Province to Khanh Hoa Province. The aggregated rainfall was recorded at 2,500mm in Thua Thien-Hue; 2,000-2,500mm in Quang Tri, Quang Nam, Quang Ngai, Binh Dinh and Da Nang; 1,000-1,500mm in Quang Binh, Phu Yen, Khanh Hoa, and Ninh Thuan. The highest rainfalls were 1,384mm (measured from 7am on 2nd November to 7am 3rd November) and 1,009mm (measured from 1pm on 3rd November to 1pm on 4th November) in Hue City and in Quang Ngai Province's Son Giang area, respectively.

The two spells of torrential rains caused two extremely severe floods in Central Vietnam. During the floods, water levels on all rivers exceeded the third alarm levels. Even water levels on some rivers were equivalent to or excessive of historical flood levels. During the flood period in early November, the flood water levels on rivers in Quang Tri and Thua Thien Hue provinces surpassed the historical flood levels (flood water level in Hue was 1 meter higher than the historical level). In the December flood, the water level in Quang Ngai Province was higher than the historical level. These are the two biggest floods in the past 100 years in this area. Flooding killed 715 people, inundated nearly 1 million houses, swept away thousands of houses, and incurred an economic loss of nearly 5,000 billion *dong*. This loss was among the greatest disaster related damage records of the 20th century in Vietnam.

Apart from flood and storm disasters, central provinces of Vietnam were also badly affected by drought, particularly in 1997, 1998, 2000, 2002 and early 2004. In 1998, severe drought destroyed tens of thousands of hectares of rice and industrial trees, and caused numerous forest fires. Drought caused a severe shortage of water to nearly 3 million people in central and central highlands provinces, and drained small scale reservoirs throughout the region (579 in Nghe An Province, 110 in Quang Binh Province, 85 in Quang Tri Province, etc.)

3. Mekong Delta provinces

In the last 20 years, Mekong provinces were enduring consecutive big floods, with flood return frequencies being the highest ever recorded. Floods in the Mekong delta have low discharge capacity; however, cause prolonged deep inundation, river bank erosion, and transportation failure. Extremely devastating floods were seen in year 1994, 1995, 1996, 2000, 2001, and 2002. Particularly, flooding in 2000 caused the highest damage to provinces frequently vulnerable to inundation in the Mekong delta.

- Floods in 1994: 407 people killed; damage estimated at 2,284 billion *dong*
- Floods in 1995: 199 people killed; damage estimated at 700 billion *dong*
- Consecutive severe flooding in 2000, 2001 and 2002: 1,044 people killed (one tenth of the total number of deaths in 15 years nationwide); 1.6 million houses submerged; nearly 500,000 hectares of rice inundated; total damage estimated at nearly 6,000 billion *dong* (US\$ 300 million).

The flood in year 2000 was as big as the historical flood in year 1961, causing inundation to the entire Plain of Reeds area and the Long Xuyen Quadrangle area (including the whole areas of Dong Thap Province, Long An Province, An Giang Provinces and some districts of Kien

Giang, Can Tho, Vinh Long, and Tien Giang provinces). Flood water levels in Moc Hoa, Hung Thanh, and Kien Binh in the Plain of Reeds area, and in Tinh Bien, Tri Ton, Thoai Son, Tan Hiep, Hon Dat, and Kien Luong in the Long Xuyen Quadrangle area were 30-50 centimetres higher than the ones recorded in years 1961, 1978, and 1996. The flood killed 481 people and caused an economic loss of nearly 4,000 billion *dong*.

In addition, sea water rising and salt intrusion also brought about great losses to the Mekong delta. The typhoon Linda in year 1997 killing nearly 3,000 people was considered as the most devastating disaster in the century nationwide.

4. Disasters in mountain areas:

For recent years, disaster occurrence in Vietnam mountain areas has tendency of getting increasingly complicated. Hail, whirlwind, landslide, flash flood, mud and rock flood etc. happen suddenly with increasingly unprecedented severity and scale, devastating small watersheds, causing serious losses in term of human lives, properties and ecological environment. It was recorded a number of typical flash floods over 10 recent years such as the flash floods happened in provinces of Lai Chau and Son La in 1994, 1996, 2000 and 2002; the flash floods happened in provinces of Lao Cai, Ha Giang, and Cao Bang in 2000, 2001, 2002 and 2004; the flash flood happened in Binh Thuan province at the end of July 1999 caused 30 people dead, hundreds of houses swept away; especially the historical flash flood happened from 17 to 22 September 2002 at 2 districts of Huong Son and Huong Khe of Ha Tinh Province, caused 53 people dead, 111 people injured, 7,253 houses swept away and collapsed, 53,210 houses submerged and affected, 6,881 ha of rice and other crops buried and submerged; the most recent severe flash flood happened in Ninh Thuan province at the end of the year of 2003 caused serious damages in term of human lives and properties.

Flash floods associated with mud and rocks have removed a number of agricultural cultivation areas, towns and hamlets, of which the Muong Lay town in Lai Chau province had been relocated due to being subjected to numerous flash floods. In rainy season, erosion events abundantly occurred, caused traffic interruptions that had been hindering relief efforts as well as affecting to people's daily living.

Preliminary findings showed that for the 10 recent years, flash floods caused 453 people dead and missing, 277 people injured and tens of thousands people affected psychologically and economically. Besides, infrastructure such as irrigation works, traffic routes, communication means etc. was seriously damaged with total loss value reached up to VND 1,700 billion.

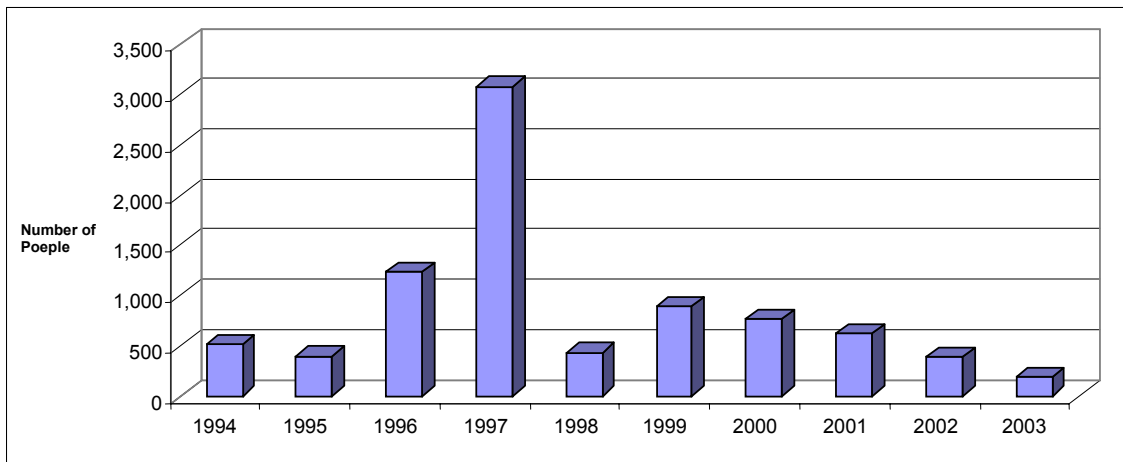
III. Table of damage assessment caused by disasters for the 10 recent years:

Damages caused by natural disaster in Vietnam from 1994 to 2003

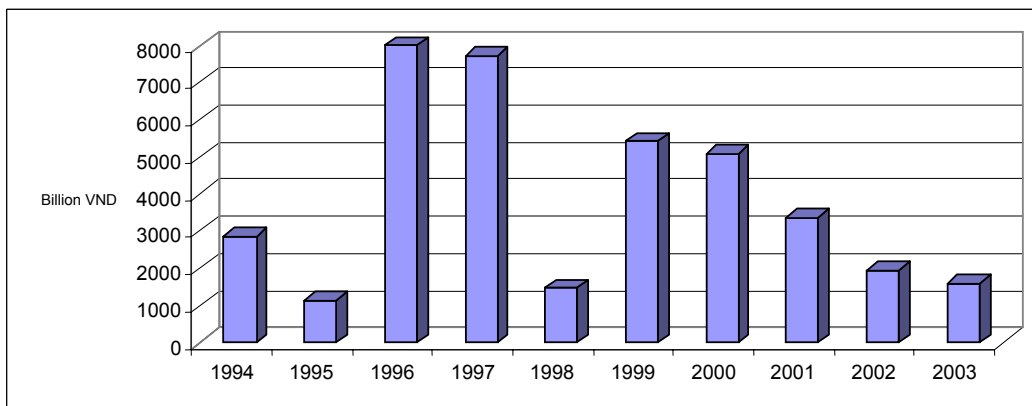
Item	Unit	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	Total
People killed	No	508	399	1.243	3.083	434	901	775	629	389	186	7.537
Houses collapsed	No	7.302	11.043	96.927	111.037	12.171	52.585	12.253	10.503	9.802	4.487	395.202
Rice fields submerged	Ha	658.676	198.439	927.506	641.393	103.422	131.267	655.403	132.755	46.490	209.764	4.692.313
Shrimp, fish poll broken	ha	6.364	120	4.761	34.619	215	1.419	2.877	1.002	310	10.581	65.955

Item	Unit	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	Total
Ships sunk, damaged	Unit	43	1.117	1.017	3.008	231	845	109	2.033	26	183	11.764
Area of forest fire	Ha	8.322	9.648	12.758	1.361	14.812	1.139	850	1.845	15.548	1.402	115.664
Total	Bil.VND	2.850	1.129	7.998	7.730	1.459	5.427	5.098	3.370	1.958	1.589	40.835

Graph of people killed by natural disaster from 1994-2003



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



PART III

**STRATEGY AND MEASURE FOR
DISASTER PREPAREDNESS AND
MITTIGATION**

A. STRATEGY FOR DISASTER PREPAREDNESS AND MITIGATION

I. For the North Vietnam:

North Vietnam locates in the Southeast Asian monsoon area, which is subjected directly to hot and humid climate of Pacific and Indian Oceans. Therefore floods and rains frequently happen in river basins annually, causing serious flooding over the Red River Delta and the north midland region. In the past 50 years, there were recorded 03 severe flood events occurred in 1945, 1969 and 1971 that caused dyke failures in a numerous places, making hundreds of hectares of land inundated and millions of people affected, costing thousands of VND billion.

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

II. For Central Vietnam:

Central Viet Nam is a long-stretching and narrow region which is frequently subjected to flood and storm disasters. Storms affected to Central provinces of Vietnam are often originated from tropical storms and depressions come from the South China Sea (East Sea), and from tropical and cold fronts.

Severe storm with strong wind is often engaged with heavy rains, causing river water level rising and flood. In case a storm or tropical depression occurs together with a cold front, it can result in long and torrential rains, causing serious flood over river basins of the Central region.

Strategy of the Vietnamese Government on disaster management 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.

III. For the Mekong (Cuu Long) River Delta:

A large area in the north of this region is subjected to inundation due to floodwater flows down from upstream Mekong River every year. The flooded area ranges from 1.2 to 1.4 million of ha in years of small and medium flooding, and around 1.9 million of ha in year of severe flooding. Inundation time lasts from 2 to 6 months, with flood depth ranges from 0.5 to 4 meters. These conditions create a lot of difficulties in life and production of local people. On the other hand, floods bring about various benefits to local residents such as: soil enrichment of alluvium, soil washing, aquatic products ...

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.

B. MEASURES FOR DISASTER PREPAREDNESS AND MITIGATION

I. Organizational framework

The Central Committee for Flood and Storm Control is responsible for assisting the Government in:

- Observing and investigating the establishment and implementation of the annual flood and storm preparedness solutions and plans;
- Issuing mandates on mobilizing labor forces, equipment, etc. to in time respond to pressing situations which are over the local authorization;
- Instructing localities to overcome consequences caused by floods and storms;
- Organizing summing up workshops on disaster preparedness and mitigation to propagate experiences, lessons, and advanced technologies in disaster preparedness and mitigation in localities and sectors

People's Committees of all levels establish the Committees for Flood and Storm Control at each level, which are responsible for:

- Helping the equivalent People's Committee to build and instruct the implementation of flood and storm measures in the territory;
- Organizing dyke protection, flood and storm preparedness and mitigation, and protecting local socio-economic areas;
- Overcoming flood aftermath.

Ministries and central sectors establish Sector Committees for Flood and Storm Control, which are responsible for:

- Building and implementing flood and storm preparedness and mitigation, protecting people, physical and technical materials under the sector's management
- Managing contingency materials and equipment in supporting to flood and storm preparedness and mitigation under the sector's management function
- In time supply materials, equipment, technologies, etc. to affected areas in emergency situations and support flood and storm aftermath overcoming, following the mobilizing mandates of the Central Committee for Flood and Storm Control
- Drawing out experiences in flood, inundation, and storm preparedness and mitigation and propagate them to localities and units in the sector.

Since the effect of the Decree No. 168/HDBT, which stipulated the functions, responsibilities, and organization of the Steering Committees for Flood and Storm Control from the central to grassroots levels, the organization of disaster preparedness and mitigation in general and flood and storm preparedness and mitigation in particular were strengthened. The effectiveness of the Steering agencies was consolidated to in time respond to disaster situation and development. A part from establishing flood and storm control agencies at levels, sectors, and localities, steering agencies for flood and storm control should also be established at key works and locations to actively respond to flood and storm development which can cause

problems in these areas. Flood and storm preparedness and mitigation actively implemented in three stages: response preparation, response, and aftermath overcoming, actively helped to mitigate damage and losses and quickly stabilized people's lives and restored production.

II. Policies

1. Land policy and land use management

The State of Vietnam promulgated the Land Use Law and other legal documents relating to land use. In addition to regulations on general management of land, the Law also had regulations on managing land for construction of residences in avoiding disaster-prone areas and using land in the scope of flood and storm prevention works, specially in the riverbed for flood release to ensure smooth flood release and reduce danger for the dyke system. Thanks to policies specifically stipulated in the Land Law, Water Resources Law, and other relevant legal documents, initial achievements in land management relating to disaster preparedness and mitigation were obtained.

2. Policies for forest planting, protecting and forest management and exploitation

Forests in Vietnam were consecutively decreased from 43% in 1945 to 28% in 1995 and the protective forests like Northwest area remained only 6%. Reasons for this is population growth in combination with the shortage of management of the State. On the other hand, consequences of wars also caused rapid decrease of forests.

Thoroughly understand the role of forest in environmental protection, especially protective forest in flood mitigation for the downstream areas, the State of Vietnam promulgated the Law on forest protection in combination with the issuance of policies as follows:

- Policy on settled cultivation and fixed residence and development of water resources in mountainous areas to stabilize livings of people who are used to shifting cultivation.
- Policy on afforestation under Program No. 327 and No. 773 of the State, the program for reforesting 5 million ha.
- Policy on land and forest transfer to encourage afforestation and forest protection
- Policy on extending farming model in the mountainous and midland provinces
- Policy on closing some forest gates to improve the preservation of protective forest
- Strengthening forest protection organization and forest fire prevention and fighting

3. Policy on managing natural resources and exploitation management

Natural resources of Vietnam are distributed thinly in highly mountainous areas. There are places of rich natural resources as coal in the northeastern north. To strengthen the management of natural resources and restrain environmental destruction. The State strengthened the management of exploitation in exploited mines of the State. The Government issued policy on managing coals to constrain free natural resources exploitation, which caused pollution and environmental destruction.

4. Water resources management policy

Water resources in Vietnam are very diversified due to high rainfalls. The distribution of surface flows under time and space is uneven, depending on the characteristics of rain. The dry season is often long. In the dry season, streams and rivers in the mountainous areas are dry. In the coastal areas, tides deeply penetrated the mainland, causing salinity in rivers and canals, affecting using water supply and agricultural cultivation.

Like in other countries, water resources in Vietnam are exploited firstly for usage, then for agricultural and industrial production.

Underground water is also remarkably exploited to serve daily usage and agricultural production. Series of drilling wells are being used for daily water demand and irrigation.

To overcome the possible scarce of fresh water and orient the socio-economic development and environmental protection, the State promulgated the Laws on Water Resources to enhance the management and suitable and effective usage of water sources, prevent pollution and waste of water, and limit impacts of water.

5. Policy on environmental protection, sustainable development, and environmental management

In many years, the Vietnamese Government concerned about environmental protection. The issuance of the Law on environmental protection contributed to the establishment of a synchronous legal environment to adjust socio-economic activities and to maintain sustainable development. Despite great efforts, industrial disasters happened and the industrial environment continued to be polluted and deteriorated, affecting the country's sustainable development.

The pressure of population growth and urbanization also increased environmental pollution. Combined studies and cooperation among natural scientific, technical, and technological sectors as well as social and humanitarian sectors are loose, especially in fundamental researches and practical activities relating to management. Environmental protection is weak and lacks of strategic orientation. Therefore, the Central Party's Political Bureau issued on 25 June 1998 the Instruction No. 36/CT – TW on “Strengthening environmental protection in the country's industrialization and modernization” in an attempt to improve the situation. An action plan was implemented with main contents as follows:

Build a Strategy for environmental protection and sustainable development

Consolidate the State's management on environmental protection

Introduce education on environment to the curricula of primary school education

Issue the Government's Decree on environmental protection

Absolutely resolve bases causing environmental pollution

Revise and supplement the Law on environmental protection

6. Policies for flood diversion and retention and dredging riverbed for flood release

One of flood and inundation mitigation measures for the downstream areas is to build flood diversion and retention works. Especially after the historical flood in 1971 in the Red River

System, the Government decided to improve the Day River flood diversion work and newly built some flood retention works on the two Red River and Thai Binh River, as well as promulgated some policy for the flood diversion and retention as follows:

Draw out annual evacuation measures to protect people's lives and properties when implementing flood diversion and retention

Work out policy for the flood diversion and retention areas to devote attention to people's livings when implementing flood diversion

Policy for flood aftermath overcoming and production rehabilitation after flood diversion

7. Policy for disaster aftermath overcoming in disaster-prone areas

In Vietnam, there are many disasters annually such as flood, storm, whirlwind, flash flood, and landslide, which caused a lot of losses to local people and properties. To mitigate disasters in the region, like other countries, the policy of the State of Vietnam on aftermath overcoming is that local authority should actively organize aftermath overcoming activities. The Government also implemented a series of policies on aftermath overcoming to quickly stabilize people's lives and restore production in the destroyed areas. The policies are as follows:

Policies on allowance for families which have people killed by disasters

Policies on allowance for medical treatment for disaster victims

Policy on supporting families which have their properties lost by disasters

Policy on supporting foods for flood-affected areas whose crops were destroyed

Policy on supporting seeds and fertilizer for agricultural production restoration

Policy on providing loans for production restoration

Decisions on rehabilitation of infrastructure facilities such as transportation and hydraulic works, schools, clinics, etc. in flood-affected areas

On the long-term, the Government is interested in studying plans for taking disaster mitigation measures in every locality.

Thanks to the mentioned above policy, disaster-affected localities quickly overcome the aftermath, stabilize people's living, and restore production

8. Policies for living-with-flood areas

In areas which are not protected by dykes and often inundated as the Mekong River Delta and the Central Part of Vietnam, the State of Vietnam aimed to implement the "living with flood" solution. The State's policies in the "living with flood" areas are:

Planning residences, transportation networks, and fruit orchards to constrain damage caused by frequent flooding

Instruct people to build house models which can get adapted with the inundation conditions

Offer loans to people to avoid inundation

Instruct people to build outer dykes, shift crop timing, using adapting species of plants for flooded areas

Investment policies for upgradation of infrastructure facilities in inundated areas to create storm and flood shelters for local people

III. Hydro-meteorological 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 informatic and telecommunication technology.

The current situation is as follows:

The hydro-meteorological observation network including:

162 surface meteorological stations (63 timing-data receiving and transmitting stations, 4 to 8 times per day)

232 hydrological stations (36 stations of level I, 30 stations of level II, and 166 water gauging stations)

29 agricultural meteorological stations

15 up-to-air meteorological stations

21 water meteorological stations

133 environmental, air, and water controlling stations

788 rain gauging stations

2 weather radar stations

3 GMS satellite image stations with low resolution

1 GMS satellite image receiving and processing and NOAA satellite orbit station with high resolution

IV. International cooperation

1. Regional disaster management cooperation within ASEAN:

Viet Nam has established and maintained a close cooperation in disaster information and management area with countries in the South-east Asian region. Since 1967, priorities in disaster management of ASEAN countries were set up with the foundation of the Standing Committee of the Southeast Asian countries on social and cultural affairs. Cooperation scopes include:

- Taking part in expert group of disaster management in the Southeast Asian region (presently Disaster Management Committee of the Southeast Asian region). Activities of the Committee are:

- Cooperation of the member countries has been promoted in fields such as: establishing common action plans for responding to disasters, strengthening response capacity, sharing experience in disaster mitigation, establishing technical cooperation projects...
- Building of national capacity through programs such as: Planning of training on disaster management network in the Southeast Asian countries; delivering training on disaster management expertise like: disaster assessment, damage and need assessment, searching and rescue of vulnerable works, prevention of forest fire, systematization of disaster prevention knowledge and experience.
- Establishing a disaster information sharing network in every Southeast Asian country such as: websites, information systems, newsletters, disaster risk mapping ... in the Southeast Asian countries; studying, developing and disseminating learned lessons; promoting the use of climate and weather forecast bulletins.
- Promoting cooperation with outside partners such as: establishing community-based disaster management projects, mobilizing funds and supports from NGOs and international organizations...
- Popularizing training programs to raise awareness and adaptability, including: organization of the Disaster mitigation Day in Southeast Asian countries, integration of disaster management to school curricular, improvement of communication and awareness raising programs in the Southeast Asian countries, dissemination of disaster management trends in development plans of the Southeast Asian countries.
- Taking part in partnership project for disaster reduction in the Southeast Asian region (PDR-SEA II).
- Joining in implementation of community awareness raising projects.
- Establishing common codes for damage assessment appropriate to the Southeast Asian region.
- Conducting studies and researches on global climate change.

2. International cooperation in disaster management:

Vietnam has made remarkable contributions in cooperation with international organizations and countries all over the world for disaster management.

- Website on disaster prevention and dyke management of Viet Nam has been developed with support from UNDP, providing relevant information at the address of: www.ccfsc.org.vn
- Taking part in cooperation programs of disaster management of Asian and UN's organizations. In 2001, Viet Nam was awarded by UN the Sasakawa Certificate of Merit, recognizing Vietnam's contributions in disaster management.

3. Cooperation with NGOs in disaster management

Vietnamese Government has closely cooperated with local and international NGOs to launch and implement projects and programs on national disaster reduction.

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

1. Water-related mitigation measures for the Red River Delta:

Main structural measures include:

- 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.
- Afforestation and protection of watershed forests.
- Improvement of dyke management and rescue.

a. Strengthening of dyke systems:

- Dyke is a basic measure to protect delta and midland areas affected by the Red River, which cover 1.44 million of ha of and land, providing habitat for 17.7 million of population. Presently, there are 45 dyke sections along the Red and Thai Binh river systems with the total length of 3,000 km.
- Implementing programmes of dyke surface hardening with concrete, of planting of bamboo and Vetiver grass for wave prevention, of improvement, upgrading and construction of under-dyke sluices, of treatment of weak dyke foundation, of construction of spillways for extreme flood event prevention.
- Constructing works for river and sea bank erosion prevention, for river channel regulation, for bank protection.

b. Dredging of river channels for quick flood water drainage:

This is a traditional measure used to be applied in the Red River Delta and the North Midland Region.

c. Solution of reservoir construction in upstream areas:

Large reservoirs are constructed for complex purpose including flood cutting, water flow regulation, water supply and power generation in dry season in the most effective way. However the first priority task of reservoirs in the upstream areas of the Red River system is to prevent flood for downstream areas.

d. Flood diversion solution:

Flood water on the Red River is to be diverged into the Day River and several areas in the upstream region of the Red River to protect Ha Noi and downstream areas. This is an emergent supporting solution applied when reservoirs have been used for cutting flood but water flood level at Ha Noi is still higher than 13.6 meters.

e. Afforestation and forest protection:

This is a traditional solution for reserving soil and water, preventing erosion and soil degradation, preventing flash flood, especially in areas where there is no reservoir in place. As planned in the 5 million ha afforestation programme to year 2010, the coverage of forest in the Northwest and Northwest of the North Viet Nam will be increased to 55.55% of the total area.

f. Organization of effective management and exploration activities of flood preventing solutions for the Red river delta and midland areas:

- Establishing a network of observation stations of hydro-meteorological phenomena for flood forecasting and early warning, as well as improving quality of flood forecasting and early warning.
- Managing downstream areas, river channel systems in downstream areas, and flood preventing works in compliance with the Flood and Storm Control Ordinance, with the Forest Establishment and Protection Law, with the Water Resources Law, with the Environment Protection law and with other related laws.
- Formulating regulations and procedures of reservoirs based on properly collaborating operation of existing flood prevention measures, for increasing their effectiveness on flood cutting for downstream areas, preventing possible failures during a flood event.
- Raise public awareness, design policies and financial mechanisms to enhance the capacity in implementing structural and non-structural measures
- Arrange forces for search, rescue and overcome the damage of floods following the 4 on-the-spot policies (local human forces, local facilities, local commandment and local logistics)
- Strengthen and improve communication systems for better dissemination of flood forecast and warning information
- Develop river flood alert models to provide timely flood alert to allow the application of proper mitigation measures.
- Prepare plans for responding to possible disaster events, including concrete measures for mitigating disasters
- Study crop structure shifting as a means to mitigate damage caused by disasters to agricultural production.

2. Water-related mitigation measures for Central Vietnam

- Reinforce the river dyke systems and the salt water resistant embankment systems to protect agricultural production and prevent early floods and flood tides
- 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

- Authorities at all levels and local people in disaster-prone areas in Central Vietnam consider flood and storm control as annual focal tasks. Training and education to improve community awareness is being carried out. Basic knowledge about floods and storms and their effective mitigation measures propagated broadly to villages, families, and individuals. Therefore, each village, each family, and each individual is being aware of disaster mitigation and management step by step, and make these activities part of their daily life, those contribute to the hunger eradication and poverty alleviation.
- Vietnam Government step by step provides modern equipment and training to improve technical expertise and the effectiveness and quality of disaster forecast and warning activities. Local agencies are being skilled with the capacity to make forecasts and to issue warnings for small and medium size river basins from general weather forecasts. Communication systems and warning transmission systems have been improved to allow every individual of the community to be informed about possible upcoming disaster situations. For Central Vietnam, early and accurate forecast and disaster warning information transmission on the mass media play an important role in disaster mitigation and management at local levels.
- Search and rescue works have been implemented efficiently when an affected area is in a severe disaster. The supply of search and rescue means, contingency food, contingency medicine, and other necessary goods are being implemented.
- 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. Cultivation is changed from three disaster prone crops a year to two disaster safe crops with higher yields.
- Forest plantation in upstream watersheds and along coastal areas is stimulated to increase the forest cover of river basins to contribute to flood reduction, to increase water flows in the dry season, and to reduce damage from high tides and storm surge to coastal residential areas.
- Incentive policies are developed to assist with the mitigation of floods and storms for specific industries in flood-prone areas, and to stabilize living and livelihood production conditions.
- Construction of industry and housing infrastructure that are suitable for disaster-prone areas is being undertaken. Structures should be located in area safe from disasters and be consolidated together to minimize the costs to the country and to the people.
- 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 Vietnam. These shelters should be built through coordination of the fishing industry, transportation authorities, and port administrations.
- Planning for construction of flood and storm control works, from upstream to downstream on rivers and in estuary areas is being further studied.

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

The objectives for flood-control and flood-mitigation measures in the Mekong Delta of Vietnam are the following:

- To protect human life and property, to maintain safe and sustainable housing for local people, to maintain social security.
- To protect the stability of agricultural production and to increase the land-use coefficient.
- To protect infrastructure works.
- To protect and sustain the ecological environment in the Delta.

To achieve these objectives, both structural and non-structural measures are being used. These measures are suitably planned for all sectors of the economy, use the most suitable technologies, be easily managed, and be compatible with Mekong River Exploitation Agreements with upstream Mekong River Basin countries.

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

- Sustainable construction and sustainable development in this flood-prone environment, and coexistence and accommodation to flooding. As all activities in the Mekong River Delta are under the influence of upstream water flow, a mutually beneficial cooperation program of flow disaster mitigation among countries in the Lower Mekong River Basin is being implemented efficiently.
- 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.
- Better standards for taking emergency actions under disaster conditions, and regulations on responsibilities in disaster management should be developed and issued.
- Flooding is an important issue in general, and flood control in the Mekong River Delta is even a more difficult and complicated task. This is because flooding effects the entire basin, all economic sectors, all local agencies and all the people. Therefore, appropriate research and development are being ongoing. In the future, it is very important to collect materials, to carry out specialized studies, and to cooperate with upstream countries to find solutions to the multi-purpose tasks of flood mitigation and management. On the other hand, plan for flood proofing of important areas, to clarify and to improve flood disaster guidelines, and to build flood resistant structures; in order to utilize the full potential of the Mekong Delta region in Vietnam.
- Full coordination with the new flood mitigation and management strategy of the Mekong River Commission is considered to be very important. 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.

C. LESSONS LEARNED

1. Active preparedness and prevention and adaptation

Each level should be proactive in the prevention and mitigation of disasters. Active adaptation should be encouraged to enable people to adjust their lives in accordance with natural conditions in order to mitigate the damage caused by disasters.

2. Disaster preparedness and mitigation is a task of the entire society which requires active participation of communities

- The 4 on-the-spot policies are significant as they help reduce the damage caused by disasters to a minimum level.
- The combined strength of different societal communities should be mobilized to overcome failures of flood and storm protection works and to effectively implement search and rescue activities.
- Education and training should be promoted to raise public awareness of disasters and disaster management.
- Child keeping centers should be established during flood season in the Mekong Delta to ensure that children are safe when their parents are away for work. This should be done by both the government and local communities.

3. Due attention from the government and close cooperation of related ministries and sectors

- The Government designs strategies and action plans for disaster mitigation, as well as supporting policies to integrate disaster mitigation into hunger eradication and poverty reduction programs, and to effectively distribute relief to victimized localities.
- The relationship between different sectors under the umbrella of the multi level committees for flood and storm control has been remarkably strengthened.

4. Increased international cooperation

- Vietnam has been cooperating closely with other countries in the region and throughout the world to better its disaster management activities.
- Support from the international community has contributed remarkable to reducing the damage caused by natural disasters to Vietnam.

D. SHORTCOMINGS AND CHALLENGES

1. Shortcomings in disaster mitigation and management in Vietnam

- The infrastructure for disaster preparedness and mitigation remains poor; government investment in disaster control infrastructure remains limited.
- Knowledge and experience in disaster prevention of people remain limited.
- Awareness of the relationship between natural disasters and environment protection remains low.

- The forecast and warning of flashflood, landslides, etc remain short-term and very limited.

2. Challenges for the management and mitigation of disasters in Vietnam

- Natural disasters have the tendency to increase in number and in severity.
- High speed urbanization and industrialization has been contributing to the increase in number of natural disasters.
- Combination of different types of disasters in a particular locality hinders the preparation of disaster preparedness and mitigation strategies and action plans for that locality.