

Adaptations to Floods and Water-Related Disasters in the Huong River Basin in Thua Thien-Hue, Vietnam

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Introduction

This paper documents the coping mechanisms and adaptation to the vulnerabilities that are associated with flood hazards and other water-related disasters in Thua Thien-Hue, Vietnam. The paper aims to contribute to the reduction of losses that are borne by flood-affected households brought about by natural hazards. Library research and on-site field data gathering from January to November of 2006 were undertaken in the Huong River Basin. The field research was undertaken in cooperation with the Sub-Institute of Culture and Information Studies in Hue City. The researcher used environmental profiling, focused group discussion, household survey and face-to-face interviews to document the following: a) the resource management practices in the area; b) the extent of damages that were brought about by flooding events, strong winds, heavy rains, and landslides; and, c) an array of community-based and government-initiated coping mechanisms and disaster management approaches in Thua Thien-Hue.

Geographical Characteristics of Vietnam

The Socialist Republic of Vietnam has a land area of 330,369 square kilometers. The average size of land that is available to one person is 0.46 hectare (ha) (0.09 ha in the Red River Delta). However, the size of cultivable land that is available per capita is only 0.103 ha. (or 0.05 ha/person in the Red River Delta) (Le Quy An, 1998, 39). The country now fights against poverty and water-related disasters. Since 1986 up to the present time, Vietnam maximized the opportunities of a market economy under a socialist system to deal with its poverty-related problems. The economy grew 8.4 % in 2005, making it one of the fastest growing countries in Asia. Its gross domestic product (GDP) was registered at \$ 44.6 billion in 2004 (Vietnam Environmental Monitor [VEM], 2005, 77). With per capita revenue of US \$ 382, the country's domestic consumption has continued to increase at a rate of more than 11 % (Vietnam Taxation 2006). Some members of the increasing population of Vietnam, which numbered 84,238 in 2005, get the most out of this rapid pace of development. In 2004, the percentage of people living below the poverty line was 37 % while about 34 % of its under 5 years of age-population suffered from malnutrition. In 2002 only 56 % of the population had access to safe drinking

water, 56 % had no access to sanitation latrines, while the infant mortality rate was registered at 26 deaths /1000 population (VEM, 2005, 77).

Vietnam's marine jurisdiction covers an area of one million square kilometers (sq km) (over 3 times its mainland area). The coastline's length is 3,260 km (excluding the coastlines of thousands of its islands) (Nguyen Chu Hoi, 2002, 101). The country has about 2,500 large and small islands that form a number of archipelagoes in the East Sea (Dang Huy Huynh, 1998, 109). It has 2,860 rivers all over the country. The abundant water resource in Vietnam is also equated with numerous water-related disasters. About 70 % of the population is annually affected by a number of wide-scale inundation and destructive flooding events. Historically, the majority of the people of Viet Nam have always lived on low-lying flood-prone areas where there are wet-rice agriculture, aqua-culture ventures and marine-based activities (The Vietnam United Nations Disaster Management Team and Disaster Management Unit-Ministry of Water Resources [TVUNDM & DMU-MWR], 1995, 2-3). The Cuulong Delta is often devastated by big floods that take place every 7 to 12 years (e.g., the flood events that took place in 1966, 1978, 1984 and 1991). The Mekong River Delta had experienced major flooding events on the following years: 1911, 1937, 1943, 1961, 1966, 1978 and 1984. Major floods often visit the Red River Delta, too, as shown by major flood occurrences in 1913, 1915, 1917, 1926, 1945 and 1971 (Le Quy An, 1998, 42). The incidence of big floods is expected to become more frequent in Vietnam as the world climate changes.

The country's losses due to extreme weather events and other water-related disasters had amounted to 2,209 billion VND in 2004. In 1999, the total amount of losses that was brought by the floods in Thua Thien-Hue Province alone amounted to 1.784 billion VND - this amount was equivalent to the revenues of the provincial government for a period of ten years (Tap Chi Song Huong-So Van Hoa Thong Tin, 1999). The livelihood strategies, houses and other properties of the affected Vietnamese households were not the only losses involved. Accompanying them are health problems, communicable diseases and temporary disintegration of community support systems.

Geographical Characteristics of Thua Thien-Hue Province

Thua Thien-Hue has a land area of 5,054 sq km divided amongst its eight districts (Please see Figure 1 on Appendix a). Thua Thien-Hue province houses the city of Hue - the ancient and imperial Capital of Vietnam from the 19th century to the first half of the 20th century. The province of Thua Thien-Hue (TTH) can be divided into five topographical regions. The Truong Son Mountain Ranges in the Southwest; a hilly zone of forests and grasslands that connect the mountain ranges and low-lying plains; the narrow alluvial plains and coastal inland sandy areas; the lagoon area; and, the coastal sandy beaches (Thua Thien-Hue Provincial Working Group [TTHPWG], 2002, 1).

In 2005, Thua Thien-Hue's population was registered at 1,134,480 with a growth rate of 1.4 % a year. Its Gross Domestic Product in 2005 was 3475.8 billion VND. Its revenue is not enough to finance its infrastructural development programs; the rest of its infrastructure development funds come from the Central Government. The GDP per person in Thua Thien-Hue in 2005 was pegged at US\$ 242.5. Seven percent of the population does not get adequate food supply on a daily basis; 21 % of the total population is still considered poor when other poverty indices are used. In the year 2002, Thua Thien-Hue's (TTH) forest covered 45.1 % of its lands. There are many forest laws and guidelines, but still, 459 recorded incidences of violations were committed by the forest users from 1995 to 2000. The rivers of O Lau, Bo, Huong, Nong, Truoi, and Cau Hai originate in the Truong Son Mountains and discharge water at a volume of approximately 6.2 billion m³ into the Tam Giang-Cau Hai Lagoon and other coastal waters of the province. The 102-kilometer-long Huong River contributes about 5.0 billion m³, or 81 %, of the total run-off in the catchment's basin (please see Figure 2 in Appendix a) (SAPROF Team for Japan Bank for International Cooperation [JICA], 2002). The Huong River consists of 28 smaller rivers and tributaries and occupies about 3, 000 km², or approximately 75% of the area (IUCN, 2004, 1).

The wet season in TTH runs from September through December. Typhoons bring in strong winds and heavy rainfall events. The yearly average number of heavy rains in Thua Thien-Hue is 5.5. During extreme weather events, the amount of rainfall can reach to 470 mm in a day. TTH's short river systems have steep slopes; it only takes about 6 to 12 hours for a gushing flood event to reach the deltaic plains of the province. The water rise in the major river systems, particularly on the Huong River, increases to a rate of a meter per hour. Flash floods frequent the small catchment's basins carrying pebbles, sand, and gravel elements; houses and other infrastructures are razed down (please see Figure 3 in Appendix a). At the lagoon systems, however, the receiving delta fans are narrow and small; sand dunes and other structural barriers protect the lagoon from seawater intrusion. The yearly average number of big floods in TTH is 3.5.

The Flood Situation in Thua Thien-Hue

The Thua Thien-Hue province has a long history of devastating flooding events. Statistical evidence indicates that four to five flood events which are above Alarm Level II occur in the province and bring devastation to the households and the province's economy each year (SAPROF Team for JICA, 2002) (Please see tables 1 and 2 in Appendix B). The most devastating flood in the past decade to hit Central Vietnam was the flood of November 1999. A total amount of 2, 288 mm rainfall was recorded in Hue City. The daily rainfall recorded at the time in Hue was 978 mm (Morrison, Silver, Nguyen, and Quan, 2000, 2). The rapidly descending runoff swelled the river systems in the area and caused water levels to rise by several meters in a period of four to six hours. The magnitudes of the 1999 flood events in the area may have reached the 1% probability of recurrence and inundated an area of about 938.6 km² with flood depths averaging to about three meters and higher (Please see Figure 4 in Appendix 2A).

The floods brought about 373 deaths and a total damage to the province of Thu Thien-Hue alone in the amount of 1, 761.82 billion VND or US\$ 116 million (US\$ 1= 15200 as of July 2002) (SAPROF Team for JICA, 2002) (Please see Table 3 in Appendix B). Storm surges caused the water level to rise up to a height of about seven meters in the coastal areas. The 1999 Floods had damaged more than 30, 000 people on the communities along the shores of the sea and the lagoon. River bank erosion and landslide incidents happened along the banks of the Bo River, Huong River and Truoi River (please see Figure 5 in Appendix a). Most residents of Thua Thien-Hue are annually threatened by the threats of inundation, bank erosion and other weather related events such as whirlwinds and typhoons. This was clearly illustrated when the storm Xangsane landed on the area in September 30 and October 1, 2006.

The XANGSANE STORM in October 2006

Xangsane is the most recent storm to hit and devastate the Thua Thien-Hue Province. For instance, the Thuong Lo Commune in Nam Dong has 217 families; they consist of both the Viet and the Katu people. To cope with the storm, members of the commune had prepared devices such as floats, medicine and food. They evacuated people who live near the river and whose houses are made of temporary building materials to safe places in the commune, such as the Community House (*Guol*), the school, the medical station, and the office building of the Commune. But even with all their preparation, the Xangsane storm brought them property damages in the amount of 450,000,000 VND. A total of 120 hectares of the commune's commercial forest were destroyed and 35 hectares of agricultural lands were damaged. In Mr. Tran Van Chang's case, the storm Xangsane caused his kitchen to collapse. Xangsane destroyed the rubber trees, the orange trees, banana shrubs cassava plants and other root and vegetable crops that he planted in his one-hectare land many years ago. He estimated that the damage to his livelihood had reached about 40 million VND. The same level of devastation was experienced in Mr. Vuong Van Vien and Ms. A. Rat's household. Their newly improved, although temporary, house totally collapsed. The rubber trees and banana shrubs were totally wiped down in their 0.8 ha farm lot. Now the couple temporarily lives inside a concrete tunnel which serves as a spillway for the flashfloods that often rush from the hills that are adjoining their farm lot; their children sleep inside their pigsty.

In Quang Dien District at the Quang Thanh Commune, Mr. Nguyen Van Khoa (the Vice-chairman of Quang Thanh Commune) reported that before the Xangsane storm hit TTH, they had prepared flashlights, boats, and other useful flood devices for the community members. They evacuated many people out of their houses to nearby church buildings and community halls. The storm destroyed 26 houses. The roof materials of 67 houses were flown out and two school buildings were damaged. The irrigation system of the commune was destroyed and caused a major breach in its dike system. Aqua culturists lost 60 shrimp ponds in an area of 26 ha. The estimated loss is about 416 million VND. For the Kim Doi hamlet, the commune lost

25 ha of shrimp ponds and damages in the amount of 480 million VND. Six ha of croplands, which were mainly used for vegetable production, were flooded and the total loss was about one billion VND per ha. In Hue City, at the Phu Binh Precint, 1000 houses were flooded and suffered an estimated damage of 200 million VND. From these individual cases, one can say that had it not been for the pre-disaster preparation or disaster mitigation of the affected households at the individual and commune levels, the damages that are brought about by the storms and flood events would have been worse. The same thing can be said on water disaster mitigation and flood hazard management at the provincial level.

Responses to flood disasters in Thua Thien-Hue Province in the context of Vietnam's Disaster Management Strategy

The Central Committee for Research and Rescue directly coordinates with the Bureau of Flood and Storm Control, Rescue and Research (BFSCRR) of Thua Thien-Hue regarding disaster management. The Central Committee provides the BFSCRR with facilities and materials for emergency activities such as the provision of a super speed canoe, lifebuoys, materials for building prefabricated houses, jute bags, and emergency relief and clothing. The Board does this under the direct supervision of the People's Committee of Thua Thien-Hue. The BFSCRR closely coordinates with the Institute of Hydrometeorology, the Department of Agriculture and Rural Development, the Department of Transportation and Construction, and other government and non-government agencies. The Board has also maximized the procurement of assistance from international organizations to help them in flood and storm loss reduction and disaster mitigation. Due to the coordinated efforts of the board and its cooperating agencies and institutions, the total amount of damages that is caused by flood disasters to the people and infrastructure of Thua Thien-Hue has been minimized.

The members of the Board closely coordinate with the Center for Hydrometeorology of the province before, during, and after the onset of any weather and water-related disaster event. They collaborated on building 37 flood forecasting towers and 65 flood marks in different parts of the province. Thua Thien-Hue's Center of Hydrometeorology is equipped with a high resolution parabolic antenna that aptly receives important weather related information. They closely study different models of flooding events. They forecast rain and flooding occurrences in real-time and in a precise manner. The Center and Board work closely with local mass media organizations (TV Station, Radio Station, and News Agency). They heavily utilize the telephone system that was installed into all communes to facilitate an efficient relay of information and communication.

The Board of Flood and Storm Control, Research, and Rescue also provides specific guidance to the following offices of the province during times of emergency: the Fishery Department and other components of the fishing industry, the coast guards, and the Department of

Transportation, and Audit and Industry to monitor the safety of fishing vessels on the ship stations and in the open seas. The People's Committee in Thua Thien-Hue solicits the cooperation of private food companies to reserve 1000 tons of rice which can supply the food needs of the affected areas during the flood periods.

Before and during disaster periods, the Board coordinates with the Department of Education by providing them with information that will help them cancel their school activities during disaster periods. They coordinate on educating the children on matters pertaining to environmental and disaster management. They invite representatives from each commune to join workshops on disaster prevention and mitigation. The Board also relocates the residents of houses that illegally encroach on river banks and helps prohibit house construction along the river banks. The Board has evacuated more than 8950 households out of landslide and flood affected areas to safer areas from 2001 to 2005.

The Board is also involved in the planning and construction of more reservoirs up in the mountainous areas. The reservoirs are simultaneously used for electricity generation and flood control. Each reservoir is equipped with telecommunications systems for efficient information relay during disaster periods. Every year, they upgrade and ensure the safety of these reservoirs in cooperation with the Department of Agriculture and Rural Development. More than 100 multi-storey primary and secondary schools were built in low-lying areas so they can be used as shelters during disaster period.

The Board also participates actively in relief and rescue activities, particularly those that pertain to the fishermen and other sectors who are lost in the open seas. After the occurrence of flood events, the Board advises the People's Committee of the province to issue guidelines on the procurement and release of reserved food and medicine supplies to the affected local residents. They coordinate with the officers of the armed forces and the frontier soldiers in providing assistance in the harvesting of crops and vegetables immediately before and after disaster occurrences. They also evacuate people to safer places during emergency periods. They collaborate in mobilizing the armed forces to clean up a disaster-ravaged area to prevent disease epidemics and participate in the rehabilitation and recovery programs in the aftermath of flood events.

The Board is also involved in the resettlement of 1420 boat households in the Province (Quang Dien district: 400, Phu Loc: 380, Hue city: 700). Looking at the incoming decades, the Board recognizes the possible effects of global climate change and the many difficulties that it will pose for flood and storm prevention, as well as disaster mitigation. The people's coping mechanism is way below the magnitude of water-related disasters but its importance is so salient during the onset and the aftermath of every disaster. The Board strengthens the community's level of preparedness and encourages the initiatives at the commune level in order to reduce the damages caused by disaster. The Board recognizes the importance of maximizing the NGO channel and

the Government's channel of information flow and service delivery. It also actively solicits the attention and collaboration of international as well as national organizations in terms of disaster training and development of the people's coping mechanisms. The BFSCRR also recognizes the importance of the production of flood and other hazards map.

The Board has also coordinated closely with the Department of Agriculture and Rural Development. They have supported the program on adopting a cropping structure, livestock-raising and fishery breeding that can withstand the wrath of floods and storms. They study and designate the land types and areas that can be planted with crops that can deal with risks that are brought about by floods. The DARD has invested time in studying which agricultural plant varieties are more flood-resistant. It advises farmers to avoid planting crops that will mature during the disaster-affected months. The farmers now practice 2 and ½ month-cropping period which was a reduction of the 3-month-cropping period that they used to follow. For long lasting programs on getting high yields and avoiding damages from floods, the department improves the variety of seeds that the farmers use for planting. From the flood maps that they draw based from past inundation events the DARD indicates where people can have shelter and refuge. They pay attention to the impacts of flooding in the province's irrigation systems. They have programs on developing ports for the fishermen and areas where all kinds of boats can anchor safely during disaster periods. They also encourage people to plant trees along the shores. The Forestry Management Bureau and the provincial government of TTH during the past decade came out with policies on forest protection, job creation, improvement of living standards, and disaster prevention. In the 7th meeting of the 3rd Provincial People's Council on August 13, 1997, they mandated that barren hills should be reforested and natural forests should be protected under Resolution no 7C/NQ-HDND3.

Another government agency that is directly involved with flood management in TTH is the Huong River Basin Management Board (HRBMB). The members of the Board study the rainfall patterns and other characteristics of the basin's different components, such as the water, topography, tidal movements, salinity intrusion, flooding events, and other pertinent environmental conditions in the river basin. The HRBMB calculates the water demands of the different users of the Huong River who heavily utilize its resources for socio-economic development. The Board is actively involved in monitoring illegal sand exploitation activities on the Huong River and in monitoring garbage collection, and disposal and management of dead animals after a flood disaster period. The Board also monitors dredging projects on the Huong River. Due to lack of financial resources, however, the Board is not successful in undertaking most of these tasks.

Some preliminary conclusions

The 8,000 kilometer-long extensive dike systems that are built on the banks of the major river systems of the country and along the sea coasts about 2000 years ago are a major testimony to the long history of how the Vietnamese people have dealt with floods. Dike building was a collective response from the members of communities who were annually devastated by floods. The government supported the strengthening of the dikes and institutionalizing dike maintenance through the establishment of the Department of Dyke Management and Flood Control. This was made evident in 1945 and in 1971 when they started the application of science and engineering principles on dike construction, strengthening and maintenance. However the dike system was not always 100 % effective in preventing the denudation of flood-prone areas in the country. Thus over the centuries, various ways of reducing the devastations that are brought about by flooding had been developed, such as the development of an extensive flood warning system in its various localities, e.g., ancient huge drums that warn people of the impending denudation found in most of the country's museums (Tran Nhon, 1994, 5-6).

Other measures that were applied and are continuously being developed are flood-diversion techniques and flood release strategies. People now have a choice as to where the excess waters can be diverged and they are able to undertake more flood preparedness programs in the process. There are now major projects on building reservoirs to contain floodwaters to avoid denudation of the low-lying areas during the rainy season and the slow release of water to lessen water scarcity during the dry season.

The government in cooperation with the people also ventured into reforestation and in making people more aware of the importance of reducing the rate of deforestation. Timely and accurate information, which can only be provided by up-to date scientific observation technologies, is well-recognized. Thus, they have developed and strengthened the science and application of weather forecasting. Direct tie-ups with other information dissemination groups such as the telecommunications industry in transmittal of flood warning and other disaster information are also heavily utilized. More importantly, however, Vietnam has institutionalized the coordination of programs and activities for flood control and disaster prevention. In the early 1990s, several key government ministries were directed to work together to protect the people from the impending threats of water-related disasters. Disaster mitigation is incorporated into the government's development agenda; not many countries have undertaken this significant move. A strategy and action plan for mitigating water disasters, which emphasized the importance of flood forecasting, disaster prevention and emergency preparedness, was drafted in Vietnam in 1994. The Central Committee for Flood and Storm Control or the Central Committee for Flood, Storm Control and Disaster Preparedness under the direct responsibility of the Minister of Agriculture and Rural Development was established in 1999. It is responsible for attending to the needs of the affected communities in the aftermath of disasters and also for the drafting of disaster mitigation plans that are necessary for budget releases and fiscal planning (The World

Bank, 2004). The importance of collaborating and planning the rehabilitation programs with transport and engineering sectors is also well recognized.

Moreover, the cooperation of the non-governmental and foreign institutions has been well-utilized by the Vietnamese government and its people. The institutionalization of the natural disaster mitigation partnership (NDM-partnership) between the United Nations Development Program and the Royal Netherlands embassy together with the different government offices and community-based leadership structures and organizations in Central Vietnam highlights this very important move (The World Bank, Vietnam 2004). The salience of sustaining the cooperation of the community members particularly in the dissemination of information and in undertaking emergency programs is continuously emphasized (Le Quy An, 1998, 52).

Based on the insights of the participants of a disaster training workshop that was held in Hanoi on October 1993, the following activities were identified by government officials from different provinces who were involved in disaster mitigation and rescue activities. The disaster practitioners and government officials indicated that it is important to incorporate disaster mitigation and disaster preparedness activities in the annual plans of various ministries which are directly and indirectly involved with disaster management. They also indicated the importance of giving disaster management training for personnel at the provincial and district levels and the salience of hazard maps production at the district level. They also see the need to further strengthen the storm and flood warning system, disaster information collection and processing, training community members in self-rescue programs, institutionalizing of plans for delivery of emergency supplies, preparation of disaster awareness handbooks for provincial officials and personnel and for the general public, development of pilot disaster mitigation projects for different kinds of hazards, and comprehensive documentation of disaster management experiences in Vietnamese and in the English language. The government officials also emphasized the need to upgrade construction techniques and to incorporate resistance to disasters in architecture and structural design; assess the current building standards and upgrade them to improve the building structures' resistance to disaster; examine the vulnerability of roads and bridges to disasters; and, to develop emergency transport maps and improve road signs. They also emphasize the importance of developing a handbook for farmers that outlines post-disaster actions that will lead them back to food production; stop deforestation; and improve the system for forest fire prevention (Hamilton and Dadivas, 1993, 12-13).

In a nation with limited capabilities to deliver a high social security against adverse shocks and disasters, the devastation on the livelihood and well-being on the households brought about by water-related disasters will always be enormous. This wretched situation is further compounded by the realization that this is not the end of the line; another flooding event is almost sure to happen again either by next year's typhoon season or if not, in the next few years to come. Although some may argue that disasters also create opportunities for development, its repeated occurrences can significantly weaken a country's bid for long-term and sustained economic

development. Moreover, if there is wide-scale mismanagement of rehabilitation funds and mishandling of future disaster mitigation programs, the smooth implementation of development programs in the future may be curtailed. To ensure the sustainability of Viet Nam's economic and social development programs, one would have to invest on the reduction of the losses that are brought about by environmental degradation. Ironically environmental degradation is often also an aftermath of water-related disasters. The benefits that will accrue from disaster loss reduction activities in most parts of the country would contribute to Viet Nam's development programs. As the cliché goes, 'a penny saved from reducing vulnerability and losses, through good planning and investments, is a penny earned for the whole country' (Lempert, Nguyen Van, and Bach Tan, 2003).

Figure 1: Administrative Map of Thua Thien Hue Province

Appendix A:

Figure 1: Administrative Map of Thua Thien Hue Province

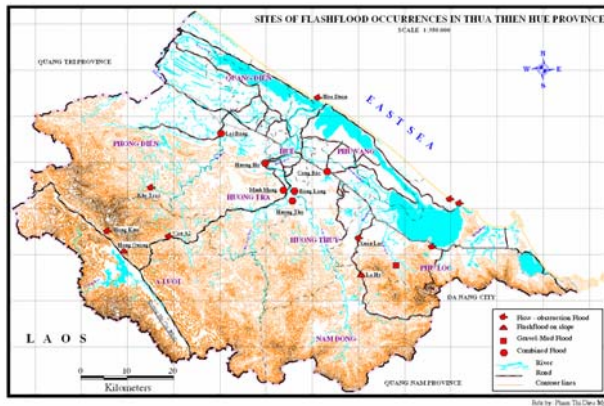


Figure 2: Hydrography of Thua Thien Hue Province

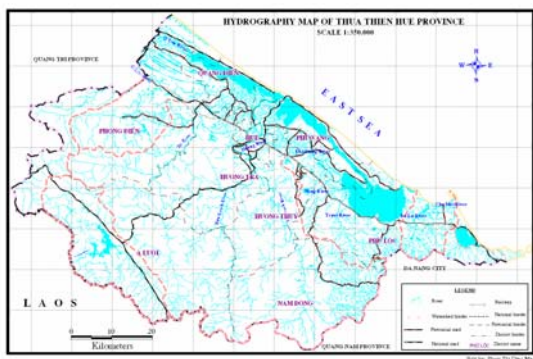


Figure 3: Flashflood-prone sites in Thua Thien Hue Province

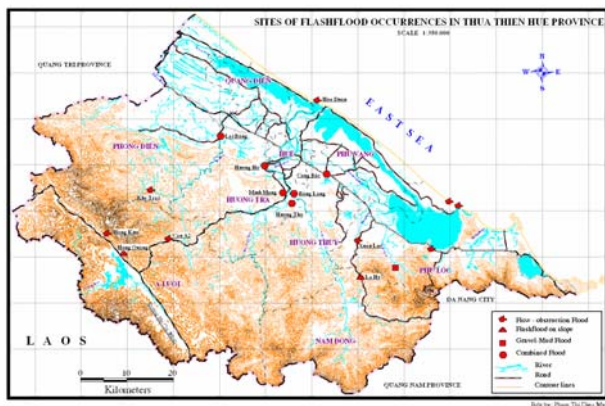


Figure 4: Recorded Depths and Area Extent of Floodwaters in Thua Thien Hue in 1999

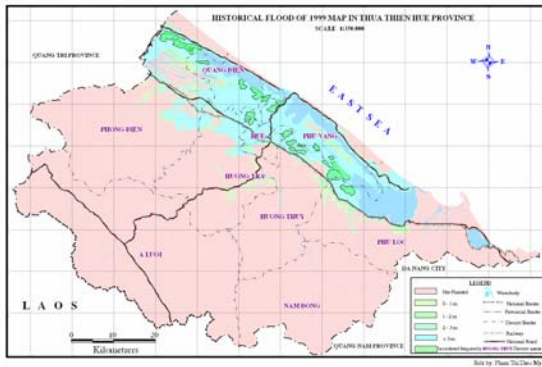
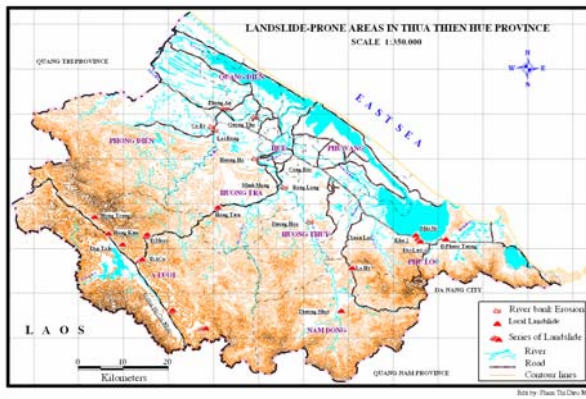


Figure 5: Landslide-prone areas in Thua Thien Hue Province



Appendix B:

Table 1: Historical Floods in Thua Thien Hue Province from 1885 to 2005

Month/year	Damages Incurred
May 1887	Severe damages recorded between Thanh Hoa and Nghe An
Sep 1894	Flooding together with a tidal wave, causing large-scale damages for the lagoon people
Oct 1897	Flooding together with a tidal wave buried the Cua eo (hoa duan) and Cua Sut (Thuan An) estuaries
Sep 1904	Four spans of the Truong Tien bridge in Hue were overtopped; the Dong Ba market collapsed; the Phuoc Duyen Tower collapsed; and, the Hoa Duan and Thua An estuaries were buried
Oct 1928	The Thuan saline water dyke was torn
Sep 1930	The dykes on the Tu Hien and Thua An estuaries were damaged
Sep 1953	1290 houses were washed away and 500 people died in Quang Binh, Quang Tri and Thua Thien Hue provinces
16 Sep 1980	173 dead in Thua Thien Hue and Thanh Hoa provinces
Jul 1981	Damaged 40,000 houses
29 Oct 1983	Hue City suffered heavy damaged: 252 people dead, 115 persons injured
16 Oct 1985	604 dead people, 234 persons injured, 98 missing bodies
25 May 1989	140 dead persons
10 Oct 1989	53 people dead, 766 injured persons
28-29 Oct 1992	Seven dead persons
28 Apr 1992	Houses were damaged
5-12 Oct 1995	11 dead people; eight missing persons
23-27 Nov 1998	267 dead people, 92 injured persons
1-6 Nov 1999	373 dead people
2-8 Dec 1999	Six dead people, 1 missing person

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