JICA REGIONAL FOCUSED TRAINING COURSE "FLOOD HAZARD MAPPING"
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PROPOSAL REPORT

FLOOD HAZARD MAPPING IN MEKONG RIVER DELTA OF VIETNAM

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A) THE ROLE OF FLOOD HAZARD MAPS TO MITIGATE FLOOD DAMAGES IN MEKONG RIVER DELTA:

The Mekong River Delta of Viet Nam is affected by floods every year. Worst disasters have hit the area in the recent years. These disasters are the greatest contributing factor for increased poverty and retarded recovery from economic hardship in the region. Recently the Government of Viet Nam has adopted a strategy for the Mekong River Delta to 'Live with Floods'.This case study on Living with Floods in the Mekong River Delta of Viet Nam illustrates the benefits of the incorporation in flood management strategies of low-tech measures and traditional coping techniques to enhance safety and improve incomes in a large area subject to annual flooding lasting several months. One of the favored low impact options being developed for living with floods in moderate flooding areas is providing low cost loans to households to raise their individual houses on piles above the highest expected flood water level. Another strategy in deep flooding areas is to build elevated earthen homesteads above the highest flood water level for entire villages; either as satellite villages or as linear areas along flood-evacuation roads. This case history describes the positive and negative perceptions of these and other non-structural methods for keeping people safe from annual flooding from the perspective of the flood impacted households themselves. Also discussed is the formulation of a self funding Water Disaster Self Reliant Fund to be used to provide the most disadvantaged individuals and households with means to resume their livelihood and for local government to recover from floods in the shortest possible period of time at the end of the cycle of annual flooding in the Mekong Delta.

INTRODUCTION

Viet Nam is one of the most disaster prone countries in the world. Because of its geography and topography, the country suffers from almost all types of disasters, among which water disasters induced by typhoons and floods are the most frequent and severe. Every year, disasters claim hundreds of human lives and cause millions of dollars of economic loss in all regions of the country. Further, rapid urbanization and industrialization in Viet Nam, resulting from the country's social, economic and technology reforms, are putting pressure on its already strained resource base. Climate change and degraded environment are also partly the cause of the more frequent and severe disasters that have occurred in recent years.

The Government of Viet Nam has always put disaster management, particularly flood and storm control as top priority in its agenda. Inheriting thousand year of experience in coping with floods in the Red River Delta, the Government's major strategy for disaster reduction has been driven considerably by structural solutions. For example, building and enhancement of the dyke and embankment systems are emphasized. Nevertheless, pubic awareness raising and mobilization of different resources for immediate response have been recognized as crucial factor contributing to Viet Nam's recognized achievements in its response to disasters. The country's experiences in coping with increasingly complex and severe over the last decade as well as the realisation of the close linkage between disasters and poverty have shown the Government the need to address this cross-cutting issue in a more integrated and holistic approach.

The Mekong River Delta of Viet Nam is subject to annual flooding, which is the most spectacular feature of this twelfth longest and the tenth largest river in the world. Nevertheless, floods, for hundreds of years have been considered by the people as beneficial to agricultural production in the region. Floods bring sediments to rice fields, help sulphate-dilution and land reclamation, enable the development of aquaculture as well as balance the ecology and promote

ecotourism. This 4 million ha region with nearly 3000 ha of cultivated areas supplies more than 50% of staple food and 60% of fish production for the entire nation, accounting for 27 per cent of the total GDP of Viet Nam. This area is often regarded as Viet Nam's "rice basket" because of its crops feed and sustain the people and make Viet Nam the second largest rice exporting country in the world.

Normal floods are not considered as disasters. People in the Mekong River Delta of Viet Nam consider a disaster when there is either no flood or a big flood that claims human lives and economic damages. Some of the worst flood disasters have hit the Mekong River Delta in the recent years. These annual and several months lasting floods have required the Vietnam Government to develop an appropriate strategy for the region so that negative consequences of floods are mitigated while the benefits that bring in are exploited for socio - economic development that contribute to poverty reduction.

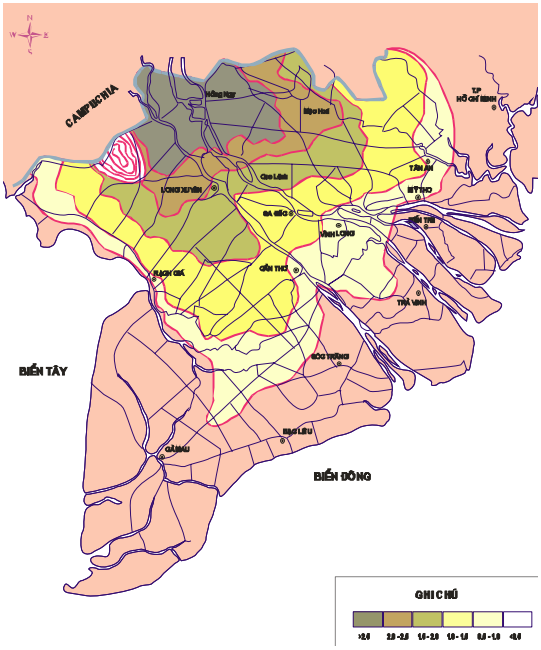


Figure 1 : Inundation map in Mekong Delta 1978's *(Source : NCHFM)*

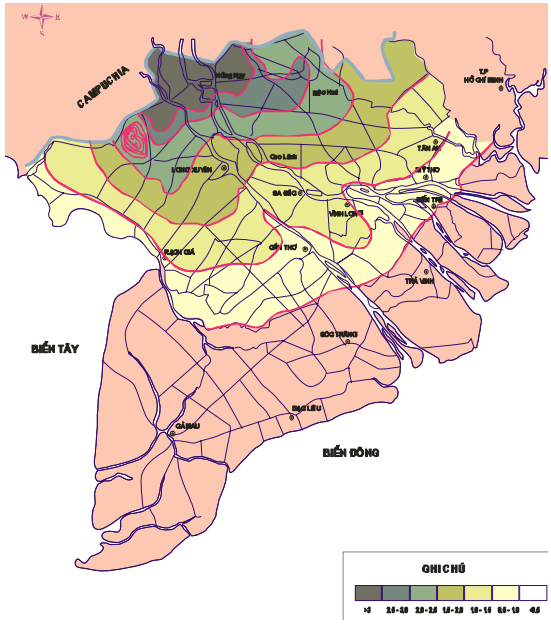


Figure 2 : Inundation map in Mekong Delta 1996 's *(Source : NCHFM)*

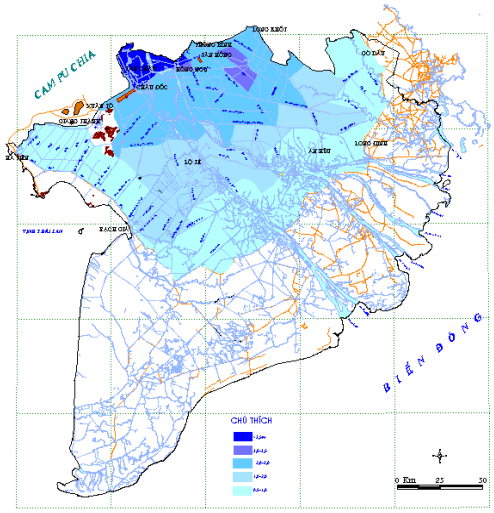


Figure 3 : Inundation map in Mekong Delta 2000's *(Source : NCHFM)*

Statistical table on damages caused by flooding, flood tides and inundation in the Mekong delta

Type of damage	Unit	2000	2001	2002	2004	2005	2,001	total
Human loss	person	**501**	**407**	**195**	**45**	**77**	**129**	**1,354**
in which children	***person***	***347***	***321***	***172***	***43***	***70***	***50***	**1,003**
Innudated households	household	891,519	356,032	321,459	34,393	42,101		**1,645,504**
Evacuated households	household	49,688	27,826	17,824	3,758	7,249	160	**106,505**
Relief needed households	household	253,107	221,993	97,463	1,821	6,265		**580,649**
Time for relief needed households	time	628,682	237,505	155,782	11,686	6,265		**1,039,920**
Collapsed households	house	4,868	19,725	5,606	340	5,270	28	**35,837**
Damaged school rooms	room	13,789	5,679	4,700	1,454	271		**25,893**
Absent pupils	pupil	815,246	354,615	263,976	35,687	739	12,914	**1,483,177**
Damaged health center	unit	377	*67*	*54*	*6*	*10*		**514**
Rice loss (fully)	ha	55,121	4,535	721	2,018	1,658		**64,053**
Inundated rice harvest with low yield	ha	159,360	53,267	20,667	10,170	14,746	200	**258,410**
Inundated farm fruits and crops	ha	62,952	29,983	2,499	7,831	11,621		**114,886**
Dead cattle and poultry	unit	668,234	104,421	18,243	-	-		**790,898**
Flooding fonds	pond		19,838		-			**19,838**
Inundated and damaged aquaculture area	ha	14,045	4,588	3,569	1,486	826		**24,514**
Flooding national roads and provincial routes	km	1,267	516	267.4	31.0	65.4		**2,081**
Flooding rural lanes	km	10,187	6,649	5,114.7	1,270.0	685.6	192.0	**23,221**
Collapsed semi-cement bridges	unit	4,634	2,102	1,537	387	491	7	**9,158**
Landslided embankment, dyke	km	5,045	6,114	3,281	194	918		**15,552**
Landslided embankment, dyke, canal	1000m3	37,342	60,445	3,919	2,422	370		**104,498**
Damaged sluices, gates	unit	2,595	1,377	1,413	641	874		**6,900**
Estimated damage total	**Billion US$**	**264.13**	**99.64**	**33.82**	**4.45**	**12.73**	**0.94**	**402.04**

THE CONCEPT OF LIVING WITH FLOODS

After the historical severe flood in the Mekong River Delta in the year 2000 the Government of Viet Nam has introduced a new concept of "Living with Floods" that has become the major strategy for disaster mitigation in this region. This strategy bases on a full realisation of the non-preventive nature of floods in the Mekong River Delta as well as their both positive and negative impacts on economic development and people's lives. It is interesting to note that "Living with Floods" had been in practice by the people in the Mekong River Delta of Viet Nam for long time before it became a strategy by the Government. Perceiving floods as almost an annual natural phenomenon, for centuries the people have spontaneously developed different traditional measures to "Live with Floods". These measures varied in different inundated areas and included evacuation to high grounds during the floods season, planting of seasonal crops to avoid flood time, planting lifting up rice and building small-scale bordering embankments to protect the crops.

Given the population boom and major development trends, there were notion and attempts for '***flood prevention***' in responding to floods in the Mekong River Delta. It was soon realised that '***flood exploitation***', meaning *consider flooding as a natural resource that needs to be*

researched and exploited for local socio-economic development seems to be the better approach in coping with floods in the region.

Building on traditional practices, under the strategy of Living with Floods, the Government has been taking up and implementing various long-term, medium and short term measures for minimizing the human death and damage of property while helping reduce poverty and ensuring sustainable development

GOVERNMENT'S POLICIES AND PROGRAMMES FOR LIVING WITH FLOODS - LESSONS LEARNED

The Government has approved a Flood Control and water resources planning up to 2010 for the Mekong River Delta. It is also in the process of reviewing and finalizing the Second National Strategy and Action Plan for Disaster mitigation that includes both water and non-water induced natural disasters. "Living with Floods" is the main strategy for the region in both documents. The Government is making systematic efforts to help the region overcome the consequences of flooding by 2005, and achieve socio-economic stability and sustainable development by 2010.

A combination of structural and non-structural measures has been taken under this strategy for reducing the flood risks and damages. It has been observed over the past two years that the strategy has been very effective in reducing the damages. However, there are constraints faced by both the Government and local communities in implementing these measures, which require further studies and more innovative and integrated interventions.

1. Building Safe Residential Areas for people

Building safe residential areas in the Mekong River Delta of Viet Nam was introduced after the historical flood in 1996 in the Government decision 99/1996/QD-TTg that provides guidance and key measures for overall socio-economic development in the region. However, not until the aftermath of the 2000 flood that the Government approved a five year programme (2001-2005) to build special, raised residential areas along roads and dykes and others away from the roadside with the aim that no more evacuation would be needed by 2006 if flood similar to the one in 2000 would occur. Raising land for 738/743 residential clusters with the total areas of 3.474 /3.504 ha and 66/66 embankment of existing residential clusters. In which, 679 residential clusters (3.243 ha) and 51 embankment have been completed land-raising. In addition to the above measure, some important towns and villages are protected from inundation by constructing/upgrading embankment around the town. Studies and voices heard at the National consultation on the impacts of floods, droughts and other water disasters in the Mekong River Delta that was held in Ho Chi Minh City of Viet Nam in January 2003 show a full support of this policy from local authorities and people, who are affected by the floods. Nevertheless, there are rooms for improvements. Raising land has been done fast, resulting in quality issues of the residential clusters that have been revealed during the 2002 flood. Construction of residential clusters should be integrated with other ongoing and future programmes on rural transportation, education, health, water supply, etc where different needs and wishes of men and women should be taken into account. The lack of necessary infrastructure facilities, particularly water supply, drainage, and sanitation in residential clusters for example, has been the main reason for a very limited number of households moving in these clusters so far (56.085/91.205 households moved in residential clusters. In addition to 29.310 households which are now living safely within completed embankments, there are only 46,5% of the registered households in residential clusters as planned programme). Consultation with and participation of the people in decision making on building the residential clusters is essential as certain local traditions and customs of

different groups of people need to be understood and respected. One typical example is that in many cases people are reluctant to move away from their rice fields and their established livelihood. Further, integrated planning and coordination are required both at central level and between provinces to ensure that the dykes and boundary embankment that are either funded by the Government funded or self-invested in one province would not increase the vulnerability of other provinces to flooding.

2. Building flood proofing houses

After the severe floods in 1996 and especially since the floods of 2000, the Government together with Viet Nam Red Cross and international donors have supported the improvement of tens of thousands of houses. Support ranges from Government interest free special loan to the people for construction of flood proof houses, free distribution of mental-frame houses by VNRC, raising houses on piles or provision of house repair and reinforcement materials, etc. These programmes have contributed significantly to the reduction of damages of houses and property. However, it was found out that while many of the recipients of free houses or materials are among the poorest and most vulnerable, the Government housing loan programme particularly benefit the middle-income groups in the delta because the poorest cannot or dare not take out these loans, for lack of collateral and repayment capacity. These lesson learned needs to be taken into account to ensure the most appropriate pro-poor policies in the current exercise to identify/select the poor households and setting prices for land and houses for mostly the poor households to move into the newly built residential clusters.

3. Enhancing Flood Release Capacity

Over the years of flooding and inundation in the Mekong Delta of Vietnam, it has been observed that the flood release capacity of the existing river system is not adequate and this has been found to be one of the main factors of inundation in the low lying areas. Often, vast areas of land are inundated with 2-3 m of water and due to the low flood release capacity of the river channels; it takes about 2-3 months for the water to drain off from the inundated areas. In order to improve the drainage capacity, the Government of Vietnam, in the past 10 years, has invested to build a number of canals for draining the water from the inundated areas. In the 90's, 21 large canals have been built in some of the flooded areas of Kien Giang and An Giang Provinces. These canals have been found to be very effective during three big floods in 2000, 2001, and 2002. However, in order to reduce the inundation of other areas, significantly flooded, similar measures need to be further improved and built.

4. Shifting of Cropping Calendar

A large group of people in the rural Mekong delta are rice farmers. They usually suffer substantial losses in income and property. The rice crop in the Mekong delta was damaged on a large scale in 2000. In order to reduce the damage, the Government advocated and promoted a shift in the cropping calendar for the Mekong delta. Generally there are two crops for rice cultivation. One is winter-spring crop and the other is summer-autumn crop. Traditionally sowing of winter-spring crop is done in February and the crop was harvested in June; the summer-autumn crop is sown in July and harvested in November. In some places the farmers also go for a third crop during some months.

The Government banned the third crop and advised the farmers to shift the cropping calendar; to sow the winter-spring crop in November instead of February and harvest in March instead of

June; and to sow the summer-autumn crop in April instead of July and harvest in August instead of November.

The traditional cropping schedule was causing heavy damage to the summer-autumn crop, as the flood season is from August to November, coinciding with the growing season of rice crop. According to the new cropping schedule the harvesting of summer-autumn crop will be completed before the floods.

This shifting of cropping calendar along with enhanced mechanisation for cutting and thrashing and use of short duration varieties has resulted in reduced crop damages. The data on damage to rice fields for 2000, 2001 and 2002 are given in the following table.

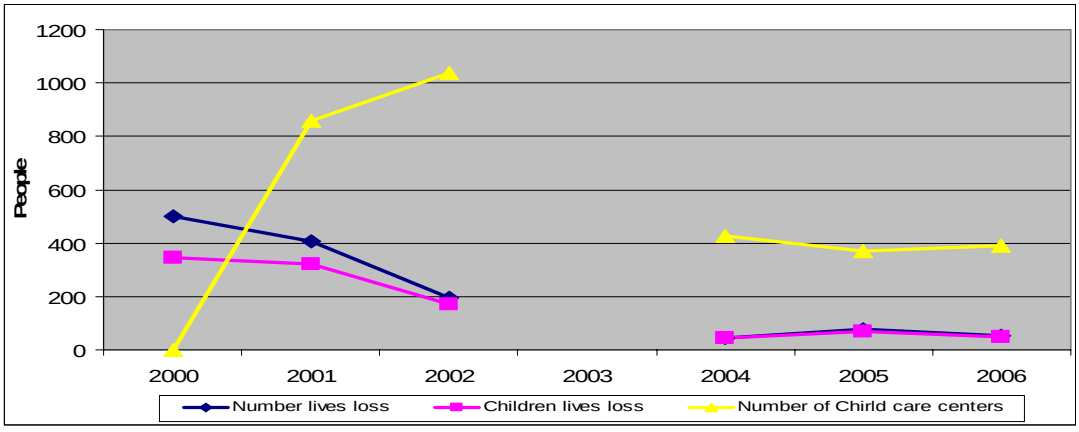
Damage to Summer-Autumn Rice Crop due to Floods in Mekong River Delta						
Type of Damage	2000	2001	2002	2004	2005	2006
Rice field destroyed, (ha)	**55,123**	**4,553**	**721**	**2,018**	**1,658**	**NG**
Rice field submerged, (ha)	**159,360**	**53,267**	**20,667**	**10,170**	**14,746**	**20,000**

***** Data in 2003 is not available due to small flood with inconsiderable damages

5. Emergency Kindergartens (Child care centres)

Children have been found to be the most vulnerable during the flood disasters. It has been observed from the past records that most deaths during the floods were of children. Day child care centres were set-up for taking care of infants and small children during flood season to enable the parents working for earning the living. Priorities were given for children of poor families to enable the parents to go out for food earning as the capacity of these child care centres was not equivalent to the needs. The Central Government and provincial authorities provided budget to build these centres, allowance for teachers and food for the children. International and national donating agencies helped with food, water and sanitation supplies as well as recreational kits. This has resulted in substantial reduction in the death of children. The Government has stepped up the setting-up of more emergency kindergartens. This allows the parents to get involved in other activities of the family and the community during the disaster times.

Figure 1 shows the drop in the loss of children lives from 2000 to 2006 thanks to the sharp increase in the number of child care centres established during the floods of 2001 and 2002



Data in 2003 is not available due to small flood with inconsiderable damages

6. Flood Safety Training for Children

Though the death of the number of children due to flooding has been reduced, it has been found that children continue to be the most vulnerable during the disasters. An analysis of the 2002 deaths has indicated that no child has died in the emergency kindergarten; the death of children

happened in homes or on the way to school. It is now considered that training on flood safety including swimming training is important for children. The Government would like to develop training programmes on these lines and introduce this training in the regular school curriculum.

Drawing from the lessons learned, the Government emphasises the importance of the following measures to "Living with Floods"

Immediate Measures

- Flood in the Mekong River Delta is at high level and will last for a long time. The immediate task is to ensure the safety of people, especially the old people and children. Local authorities should mobilize available materials and forces for relief and evacuate people from highly inundated areas to safer locations. It is necessary to get search and rescue force well prepared for possible incidents.
- Provinces should use local resources – local budget, social allowance, and contingency funds – to promptly provide relief aids to poor and affected households, ensuring no households is hungry and sick.
- Continue to increase the system of kindergarten to take care of children. Prepare plans for safe assurance for pupils. Strictly implement patrols and on-duty works.
- Environmental protection in resident clusters is a pressing problem. Epidemics should be prevented. Free medical treatments should also be provided to flood-affected people.
- Continue to implement the evacuation plan for residents of low-lying areas which face the danger of heavy inundation, and for eroded riverside areas. Households in endangered areas should be forced to evacuate to safer places.
- Right after flood waters receded, authorities of all levels should implement plans to help flood-affected people to recover from flood effects, to resume and stabilize lives and production. Materials, seeds, and capital should be provided to people to actively prepare for the next winter-spring rice crops.

Long-Term Measures

- Provinces in the Mekong River Delta need to continue implementing Decision No. 173/2001/QD-TTg by the Prime Minister on socio-economic development in the Mekong River Delta, including speeding up the construction of transportation and water resources works under the approved planning mentioned in the list of the Decision No.173.
- Flood-prone provinces should check land use planning and follow the new crop schedule, appropriate mix of agricultural, forestry, and fisheries to reduce flood damage, and to enhance the effectiveness of production and sustainable development. Local authorities should plan for the outer dyke system to protect rice crops as well as industrial trees and orchards.
- After flood recedes, departments and local authorities will reassess flood losses in infrastructure and undertake rehabilitation measures. The Government should continue to give priority for flood preparedness and mitigation works in Government plans for year 2003 and thereafter.
- The Government should monitor relevant departments to organize meetings for provinces in the Mekong River Delta to draw lessons from the experience of dealing with the flooding in 2002 in accordance with 'living-with-flood' strategy, especially the planning and investment in building transportation, water resources works, and residential clusters in an attempt to solve socio-economic problems in flood-prone areas.

B. FLOOD HAZARD MAPPING IN VIETNAM

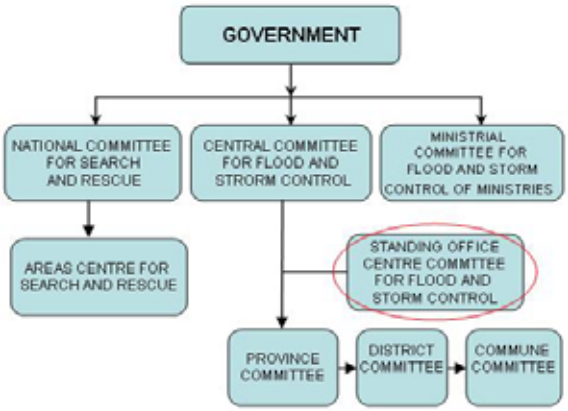
Flood is a main disaster in Vietnam. Every year flood occurs in 3 regions (North, Middle and South). Flood hazard map is a very important tool. It is a non-structure measure for flood damage mitigation. In the future, Flood hazard map will be developed in all flood plain area.

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.

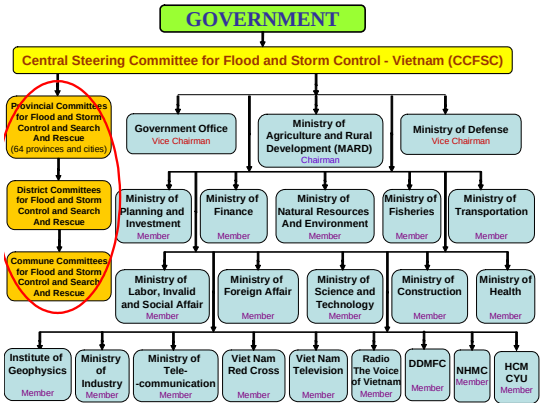
In the part of mekong river in Vietnam, flood from river comes to flood plain every year. Every year, there are flood plains in some areas in 4 - 5 months. Flood Hazard map is a tool for evacuation and establishment of land use plan.

C. 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 hazard map.

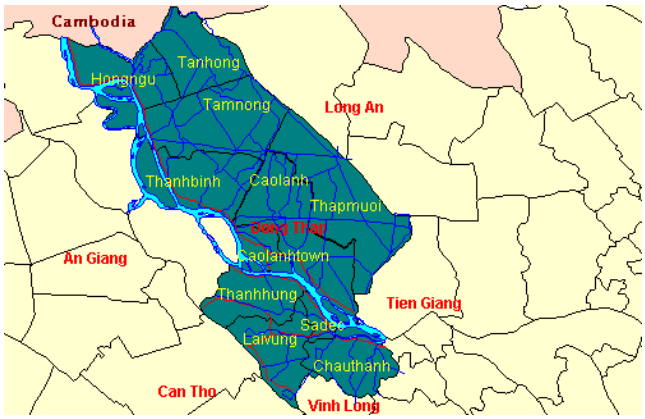
D. THE MAIN ORGANIZATION RESPONSIBILITY FOR DISSEMINATING ANTICIPATED INUNDATION AREA MAP:



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.

E. THE "ACTION PLAN" OF MAKING FLOOD HAZARD MAPS IN CUU LONG RIVER DELTA:

Target river basin area is Dong Thap province.



The natural area of the whole province is 323,765 ha, covering 11 districts and urban towns. The area of Dong Thap Muoi is 231,010 ha, including 07 districts and urban towns, making up for 71.35 % of provincial area. The southern area is mingled between Tien and Hau river and includes 4 districts and urban towns with, covering an area of 92, 55 ha or 28.65 % of the area of the province.

- Agriculture land: 231,010 ha, mainly found in the centre Dong Thap Muoi .
- Due to its location in the upstream of Cuu Long river, the province has 48.702 km as border lines to Cambodia in Hong Ngu and Tan Hong districts. This is why the province is the first and the most direct to be affected by flood.
- Most of the land here is deeply inundated during flood season. The prolonged flooding time is one of the many constraints to agriculture production and livelihood.

Total damages caused by natural disasters during 11 year period (1996-2006) in Dong Thap province:

No.	Items	Unit	Quantity
A	**Loss of Lives**	People	**404**
1	Children	People	303
2	Adults	People	101
B	**Loss of property**		Value
	Total damages	US$ Million	**121,128**
1	Agriculture	US$ Million	38,306
2	Hurricane	US$ Million	1,983
3	Damaged houses	US$ Million	32,719
4	Education	US$ Million	4,084
5	Health care	US$ Million	630
6	Office	US$ Million	6,842
7	Transport	US$ Million	23,198
8	Hydraulic works	US$ Million	7,822
9	Residential areas	US$ Million	218
10	Bank erosion	US$ Million	7,119
11	Other damages	US$ Million	4,575

Usefulness of Flood Hazard Map in Dong Thap province:

- To reduce property loss and casualties;
- A tool to plan residential area, land use.
- 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 action plan of making FHM in Dong Thap province:

Year	Actions plan	Cost (US$)
	• Soft ware: Arc GIS	3,000
	• Hard ware (PC, Notebook, Scanner, plotter, printer, camera, GPS, ect.)	23,000
2008	• Reviewing the exiting inundation map in Dong Thap Muoi, Dong Thap province. • Collecting data: Map (photography, administration etc.); Boundary condition (hydraulic, weather, rainfall, run-off etc.); Satellite Image; GIS data; etc. • Preparation the data.	46,000
2009	• Implementing Flood Hazard Mapping to Dong Thap Muoi, Dong Thap province with staff of DDMFC, HWRU, NCHFM, MRC of Viet Nam…, local government and people in the flood plain region. • Educating people and enhancing their awareness due to flood disaster preparedness.	90,000
2010	• Develop survey strategies to acquire information about resident perception toward flood. • Develop flood inundation and hazard map. • Provide training for local government on the use of flood hazard map. • Disseminate the completed FHM to the target area (River Basin).	30,000
2011 to 2015	• Applying to other region in Vietnam. • Develop and improve technique in developing flood hazard map. • To review the effectiveness of FHM in terms of reducing cost of damages/loss of life.	N/A
Total		**200,000**

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.
- The limit budget for non-structure measure for damage mitigation of disaster.

- Awareness of people in this area is limited.

F. CONCLUSION

1. Flood Hazard map is an effective tools in minimizing the flood disaster in the country, it is very useful to minimize loss of human lives and properties and the smooth, safe and fastest way to move to evacuation area can be attain by using flood hazard map. It is also effective in using this to decide for the flood control structure to be used in different area.
2. Having a month of stay in Japan and focusing on the training of flood hazard mapping is a big help that we gained so much knowledge, friends and enhance our capability in producing effective, simple and informative FHM.
3. 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 proccess.