Roadmap toward Effective Flood Hazard Map in Lampang Thailand

JICA region-focused training course on flood hazard mapping

JFY 2005

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A) The role of flood hazard maps to mitigate flood damages in Thailand

1) The flood status in Thailand

General background

Thailand is a Southeast Asian country comprising 76 provinces with 60 million inhabitants, lying in the tropical zone within latitude 5°37' N and 20° 27 N and longitude 97° 22'E. The country covers an area of 514,000 km^2, is some 1,650 km from north to south, and is 770 km from west to east. The narrowest portion is only 15 km across. Thailand is situated in the Indo-Chinese Peninsula, sharing borders with Myanmar to the west and north, Laos to the east and north, Cambodia to the east and Malaysia to the south.

Topographically, Thailand is characterized by mountains in the north which continue to the south-east; flat alluvial plains intersected by winding rivers and irrigation canals which flood during the rainy season; a certain amount of undulating country; and maritime features such as sandy beaches, mangrove swamps, irregular coastlines and numerous islands.

Major causes of floods in Thailand

Floods in Thailand are normally caused by tropical storms and depressions, rarely by typhoons. The tropical storm season is from about May to December. During the first two mouths and the last month of the season, the probability of storms occurring in the country is minimal. It rises during August to November, especially in September and October where the probability is maximum. Statistics of a 46-year period (1951–1996) show that on average 3.5 storms occur annually, while 0.9 storms occur during the months September and October.

The most common storm track is westward from the north-east of Thailand. It causes heavy rain in its passage over land. The low-lying areas of the Central Plains usually have the flood condition according to the intensity of heavy rain during the storm season.

From early September to mid-November 1980, severe flooding was experienced over vast areas of northern, north-eastern and central Thailand, including the Bangkok Metropolis and adjacent areas. It was apparently caused

by excessive rainfall brought about by two depressions which occurred on 6 and 7 September and 17 September. The maximum 24-hour rainfall was 156 mm in Uttaradit Province in the north in September and 147 mm in Kalasin Province in the north-east on 15 September.

Including the active monsoon pass trough the upper Thailand during September and early October with those depressions, flooding in 47 provinces of upper Thailand and in one province in Southern Thailand affected 203,386 families, or 831,368 persons, whereas 2,394 houses were destroyed. A total of 61 persons were reported dead, with others injured during the flood events. It was estimated that about 928, 000 hectares of farmland were damaged, from which about 12,000 families or 70,000 persons were evacuated to safe places. The total damage caused by the 1980 flood in upper Thailand, excluding the Bangkok Metropolitan area, was estimated at around 1,546 million baht. Flooding in the lower Chao Phraya River Delta areas, particularly in the Bangkok Metropolis, was prolonged from early October to mid-November. Damage incurred by the 1980 flood in the Bangkok Metropolis itself has been roughly estimated at many millions of baht. Thousands of urban residents were inundated. The 1980 flood is regarded as one of the most disastrous natural events ever recorded in Thailand.

In 1995, Thailand experienced very severe floods caused by the combination of tropical storm Lois, the south-west monsoon and low pressure systems. They caused major floods in upper Thailand including Bangkok Metropolis and adjacent areas during the period from mid-July to the end of September. A total of 64 provinces (15 provinces in the North, 19 in the Northeast, 17 in the Central plains, eight in the East and five in the South) were flooded. It was estimated that about 1.7 million hectares of farmland were damaged, which affected 1.4 million families or 5 million persons were affected. More than 12,000 houses were destroyed. There were 413 deaths and about 18,000 families or 60,000 persons were evacuated to safe places. The total damage in upper Thailand, excluding the Bangkok Metropolitan area, was estimated at around 10,545 million baht (US$ 421.8 million).

Besides the major cause of floods described above, the other causes that aggravate flood problems in flood plain areas include insufficient capacity of rivers and canals, poor drainage and sewerage systems in populated areas, destruction of forest, poor management of land, and the inadequacy of reservoirs. Especially for the Bangkok Metropolitan area, flooding in urban areas is due to heavy rain downpour in the area, over-bank flow on the flood plain of the Chao Phraya River, tidal effect superimposed on the flood wave of the Chao Phraya River, land subsidence which is due to groundwater abstraction, obstruction of water ways by extension of the urban area and metropolitan irregularity, and destruction of public utilities.

2) The outline of the present countermeasures for mitigating flood damages in Thailand

At the present, there are two types of countermeasures for mitigating flood damages in Thailand:

1. Structural measures

Government organizations responsible for flood control and mitigation have proposed many flood control projects. However a few projects are completed due to lack of the budget. The examples of structural-measure projects are dam constructions, weir constructions, embankment and levee constructions, etc.

The evidence of the effectiveness of structural measures was on 1995 flood. Due to the severe damage caused by flooding in Bangkok in 1980, several measures were implemented for flood protection. Flood protection works for the Bangkok Metropolis included the construction of embankments, improvement of drainage canals, and provision of drainage pumps, dikes and zoning. The effect of the project was studied and a diversion canal was built to discharge excess flow directly to the sea, together with preventing tidal effects by building a sea barrier. It is effectively protect the city core of Bangkok from major flooding in 1995.

Nonstructural measures

Many nonstructural measures, e.g. rainfall and flood forecasting, flood warning, and historical flood maps are implemented. However, the implementation are not well enough due to lack of modern instruments such as the real time rainfall and runoff recorder, the coordination between concerned organizations is not good enough, and the attitude of the people in flood plain to countermeasures.

Practically, Thai central government assigns the flood control and mitigation system into three stages. The stages and tasks in each stage are as follows:

1. Before flood stage;

   1.1 Preparation of historical flood map.

   1.2 Setting up the special center for flood protection and mitigation.

   1.3 Flood defense planning and workshop.

   1.4 Preparation of manpower, machines, equipments, and rapid flood alert team.

1.5 Installation of rainfall and runoff recorders, alarming equipments, and assign recording persons at each recording stations.

1.6 Dissemination of rainfall, water level, runoff, and flood risk area.

1.7 Construction of reservoirs, ponds, and excavation of channels.

2. During flood stage;

2.1 Evacution of people and properties to the safe area.

2.2 Distribution of emergency food.

2.3 Damage investigation and offering of the first aids.

2.4 Set up the security system.

2.5 Report the situation until it is recovered

3. After flood stage;

3.1 Setting up the mitigation unit.

3.2 Provision of the temporary residences, food, clothes clean water, and treatment of injurers.

3.3 Investigation of the damages and losses in detail.

3.4 Disposal of rubbish, removing mud, restoration of household and public goods.

3.5 Distribution of relief funds.

3.6 Restoration of affected facilities.

3.7 Provision of jobs for jobless people who are affected from flood.

Many organizations are assigned to act on flood control and mitigation, e.g. Land Development Department, Water Resources Department, Disaster Prevention and mitigation Department, Meteorological Department, Royal Irrigation Department, Provincial Office, army forces in flood area, and the private organizations.

As mention above, historical flood maps are used as nonstructural measures on flood control and mitigation in Thailand. The role of these maps is to provide the warning to the people who live in the past flood area. However, the usefulness of these maps is limited because no relation between flood area and amount of rainfall or flow in the river is shown in these maps. Hence, it will be better if we have flood hazard maps which show such relation. These maps can be used effectively for flood warning and evacuation purposes.

However, flood hazard maps in Thailand are different from ones in Japan on some characteristics as follows:

1) Difference in inundation area

Almost all of the inundation areas in Japan are protected by levee and the inundation occur because of levee break and inland rainfall. But in Thailand almost all of inundation areas have no levee and the inundation occur due to the large amount of water flow from the upper part of basin and has the wide cross section of flow.

2) Difference in the characteristic of evacuation

Although the objective of the evacuation in Japan and in Thailand is to save the lives of the people and their properties, it has some difference in the characteristic of evacuation. In Thailand, people have high awareness in their properties. It seems impossible to evacuate on foot only as in Japan. Hence, it should be considered on the evacuation by car. The evacuation route and evacuation order must be planed for smooth evacuation. Moreover, the evacuation during flood should be considered to evacuate the people who are stuck in their home.

3) Difference in the attitude of people in inundation area

In Thailand, the big floods rarely occur in the same area as in Japan. Although floods occur in some area almost every year, it is only the small flood. This phenomenon makes the people have less awareness in flood disaster. The response of the people to flood hazard maps may not the same as in Japan due to this reason. However, flood hazard may give the positive effect to the attitude of people as in some cases in Japan. Seeing the expected inundation area map together with their experience in the past flood may raise their awareness in flood disaster.

B) The allocation of roles in making flood hazard maps in Thailand

There are many government organizations in Thailand that have the responsibility in water management, e.g. the Water Resources Department and the Royal Irrigation Department. These organizations can take responsibility for making an anticipated inundation area map. In my opinion the Royal Irrigation Department should take this responsibility because it has human resources and experiences in this area.

Lampang municipality which is located in Wang river basin is the area I choose for making the flood hazard map. Hence, the organization which should hold the main responsibility for making and disseminating flood hazard maps is Lampang municipal office.

C) The action plan of making flood hazard maps in Thailand

As I mentioned before, Lampang municipality is the area I choose for making the flood hazard map. This area is in my responsibility and I am familiar with its topography. it is easy for me to search for the necessary data for making the flood hazard map. This hazard map, at the first stage, will be used for the government official as a guideline to give the warning and to plan evacuation when flood occur. Rainfall data, water level data, and flow data of this area are available. The topography or elevation data of this area is not available. However, in the first stage of making the flood hazard map, I will try to search for this data from internet website that I have known from this training course. Regardless of the accuracy, making the flood hazard map using elevation data from this source is possible. But if we need the more accurate flood hazard map, the survey of elevation data is necessary. However, the lack of budget is the big problem to overcome.

The action plan within the next five years is shown in the table 1.

Table 1. The action plan of making flood hazard maps in Thailand

Action Plan	Year				
	1	2	3	4	5
1. Learning of how to make the FHM					
2. Collection of necessary data					
3. Compositon of anticipated inundation map					
4. proposition and evaluation of anticipated inundation map					
5. Proposition of budget required for ground survey and publication of FHM					
6. Ground survey					
7. Composition of the FHM					

Problem in Making flood hazard maps in Thailand

The following issues are the main problems found in making flood hazard maps in Thailand:

1. Lack of data

The topographic data of the area in Thailand is rarely available. Only in some specific area that has this data, e.g. the area that is planned to use as the construction site. Although it is available, in some area, it is not in the digital form. Thus, more works have to be done to convert the logical data into digital data and require more time to do so.

2. Lack of the budget

As mentioned before, many of flood protection and mitigation projects can not be implemented due to lack of the budget. Many projects are still in waiting list to be implemented. Hence, receiving the budget for making flood hazard maps is very difficult.

3. Attitude of the administrators to flood hazard maps

This problem is the effect of lack of the budget together with the characteristic of flood in Thailand such that the big flood rarely occurs in the same area. Although some areas have been flooded almost every year, it is a small flood. Both of these reasons may result that, in the opinion of the administrators of the organizations involved in flood control project, flood hazard maps has less important compare to the other flood control projects. However, the attitude of administrators may vary in each person depending on their knowledge and understanding on flood hazard map.

D) My advice/suggestions for making this training course more meaningful

I very impress in flood management in Japan. It is well organized in both structural and nonstructural measures. This training course is also well organized. The only one thing I would like to suggest is the time distribution. We spend a lot of time in listening to the lecturers about their knowledge and experiences in flood hazard maps but we have a little time to do the important exercise such as exercise on runoff analysis and GIS. Many lecturers provide us the same content on flood hazard maps. In my opinion the time for the outline, the meaning, and the status of flood hazard map should be reduced and give more time in exercise.