HOUSING POLICY AND STRATERGY TO REMOVE PEOPLE AND COMMUNITIES FROM FLOOD PLAIN IN UBONRATCHATHANI

SDHABHON BHOKHA
Faculty of Engineering, Ubonratchathani University, Ubonratchathani 34190, Thailand,
sdhabhon@eng.ubu.ac.th

ABSTRACT

Ubonratchathani is a province in North - Eastern of Thailand, which has been suffered from the "Mun river" flooding since last-long history as well as in recent years. Results from simulating the mathematical model and field surveys confirm that the local administration's proposal to construct the retaining structure along the riverbank up to the elevation +118 MSL (where the elevation +112 MSL is considered "critical") would not be the proper solution to prevent flooding because of two reasons. First, almost all the people and communities have settled and lived in the flood plain along the river illegally, few of them are now living in harmony with the river i.e. cultivation or fishing. Secondly, constructing the retaining wall still needs further improvements of infrastructures e.g. waste treatment or disposal, road, electricity as well as residents. As the Government has launched the housing policy for relatively low-income and homeless people through the National Housing Authority (NHA), one possible alternative is to remove the people and communities away from the flood plain instead of constructing the retaining wall or paying the compensation. Housing policy and management strategies should be established i.e. land acquisition, investment of infrastructures, appropriate type of housing, cost, payment schedule and period as well as criteria for the people to occupy the housing unit. Accordingly, the flood plain should be considered "risk area" and legal action should be taken i.e. limiting the amount of compensation and encorage the people move away gradually. The on-going project has acquired information and data i.e. numbers of household, size of family, profession, average income, construction plan and technique and preferences of the people (type of housing, location, cost, terms of payment). Two alternatives would be compared, which are: 1) constructing the retaining wall and improving related infrastructures with perhaps, occasionally pay the compensation to the people when unusually flooding occurs; or 2) implementing the housing project for the people who would be removed from flood plain. Preliminary results show that the latter alternative would be the promising solution for people and local administration and would be a good illustration to solve the similar problems in other areas.

Keywords: Ubonratchathani, Mun & Chi river, flood plain, compensation, housing policy, risk area, compensation.

INTRODUCTION

Ubonratchathai is a province in far North - Eastern of Thailand, it consists of 20 districts and five sub-districts. Among these, the “Muang Ubon” and “Warinchamrab” district (in short, called “Muang ” and “Warin”, respectively), which have great impacts to economics of the province are situated on the opposite banks of the Mun river. Ubonratchathani has its boundary closes to three other provinces (Amnatchareon, Yasothon, Sri Saket), Laos PDR and Combodia. A river called the “Chi” river, which originates from upper part of the North – Eastern flows and joins the “Mun” river, which originates from the upper middle part of region at Ubonratchathani and then, the Mun river flows through part of the province and joining with the “Khong” river. The three main rivers form a big basin called “Khong-Chi-Mun” basin. Figure 1 shows the map of Thailand and location of Ubonratchathani, Figure 2 shows the Khong-Chi-Mun basin, which is bounded by the three main rivers.

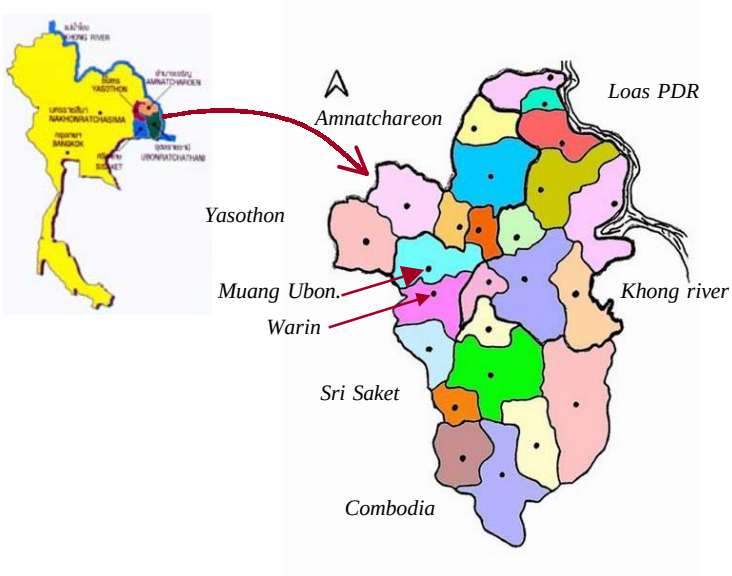


Fig. 1 Map of Thailand and Location of Ubonratchathani.

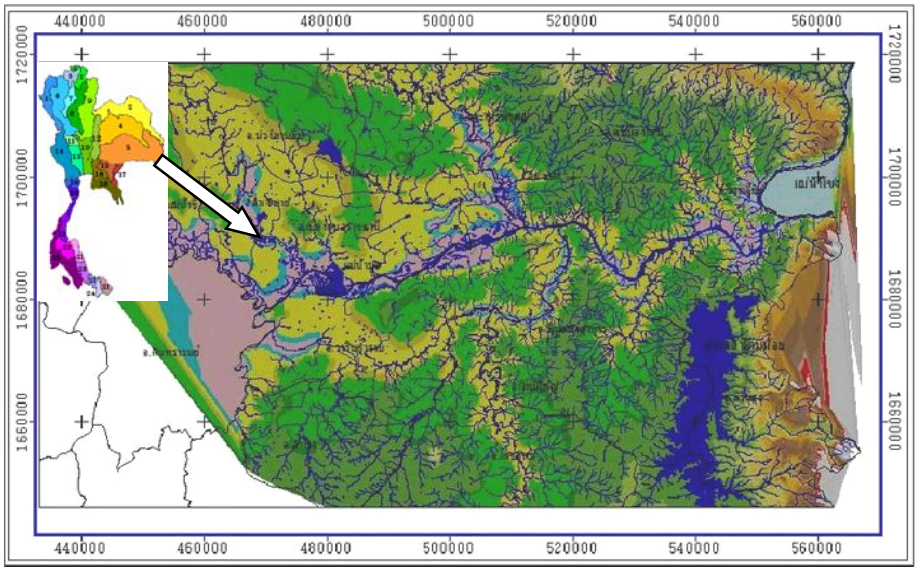


Fig. 2 Khong-Chi-Mun River Basin and Land form of Ubonratchathani.

Total area of Ubonratchathani is 15,839 km^2, most areas are forest and agricultural lands. Table 1 presents land utilization in Ubonratchathani and Table 2 presents damaged area from flooding in Ubonratchathani, respectively. Total population of Ubonratchathani (as of December 2002) is 1,792,774 (899,005 male and 893,769 female), that 14.6% are living in the urban, the density of population is 111.3 persons per km^2, with 4.0 and 4.7 persons per household within the urban or rural zone, respectively. Gross Provincial Product (GPP) in 2000 is 37,893 Million Baht (40 Baht = 1 US Dollar, approximately), where per capita GPP is 222,224 Baht, respectively. Three major sectors are services, agriculture and business (Table 3).

Table 1 Land Utilization in Ubonratchathani (2002).

Categories	Area, km^2	Percentage
Forest	5,904	37.3%
Agriculture	7,272	45.9%
: Paddy field	6,430	40.6%
: Cultivation	477	3.0%
: Orchard	270	1.7%
: Flower plants	4	0.0%
: Vegetation	51	0.3%
: Others	40	0.3%
Unclassified	2,663	16.8%
Total	15,839	100%

(source: Ubonratchathani province, 2002)

Table 2 Damaged Area from Flooding in Ubonratchathani (2002).

Categories	Area, km^2	Percentage
Total flooding area	515	100%
: Paddy field	511	99.2%
: Cultivation	2	0.5%
: Orchard & others	2	0.4%

(source: Ubonratchathani province, 2002)

Table 3 GPP of Ubonratchathani in 2000

Sector	GPP, Baht	Percentage
Services	7,418	19.6%
Agriculture	7,338	19.4%
Business	6,280	16.6%
Others	16,857	44.5%
Total	37,893	100%

(source: Ubonratchathani province, 2002)

REVIEWS OF THE PROBLEMS

As it is situated in the large basin, the Ubonratchathani province has its last long historical records of flooding over the vast area specially, in the recent years. The Mun river has its maximum capacity at 2,400 m^3/sec in average, while the maximum flow in 2002 measured at the station nearby the bridge connected between the two main districts (called station M7) is 6,800 m^3/sec. This result in high water level and flooding in the area along both sides of river, including the urban area, which has great economics impacts. Figure 3 shows minimum and maximum water level at the controlled station M7 during 1985 - 2003. Minimum water level has slightly changes, in 1995, the minimum level is +106.21 MSL (measured in dry season). The maximum water level varies widely, recently, it is +115.77 MSL in 2003. However, the historical maximum level in 1978 was +118 MSL.

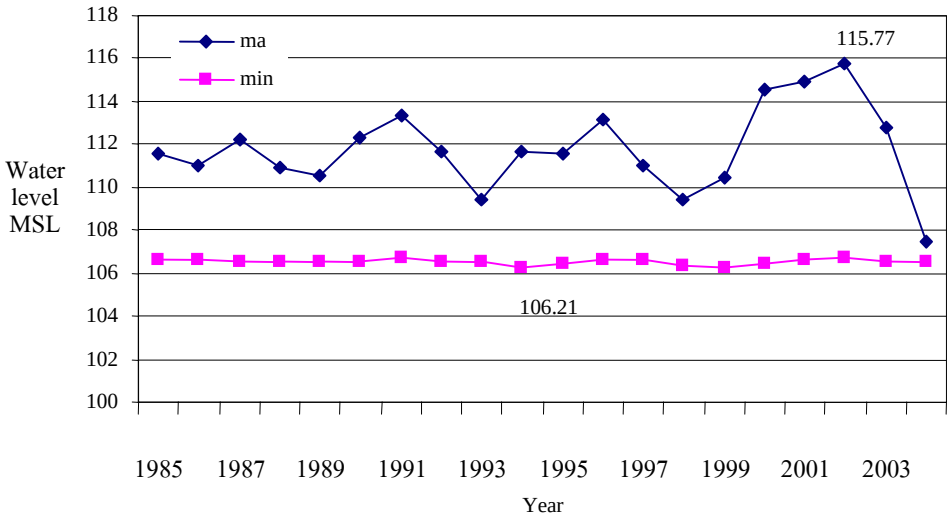


Fig. 3 Water Level of Mun River at Station M7 (1985- 2003).

In the past, there seemed no complaint from the people as those who had water-related life or activities lived in the flood plain along the Mun river (e.g. cultivation, fishing and earthenware products). Now a day, more people has settled and lived in the flood plain even the land is belong to the public. Although their living activities are not water-related, they have no choice to have the better residents because of relatively low income. Temporary or rather permanent residents have been built without permission from the local administration, therefore, their livings do not conform the town planning and they live with inadequate infrastructures or utilities such as road, water supply, electricity, waste water treatment and solid waste disposal. When it is flooding, the local administration could support the people only as necessity with limited budget, lack of well-planning and management to protect the people even warning them in advance. The local administration could only support moving the people to another safe place, provide temporary residents, transportation, pay compensation for fatal, injuries, lost of properties or jobless because of flooding. Doing this way, the local administration has to prepare amount of emergency budget, which might be varied year to year. Even the budget for compensation has been increased rapidly, it seems that the compensation could not satisfy the people or definitely recover all the damages, repairs or losses. In 2002, it is averaged that the compensation is 30,000 Baht per household. Figure 4 shows examples of flooding effects to the people and communities on the flood plain along the Mun river banks i.e.

slope failure, solid waste disposal problems, motor transportation, loss of resident, lack of food and water as well as diseases and health problems.

Fig. 4 Examples of Mun river's Flooding Effects to the People and Communities.

The Ubonratchathani's Chamber of Commerce reported that flooding in 2002 disconnected the motor transportation, then effected in lost of businesses, industries, tourism and other services, which cost more than 1,000 Million Baht, approximately. For the reason, short-term measures had been proposed and implemented by the regional sector of the Department of Highway. The West ring road, which is connected the two main districts (Ubon and Warin) was raised up to the elevation +116 MSL in average and the asphaltic shoulder had been superseded by the concrete pavement such that the motor transportation could be maintained without effects from high level flooding. Accordingly, bridge openings had been widen, pipe or box culverts had been installed additionally in order to increase the capacity to drain the run-off flow. As high water level and long period of flooding in recent years caused severe damages, the local administration decided to resolve the flooding problems as an integrated and sustainable project.

PROJECT, OBJECTIVES AND SCOPES

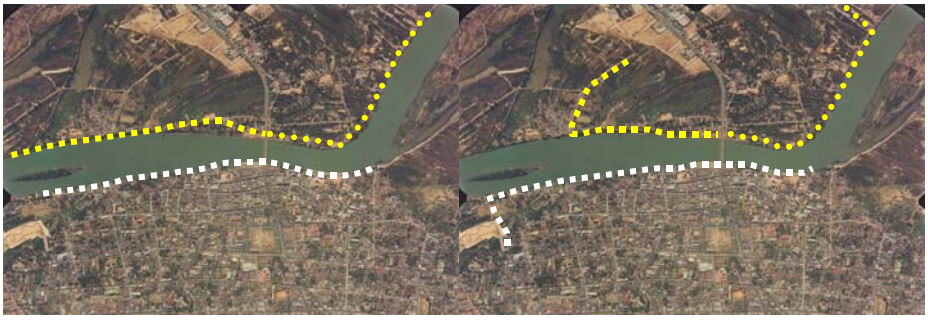
The local administration asked the Ubonratchathani University (UBU) and regional sector of Royal Irrigation Department (RID) to prepare research project proposal in 2002. The project is divided into three sub-projects, which are: 1) modeling and simulation of river flow and flooding; 2) social, economic and environmental impacts from flooding and resolutions; and 3) constructing a canal to increase the flow capacity by diverting the flow from down stream of the Mun river away. Total project cost is 4.9 Million Baht, which is sponsored by the Government of Thailand. The project was planned to complete by end of 2003. However, it is extended to end of 2004. Main purposes of the project are as follows:

1. Computer simulation model would be built. Such that it is capable to forecast the flow in the Mun river and flooding according to various situations. The model deals with hydrological and hydraulic data (i.e. rainfall intensity, flow and water level at each controlled stations along the river) and Geographic Information System (GIS, which consists of terrain topography and flood plain, cross section of the river, buildings, hydraulic structures and other obstructions to the flow).

2. By means of the computer model, possibility of various proposals to prevent flooding shall be simulated or verified.
3. Economics, social and environmental impacts due to flooding in the two main districts (Muang and Warin), feasible alternative or solution as well as planning and management strategies for implementation shall be proposed.
4. Possibility to divert the flow from the Mun river in rainy season by means of the new excavated canal shall be verified by means of the computer model.

REVIEWS OF THE EXISTING ALTERNATIVE

Former studies, which had been carried out by the Public Works Department (PWD) and the consultant in 1994 recommended that the flood protection structure, called "retaining wall" should be constructed along both sides of the Mun river bank in the urban area (total length is 2 to 4 kilometer). The project had been designed for 100 years return period, top elevation of the retaining wall is +118 MSL and estimated cost is 500 Million Baht, approximately. This is to protect the urban area in the two main districts from flooding even it would cause more serious side effects (i.e. higher water level and longer period of flooding) in the upstream or down stream area, which most lands are paddy field or cultivation. Recently, new proposal with similar concept but slightly different in alignment and details, has been launched by the Department of Disaster Prevention and Mitigation (DDPM). Figure 5 compares the proposed alternatives by the PWD and DDPM



a) PWD alternative b) DDPM alternative

Fig. 5 Proposed Alignment of Retaining Wall by PWD and DDPM.

Even the proposal to construct the retaining wall were approved or implemented, there would not guarantee that the expensive structure is capable to withstand when unusual flow occurs. In social and environment points of view, the rather high retaining wall obstruct the river view as well as accessibility of the people to the river for their usual consumption, cultivation, transportation or recreation. Further, the communities along the river banks need to be provided or improved continuously e.g. road, electricity, water supply, waste water treatment plant, solid waste disposal zone, irrigation for agriculture (cultivation or farms) and specially, quality of the residents. Figure 6 illustrates examples of poor quality residents, which need to be improved or modified. The people may not accept the proposal to construct the retaining wall thus, alternative solution needs to be proposed.

Figure 6 Examples of Residents to be Improved or Modified.

RESULTS FROM COMPUTER SIMULATION SUB-PROJECT

The computer simulation model had been built and calibrated to fit the flow parameters using historical data. Consequently, various proposed alternatives to prevent flooding are simulated and tested by means of the model. The simulation results show that there is no single alternative or solution that can solve the flooding in Ubon and Warin, independently (even the third sub-project). In other words, numbers of alternative should be implemented together. Even one seems useless for preventing flooding, it would be of some uses in storing the excess water for consumption in dry season. Figure 7 presents the computer simulation output i.e. the boundary of flooding when the water level is +116 MSL. It is recommended that the people and residents in this coverage area should be removed to another safe place permanently, and the area then should be considered "restricted or risk area". Moving the people, residents or communities then need interdisciplinary e.g. legal action, political, architecture, engineering, planning and management, social and economics, health and environmental science.

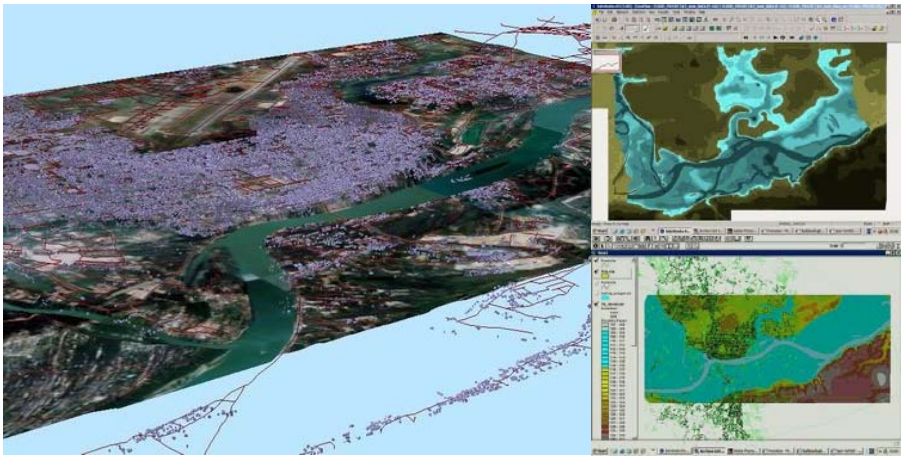


Fig. 7 Computer Simulation Output: Boundary of Flooding at Water Level +116 MSL.

NEW PROPOSED ALTERNATIVE

One possible alternative to resolve flooding problems is to remove the people and communities away from the flood plain. The local administration should support the people and communities in seeking the safe place from flooding to settle and live permanently instead of paying the compensation or constructing the retaining wall with further additional costs for improving infrastructures and utilities (that the unusual flooding can still be occur). This sustainable alternative seems to be the promising solution as the Thai Government has launched the housing policy for relatively low-income and homeless people through the National Housing Authority (NHA). So far, the NHA used to support the improvement of residents and environment of few communities in the flood plain in Ubon and Warin. If low-cost resident can be acquired, and it allows the buyer a rather long paying period, almost all the people would attempt their effort to purchase the first permanent house for their life and families. Accordingly, the flood plain should be considered "risk area". The people should be allowed to extend living in the flood plain for considerably period i.e. five to ten years. Perhaps, the local administration has to pay for compensation due to flooding during this transition period to encourage the people having the new house and prepare to move gradually. After that, legal action should be taken to the illegal people or resident strictly.

Unless the local administration implement the proposed alternative, the amounts of compensation and repairing the damaged infrastructures after flooding are increasing, continuously. Table 4 presents the changes in communities, households, and population, which were damaged or affected from flooding during 2001-2003. The numbers of damaged or affected community, household and population increase 20 to 26.8% (2001-2002). Even there was no critical flood in 2003, half of them were damaged or affected.

Table 7 Damage or Effects from Flooding during 2001-2003.

Damages or effects from flooding	2001			2002				2003			
	Ubon.	Warin.	Total	Ubon.	Warin.	Total	+/- (%)	Ubon.	Warin.	Total	+/- (%)
Nos. of community	17	13	30	23	13	36	20.0%	18	11	29	-19.4%
Nos. of household	1,160	1,505	2,665	1,606	1,640	3,246	21.8%	875	1,201	2,076	-36.0%
No. of population	5,430	7,144	12,574	6,833	9,110	15,943	26.8%	3,278	4,383	7,661	-51.9%

Remark: no critical flooding in 2003, only those who live in the flood plain, which elevation is lower than +112 were affected.

Housing policy and management strategies should be established systematically and need interdisciplinary i.e. urban planning and management, architecture, engineering, social economics, legal aspects, environment and health care. Land acquisition or location of the project shall be selected based on the preference of the people and availability of infrastructures and utilities i.e. road and access, flood protection dike and drainage system, waste water treatment plant, solid waste disposal, water supply, electricity, and telecommunication system. Design of house should conform to the local life style, topography and climate. Therefore, typical local housing styles are planned to be modified to achieve good engineering design i.e. sing durable material, ease the mass construction and cost saving. Functional area of each house should be arranged such that it is adequate for various sizes of family. Necessary infrastructure i.e. road, drainage, waste treatment plant, solid waste disposal, water supply, electricity and landscape should

be provided for the housing project. Figure 8 shows some typical local housing style to be modified.

Figure 8 Some Typical Local Housing Style for Further Modification.

ON-GOING AND FURTHER WORKS

The on-going project is now collecting further data i.e. size of family, profession, average income, preferred type of housing and location, acceptable cost (or preference price to purchase), terms of payment and paying period as well as construction planning and technique. Two alternatives would be compared by means of economics evaluation: 1) existing alternative (constructing the retaining wall with improvements of the communities and occasionally compensation to the people when unexpected flooding occurs); and 2) new alternative (implement the housing project for the people who would be removed from flood plain).

CONCLUSIONS

1. Conclusions of the computer simulation sub-project and recommendations for the two on-going sub-projects can be drawn as follows.
2. The computer simulation model had been built. It can be used as tool for forecasting occurrence and effects of flow in the Mun river along Muang and Warin district (Ubonratchathani province), water level and duration of flooding when rainfall, upstream flows or water levels are known.
3. The results from computer simulation show that there is no single proposal or alternatives that can resolve the flooding problems in Ubon and Warin, definitely. Numbers of proposal or alternative should be implemented together to prevent flooding as well as to store the water for consumption in dry season.
4. The model also strongly confirms that constructing the high retaining wall along both sides of the Mun river bank in Ubon and Warin would not guarantee flooding.

RECOMMENDATIONS FOR ON-GOING SUB-PROJECTS

Based on the obtained result from computer simulation model, the existing alternative of constructing the high retaining wall would not appropriate to prevent flooding for the urban area of Mung and Warin districts. The numbers of problem specially, the illegal settlement of people and communities in the flood plain could not be resolved definitely. On the other hand, the new proposed alternative of housing policy and strategy to remove the people and community from flood plain would be a promising solution. As the planning and management of infrastructure project, the new proposed alternative needs interdisciplinary approaches specially, legal, social, economics and environment. Additional data is now being collected and analyzed so that the policy, implementation plan and management strategies could be set up. Local administration should arrange the public hearing, as the most important key of the success of this sub-project is acceptance of the people and communities in the flood plain. When this sub-project is accepted and implements, diversion of the down stream flow from the Mun river (the last sub-project) would be unnecessary. Hence, the housing policy and strategy to remove the people and communities from the flood plain in Ubonratchathani as proposed by this sub-project would be a good solution for similar problems in other areas.

REFERENCES

National Statistics Office (2003) Statistical Reports of Ubonratchathani. Ministry of Information and Communication Technology, Bangkok.

Ubonratchathani Province (2002) Executive Summary: Agricultural Area Affected from Flooding. Unpublished, pp. 1 – 20.

Ubonratchathani University (2003) Inception Report: Studies and Resolution of Flooding in Ubonratchathani. Unpublished, pp. 1.1 – 7.54.

Ubonratchathani Province (2003) Strategic Provincial Development Plan. Unpublished, pp. 1 – 85.

Ubonratchathani Province (2003) Summary of Situations and Supports according to Flooding. Unpublished, pp. 1 – 9.