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The Level of Satisfaction towards Flood Management System in Kelantan, Malaysia

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ABSTRACT

The community in the Kelantan River Basin is still confronted by the problem of ineffectiveness of flood management system despite the government's efforts to come up with various approacheson flood management systems to assist flood victims. The main objective of this study is to evaluate the level of residents' satisfaction towards the implementation of flood management system. This study is quantitatively designed which utilized a questionnaire distributed to 160 respondents selected by stratified cluster simple one-stage sampling technique. The statistical technique used is mean comparison and one-way ANOVA to explain the residents' perceptions among the districts involved with regards to the efficiency of the implemented flood management system. Based on the outcome of the study, the mean value related to the level of satisfaction of flood victims showed a decreasing pattern from before, during and after flood occurrences. For example, the mean comparative study reveals that the residents of Tanah Merah district recorded the highest dissatisfaction level for the three periods (before 3.04, current 2.95 and after 2.02) in comparision to other districts. The results illustrate a low efficiency level in flood management before flood occurrence. For instance, the community is still not quite satisfied with the effectiveness of warning system, action time intervals and current announcement time intervals regarding latest developments in flood situation with all these variables not achieving significant level of 0.05. The same applies to the situation on after flood effects such as in terms of dispensing flood assistance, controlling of infectious diseases and actions toward each resident's complaints. Thus, government have to reconsider about the level of residents' satisfaction to current flood management systems namely before, during and after floods occurrence and systematic planning in flood management

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system reflects proactive cooperation among relevant parties in preparation for flood disaster.

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INTRODUCTION

Flood occurs when water over flows from the river banks and inundates the closest plain where water was not prevalent earlier.. Normally, this overflow happens when heavy rain takes place non-stop for a duration of several days at certain locations. Flood is also defined as a situation where water flows exceed the carrying capacity of a river resulting in overflows over the river banks (Erickson 1971, Goh 1981, Griffiths 1985, Hoyt & Langbein 1966, Jamaluddin & Ismail 1990, Smith 1993).

Massive floods in Malaysia occurred as early as 1886, 1926, 1967, 1971 and 1986 and lately this situation has continuously worsened.. One of the areas in Malaysia which experienced frequent flooding is in the Kelantan River Basin (DID, 2005). This is because the flood that inundated the basin is categorised as a major flood area (?) and the frequency of occurrence is high (Sham, 1973). For example, the major flood episode in 1967 caused the area to be declared as Emergency Area as 84 percent of residents of Kelantan State were affected and a lot destruction of basic facilities such as roads and hospitals (Low, 1983; Sham, 1973).

To control flood, there are two approaches used by the government namely the structured and non-structured method. Normally, the structured method of controlling flood is more objective in nature since the level of risks is measurable and convincing (Cvetkovich *et al*. 1992). However, due to the escalation of cost, the non-structured method is also important to be introduced as an alternative method to flood management. In addition, the involvement of government, community, private sector and NGO's is vital to maximize the effectiveness of any forms of implemented flood management. For the Kelantan River Basins, although the government has already implemented various steps and actions to assist flood victims at the before, current or after flood stage, the residents are still being engulfed with the issue of poor effectiveness of the flood management system.

The main question however is to understand the level of satisfaction among residents involved toward the implementation of the flood management system. This study assumes that this level of satisfaction among residents towards government flood management system is significantly varied among the districts involved at each stage; before, during and after the flood occurrence. Therefore, the objective of this study is to evaluate this level of satisfaction towards flood management system in Kelantan River Basins at the three stages.

Evaluation of residents' satisfaction includes items such as response on the warning system, efficiency in warning system delivery, response time, reminders and cooperation of relevant authorities. As

for the during flood stage, the following aspects are taken into consideration namely rescue equipment such as boat and safety/life jackets, safety during transfer or evacuation process, cooperation of rescue team, cleanliness of evacuation centers temporary shelter, foodstuff supply, evacuation centers temporary shelter surroundings, service and assistance distribution. For the after flood stage, among the questions raised are distribution of flood assistance, health control, public amenities repairs and public complaints.

The occurrence of flood is synonymous to the state of Kelantan due its significant frequency in that state. The flood occurrence also cause losses and damages to properties and many lives. One of the main reasons for the high incident of flood in the state is due to large-scale land clearing activities for commercial agricultural purposes such as for rubber and oil palm estates (Tuan Pah Rokiah, 2010). The total area of land use such as forest, rubber and oil palm indicates that there is a big annual change as most lands are utilsed for commercial agricultural activities (Table 1).

For instance, during the year 1961 to 2006, Kelantan River Basins has experienced flooding for a total of 275 times at early warning level, 92 times at warning level and 23 times at dangerous level (Tuan Pah Rokiah, 2010). The same situation also exists for other sub-basin regions such as Lebir, Galas, and Pergau which recorded increasing flood frequency and magnitude. This scenario also illustrates higher flood risk tendency if relevant parties do not take prudent mitigation measures including flood management system especially for the three stages of before, during, and after flood occurrence. If proper measures are implemented, unwarranted events such as loss of properties, lives, and spreading of infectious diseases can certainly be avoided.

In Malaysia, flood management normally employs structural engineering approach. However, this approach is found to be less effective in tackling human related flood issues or problems (Chan, 1995). According to Chan (2009), since flood problem is closely related to human factor, therefore, the best approaches to solving flood problem should also be non-structural (humanity-based). The importance of this non-structural approach must be reemphasized through the concept of environmental humanities (Chan, 2010).

Also, according to Levy *et al*. (2005) the proposal for Disaster Support Systems (DSS) is a non-structural approach introduced to improve the planning and effectiveness

TABLE 1
Landuse Changes by Year 1984, 1997 and 2004

Landuse Types	1984 Area (ha)	1997 Area (ha)	2004 Area (ha)	Average
Forest	10454677597.83	801154.92	710073.92	3485396276
Rubber	116835.97	163510.79	142170.10	140839
Oil Palm	20656.6	65835.01	87974.12	58155.2

Source: Kementerian Pertanian Malaysia 2004

of flood management. Among the vital elements of DSS are communication, knowledge transfer, skill improvement in forecasting ability and the transparency of strategic flood decision management. In addition, the study by Vari (2002) at Lower Tisza found that the forms of flood control is not necessarily needed to be informed but it is vital that the public be informed of the level of risks associated with flood so as not to create a panic situation in the community.

Study in Vietnam found that the effects of *doi moi* policy really provide much of awareness to the community in order to face the flood disaster by building more durable housing, building home in stages using better resistant building materials. Up to the year 2005, there was 17 percent of houses built using more durable materials, 65 percent using semi durable materials and 18 percent still using less durable materials (Tran *et al*. 2009). According to Warner (2008), efficient flood management system requires a close cooperation by each level of the community, private sector and local leaders. These groups should not be left out in facing major flood disaster but they should act an "army" to help the flood victims.

STUDY AREAS AND RESEARCH METHODS

The study coveredKelantan River Basins which is divided into several sub-basins namely Sungai Kelantan, Sungai Galas, Sungai Lebir and Sungai Pergau (Fig.1). The total area of this Kelantan River Basins is about 13,100 square km or 85 percent of the Kelantan state area consisting eight districts namely Kota Bharu, Pasir Mas, Tumpat, Tanah Merah, Machang, Kuala Krai, Jeli and Gua Musang.

The selection of the respondents is based on the worst flood-hit area and the most frequent occurrence of flood for each of the districts involved. For example, Kuala Krai district in the Manek Urai area, has been chosen to represent the district because the area was worse-hit by flood for each and every year. Based on the same principle, the districts that were involved in the selection of respondents are Kota Bharu, Pasir Mas, Tumpat, Tanah Merah, Machang, Kuala Krai, Jeli and Gua Musang with a total respondent of 160 people.

The design of this study is quantitative in nature where questionnaires were distributed to 160 respondents. There are 4 sections in the questionnaire namely demographic, flood management system at before, current and after flood stage. To measure the respondents' level of satisfaction toward the flood management system by the government, Likert's Scale is used ranging from 1 (not satisfied) to 4 (strongly satisfied). Respondents were selected from flood victims relocated to each district relocation centers. This study uses stratified cluster simple one-stage sampling technique as used by Xie *et al*. (2008). A total of 20 respondents were selected using the said technique for each district which cumulatively totaled to 160 respondents. According to Carver and Nash (2005) and Mohd. Majid (1990), sample size of 30 is adequate for the purpose of inferential

statistics. However Mohd. Majid (1990), added that sample size of 100 is better to provide more representation of respondents of various background.

In this study, respondents are required to fill out questionnaire forms after the flood and the respondents are the same persons for the 3 situation of before, current and after the flood occurrence. However, for the district of Pasir Mas, the responses are only for the before and after flood occurrence as there were no flood victims being relocated to relocation center. Therefore, this study validates that the sample size is adequate, suitable and acceptable for statistical analysis purposes.

Since the study is quantitative in nature, all the data collected from the questionnaires were analyzed using the inferential statistics such as mean comparison, one-way ANOVA and correlation. The selection of these statistical techniques is deemed appropriate considering the types of data collected and hypotheses formulated, for instance, the application of mean comparison and one-way ANOVA techniques to demonstrate the level of resident's satisfaction amongst the districts towards the current flood management system as frequently used by Abd. Rahim (1999, 2009). Mean comparison analysis is applied to obtain the overall views of a particular phenomena and standard deviation statistic is used to detect variation in perception among all the respondents. On the other hand, one-way ANOVA method is utilized to detect the level of significant

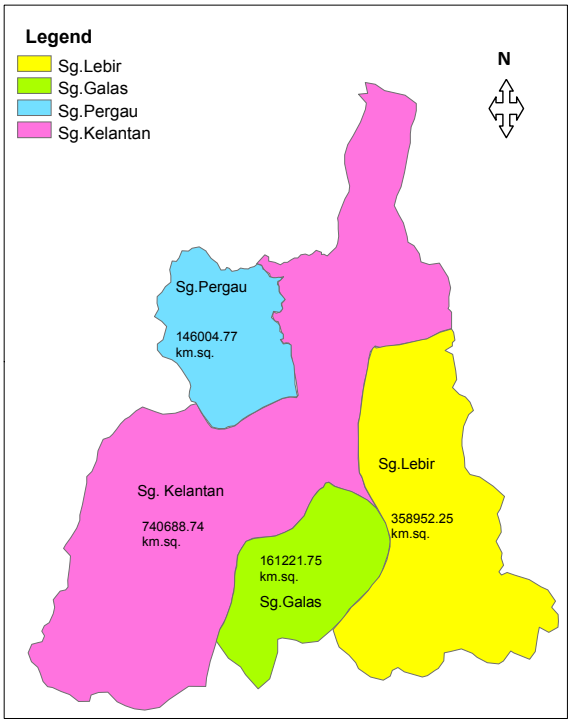

Fig.1: Sub-basins of the Kelantan River Basin
(Source: Tuan Pah Rokiah, 2010)

in perception differentiation among the respondents consisting of three or more groups (among the districts).

RESULTS AND DISCUSSION

The efficiency of flood management system is essentially important because it influences two vital components; the safety of human lives and property damages and losses. If the government is practicing proper and efficient flood management system (before, during, and after flood occurrence), the extent of loss or damages of human lives and properties can certainly be incrementally reduced (Vari, 2002).

The efficiency of flood management system can be evaluated through various approaches, one of which is through measuring the level of satisfaction among the residents who live within the study area. This level of satisfaction can be evaluated from several aspects, for instance, efficiency and effectiveness level, or cooperation and assistance provided by the government. Hence, two types of analysis are carried out namely the mean comparison and one-way ANOVA to rationalize the study hypothesis that there exist significant differences or discrimination of residents' perceptions among the districts towards the efficiency of flood management system delivery.

Mean Comparison

To detail out the study hypothesis that there exists significant differences of residents' perceptions among the districts towards the efficiency of flood management system delivery (before, during, and after), mean comparison method is used. Evaluation of residents' satisfaction at before flood occurrence stage includes warning system, efficiency in warning system delivery, response time, reminders and cooperation of relevant authorities to the residents involved. Based on mean value for the before flood stage, the study found that Gua Musang and Tumpat District recorded the highest mean value of 3.46 each and standard deviations of 0.3697 for Gua Musang District and 0.3346 for Tumpat District respectively.

This scenario illustrates that the level of satisfaction is high among the residents in these two districts towards the flood management system at the before flood occurrence stage as compared to other districts. For Tanah Merah and Kuala Krai District, the results show the lowest mean scores of 3.04 and 3.30 respectively with corresponding standard deviations of 0.3700 and 0.3898. This clearly demonstrates that residents in these two districts have a rather low level of satisfaction towards the efficiency in flood management system in their districts. The difference in higher or lower mean value is dependable on the level of cooperation among the government agencies of corresponding districts in delivering flood information before the occurrence of flood. For the other districts, mean recordings are almost similar with readings ranging from 3.33 to 3.39. This also indicates that the residents in these districts within the Kelantan River Basins are generally satisfied with flood management system at the before flood occurrence.

Furthermore, to illustrate the level

of satisfaction among the flood victims during the flood occurrence, a number of questions need to be addressed. These include rescue equipment such as boat and safety jacket, safety during transfer or evacuation process, and cooperation of rescue team, cleanliness of evacuation center/temporary shelter, foodstuff supply, evacuation center/temporary shelter surroundings, and service and assistance distribution. The study outcomes show that for the during flood stage, there is a slight variation in the mean value where the scores for each districts decreased. This is an indication that the level of satisfaction among the residents involved for these districts are generally low especially for Tanah Merah District with mean score of 2.95 and for Jeli District is 3.07. Standard deviations for these two districts are 0.3201 and 0.1753 respectively (Table 2). The difference in standard deviations for each

TABLE 2
Mean value for the level of residents' satisfaction towards flood management system by districts

Stage	Districts (Jajahan)	Overall Mean	SD
Level of Satisfaction Towards Flood Management System BEFORE Flood Occurrence	Gua Musang	3.46	.36970
	Jeli	3.35	.28756
	Kota Bharu	3.33	.35145
	Kuala Krai	3.30	.38984
	Machang	3.33	.41413
	Pasir Mas	3.39	.36109
	Tanah Merah	3.04	.37009
	Tumpat	3.46	.33467
Level of Satisfaction Towards Flood Management System DURING Flood Occurrence	Gua Musang	3.11	.21437
	Jeli	3.07	.17531
	Kota Bharu	3.11	.19759
	Kuala Krai	3.21	.19051
	Machang	3.16	.17548
	Pasir Mas*	-	-
	Tanah Merah	2.95	.32013
	Tumpat	3.21	.13650
Level of Satisfaction Towards Flood Management System AFTER Flood Occurrence	Gua Musang	2.27	.08156
	Jeli	2.27	.11180
	Kota Bharu	2.30	.08156
	Kuala Krai	2.26	.08377
	Machang	2.11	.24839
	Pasir Mas	2.30	.08719
	Tanah Merah	2.02	.21134
	Tumpat	2.28	.10949

Includes All Districts except Pasir Mas- No data DURING flood (N= 140)

(Source: Tuan Pah Rokiah, 2010)

of the districts demonstrates that there are significant variations with regards to the level of residents' satisfaction towards the services being provided to them during the flood occurrence.

This situation reveals that flood victims from both districts are rather less satisfied with the flood management system implemented by the government. The districts that recorded highest mean value (3.21) are Kuala Krai and Tumpat. However, this highest mean value is for the during flood occurrence stage. When compared with the mean value at the before flood occurrence stage, the value is actually lower (i.e. for Tumpat, the mean value of before flood occurrence stage is 3.46). This situation indicates a reduction in mean value of the during flood occurrence stage as compared to the mean value at the before flood occurrence stage. Besides, there is one district (Pasir Mas) with no data during flood stage due to possibly the non-existence of flood victims being relocated or relocating to relatives' house.

This district was actually one of the worst flood hit districts around the year 1970's to 1980's (Tuan Pah Rokiah, 2010). However, after a number of flood mitigation measures were built along Kelantan River including the construction of higher concrete levees and pump houses, the intensity of flooding in this area was reduced to about 0.5 meter. This has resulted in a lesser number of flood victims needing relocation to temporary shelter. The opposite is happening to the residents who live in the district of Pasir Mas on the Thailand border which experiences more frequent and severe flooding due to the overflows from Golok River (i.e. Pekan Rantau Panjang).

The trend in mean value also shows that the level of residents' satisfaction is declining for the after flood occurrence stage. Among the questions that need to be addressed include the distribution of flood assistance, health control, public amenities repairs, and public/residents complaints. Tanah Merah district recorded the lowest mean value of 2.02 with standard deviation of 0.2113 and this is followed by Machang district with mean value of 2.11 (standard deviation of 0.2483). On the other hand, Kota Bahru and Pasir Mas districts recorded the highest mean value of 2.30. The mean value for other districts ranges from 2.26 to 2.28. This situation may be caused by urgent needs by the residents of Pasir Mas dan Kota Bharu districts as compared to Tanah Merah and Machang districts after the flood such as complaints on road or bridge damages by the flood.

Based on this study, mean value for the level of flood victims' satisfaction toward the efficiency of flood management is declining from the time before, during, and after flood occurrence. Furthermore, the level of flood victims' satisfaction in Tanah Merah district is generally unacceptable. This is because in the three stages of flood, the mean value recorded for this district is the lowest (before 3.04, during 2.95 and after 2.02). This scenario exhibits that the flood management in Tanah Merah district needs to be given priority for improvement as compared to the other districts such

as Kota Bharu and Pasir Mas districts. In addition, Tanah Merah district is one of the districts in Kelantan that experiences higher frequency of flooding during the rainy monsoon season. Hence, prudent monitoring on the part of government must definitely be undertaken in order to improve the level of flood victims' level of satisfaction in that area. Overall, there exist differences in the level of satisfaction among the communities towards the efficiency of flood management system in the Kelantan River Basins.

One-Way ANOVA

Meanwhile, to detail out the study that there exist significant differences in perceptions among residents from the various districts, discussion can be divided into before, during and after flood occurrences.

Before Flood Occurrence

To examine the level of residents' satisfaction toward the efficiency of flood management system for each district, a total of eight questions were presented. However, based on study outcomes, only four out of eight questions achieved significant level. For the question on the delivery method of flood warning system, the mean value is 3.34 and the significant level is at 0.05 where P=0.014. This demonstrates that there are variations in residents' perceptions in each district within the study area.

On the question regarding the advise/ reminders on safety and flood danger, the mean value is 3.43 and the significant level is at 0.05 with P=0.009. The residents' norms of not giving much attention to the safety and flood danger has resulted in the existence of differences of opinions among them with regards to the safety reminders/warnings issued by the authority. In addition, the "lassie faire" attitude among the residents also contributed to the wrong and loose interpretation on safety issues.

On the question of patrol/surveillance undertaken by the authority of respective districts, the mean value recorded is 3.36 and the significant level is at 0.05 with P=0.011. Differences in residents' perception regarding patrol and surveillance by authority of respective districts are based on frequency of patrol, competency and other factors. For the question on general views of the overall flood management system before flood occurrence, the mean value is 3.21 and the significant level is at 0.10 with P=0.061.

In addition, there are four questions that do not show significant differences in residents' perceptions in satisfaction towards before flood stage management system. These include questions related to the efficiency of warning system, time intervals given to residents to act after warnings have been issued, time intervals of flood reports disseminated to residents, and cooperation given by the authority.

During Flood Occurrence

One-way ANOVA analysis for during flood occurrence indicates an increase in the number of questions with significant level at 0.05. This shows an increase of the number of residents with different opinions regarding the level of satisfaction towards

the efficiency of flood management system during the flood. To evaluate the level of satisfaction during flood, a total of 19 questions were presented. Based the study results, a total of 17 questions indicates differences in opinions among the districts at the significant level of 0.05 (Table 3). For an evaluation of satisfaction level among the respondents within various districts, there is one district with no data for the during flood stage. The district is Pasir Mas where there were no flood victims being evacuated. This makes the total number of respondents to be 140 for all the seven districts.

As a whole, the residents of Kelantan River Basins hold different views among the districts in relation to the management system during flood. On the level of satisfaction, a total of eight questions recorded mean value from 2.21 to 2.89 and this certainly indicates a low satisfaction level, thus it can be concluded that the efficiency of management system is weak. This means that in general, the residents in

TABLE 3
One-way ANOVA for the level of respondents' satisfaction during flood occurrence for all districts

Level of Satisfaction for Flood Management DURING Flood	Mean	F	Sig.
Competency in terms time taken in rendering rescue assistance	2.21	5.626	.000
Safety emphasis during victims' evacuation activities	3.46	4.277	.001
Safety surveillance of victims' houses and properties left behind	3.53	4.407	.000
Cooperation & consideration of rescue team.	3.53	3.783	.002
Cleanliness of evacuation center/ shelter, toilet, sleeping space, and food preparation place	2.34	4.419	.000
Adequate food preparation and healthy diet	2.84	6.225	.000
Cleanliness of evacuation center/ shelter surroundings from garbage, food wastages, or liquid wastes	2.40	7.041	.000
Maintenance of cleanliness during food and beverage preparation	2.57	2.847	.012
Provision of clothing, blankets, and diapers to flood victims	3.02	9.352	.000
Spare-time activities for adults at evacuation center/ shelter	2.89	7.379	.000
Spare-time activities for children at evacuation center/ shelter	2.77	3.682	.002
Health monitoring at evacuation center especially for senior citizens and children	3.64	3.576	.003
Monitoring of safety by the authority	3.78	3.010	.009
Assistance distribution at evacuation center/ shelter	3.72	4.081	.001
Service of workers/staff at evacuation center/ shelter to flood victims	3.75	2.860	.012
Existing flood conditions report for flood victims at evacuation center/ shelter	3.73	1.995	.071
Cooperation from authority to solve problems during stay at evacuation center/ shelter	3.73	3.619	.002

All districts except Pasir Mas - No data (N= 140)

Source: Tuan Pah Rokiah, 2010

the study area possess somewhat identical views towards the flood management system during flood in their areas. There were however, significant differences of views among residents of different districts within the study area toward the efficiency of management during flood as implemented by the government.

After Flood Occurrence

To examine the level of residents' satisfaction towards management system after flood, there were six questions presented. These include those related to assistance, controlling of infectious diseases, public amenities repairs, public complaints and others. The study results show that three out of six questions achieved significant level at 0.05. On the other hand, the rest of the questions indicate that there are no differences in views among the respondents of all the districts. This includes questions on public amenities repairs, safety surveillance of authority and general views of respondents after flood occurrence.

The questions that recorded significant differences in opinions amongst the respondents of various districts are questions related to assistance to flood victims, control of infectious diseases, and complaints where each questions recorded the mean value of 2.76, 2.63 and 1.98 respectively at significance level of 0.05 with corresponding P=0.000, 0.000 and 0.022 (Table 4). However, if these mean values are further examined, there seems to be a tendency of respondents to have a low satisfaction level for management system after flood. For instance, the mean values just recorded low scores ranging from 2.01 to 2.76 which show situation of less satisfactory. Furthermore, there were values recorded lower than 2.0 such as 1.98 which clearly indicates total dissatisfaction of the management system.

As a whole, these situations illustrate the level of efficiency of management after flood is considered low. An example is from the point of views of rendering assistance, controlling of infectious diseases after flood (cholera, dengue) and actions for each resident compliant. Hence this study found that there were significant differences with regards to the residents' satisfaction on government management system for situations of before, during and after flood among the districts in Kelantan.

TABLE 4
one-way anova for satisfaction level after flood for all districts

Question No.	Satisfaction level AFTER flood	Mean	F	Sig.
1.	Assistance to flood victims	2.76	35.038	.000
2.	Control of infectious diseases AFTER flood	2.63	7.419	.000
5.	Immediate actions taken for any public complaints or problems	1.98	3.353	.022

All Districts (N= 160)

Source: Tuan Pah Rokiah, 2010

CONCLUSION

Systematic planning in flood management system reflects proactive cooperation among relevant parties in preparation for flood disaster. Thus, government has to consider about the level of settlers' satisfaction to current flood management systems namely before, during and after floods materialization. With such prudent actions, it can certainly assist flood victims in the preparation of any flood disaster especially to those who resides in more vulnerable flood-prone remote/interior lowlands. This study proposes improvement to the information delivery techniques such as the effectiveness of early system (P=0.07), action time interval (P=0.18) and announcement time interval (P=0.23).

Based on this study, the residents or the community are still not satisfied with the flood management system as the analyis found that all the valeus are not significant at 0.05. Furthermore, for the period of after flood, there are two aspects that the residents were not satisfied at the insignificant level of 0.05 that is repairs of damaged public facilities (P=0.12) and monitoring of safety and security after flood (P=0.11). However, for the period of during flood, the residents show some satisfaction towrds the flood management system implimented by the government.

Therfore, the government should improve several aspects of the flood management system especially before the flood such as infomation delivery techniques in terms of the effectiveness of earling warning system, time interval for disater announcement and time interval for actions. And for the period after flood, the government should be sensitive to the timely repairs public faclilities and improvement on safety and security monitoring.

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