Attachment 06

Questionnaire Survey on Flood Information Needs

Preface

The great flood in 2011 caused tremendous damage in many parts of Thailand. It had been occurred since the end of July 2011 till the middle of January 2012. Finally, 65 of Thailand's 77 provinces were declared as flood disaster zones, and over 20,000 km^2 of farmland was damage. The estimated economic losses over 1,900 million Baht was calculated from damage to infrastructure, agricultural, industry and social sectors. Seven industrial estates were damaged due to barriers failure, resulting in flooding of dozen of major factories and country-wide disruption of manufacturing supply chains.

This study gathers important information from 5 provinces in the Chao Phraya River Basin, in which were inundated in 2011, by using the questionnaires. The respondents from Ayutthaya, Sing Buri, Ang Thong, Chai Nat and Lopburi have been divided into 3 groups, as city resident, farmer and factory. In addition, the mass media representatives from Thai PBS, Ch 3, Ch 7 TV stations and social media, and the authorities from flood defense organizations who had dealt with the 2011 great flood have also been interviewed. The results from 5 groups of respondent presents the problems related with flood management, information distribution, warning and evacuation processes, and the needs of people, communities, factories and related agencies before, during and after the flood.

It could be expected that, with use of the questionnaire and interview results from this study, Thailand will have the efficient protection and mitigation measures that are applicable and suitable for the citizen along the Chao Phraya River Basin.

Table of Contents

List of Figures

List of Figures (Cont'd)

List of Figures (Cont'd)

List of Figures (Cont'd)

List of Tables

Tables

QUESTIONNAIRE SURVEY ON FLOOD INFORMATION NEEDS IN PROJECT FOR COMPREHENSIVE FLOOD MANAGEMENT PLAN FOR THE CHAO PHRAYA RIVER BASIN, COMPONENT 3

1. Introduction

In 2011, there had been the occurrence of severe flood in many parts of Thailand. The flood had been occurred since the end of July, which is the monsoon season, due to Tropical Storm Nock-ten. It caused heavy precipitation in Northern and Northeastern Thailand, with flash flood in many provinces. There were deaths found in Chiang Mai, Lampang, Lamphun, Mae Hong Son, Nan, Phrae, and Uttaradit in the North, and Bung Kan, Nakhon Phanom, Nong Khai, Sakon Nakhon and Udon Thani in the upper Northeast. The upper-central provinces of Phichit, Phitsanulok, Sukhothai were also flooded as the flooding spread down the overflowing Yom and Nan Rivers. Prachuap Khiri Khan on the gulf coast was also affected.

Flood had been continued till late August due to heavy rain and the discharge from Bhumibol and Sirikit Dams. Floodwater reached 50 cm in Nan and became the highest recorded in 16 years in Phisanulok province, while large areas in Nakhon Sawan and Nakhon Nayok had been increasingly affected. The other lower central provinces such as Uthai Thani, Chai Nat, Sing Buri, Ang Thong, Suphan Buri, Ayutthaya, Pathum Thani and Nonthaburi were then flooded in September. Large areas of paddy filed in these provinces were inundated due to the broken of RID water gates. They were then reserved as the retention area for straining the floodwater from Bangkok, the capital city.

However, in October the floodwater reached Bangkok and the Chao Phraya river mouth. It persisted in some area until the middle of January, 2012. Finally, 65 provinces were declared as flood disaster zones, and over 20,000 km^2 of farmland was damage. The estimated economic losses over 1,900 million Baht was calculated from damage to infrastructure, agricultural, industry and social sectors. Seven industrial estates were damaged due to barriers failure, resulting in flooding of dozen of major factories and country-wide disruption of manufacturing supply chains. The damage was concluded to 804 businesses. Department of Disaster Prevention and Mitigation reported on January 17, 2012 of certain number of dead 813 cases, 3 missing persons. In which the World Bank estimated total damage worth more than 1.44 trillion Baht.

Since then, Government of Thailand (GOT) has urgently pushed the effort to provide various mitigation measures in order to protect and mitigate the damage due to flood that would occur in the future. Sharing information among different agencies has been accumulated and reviewed, such as the information and rules related with large dams operation, the present condition of existing embankments and drainage canals, including the information related with people in and around the inundation areas. However, it seems that the existing information and actions of GOT are inadequate, especially for the decision making process. GOT needs assistance and cooperation from countries who have great experiences with natural disaster.

Japan International Cooperation Agency (JICA) has been providing the technical assistance in collaboration with the Royal Thai Government Agencies to study for the improvement of flood management system in the Chao Phraya River Basin. Therefore, besides the physical characteristics of the Chao Phraya River Basin and the sequence of flood in 2011, the understanding of the nature and needs of people should be clarified as well.

2. Objectives of the Study

During this study, the important information has been gathered via the questionnaire survey on flood information needs in project for comprehensive flood management plan for the Chao Phraya River Basin. The inundation areas of the Chao Phraya River Basin, as shown in *Figure 1*, have been selected as the survey area. The respondents in 5 provinces, i.e. Ayutthaya, Sing Buri, Ang Thong, Chai Nat and Lopburi, in which were affected by 2011 great flood, have been divided into 5 groups are as follows:

- city resident,
- farmer,
- factory,
- mass media, and
- flood defense organizations

in order to:-

1. understand the behavior of great flood in the lower Chao Phraya River Basin,
2. understand the flood management measures of the GOT and local authorizes,
3. understand the existing crisis management measures of both local and nation scales,
4. understand the information distribution and disaster warning system of Thailand, and to
5. understand the needs of related agencies and communities before, during and after the occurrence of flood.

Therefore, in the future, the protection and flood mitigation measures with use of integrated flood warning systems will be applied and implemented appropriately.

3. Scopes of the Study

The questionnaire surveys have been conducted among 5 groups of respondents in the lower reach of Chao Phraya River Basin as shown in *Figure* 2. The number of interviewees of each group and surveyed areas are presented in *Table 1*.

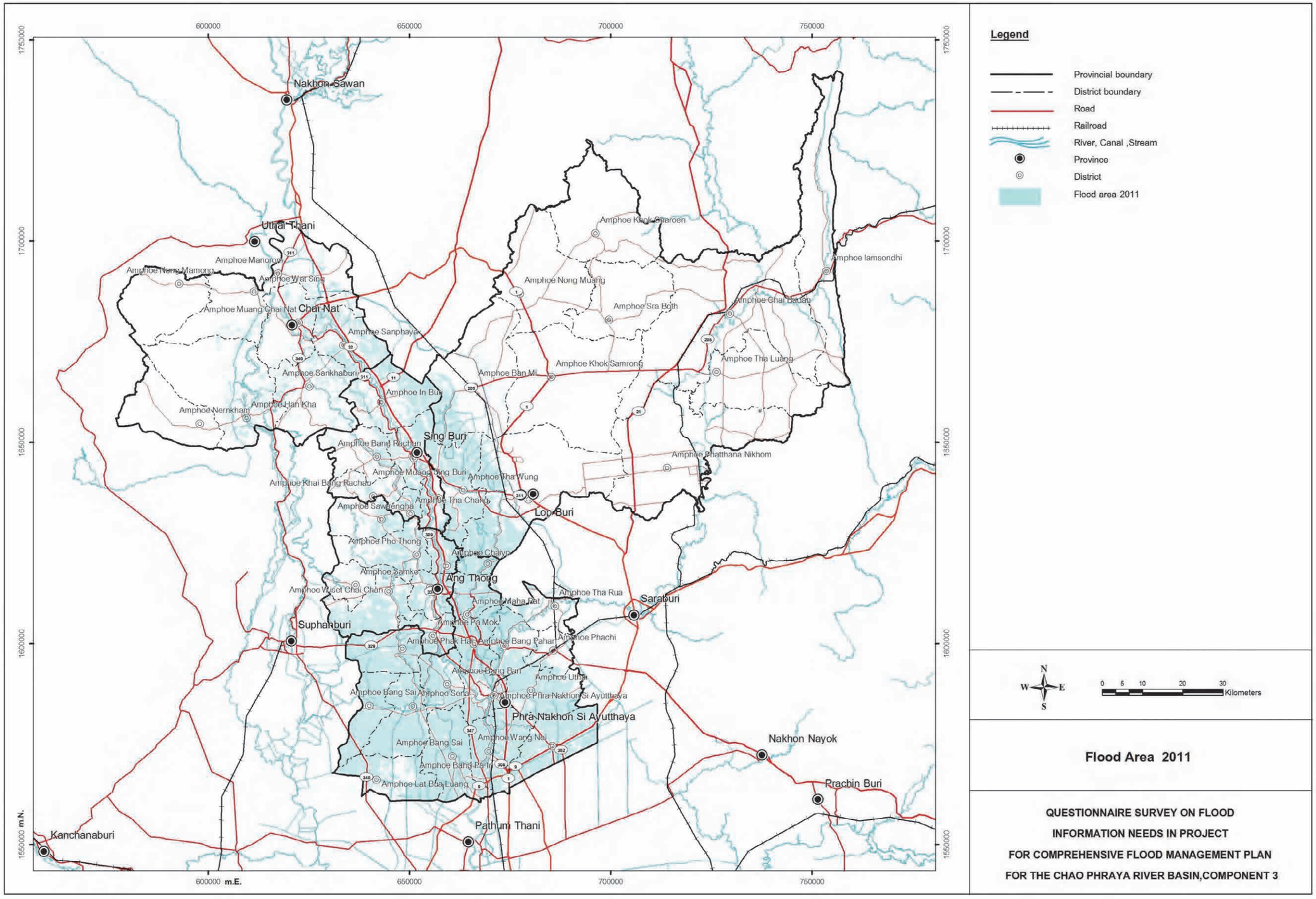


Figure 1 The inundation area, due to great flood in 2011, in the Chao Phraya River Basin

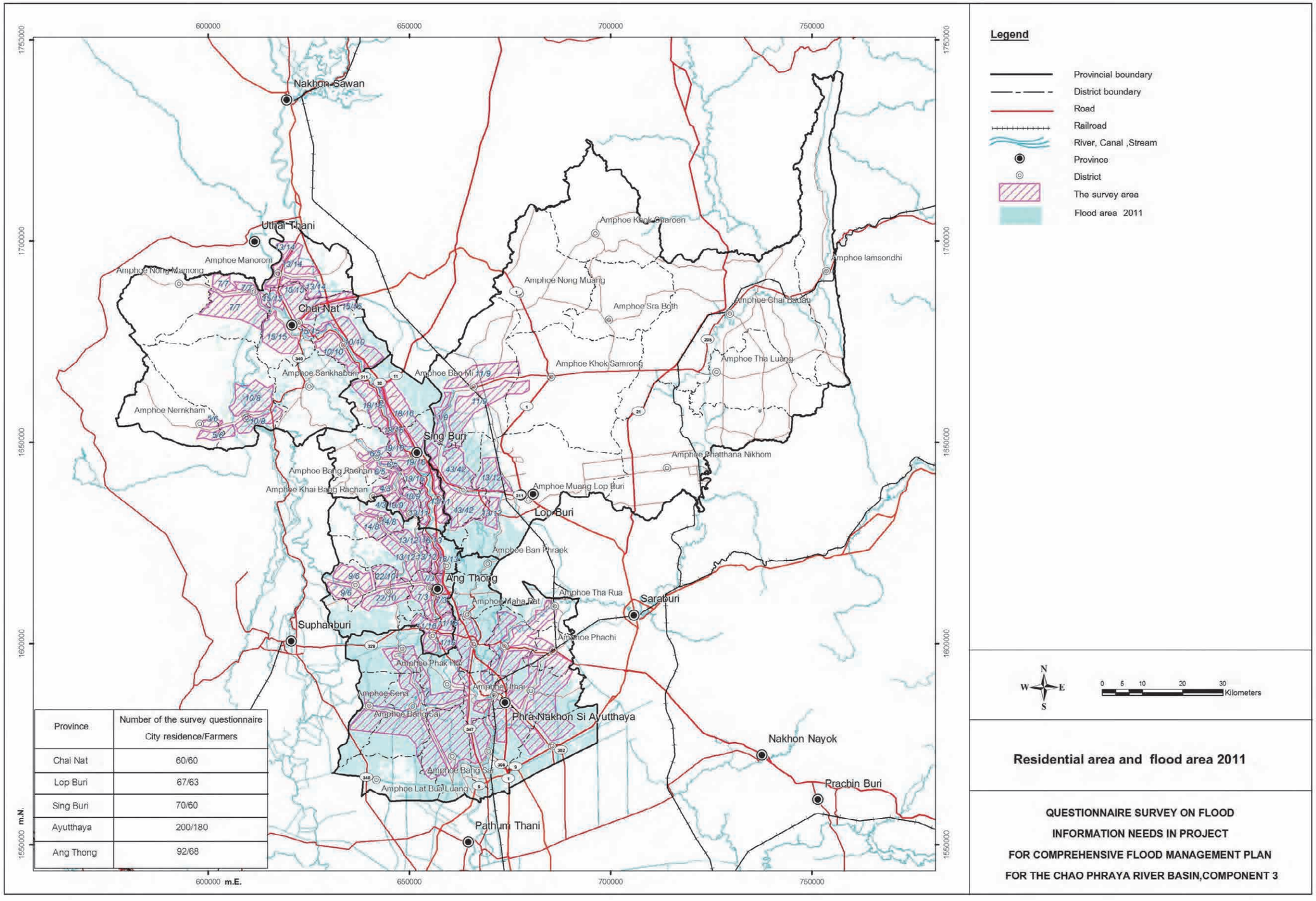


Figure 2 The area where questionnaire surveys have been conducted, overlay with the inundation area due to great flood in 2011

Table 1 Number of Respondents of each Groups and Survey Areas

Respondent Category	Target Numbers of Interviewee	Target Areas of Survey
City resident	Not less than 400	In 5 provinces, which are:- 1. Ayuthhaya 2. Sing Buri 3. Ang Thong 4. Chai Nat 5. Lopburi
Farmer	Not less than 400	
Factory	21 (approx.)	In 7 inundation industrial estates, which are:- 1. Saharattananakorn 2. Hi-tech (Ban Wa) 3. Factory Land 4. Bang Pa-In 5. Bangkadi 6. Rojjana 7. Navanakorn
Mass media	10 (approx.)	In various field of mass media
Flood defense organization	5 (approx.)	Both in local and nation scales
Sum	**836** (approx.)	

4. Methodology

The study has been conducted in 7 steps as showed in *Figure 3*.

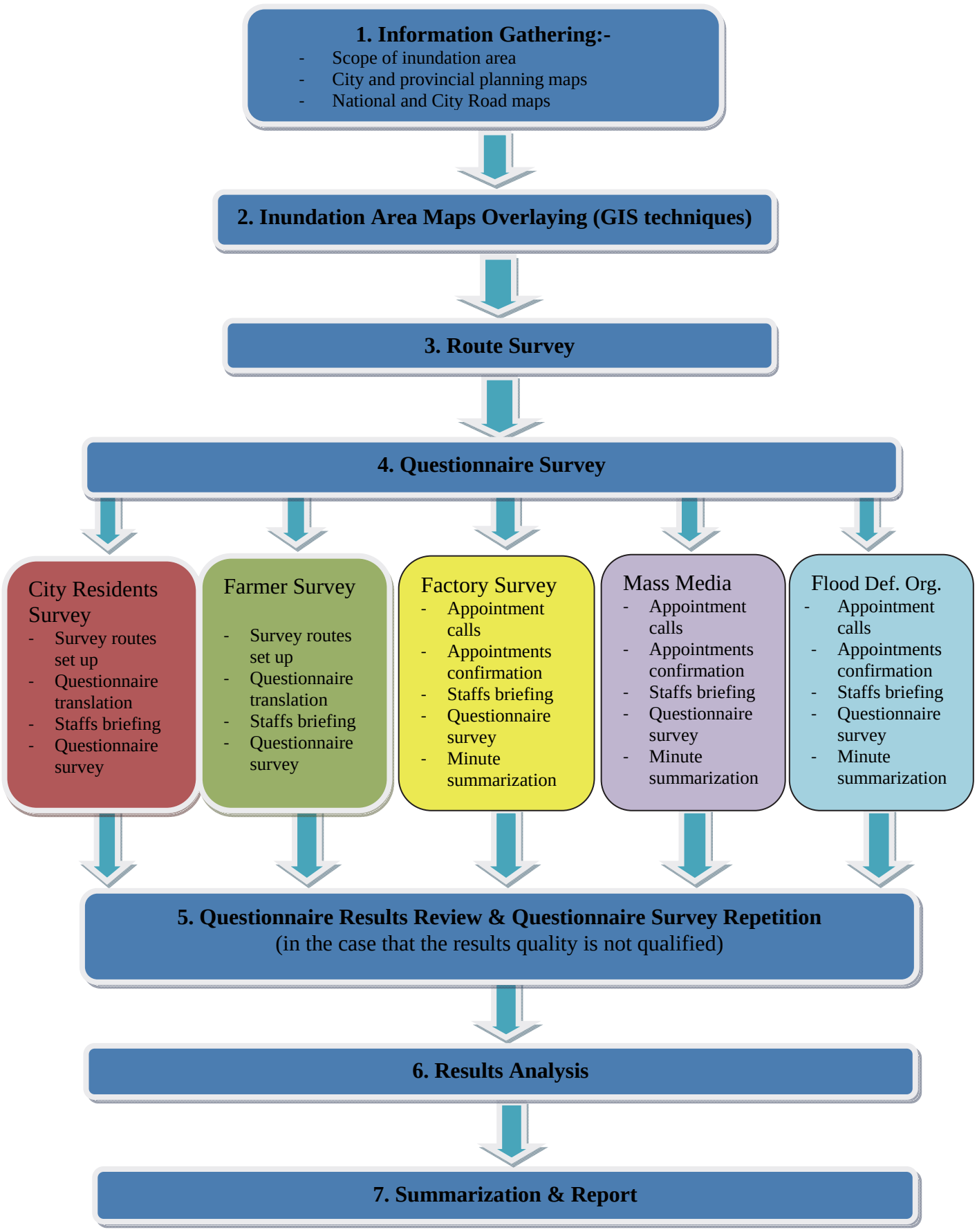


Figure 3 Steps of the Study

4.1 General Inundation Information and Surveyed Area Acquisition

In order to gather necessary information related with flood and flood management on the lower reach of Chao Phraya River Basin, the questionnaire surveys have been conducted among residents and communities in the inundation areas from the middle of October till December, 2012.

First of all, the information and secondary data such as inundation maps, city planning maps and road maps from related government agencies, such as Royal Irrigation Department (RID) and City Planning Office, have been collected. They have been analyzed and overlaid by GIS techniques. Then, the survey routes have been selected and the communities along the roads have been carefully chosen, subsequently, as the target areas with the aim of maximum covering the 2011 inundation area, as shown in *Figure 4*.

Meanwhile, the questionnaires for city resident and farmer, which were provided by JICA Team, have been translated into Thai, as attached in *Appendix A*, and distributed to surveyors. They have been oriented, in order to make clearly understanding in purpose and detail of the questionnaires.

4.2 City Residents and Farmers Interview

The surveys have been conducted in the inundation area in 5 provinces, which are Ayutthaya, Sing Buri, Ang Thong, Chai Nat and Lopburi, as presented in the maps in *Figure 5, 6, 7, 8, and 9*, respectively, under the responsibility of coordinators and the team leader.

The first round of city residents and farmers in all provinces interviews have been finished around the end of November, 2012. However, after the results have been reviewed, the questionnaire survey repetition has been conducted in some areas at the middle of December, 2012. Afterwards, all results from the city residents and farmers interviews have been statically analyzed, summarized and reported subsequently.

4.3 Factories Interview

For the factories in seven-industrial estate interview, based on the inundation maps and secondary data, more than 35 factories have been randomly chosen. They have been called and confirmed for the appointments, with the official letters from JICA. Then, the interviews with 23 factories, which are listed in *Table 2*, have been carried out, with the cooperation from JICA staffs, in December 2012. The minute of the meetings have been summarized and reported accordingly.

4.4 Mass Media Interview

The name lists of related mass media agencies have been ensured. They have been called and confirmed for the relation with 2011 flood information distribution. After the appointment confirmations with respondents, as listed in *Table 3*, have been done, the interviews, with the controlled by JICA staffs have been conducted. The minute of the meetings have been summarized and reported consequently.

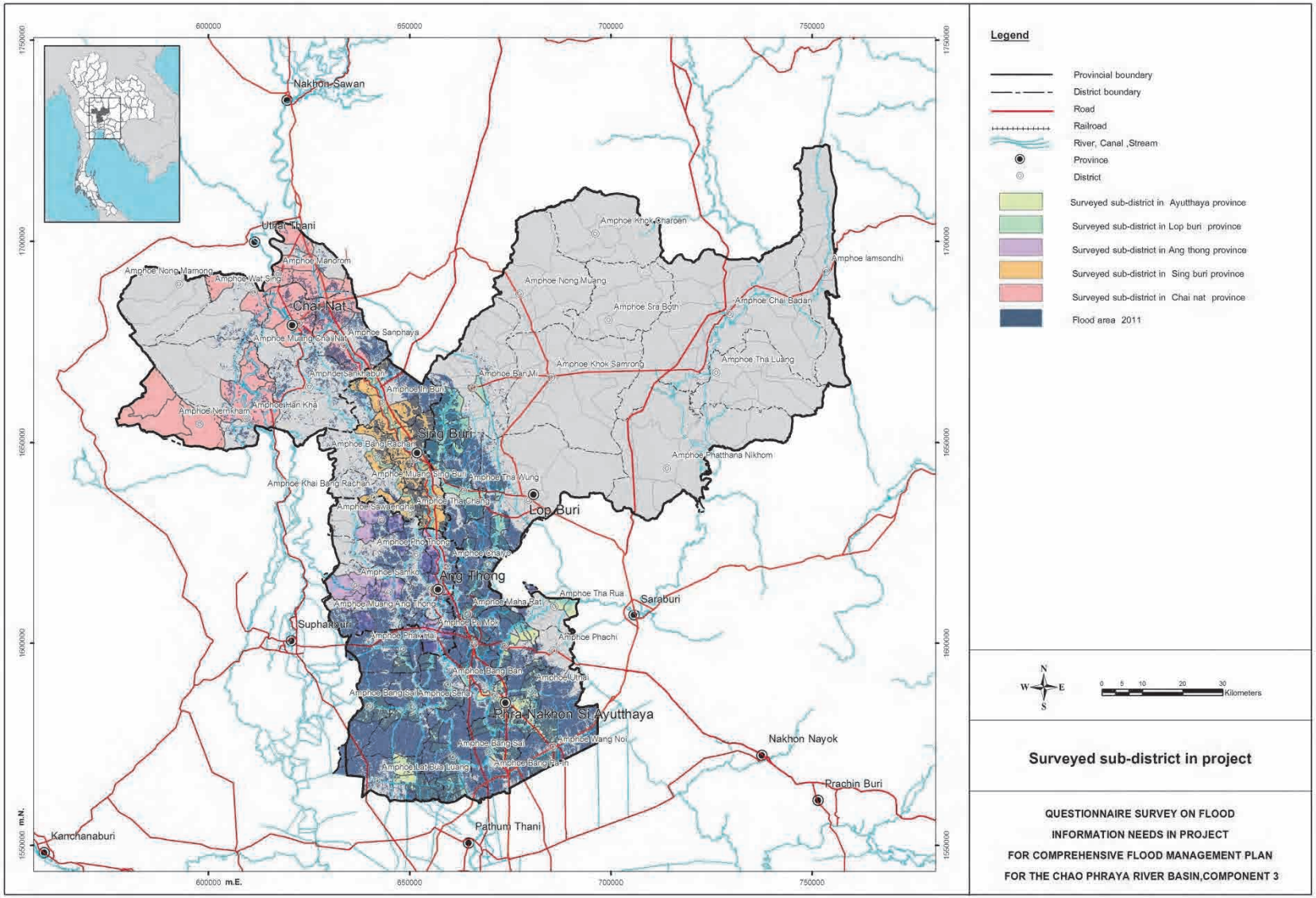


Figure 4 The surveyed area, with names of sub-district or Tambon, overlay with the inundation area due to great flood in 2011 in Ayutthaya, Sing Buri, Ang Thong, Chai Nat and Lopburi Provinces

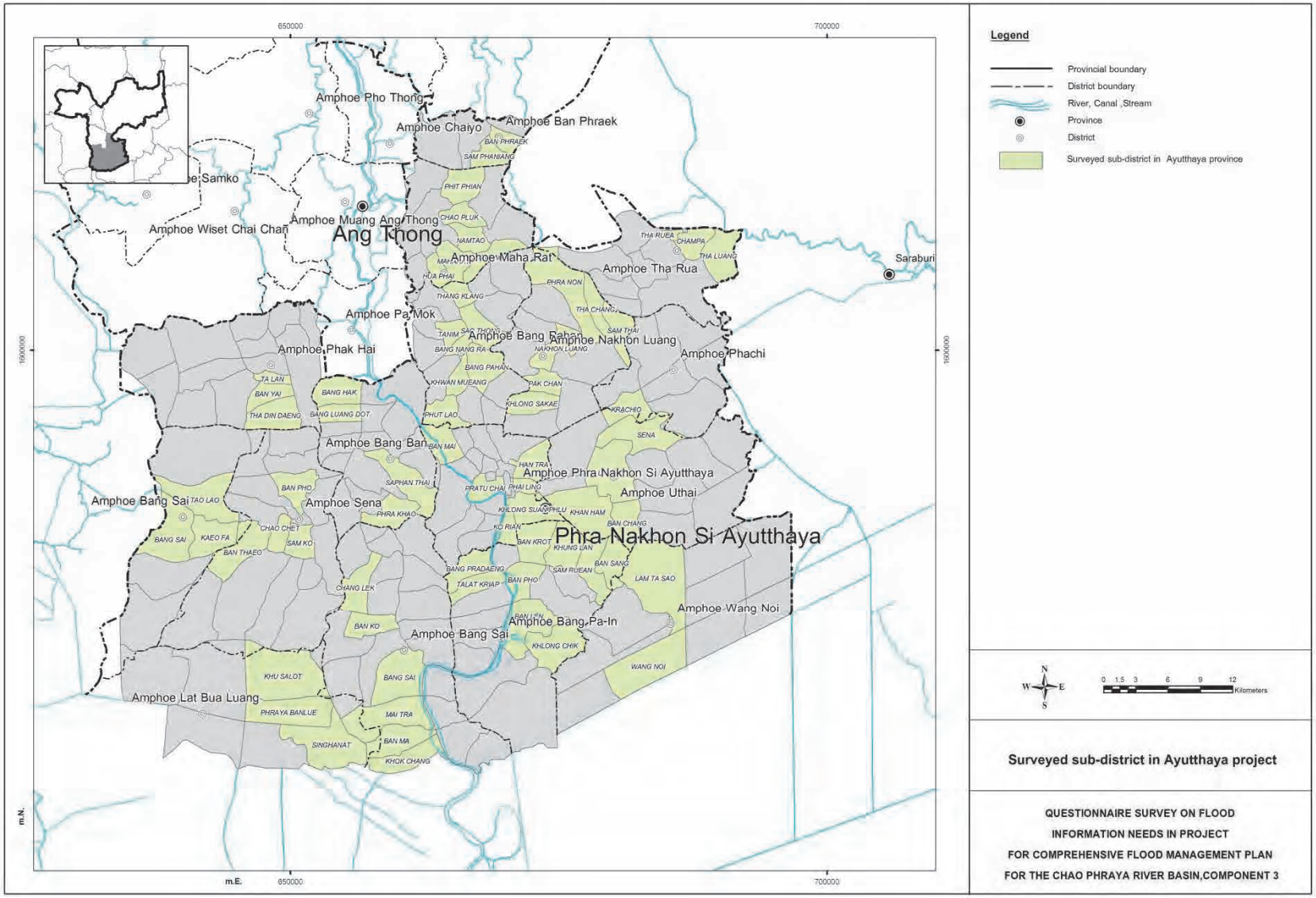


Figure 5 The sub-district (Tambon) surveyed areas in Ayutthaya province

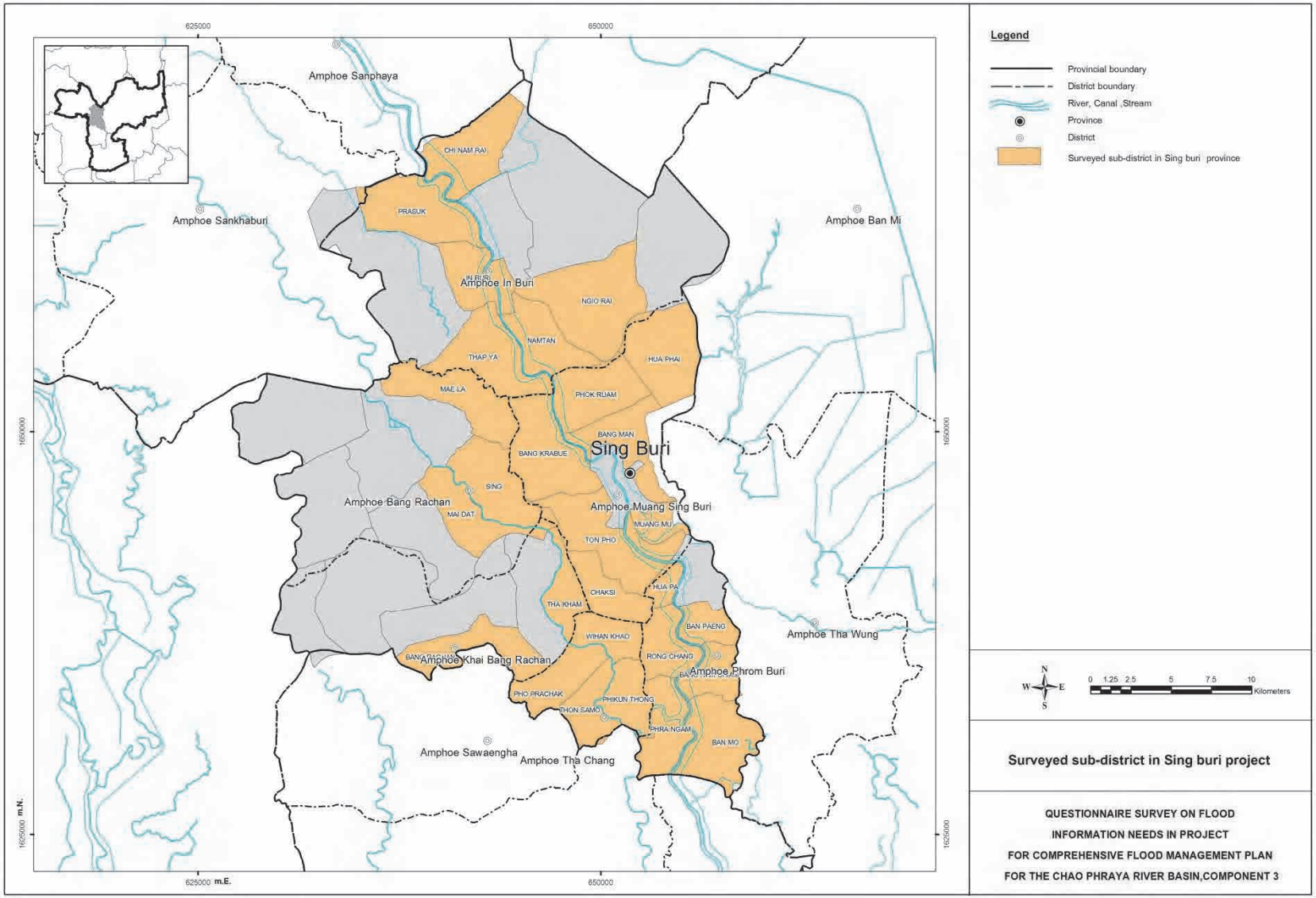


Figure 6 The sub-district (Tambon) surveyed areas in Sing Buri province

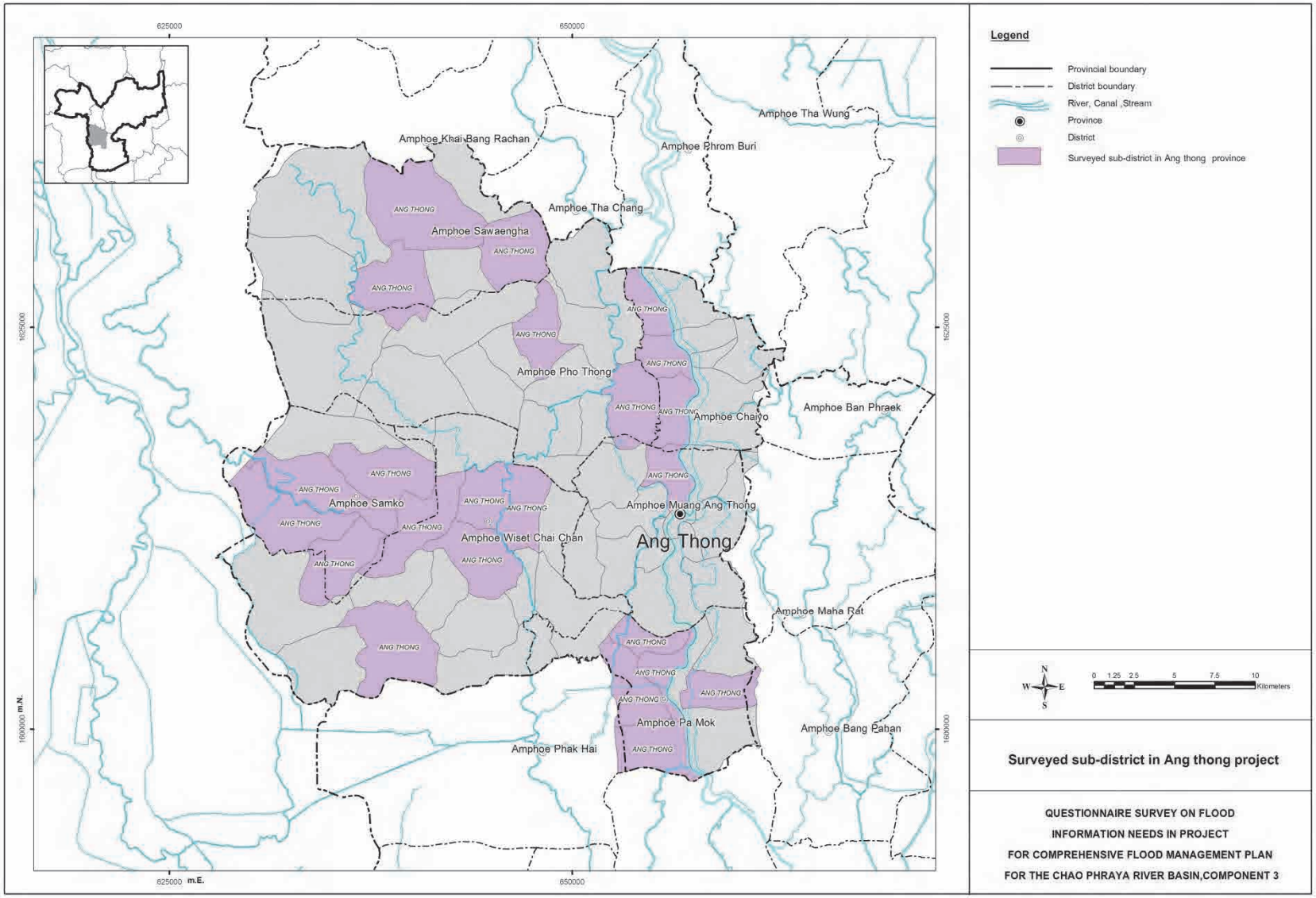


Figure 7 The sub-district (Tambon) surveyed areas in Ang Thong province

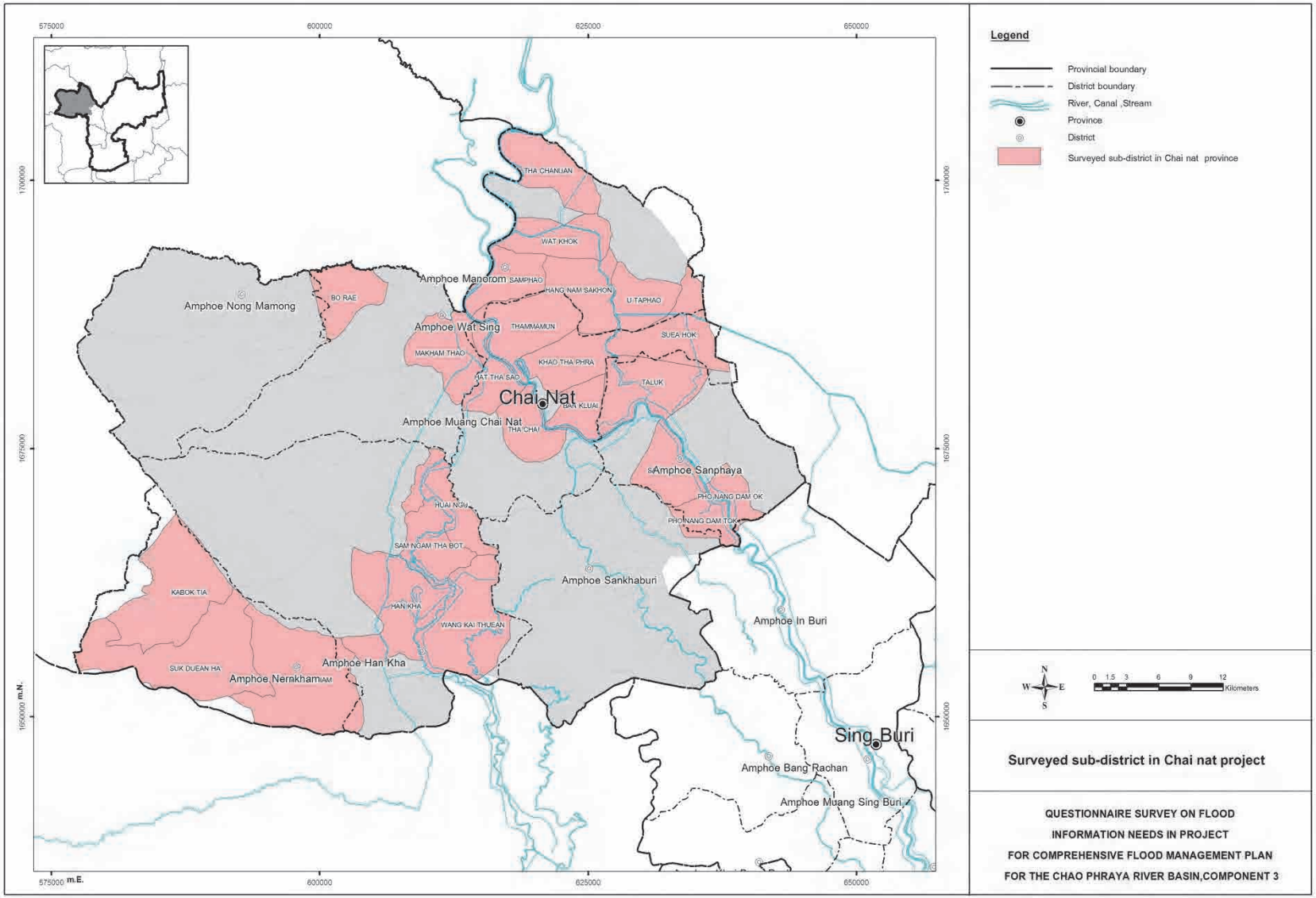


Figure 8 The sub-district (Tambon) surveyed areas in Chai Nat province

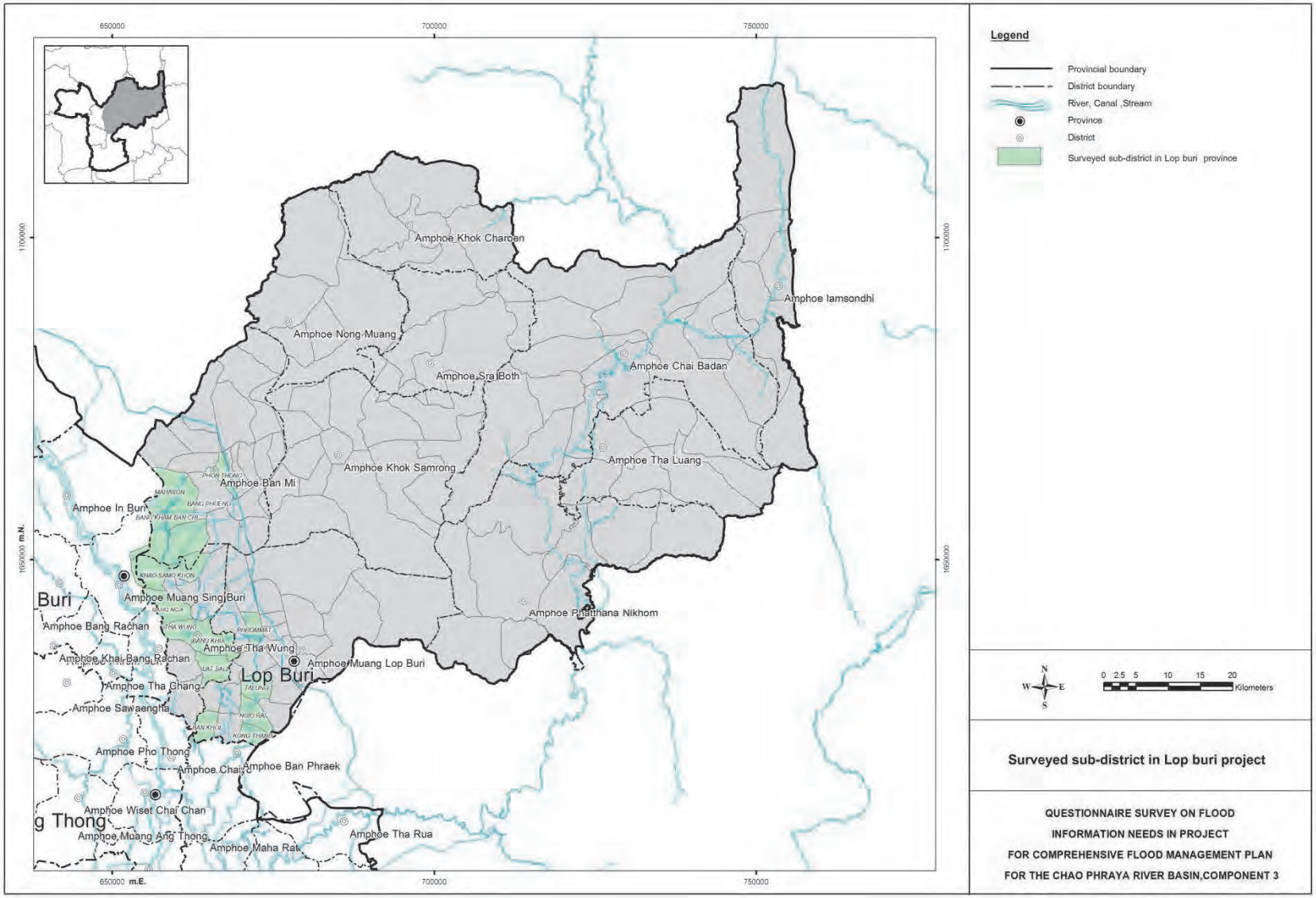


Figure 9 The sub-district (Tambon) surveyed areas in Lopburi province

4.5 Flood Defense Organization Interview

Flood defense organizations have been listed and called for the appointments. After the schedules have been confirmed by the authorities listed in *Table* 4, the interviews have been done by JICA staffs, with coordinators support. The minute of the meetings have been summarized and reported afterward.

Table 2 Name list of Respondents from 23 Factories in 7 Industrial Estates

Industrial Estate	Factory Name	Interviewed		Persons in Chart
		Date	Time	
1. Hi-tech (Ban Wa)	1. Hana Semiconductor	06/12/12	10:00	Coordinator: Mr. Apichote JICA Staff: Mr. Koga
	2. Kobe Electronics Material	06/12/12	11:00	
	3. Chiyoda Integra	06/12/12	13:00	
	4. Mikuni (Thailand)	06/12/12	14:00	
	5. Soode Nagano	14/12/12	13:00	Coordinator: Mr. Apichote
2. Saharattananakorn	1. Siam Kensetsu	11/12/12	11:00	Coordinator: 1. Mr. Somruthai 2. Mr. Apichote
	2. Aqua Nishihara	12/12/12	10:30	Team Leader: Dr. Sitang Coordinator: Mr. Apichote Interpretor: Dr. Pongsun
	3. Yamamoto Foundry	13/12/12	13:30	Coordinator: Mr. Apichote JICA Staff: Mr. Koga
3. Factory Land	1. Fuji Autopart	14/12/12	15:00	Coordinator: Mr. Apichote
	2. Asada Chemical	14/12/12	16:00	Coordinator: Mr. Apichote
	3. Samco Seiki (Thailand)	18/12/12	13:00	Coordinator: Mr. Apichote
4. Bang Pa-In	1. Nippon Super	11/12/12	13:30	Coordinator: 1. Mr. Somruthai
	2. Rockworth	11/12/12	15:00	2. Mr. Apichote
	3. Mitsui Precision Thai	18/12/12	09:00	
5. Bangkadi	1. Toshiba Lighting	17/12/12	09:00	Coordinator: Mr. Apichote
	2. Toshiba Semiconductor	17/12/12	10:00	
	3. Nidec Shibaura	17/12/12	13:30	
6. Rojjana	1. Nihon Seiki Thai	13/12/12	09:00	Coordinator: Mr. Apichote JICA Staff: Mr. Koga
	2. Izumi Industry	13/12/12	10:00	
	3. Thai Horikawa	18/12/12	11:00	Coordinator: Mr. Apichote
7. Navanakorn	1. Kawasumi Laboratories	13/12/12	16:30	Coordinator: Mr. Apichote JICA Staff: Mr. Koga
	2. Panasonic Manufacuring (Thailand)	14/12/12	10:00	Coordinator: Mr. Apichote
	3. Tomy Thailand	18/12/12	15:00	Coordinator: Mr. Apichote

Table 3 Name list of 9 Respondents from Mass Media Group

Respondent	Position / Organization	Date	Time
1. Mr. Anon Untimanon	CNSA Supreme Commander/ Central on Normalization Society Affairs	07/11/12	09:00 – 11:00
2. Ms. Nattaporn Artharn	News Reporter, Program coordinator / Thai PBS	07/11/12	12:00 – 13:00
3. Ms. Aruchita Uttamaphokin	News Reporter, Program coordinator / Thai PBS	07/11/12	13:00 – 14:00
4. Ms. Anunta Intra-aksorn	Social Media Coordinator	09/11/12	13:00 – 14:00
5. Ms. Wilawan Boonchan	Communication Advisor, Program Coordinator / Thai PBS	09/11/12	14:30 – 17:00
6. Ms. Chada Somboonpol	News Reporter / Ch 7	29/11/12	14:00 – 15:00
7. Ms. Pracha-on Prayadsap	News Reporter / Ch 7	29/11/12	15:00 – 16:00
8. Mr. Anuwat Fuengthongdaeng	News Reporter, Program Coordinator/ Ch 7	29/11/12	16:00 – 17:00
9. Mr. Klit Janepanichayakarn	News Reporter / Sky Report ; Ch 3	12/11/12	11:30 – 12:30

Table 4 Name list of 10 Respondents from Flood Defense organization Group

Respondent	Position / Organization	Date	Time
1. Dr. Nat Majang	Secretary of Members of Flood defense org., belonged to GOT	07/11/12	15:00 – 16:00
2. Dr. Surajate Boonya-Aroonnet	Head of Hydro Modeling Section/ HAII	08/11/12	08:00 – 09:00
3. Dr. Chukiat Sappaisan	Members of Flood defense org., belonged to GOT	09/11/12	16:30 – 18:00
4. Mr. Supapap Patsinghasanee	DWR, working members in Flood defense org. GOT	08/11/12	14:30 – 15:30
5. Mr. Lamduan Kraisamrit & Ms. Sarah Visetsak	Officer / Koh Rean SAO, Ayutthaya	13/11/12	11:00 – 12:30
6. Mr.Anupab Phusilpa & Mr.Sirunyavat Ampavanon	Officer / Pak jun SAO, Ayutthaya Province	13/11/12	9:00 – 10:30
7. Mr. Uklit Thawornkraikul	RID staffs in Lopburi Province	13/11/12	13:30 – 17:00
8. Dr. Wattana Kanbua	TMD	29/11/12	09:00 – 11:00
9. Mr.Suna Konboon	Officer / Office of DDPM-Saraburi Province	28/11/12	12:30 – 13:00
10. Mr.Noppadol Kamnungnate	Officer / Office of DDPM-Sing Buri Province	28/11/12	12:30 – 13:00

5. Results

5.1 General Information of Surveyed Area

The questionnaire surveys have been conducted in the lower reach of the Chao Phraya River Basin, in 5 provinces which are Ayutthaya, Sing Buri, Ang Thong, Chai Nat and Lopburi. Although all of them were submerged under water for more than 30 days, but the damage were different in sizes of both residential area and agricultural land, as presented in *Table 5* and *Figure 10.*

Table 5 Provincial Information with Inundation Area Size
(Period of concerned: January – October 2011)

Province	Population[1] (capita)	Provincial Area[1] (km^2)	Inundation Area[2] (km^2)	Percentage of Submerged Area (%)
Ayutthaya	754,595	2,556.640	2,326.927	91.02
Ang Thong	283,943	968.372	772.822	79.81
Sing Buri	216,969	822.478	645.873	78.53
Chai Nat	339,006	2,469.746	1,095.083	44.34
Lopburi	752,775	6,199.753	846.572	13.65

Source: 1. Department of Provincial Administration
2. Geo-Informatics and Space Technology Development Agency (Public Organization)

Most of the area in Ayutthaya, of about 90%, had been submerged while the number of inundation area in Ang Thong, Sing Buri, Chai Nat and Lopburi were about 79.81%, 78.53%, 44.34% and 13.65% respectively. These numbers resulted in questionnaire target numbers setting in this study. Although the numbers of questionnaire in each province are not directly proportional to the percentage of submerged area, as shown in *Figure 11*, but this study paid much attention on Ayutthaya since it was the most severed area. The flooding in Ayutthaya became worsen as flood water entered the city and historical park, forcing evacuation. Additionally, after the barriers protecting industrial estates failed, dozens of major factories in 7 industrial estates, as shown in *Figure 12*, had been disrupted and caused country-wide manufacturing supply chains problem.

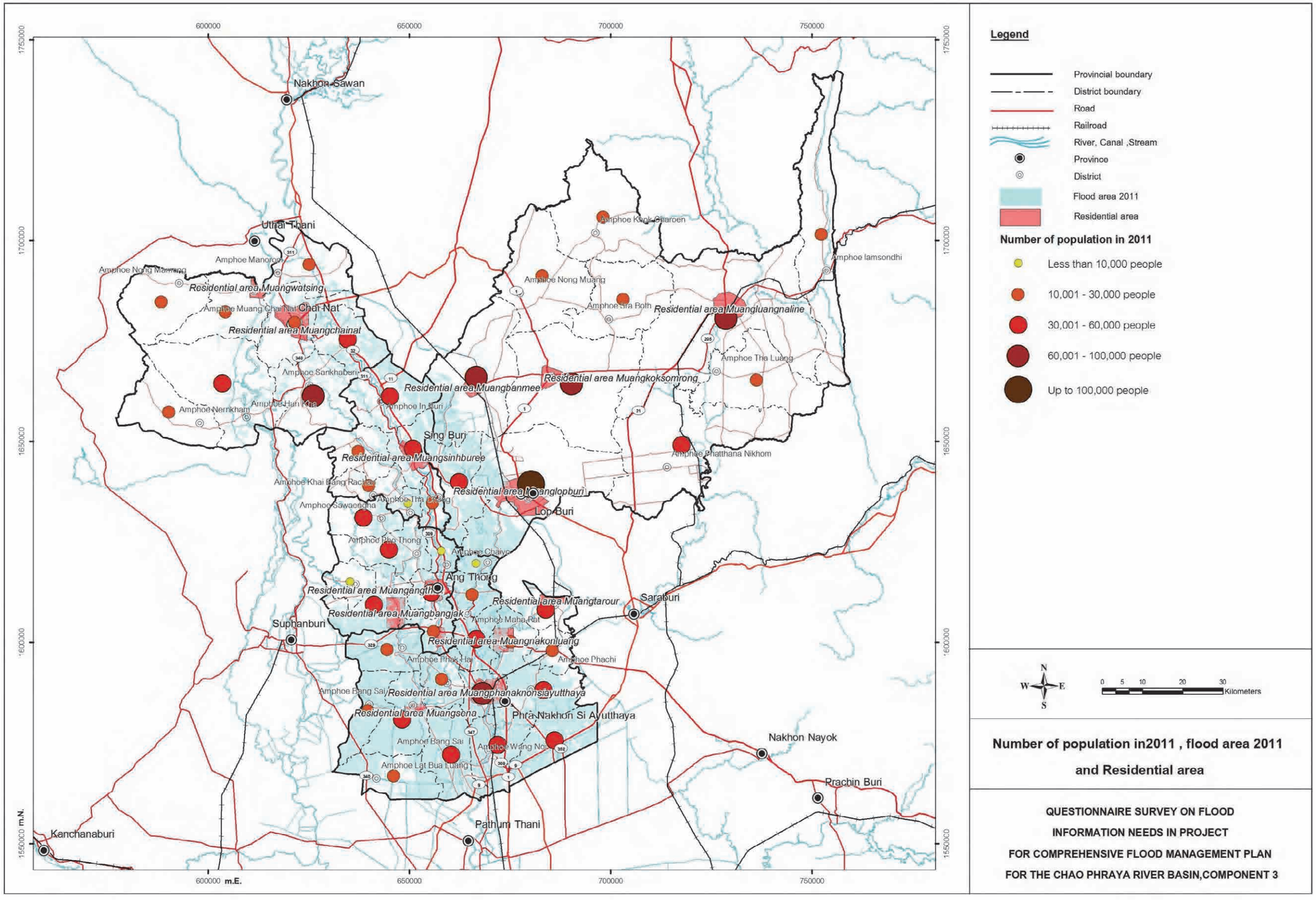
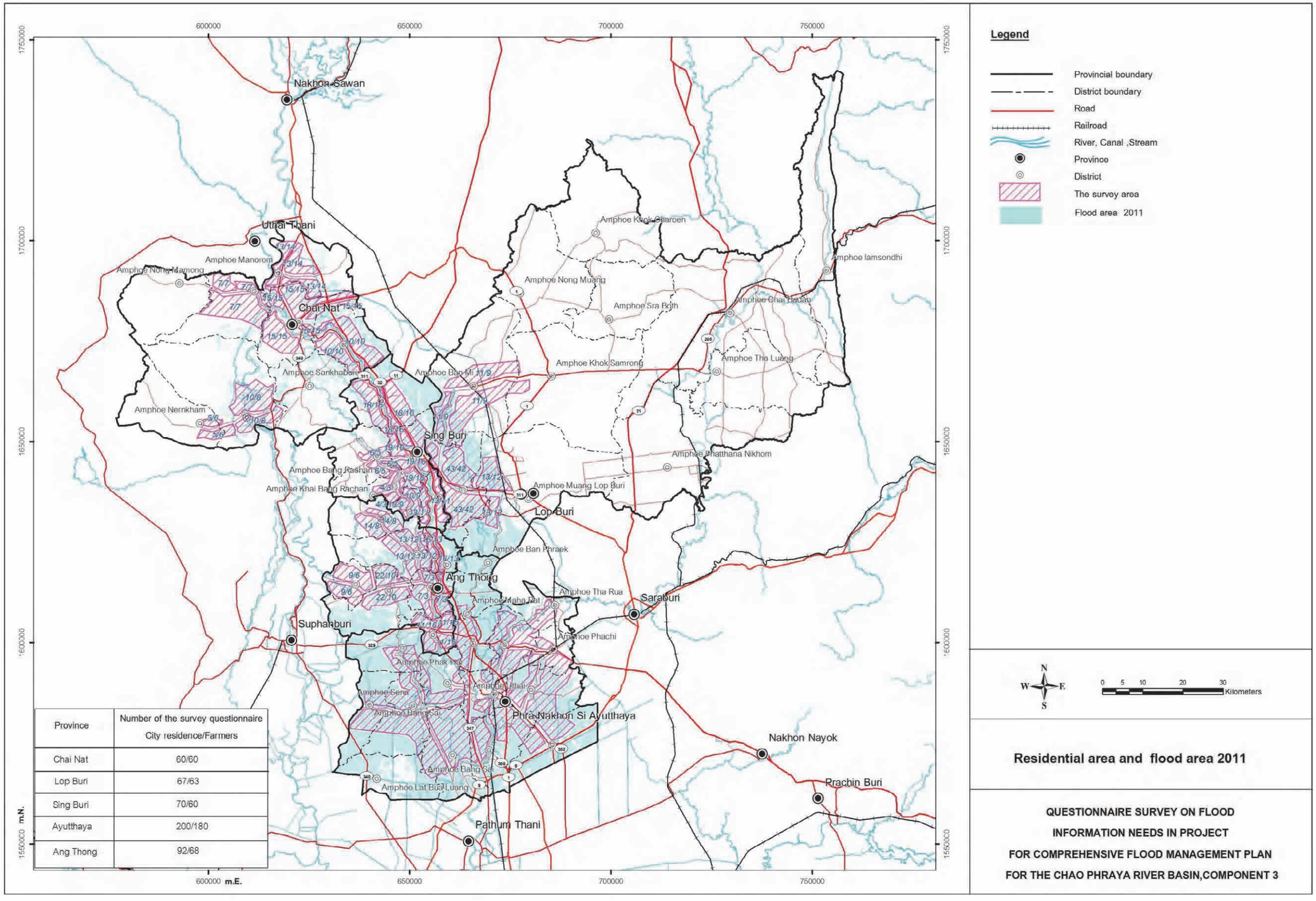


Figure 10 The 2011 Inundation Area in 5 Provinces in the Chao Phraya River Basin, with Population Number



Province	Number of the survey questionnaire City residence/Farmers
Chai Nat	60/60
Lop Buri	67/63
Sing Buri	70/60
Ayutthaya	200/180
Ang Thong	92/68

Figure 11 The 2011 Inundation Area in 5 Provinces in the Chao Phraya River Basin, with Numbers of Surveyed Questionnaire (City Residence / Farmers)

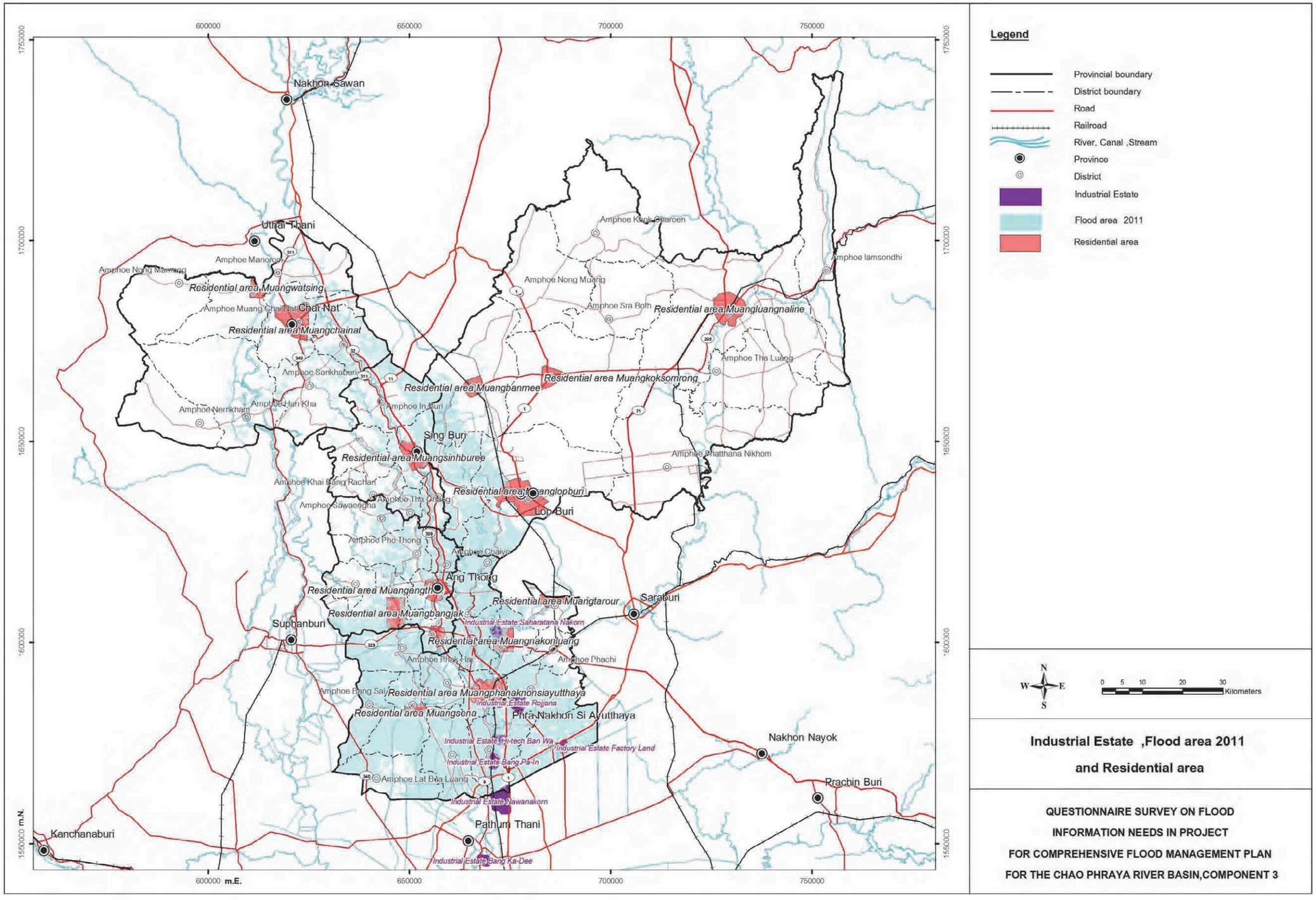


Figure 12 Seven Industrial Estates that were affected by 2011 Flood

5.2 Farmers and City Residents Interview

The number of respondents in each province with the area of sampling are shown in *Table 6* and in *Figure 13*, *14*, *15*, *16*,and *17* for Ayutthaya, Sing Buri, Ang Thong, Chai Nat and Lopburi, respectively.

More information of surveyed sub-districts, with the distance from the Chao Phraya River and the number of respondents in each area are presented in detail in *Appendix B.*

Table 6 Respondents in each Sampling Province

Province	Number of Respondents	
	City residents	Farmers
Ayutthaya	200	180
Ang Thong	92	68
Sing Buri	70	60
Chai Nat	60	60
Lopburi	67	63
Sum	**489**	**431**

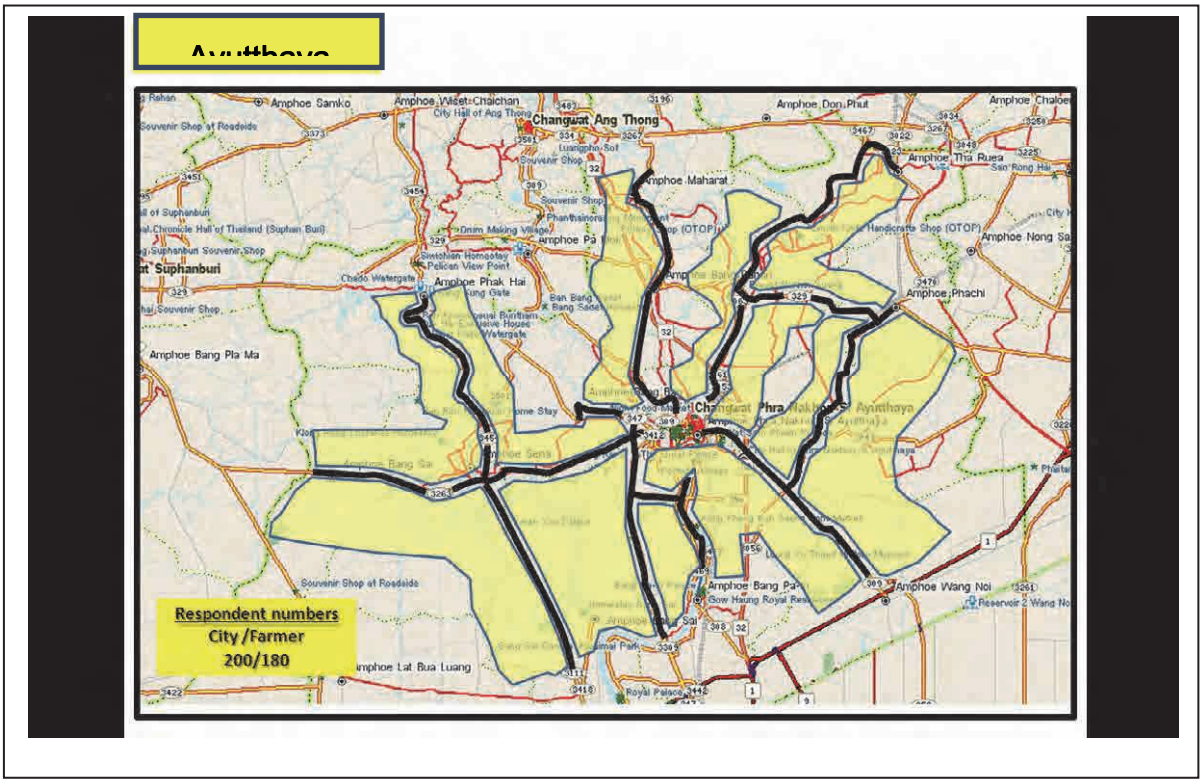


Figure 13 Sampling Area and Respondents Number in Ayutthaya province

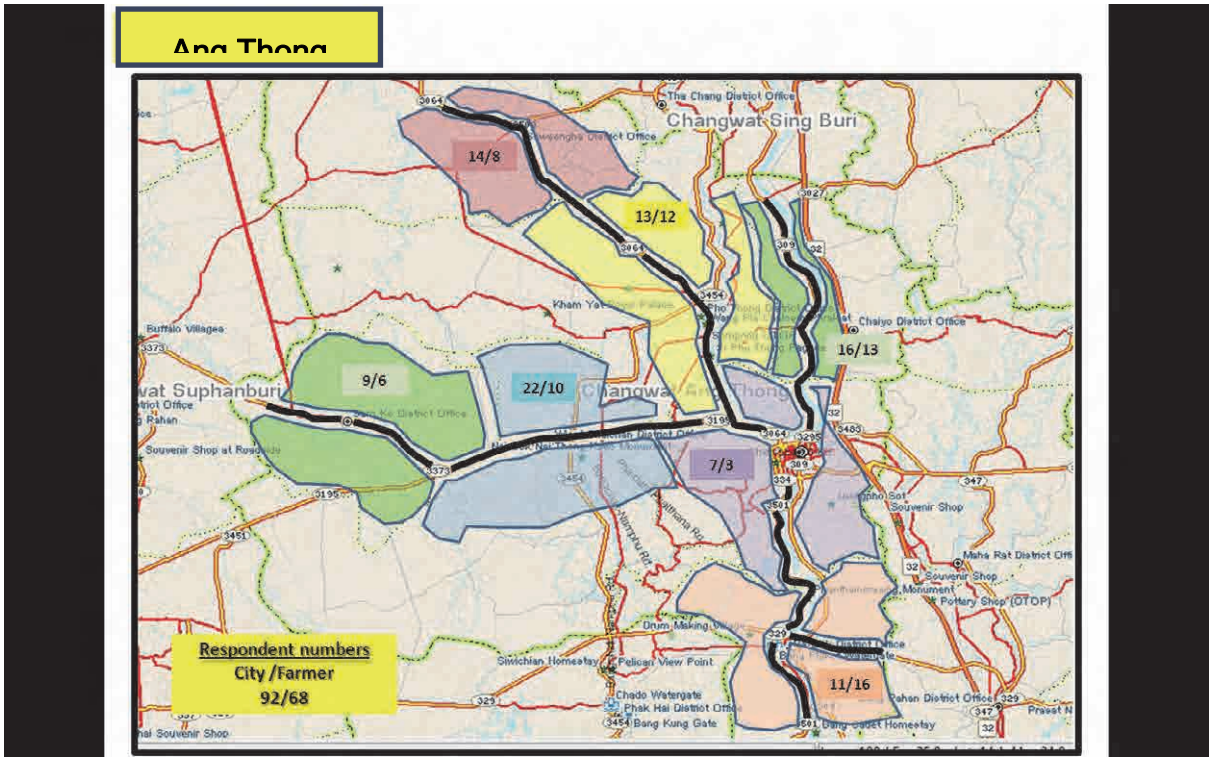


Figure 14 Sampling Area and Respondents Number in Ang Thong province

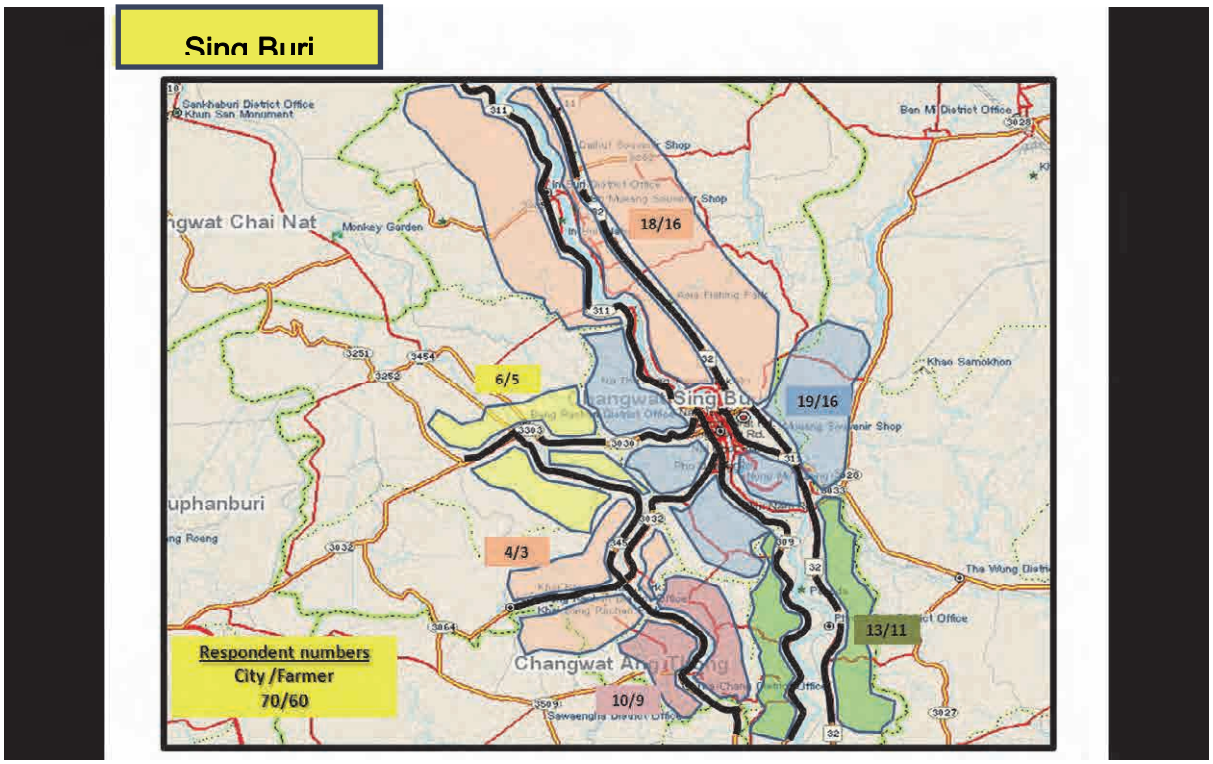


Figure 15 Sampling Area and Respondents Number in Sing Buri province

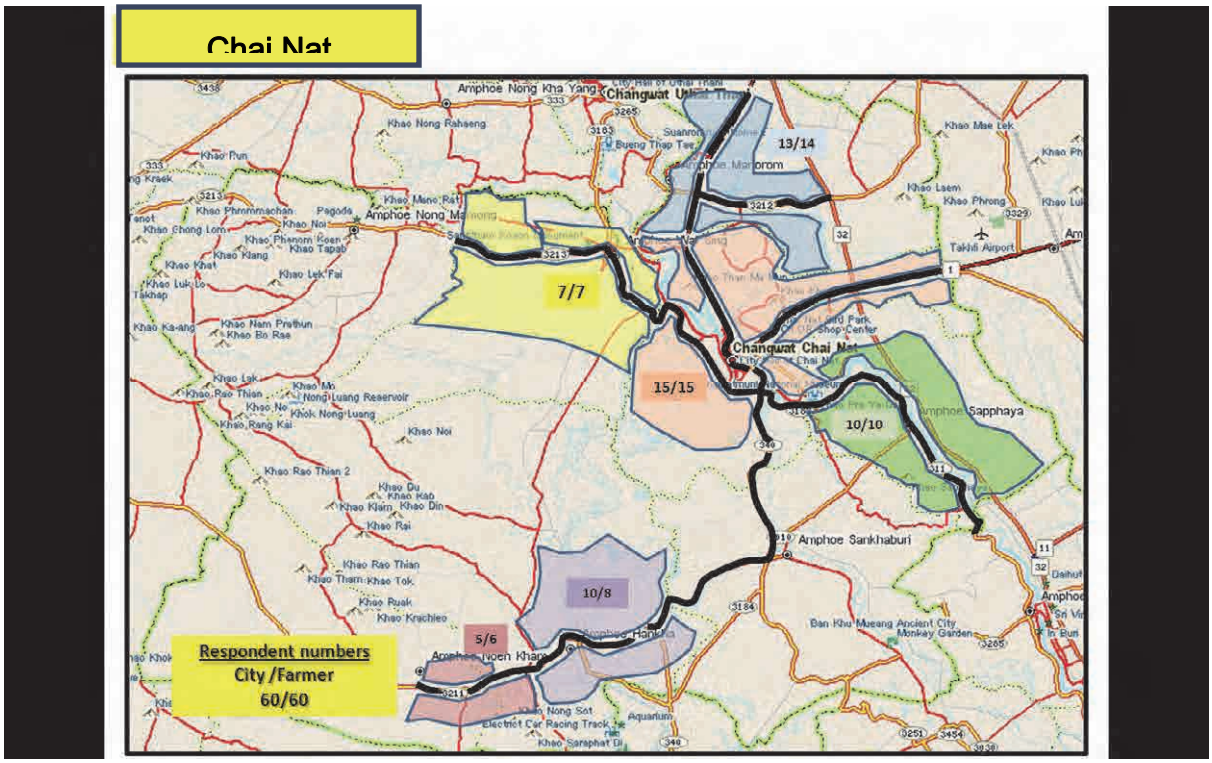


Figure 16 Sampling Area and Respondents Number in Chai Nat province

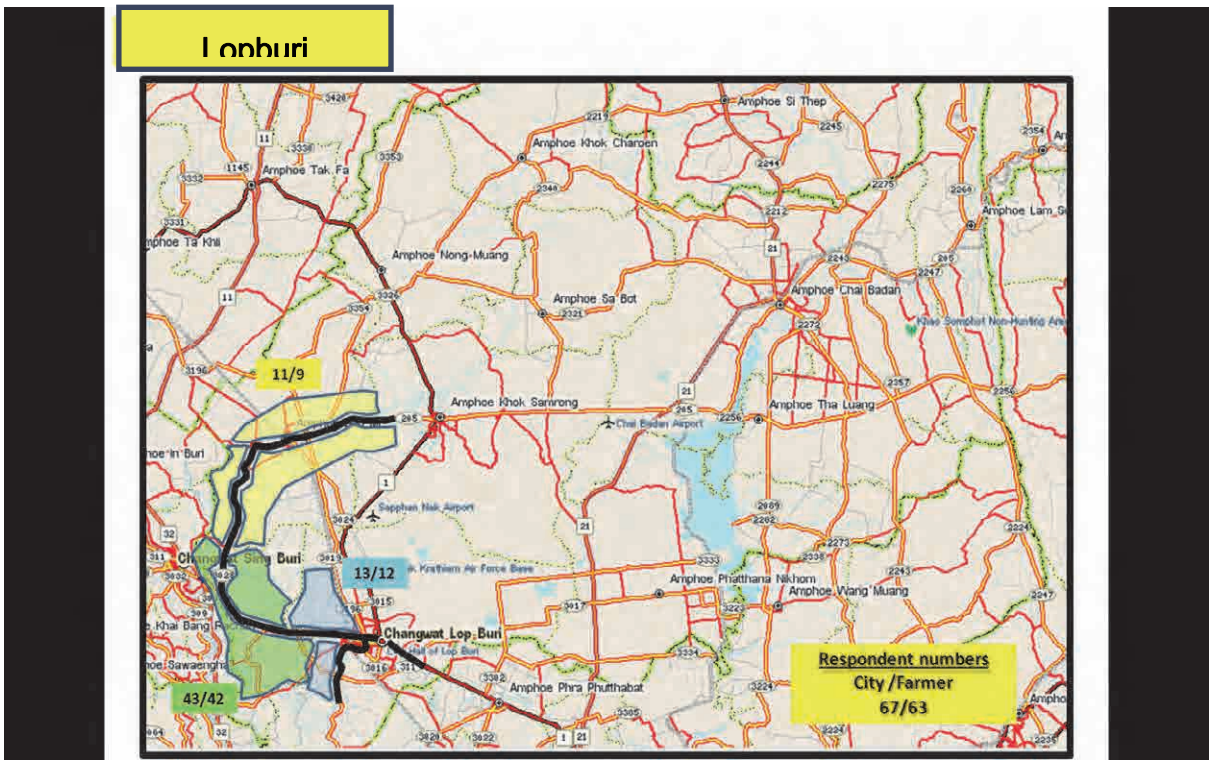


Figure 17 Sampling Area and Respondents Number in Lopburi Province

5.2.1 Farmers Interview

The interview results of farmers in 5 provinces are reported in *Appendix C*. It could be summarized as follows:-

Ayutthaya Province

The number of farmers who answered the questionnaire is 180, which is 41.76% of total respondents in farmer group. Most of the respondents own single story house, in which the number is 90.56%. It was found that about 60% had realized that their houses and farmlands would be inundated, thus more than 85% of these 60% had prepared to handle with the situation by moving agricultural machines to higher places, 75% premature cropping and carrying agricultural products out, 67% preparing means of transportation after inundation and 59% moving agricultural products to higher places. However, more than 30% of them, although were informed before the flood occurred, did not take any action since 37% of them did not have enough time to do damage alleviation actions, 21% didn't know what to do, 16% thought that they would not be affected by inundation and 14% thought their farmlands would not be inundated. More than 37% of them had never been flooded before and more than 37% of them thought that the water level would be shallow, additionally, 25% of them did not believe in the prediction and the warning. Thus, they took damage alleviation action when inundation area approached and/or after the flood water reached their houses and farmlands. The percentages of farmers' action are shown in *Figure 18, 19* and *20* for before, during and after inundation, respectively.

The questionnaire result revealed that the most effective means of information acquisition for damage alleviation actions are TV, local community, and information from regional government, since they are easy to acquire information and the information is easily understandable, as shown the results in *Figure 21* and *22*. In which the necessaries information are warning and alarm released by the public organization (Meteorological department or local government), live report of inundation by media such as TV and inundation area and water depth. Additionally, the information that is also needed, but was not available, is the forecasted time until water is drained, as presented in *Figure 23.* Furthermore, it should be realized that most of the respondents, more than 97%, need the information of inundation for effective damage alleviation action at least 7 days before inundation.

About the warning and forecast processes, although the forecast of inundation area includes the prediction error of a natural phenomenon, and the prediction error of the simulation, cause the uncertainty, but 40% of the farmer respondents in Ayutthaya think that the forecast is helpful while 27% think that if the limit (width with error) of a predicted value is shown, it will be helpful and 15% feel that forecast is helpful the same as the alarm and warning from Meteorological Department, as shown the percentage result in *Figure 24.*

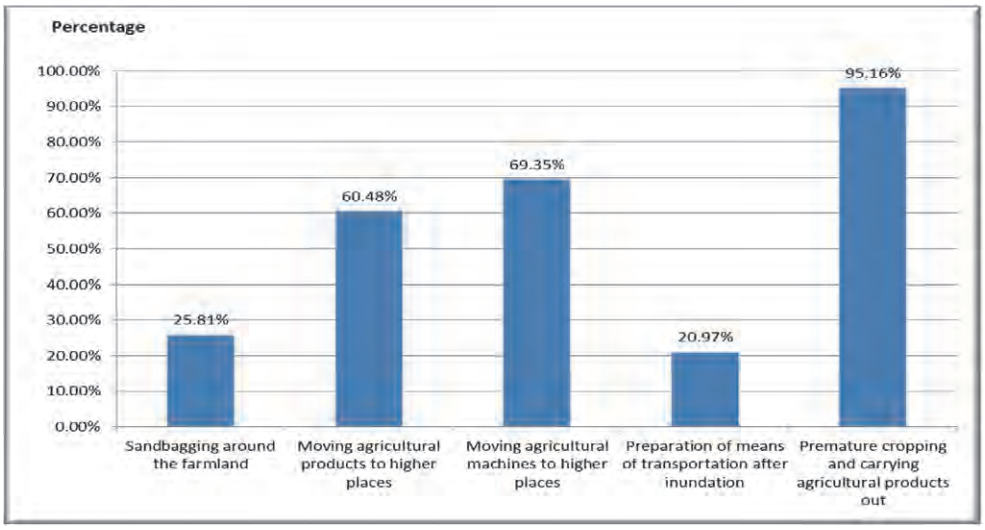


Figure 18 Farmers in Ayutthaya: Action for Agricultural Products before Inundation

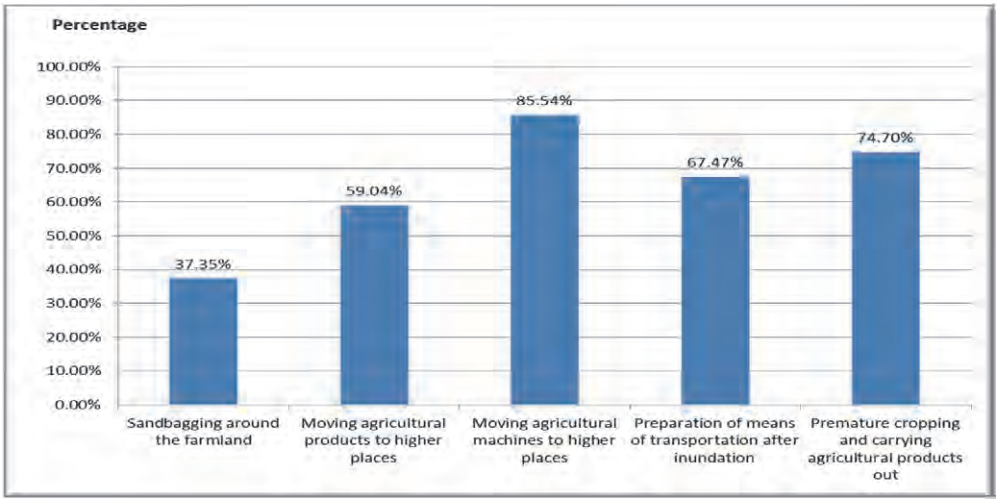


Figure 19 Farmers in Ayutthaya: Action when Inundation Area Approached

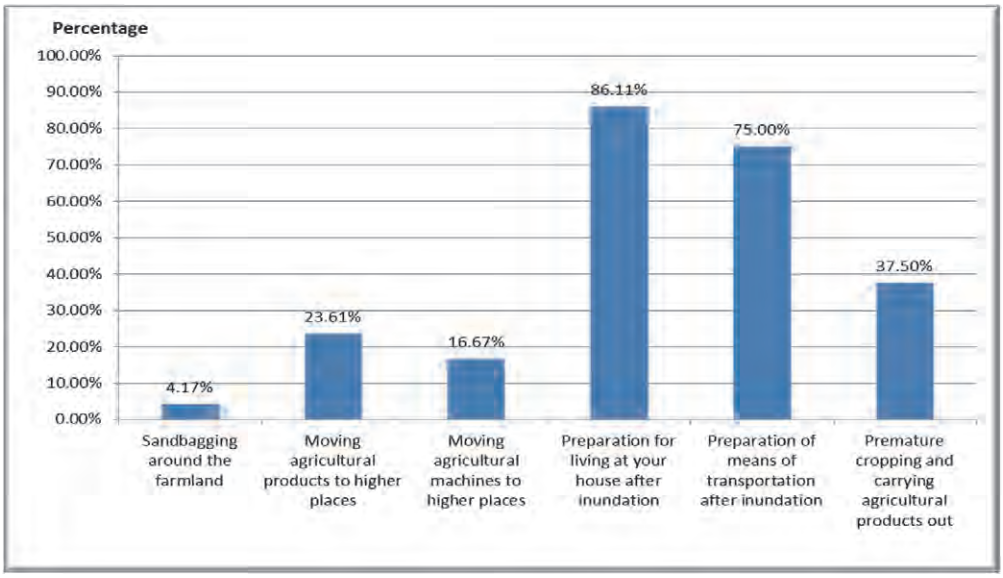


Figure 20 Farmers in Ayutthaya: Action for Agricultural Products after Inundation

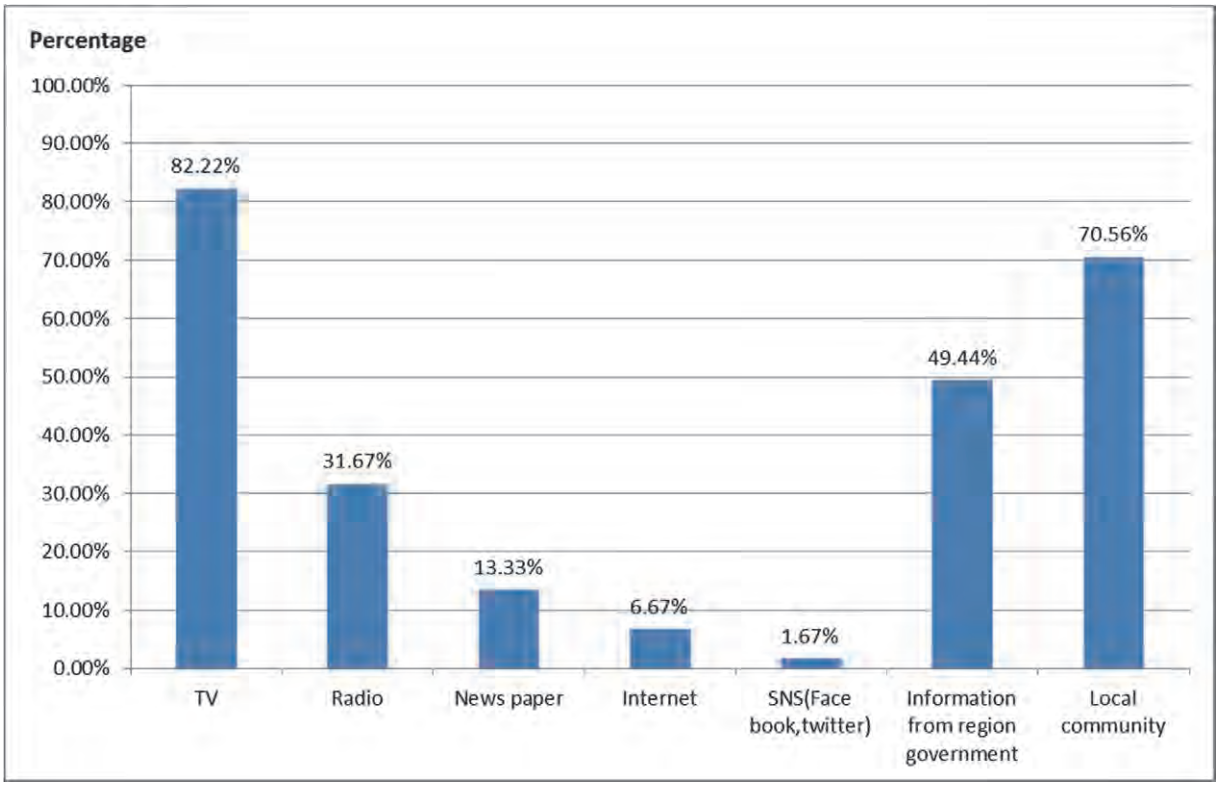


Figure 21 Farmers in Ayutthaya: Most Effective Means of Information Acquisition for Damage Alleviation Actions

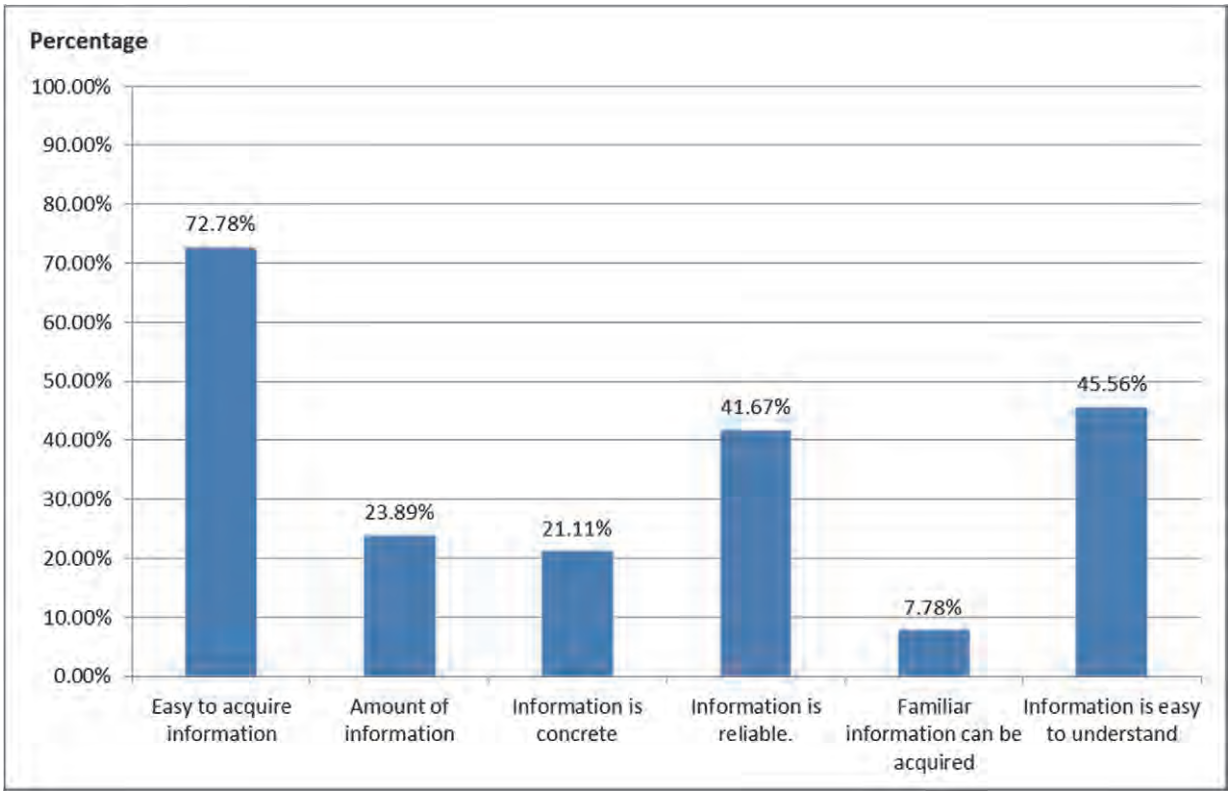


Figure 22 Reasons Support Effectiveness of Means of Information Acquisition (in Figure 21) for Damage Alleviation Actions

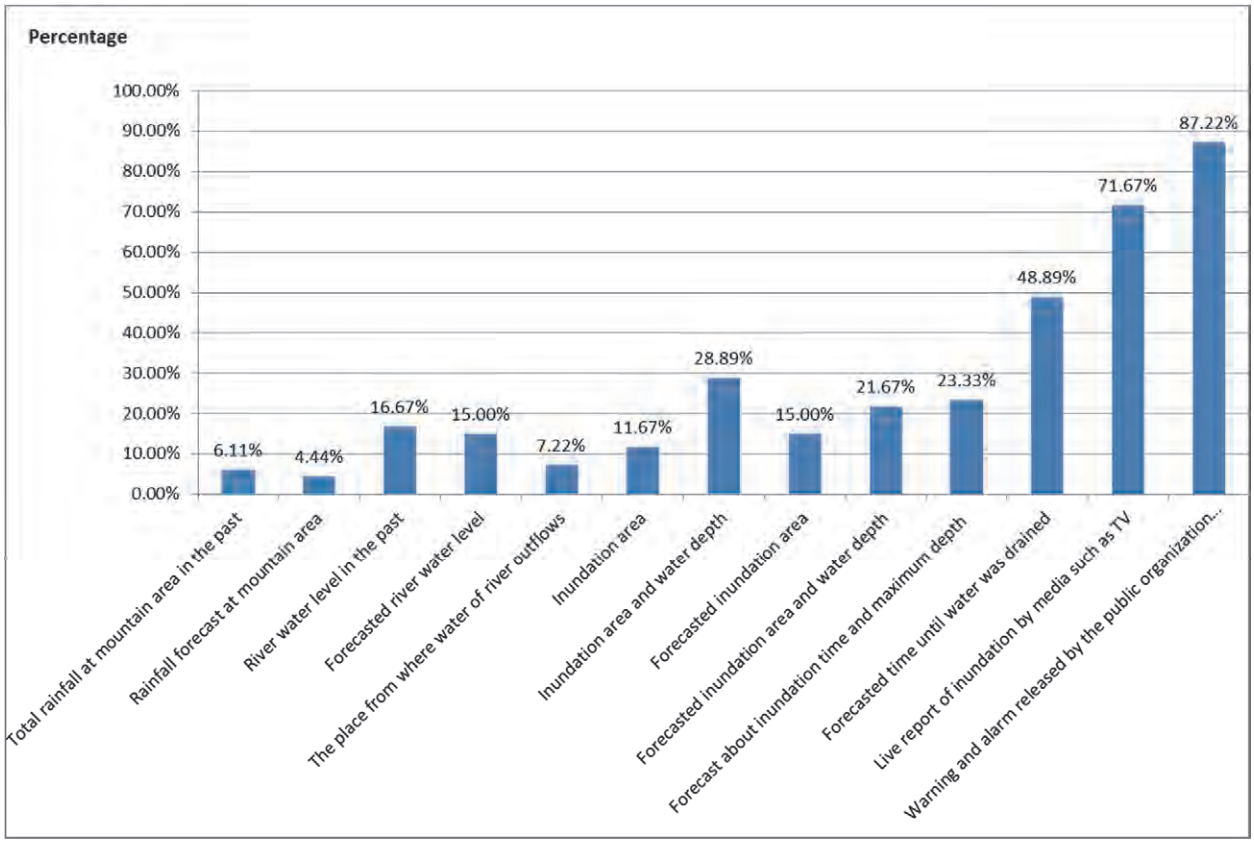


Figure 23 Farmers in Ayutthaya: Additional Required Information

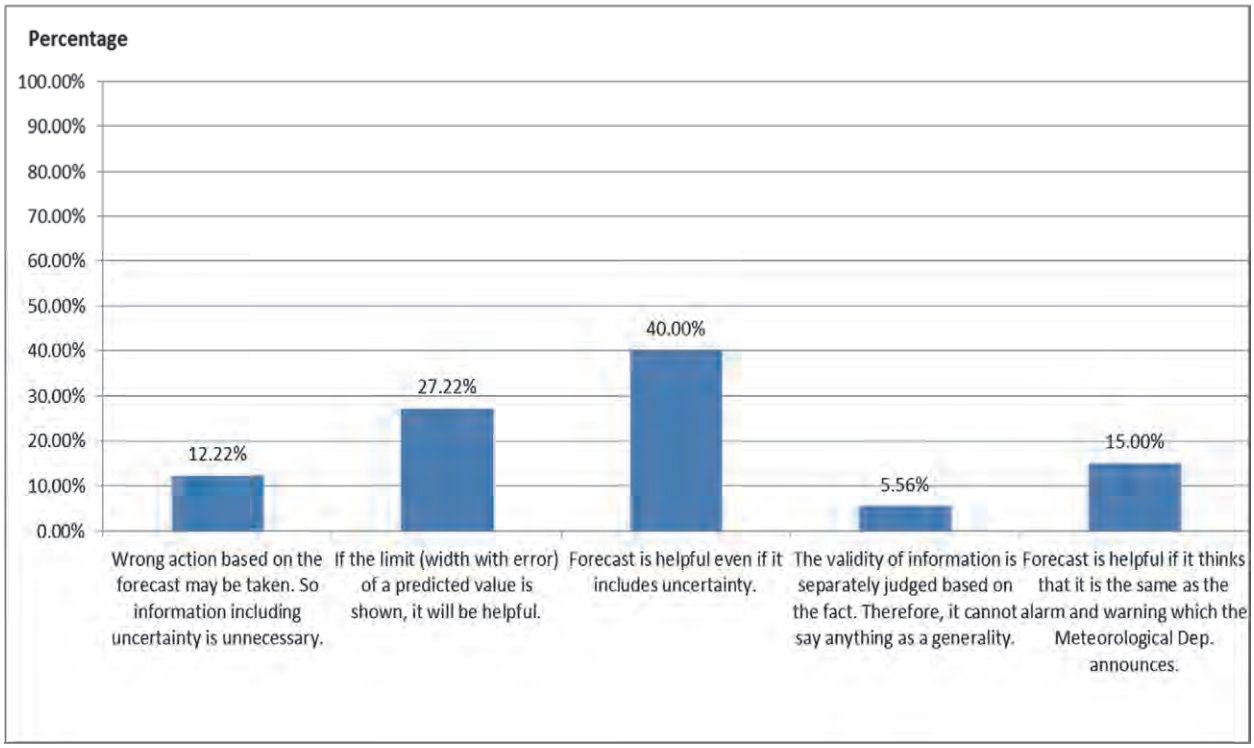


Figure 24 Farmers in Ayutthaya: Opinions of Respondents on Uncertainty Warning and Forecast

Ang Thong

The number of respondents in Ang Thong is 68, which is 15.78% of total respondents in farmer group. Most of them, 78%, own single story house and grow rice as economical crop, in which 97% of agricultural products were soaked during the flood in 2011. It was found that after they acknowledged about the inundation, 78% of them took damage alleviation actions for agricultural products before inundation by premature cropping and carrying agricultural products out, moving agricultural machines to higher places, and sandbagging around the farmland, as shown the result in *Figure 25*. Meanwhile 22% of the respondents did not take any action before the flood water reached their places because most of them did not know how to deal with the situation and about 20% though the farmland would not be inundated. However, when the inundation were approached, just only 31% of the respondents took actions, in which about a half preparing means of transportation after inundation, as shown in Figure 26. The other 69% of all respondents did not do any action since they did not know how to do and though the time was not enough. Moreover, after the flood water spread through the farmlands, 79% of the respondents did not do anything since they though that there was no effective measure, while others prepared means of transportation, prepared for living during the inundation period, and moved agricultural machines to higher places, as shown in *Figure 27*.

The questionnaire result revealed that the most effective means of information acquisition for damage alleviation actions are TV, local community, and information from regional government, since they are easy to acquire information and the information is easily understandable, as shown the results in *Figure 28* and *29*. The necessaries information are warning and alarm released by the public organization (Meteorological department or local government), live report of inundation by media such as TV and inundation area and water depth. Additionally, the information that is also needed, but was not available, is the forecasted time until water is drained, as presented in *Figure 30*. Furthermore, it should be realized that all of respondents need the information of inundation for effective damage alleviation action at least 7 days before inundation.

About the warning and forecast processes, although the forecast of inundation area includes the prediction error of a natural phenomenon, and the prediction error of the simulation, cause the uncertainty, but 37% of the farmer respondents in Ang Thong think that the forecast is helpful while 29% think that if the limit (width with error) of a predicted value is shown, it will be helpful and 16% mentioned that wrong action based on the forecast may be taken, so information including uncertainty is unnecessary. The result is shown in *Figure 31*.

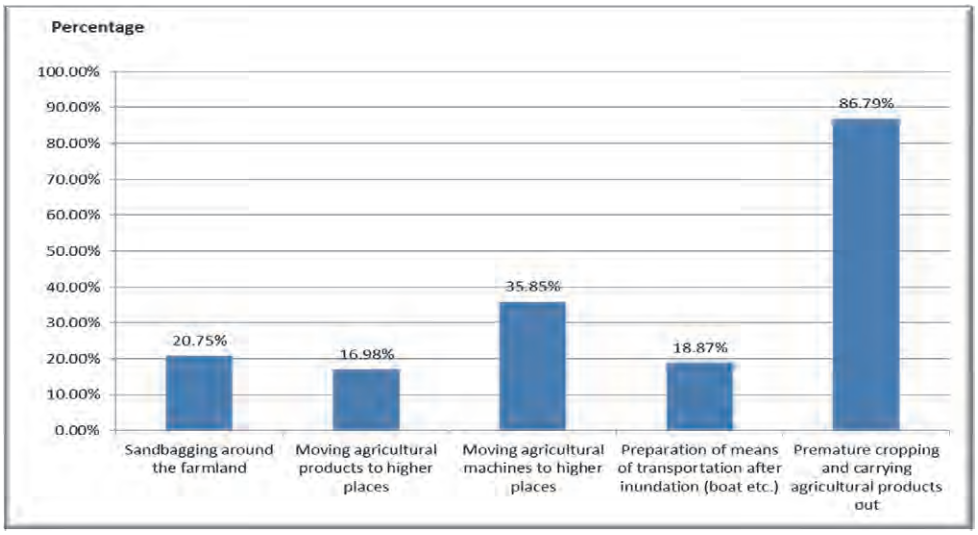


Figure 25 Farmers in Ang Thong: Action for Agricultural Products before Inundation

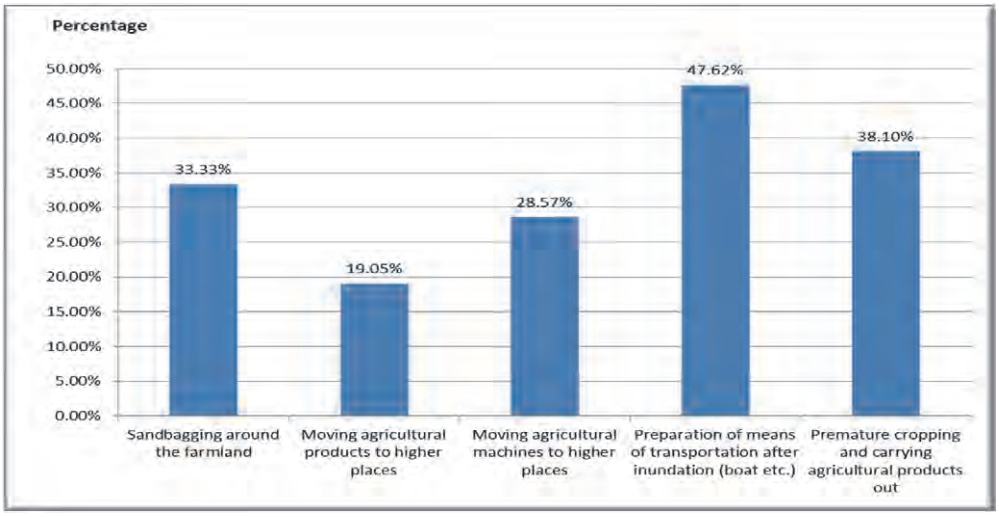


Figure 26 Farmers in Ang Thong : Action when Inundation Area Approached

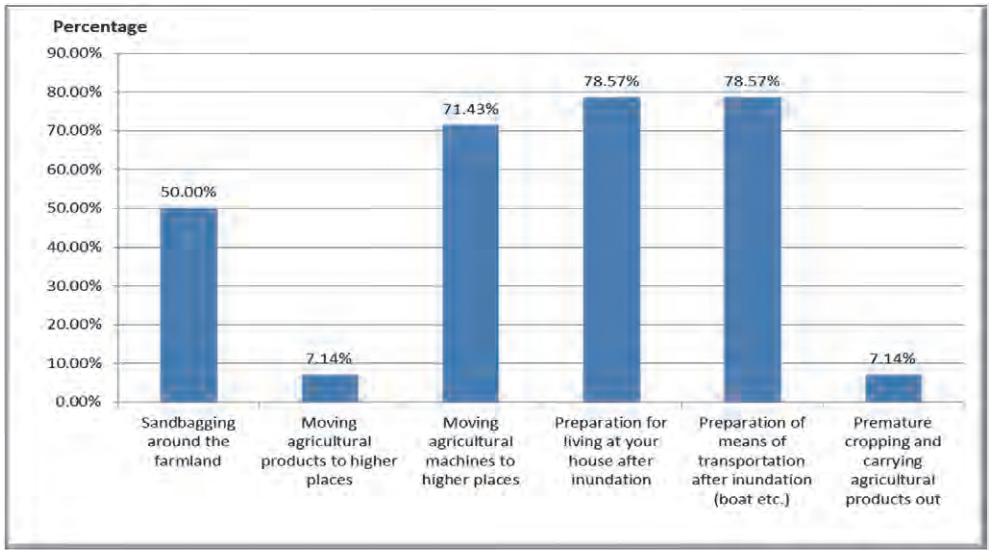


Figure 27 Farmers in Ang Thong: Action for Agricultural Products after Inundation

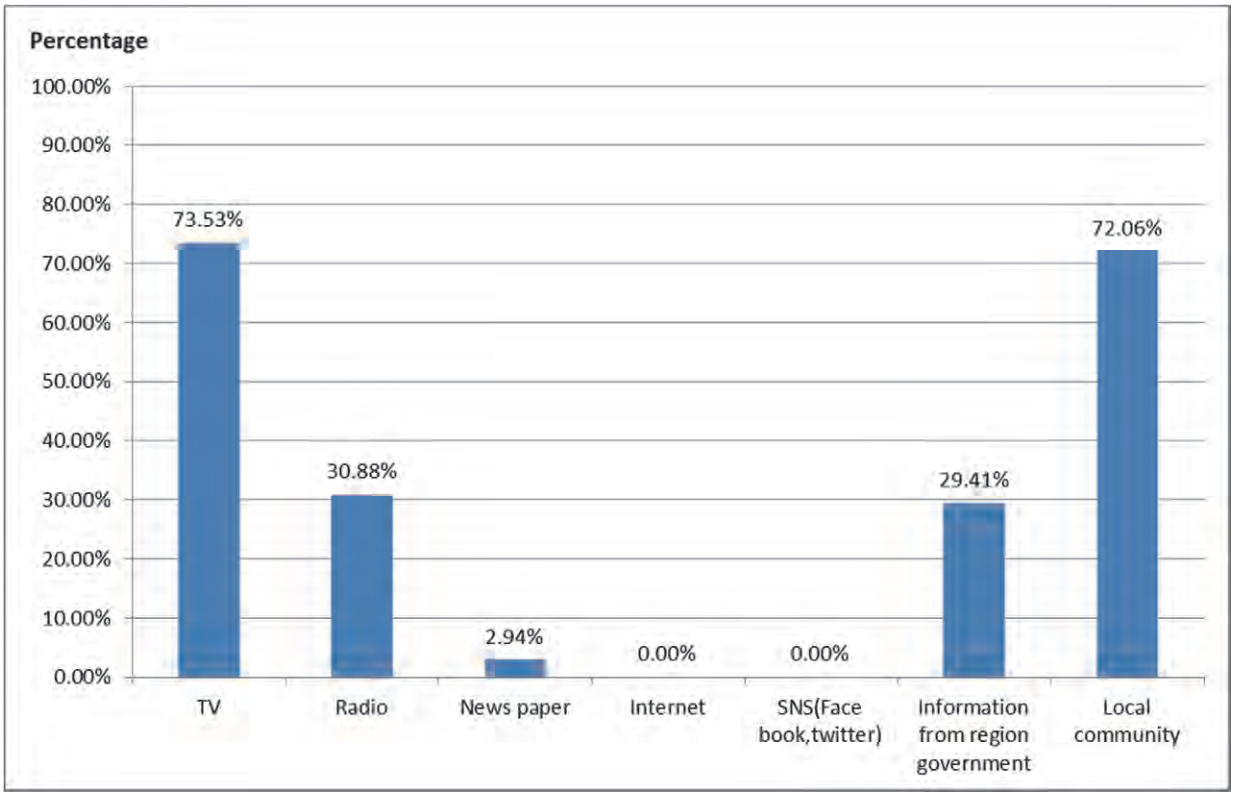


Figure 28 Farmers in Ang Thong: Most Effective Means of Information Acquisition for Damage Alleviation Actions

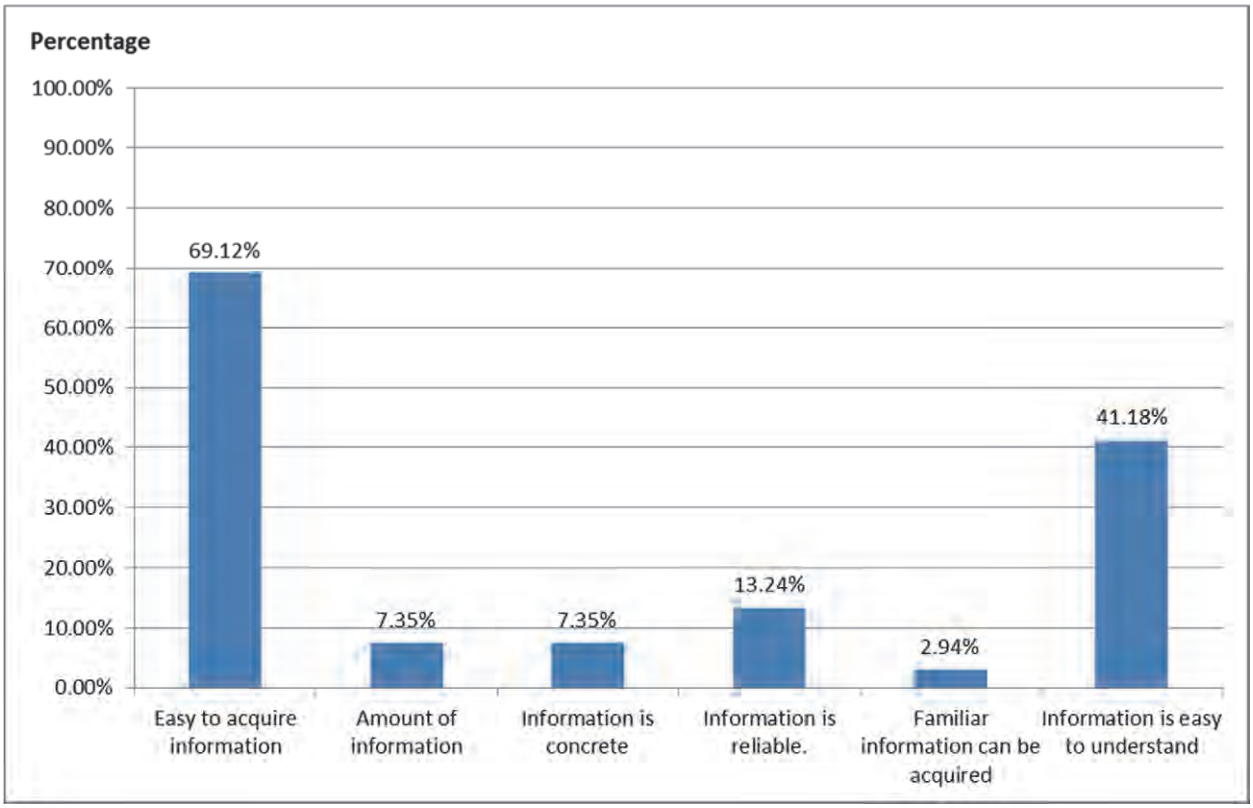


Figure 29 Reasons Support Effectiveness of Means of Information Acquisition (in Figure 28) for Damage Alleviation Actions

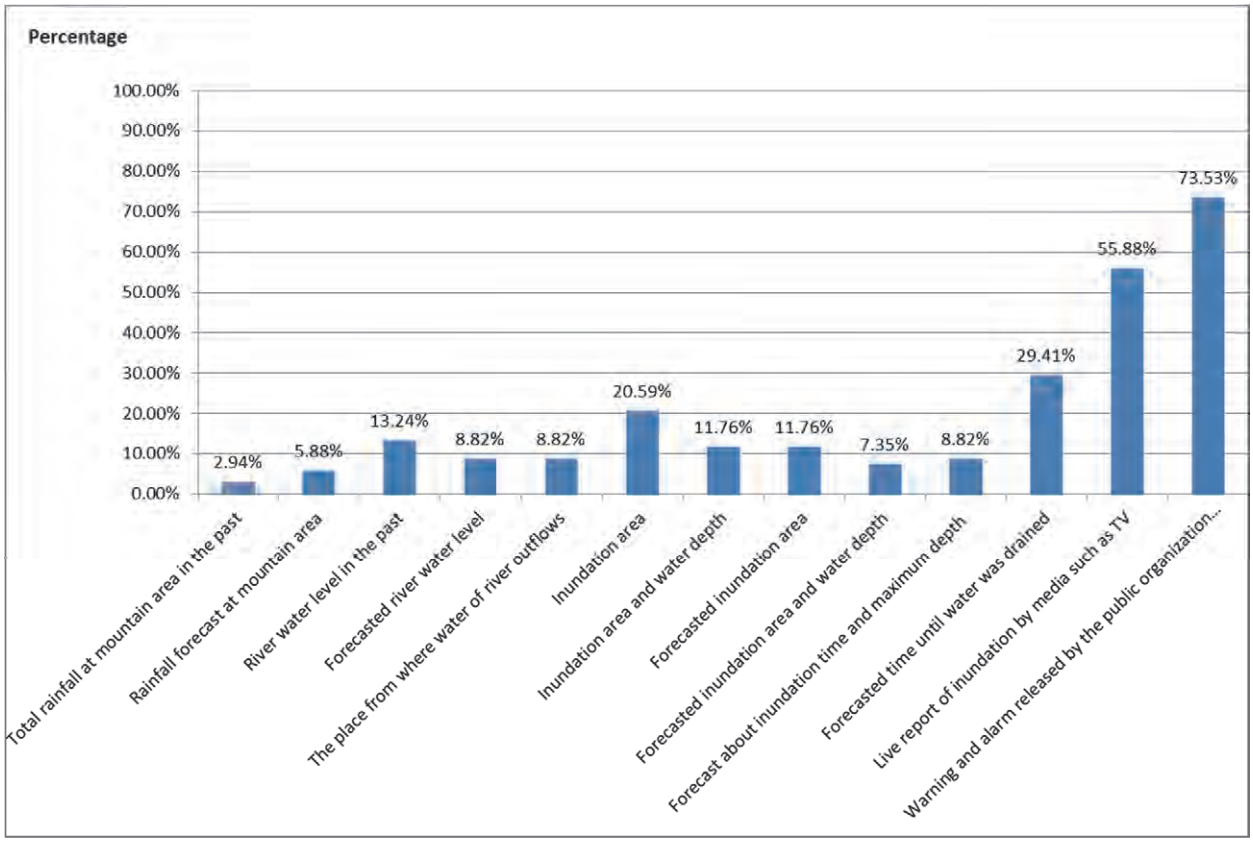


Figure 30 Farmers in Ang Thong: Additional Required Information

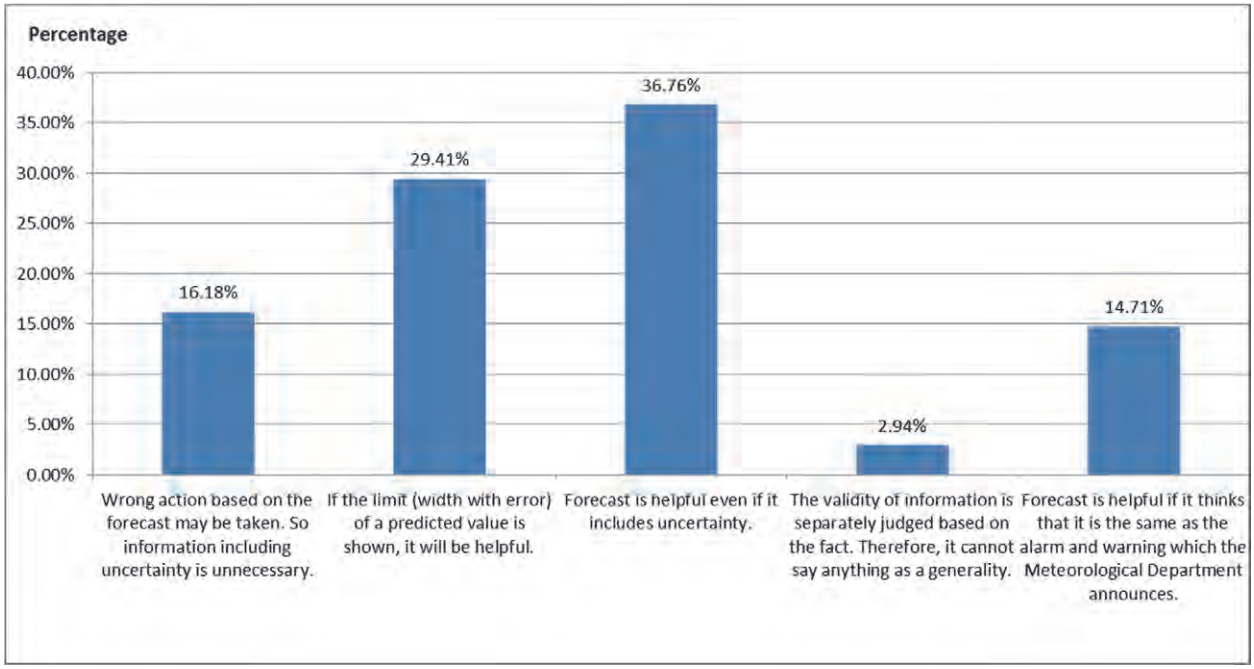


Figure 31 Farmers in Ang Thong: Opinions of Respondents on Uncertainty Warning and Forecast

Sing Buri

The number of respondents from Sing Buri is 60, which is 13.92% of the total respondents in farmer group. More than a half of them live in single story house and realized that their houses and farmlands, in which 97% of respondents grew rice, would be flooded. After they acknowledged about situation, 98% took damage alleviation actions for agricultural products before inundation, in which 78% of this portion premature cropped and carried agricultural products out, 15% moved the machines to higher places and 15% aligned sandbag around the farmland, as the data shown in *Figure 32*. Although, it seems that the farmers in Sing Buri were aware and ready to handle with flood, but 100% of the respondents said that all of agricultural products were soaked anyway. When the flood water reached their areas, 100% of respondents took action by preparing means of transportation such as boat, moving agricultural machines and agricultural products to higher places, as the number shown in *Figure 33.* After inundation, 93% of surveyed farmers had some actions; i.e. 79% prepared water, food, etc., for living at their houses, and 26% prepared means of transportation after inundation, as results presented in *Figure 34*, while 7% of the respondents in Sing Buri did not do any action since they thought there was no effective measure.

The questionnaire result revealed that the information that were useful before and during the flood period are warning and alarm released by the public organization (Meteorological department or local government) and live report of river by media such as TV. Besides, during the inundation approaching period, the forecasted river water level were also necessary, with the needs of forecasted time until the area around their houses gets dry in the period after the inundation. Most of the information was gathered from TV, regional government and local community, in which related with their opinion about the most effective means of information acquisition for damage alleviation actions are TV, local community, and information from regional government, as shown in *Figure 35*. The farmers realized that these sources of information are reliable and easy to be acquired, as the reasons shown in *Figure 36*. Furthermore, the information that the respondents need, other than the acquired one, are the forecast about inundation time and maximum depth, inundation area and water depth, as shown in *Figure 37*, in which should be intelligible with figure or table and easy to understand.

About the warning and forecast processes, although the forecast of inundation area includes the prediction error of a natural phenomenon, and the prediction error of the simulation, cause the uncertainty, but 48% of the survey farmers in Sing Buri think that it is helpful similar to the alarm and warning from Meteorological Department. 18% think that the forecast is helpful even if it includes uncertainty and 23% feel that if the limit (width with error) of a predicted value is shown, it will be helpful. The result related with warning and forecast processes is shown in *Figure 38*.

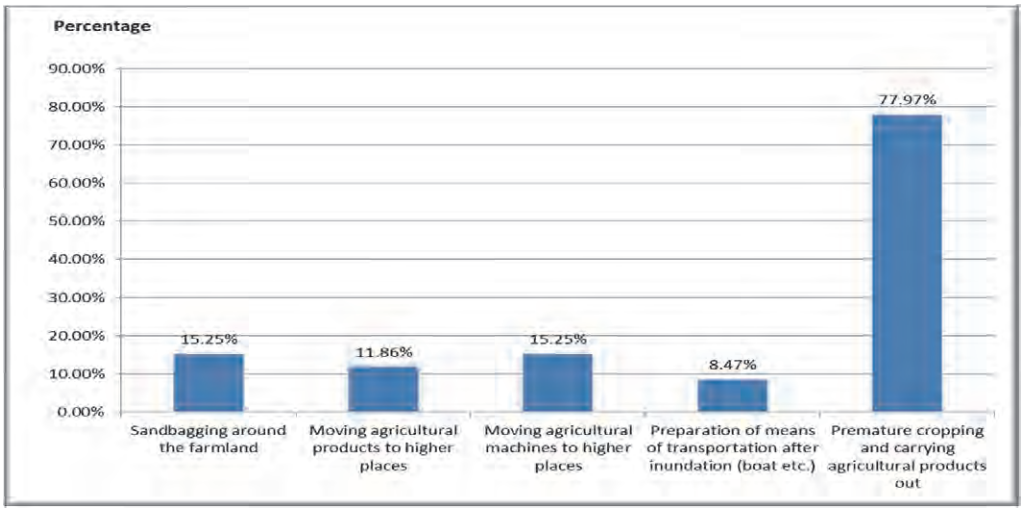


Figure 32 Farmers in Sing Buri: Action for Agricultural Products before Inundation

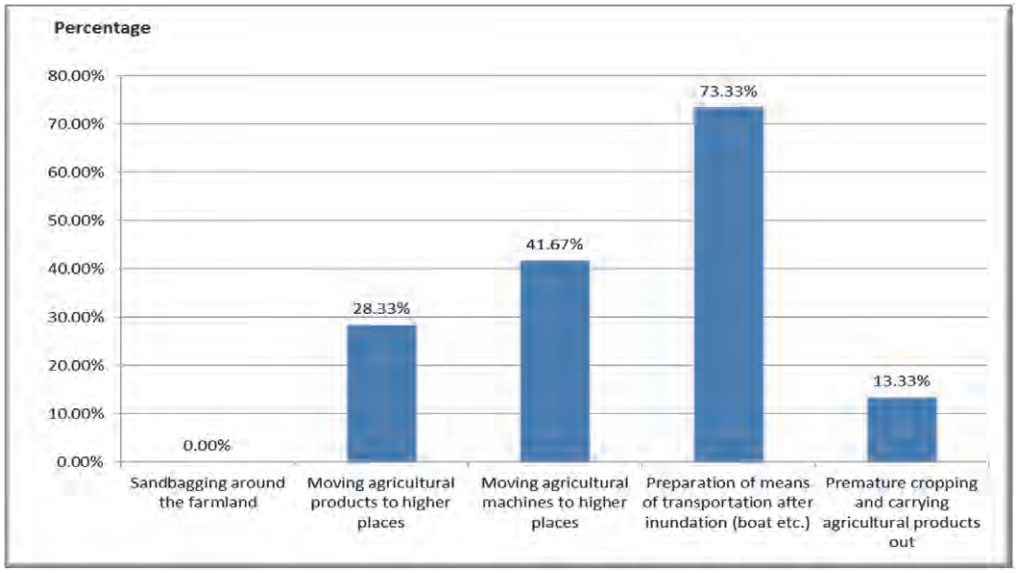


Figure 33 Farmers in Sing Buri : Action when Inundation Area Approached

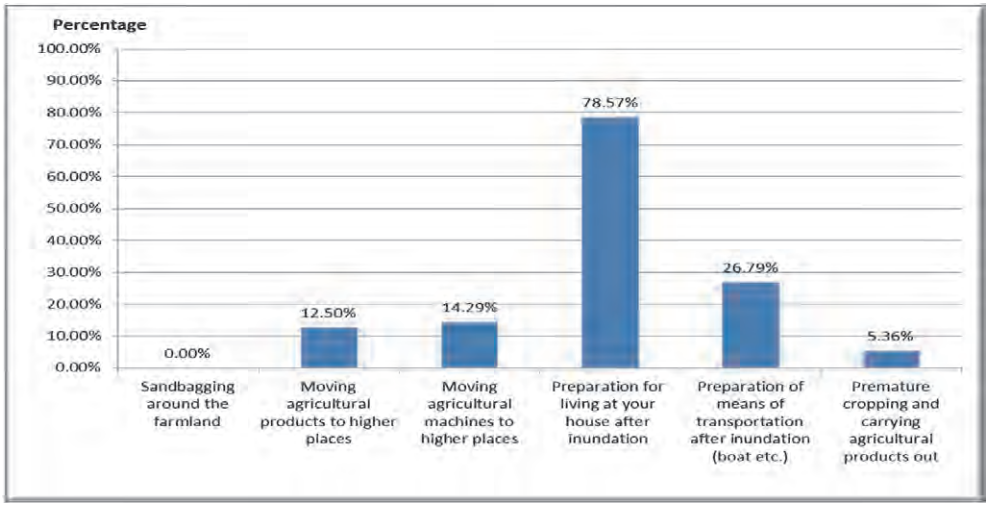


Figure 34 Farmers in Sing Buri : Action for Agricultural Products after Inundation

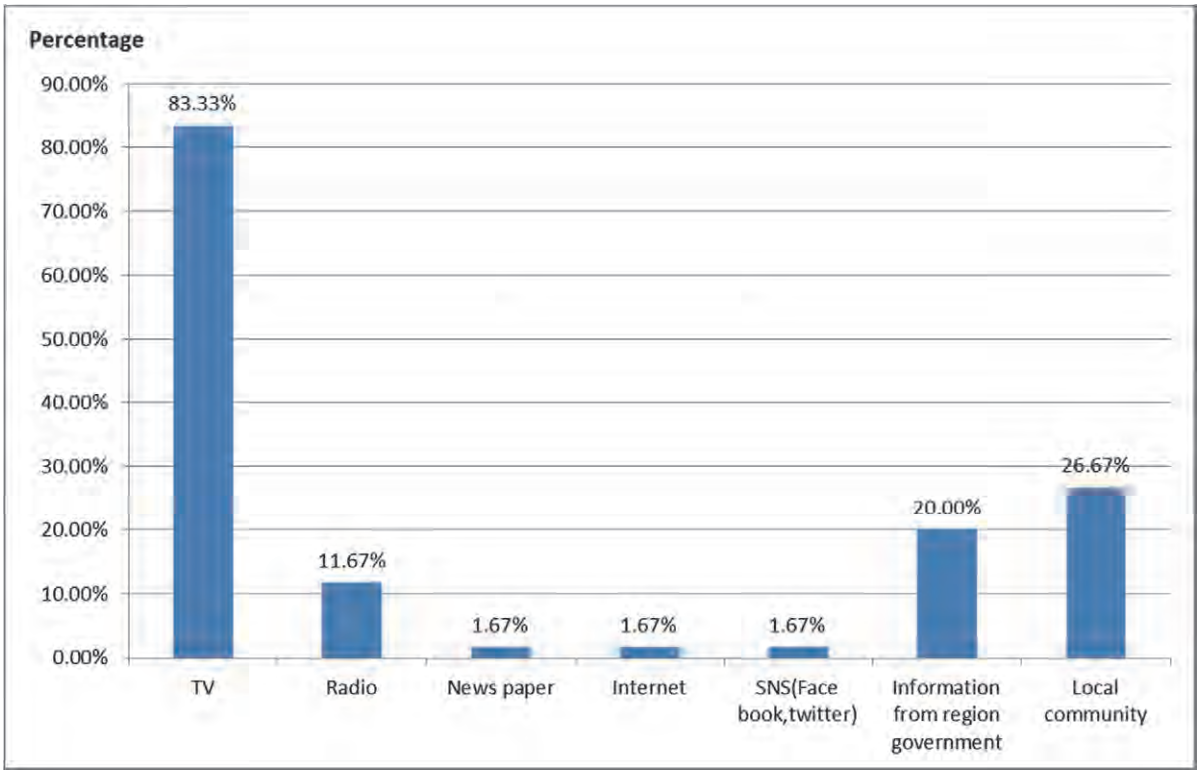


Figure 35 Farmers in Sing Buri: Most Effective Means of Information Acquisition for Damage Alleviation Actions

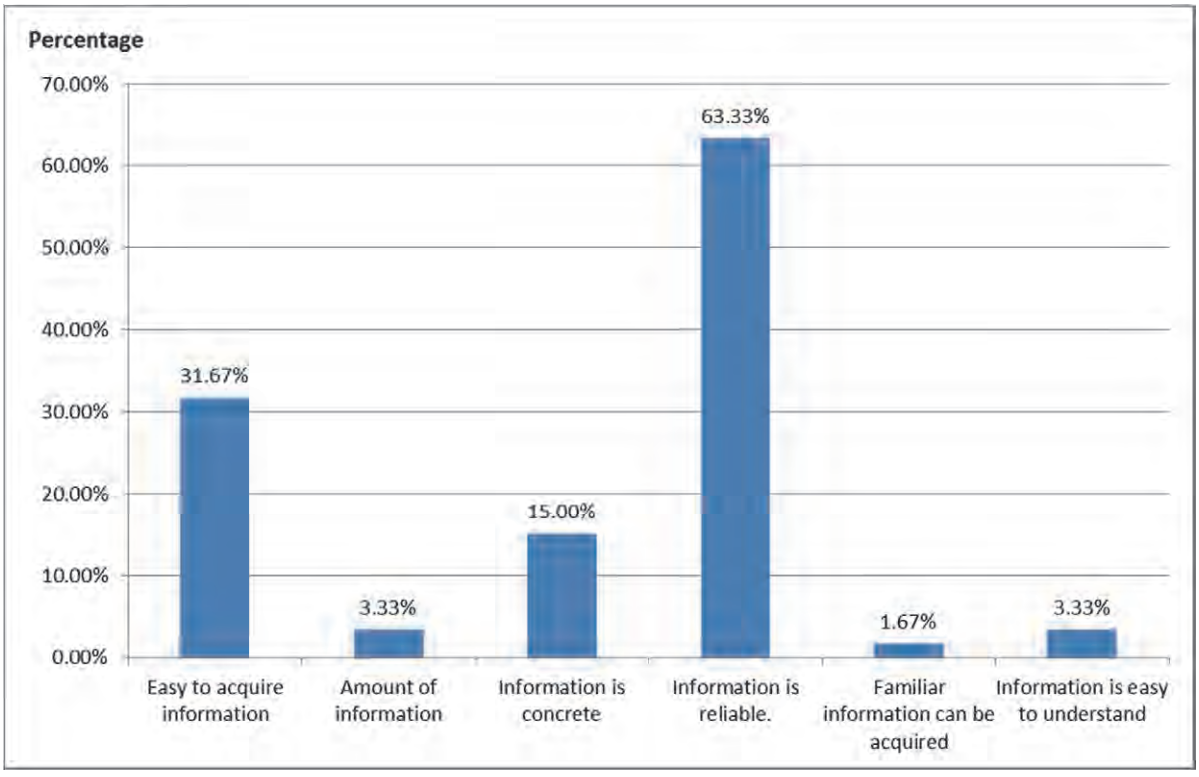


Figure 36 Reasons Support Effectiveness of Means of Information Acquisition (in Figure 35) for Damage Alleviation Actions

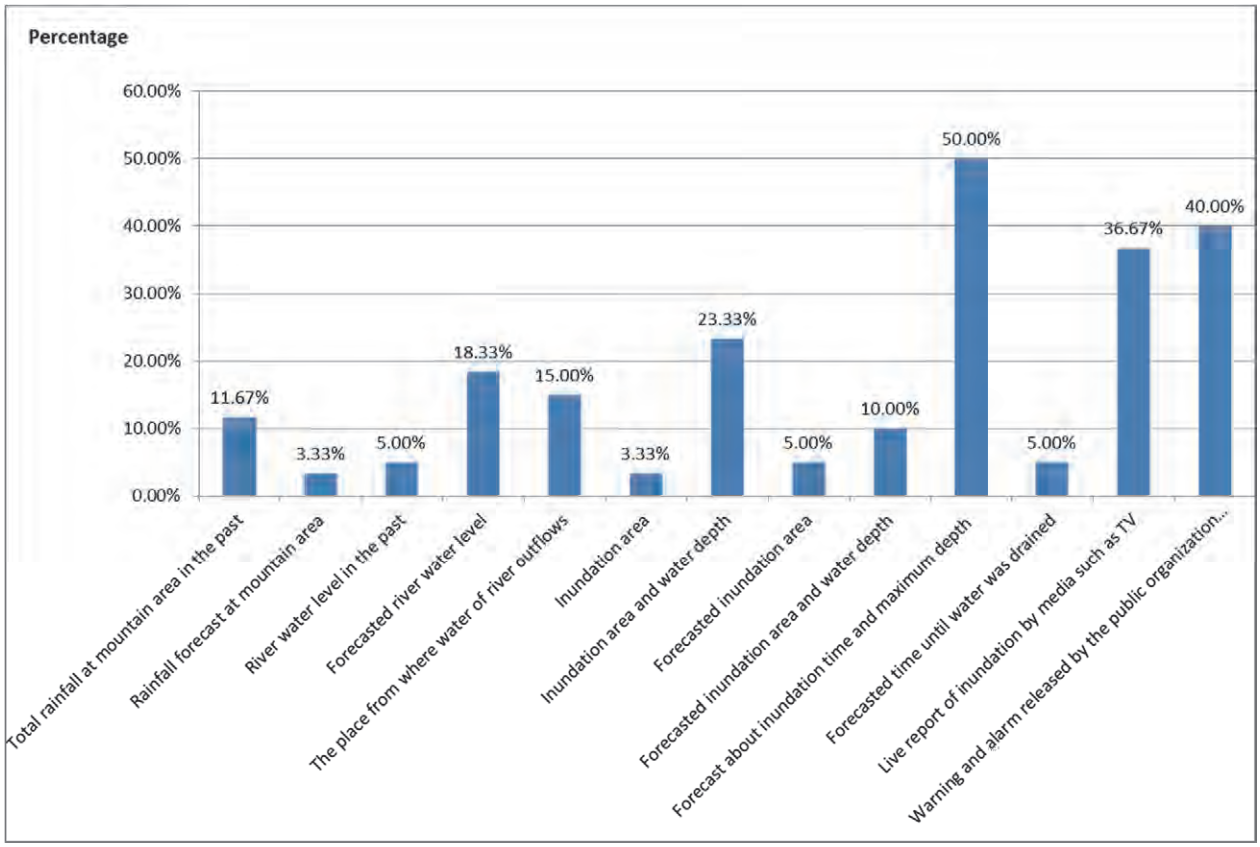


Figure 37 Farmers in Sing Buri: Additional Required Information

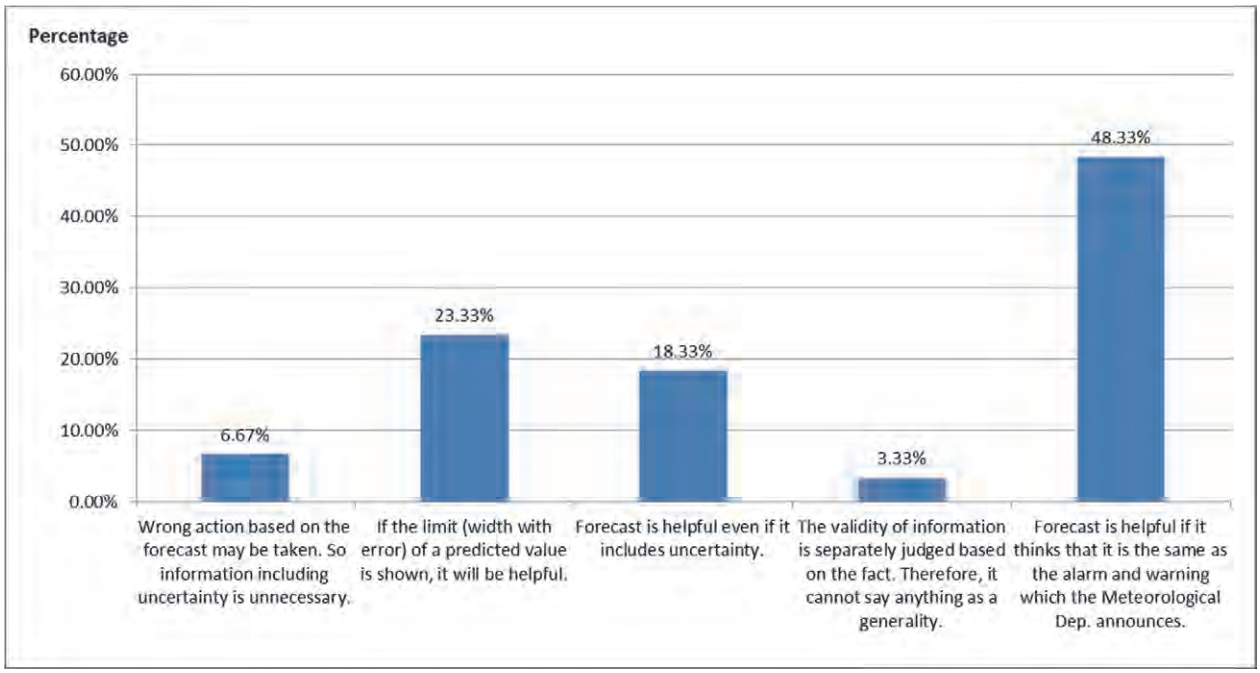


Figure 38 Farmers in Sing Buri: Opinions of Respondents on Uncertainty Warning and Forecast

Chai Nat

The number of respondents in Chai Nat is 60, which is 13.92% of total respondents in farmer group. 77% of them own single story house and grew rice as economical crop, with 18% grew fruits. It was found that all of agricultural products of the sampling farmers were soaked, although they all noticed about the flood one week before inundation and prepared to handle the situation. 95% of respondents premature cropped and carried agricultural products out and 18% aligned sandbag around the farmland, as the numbers shown in *Figure 39*. Additionally, 98% of respondents also took damage alleviation actions when inundation area approached by preparing means of transportation after inundation and moving agricultural machines to higher places, as the percentages shown in *Figure 40*. After the inundation, the farmers in Chai Nat seem to be well-prepared since 95% of them prepared food, water, etc., for living at their houses and 9% prepared means of transportation after inundation, as shown in *Figure 41*.

The respondents in Chai Nat had various actions, in order to mitigate the inundation effect, since they got the information before the occurrence of flood around their houses and farmlands. 93% thought that the warning and alarm released by the public organization such as Meteorological department or local government, with live report of river by media such as TV are useful. When the flood water reached their places, they thought that not only the warning and alarm and live report of river are useful, but the forecasted river water level is also important. After the inundation, the farmers mentioned that the information of forecasted time until the area around their houses and farmlands gets dry is needed. However, Chai Nat has different result in means that they got information, compare with Ayutthaya, Ang Thong and Sing Buri; i.e. 97% of respondents acquired the information from region government, in which the number is higher than TV, 92% , and local community, 77%. The target groups gave information that the most effective means of information acquisition are TV and regional since they are reliable and easy to acquire the information, as the questionnaire result shown in *Figure 42* and *43*. Additionally, the information that are also needed other than the acquired information are the forecast about inundation time and maximum depth, inundation area and water depth and warning and alarm by the public organization, as the information shown in *Figure 44*. Furthermore, it should be realized that most of the respondents, more than 93%, need the information of inundation for effective damage alleviation action at least 7 days before inundation.

About the warning and forecast processes, although the forecast of inundation area includes the prediction error of a natural phenomenon, and the prediction error of the simulation, cause the uncertainty, but 37% of the respondents in Sing Buri think that the forecast is helpful as the alarm and warning from Meteorological Department, while 33% think that the forecast is helpful even if it includes uncertainty and 18% think that if the limit (width with error) of a predicted value is shown, it will be helpful. The result of this part is shown in *Figure 45*.

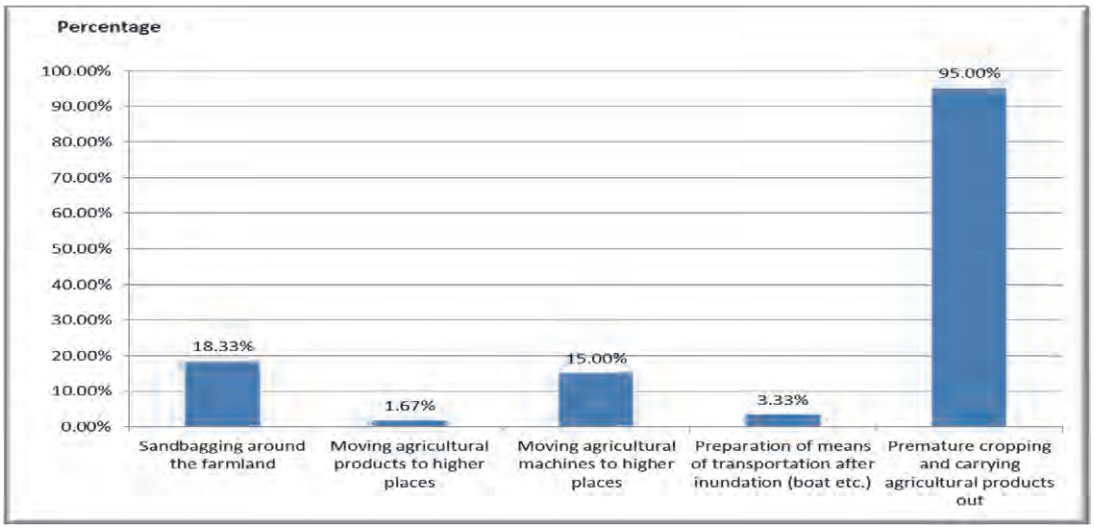


Figure 39 Farmers in Chai Nat: Action for Agricultural Products before Inundation

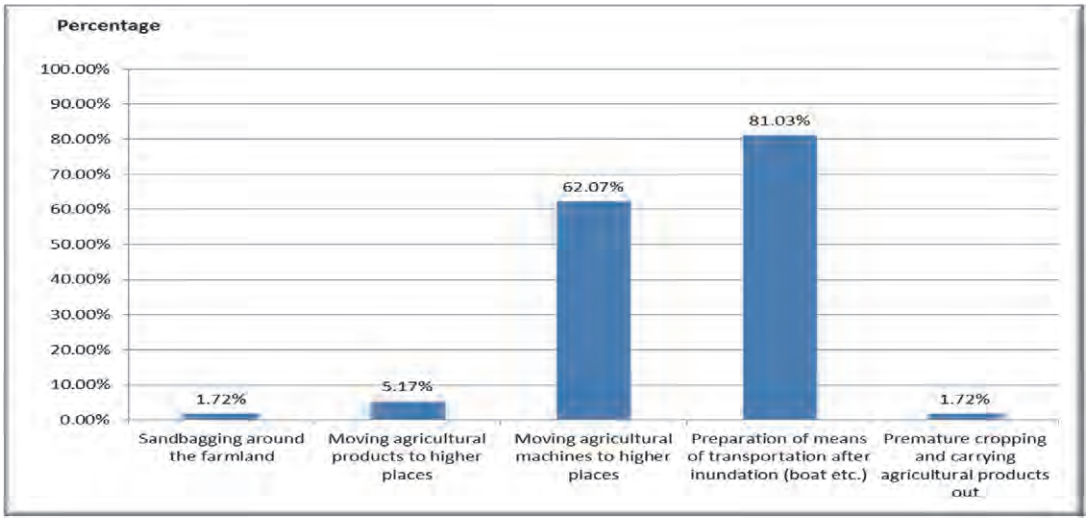


Figure 40 Farmers in Chai Nat: Action when Inundation Area Approached

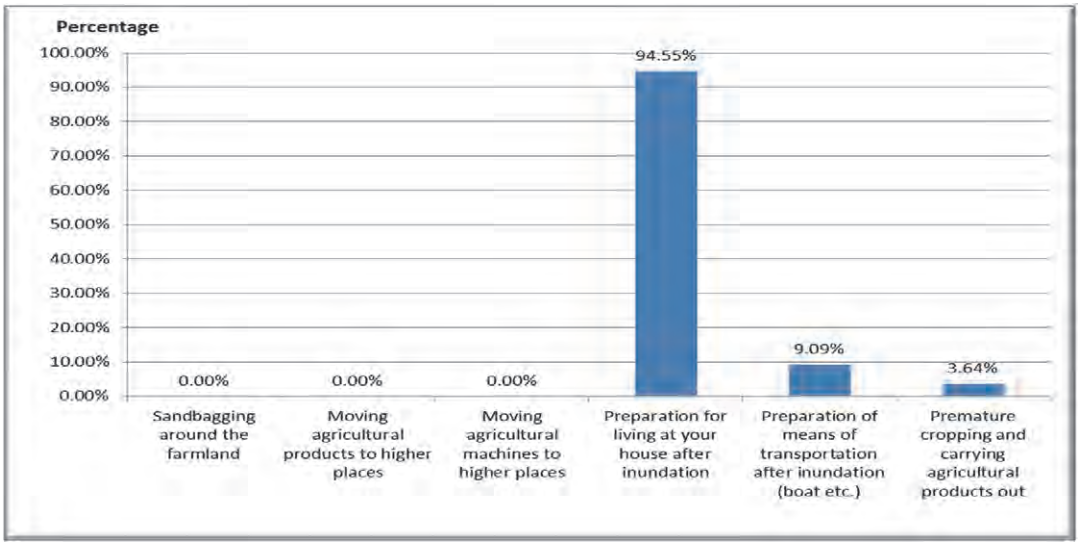


Figure 41 Farmers in Chai Nat: Action for Agricultural Products after Inundation

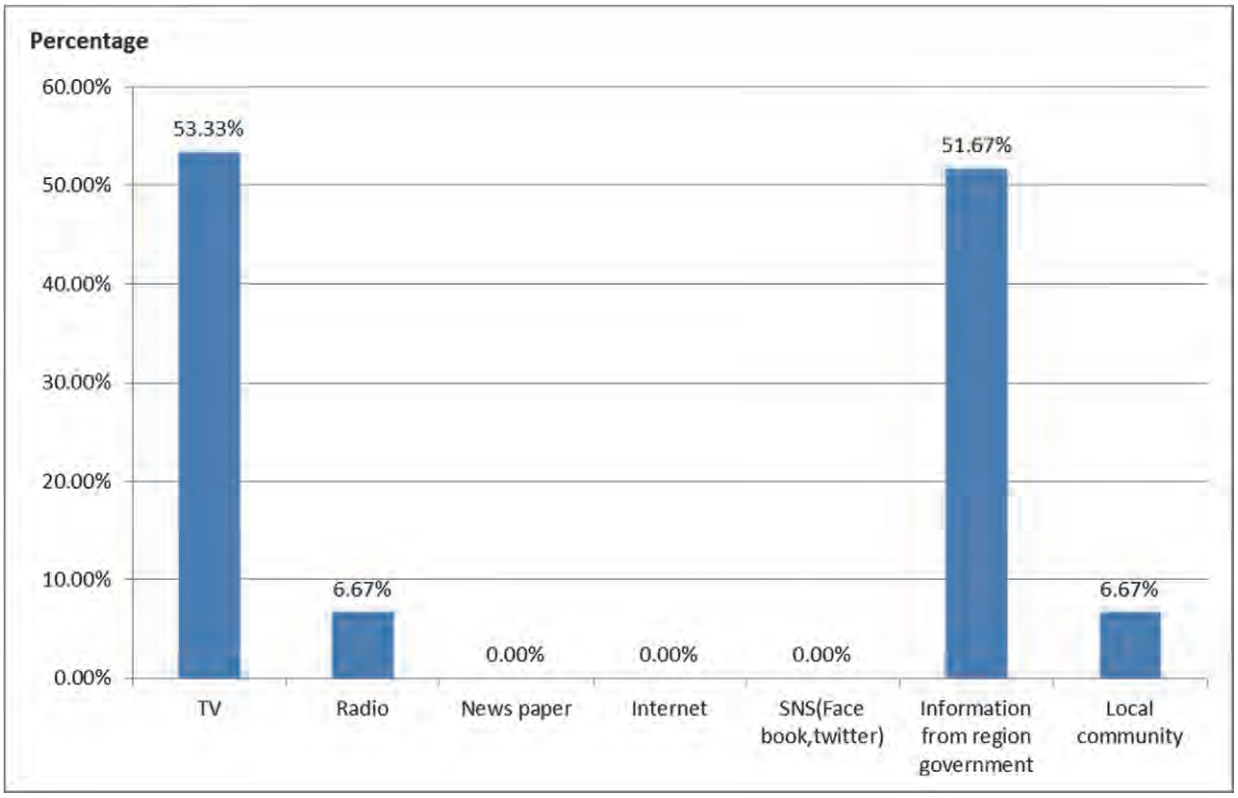


Figure 42 Farmers in Chai Nat: Most Effective Means of Information Acquisition for Damage Alleviation Actions

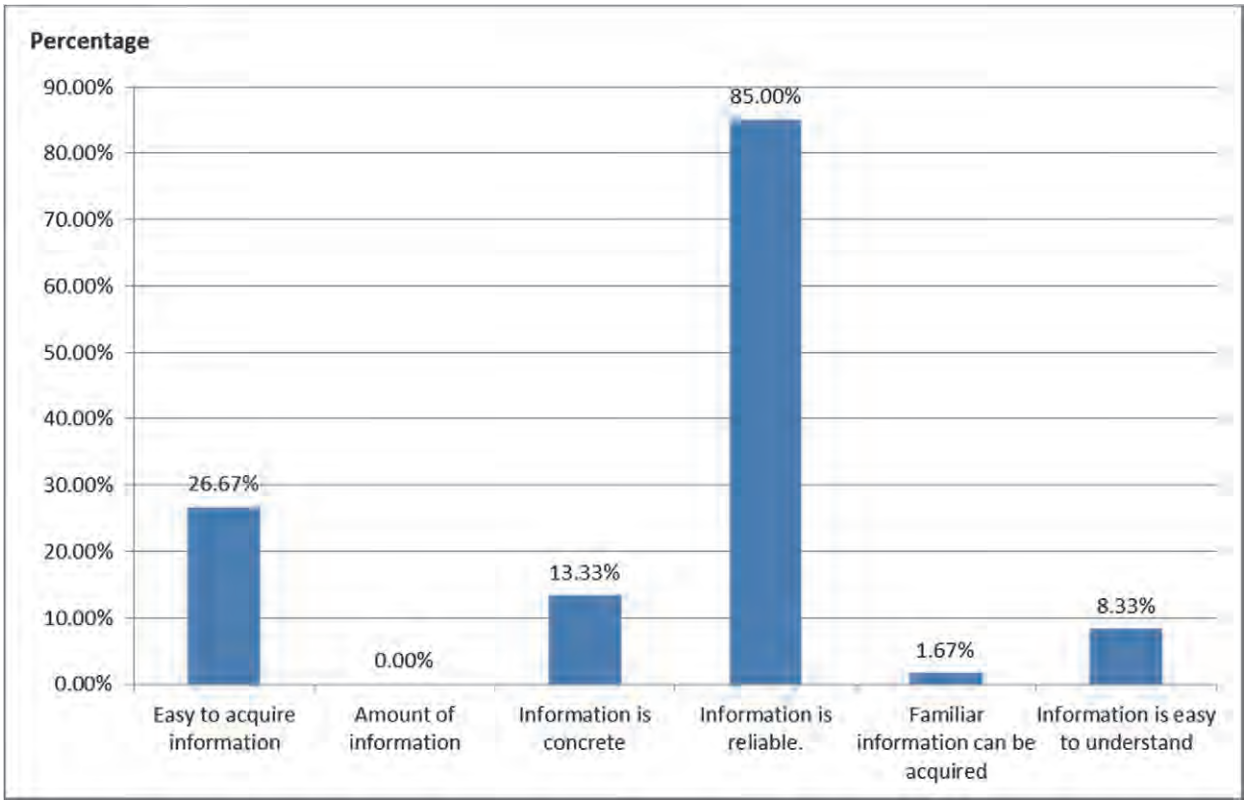


Figure 43 Reasons Support Effectiveness of Means of Information Acquisition (in Figure 42) for Damage Alleviation Actions

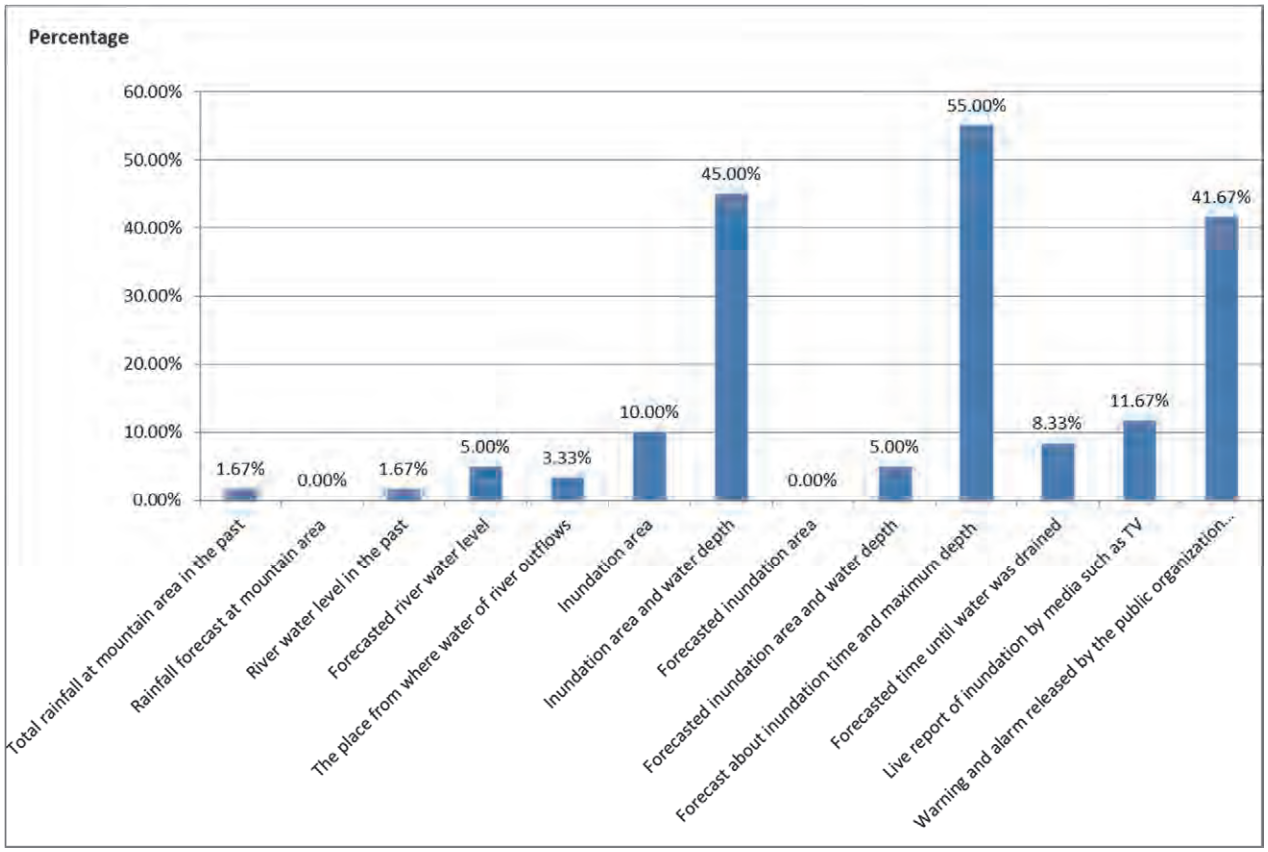


Figure 44 Farmers in Chai Nat: Additional Required Information

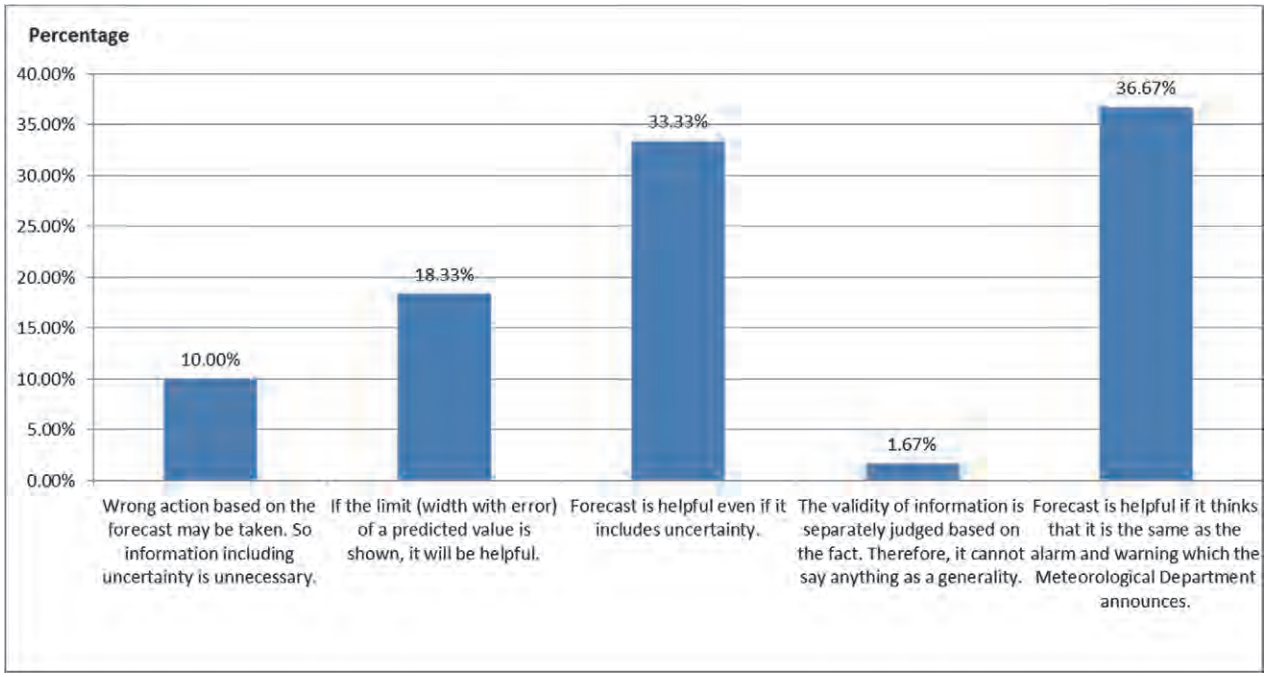


Figure 45 Farmers in Chai Nat: Opinions of Respondents on Uncertainty Warning and Forecast

Lopburi

The number of respondents from Lopburi is 63, which is 14.62% of the total respondents in farmer group. About 89% of the respondents own single story house and 92% of them grew rice. Although 69% of the survey farmers took damage alleviation action for agricultural products before inundation by premature cropping and carrying agricultural products out, Moving agricultural products and machines to higher places, as shown in *Figure 46*, but all of their agricultural products were still soaked under the water while the other 31% had information but did not know what to do. Some of them thought the farmlands would not be inundated and some of them felt that the time was not enough, so they did not take any action. However, when the flood water reached their houses and farmland, more than 60% of the respondents did not do anything since they did not know what to do and some of them felt that they did not have enough time. The other 40% prepared themselves by premature cropping and carrying agricultural products out, moving agricultural products and machines to higher places, as percentage shown in *Figure 47*. Besides, after the inundation, more than 82% of the respondents did not take damage alleviation action with the reason that they had no effective measure while the other 18% had various actions such as 54% of them premature cropped and carried agricultural products out, 45% prepared means of transportation after inundation and 45% moved agricultural products to higher places, as the number shown in *Figure 48.*

The questionnaire result revealed that the information that were useful before and during the flood period are warning and alarm released by the public organization (Meteorological department or local government) and live report of river by media such as TV. Besides, during the inundation approaching period, the forecasted river water level were also necessary, with the needs of forecasted time until the area around their houses gets dry in the period after the inundation. Most of the information was gathered from TV, local community and regional government, in which related with their opinion about the most effective means of information acquisition for damage alleviation actions are TV, local community, and information from regional government, as shown in *Figure 49*. The farmers realized that these sources of information are reliable and easy to be acquired, as the reasons shown in *Figure 50.* Furthermore, the information that the respondents need, other than the acquired one, are the forecasted inundation area with the warning and alarm and live report on inundation by media, as shown in *Figure 51*, in which the information should be periodical updated and can be acquired when necessary.

About the warning and forecast processes, although the forecast of inundation area includes the prediction error of a natural phenomenon, and the prediction error of the simulation, cause the uncertainty, but 35% of the respondents think that it is still helpful, 29% think that if the limit (width with error) of a predicted value is shown, it will be helpful and 23% think that the forecast is helpful the same way as the alarm and warning from Meteorological Department. The result related with warning and forecast processes is shown in *Figure 52*.

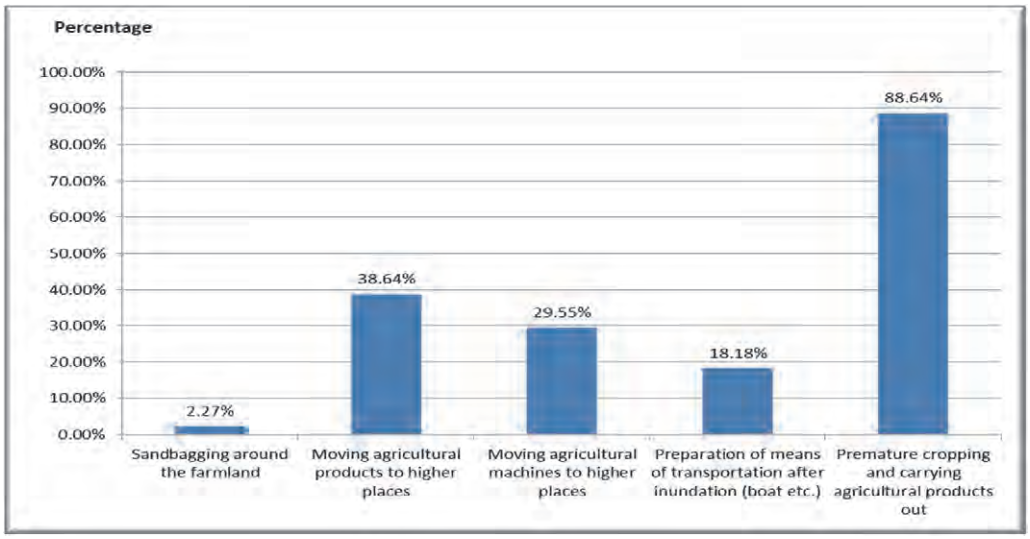


Figure 46 Farmers in Lopburi: Action for Agricultural Products before Inundation

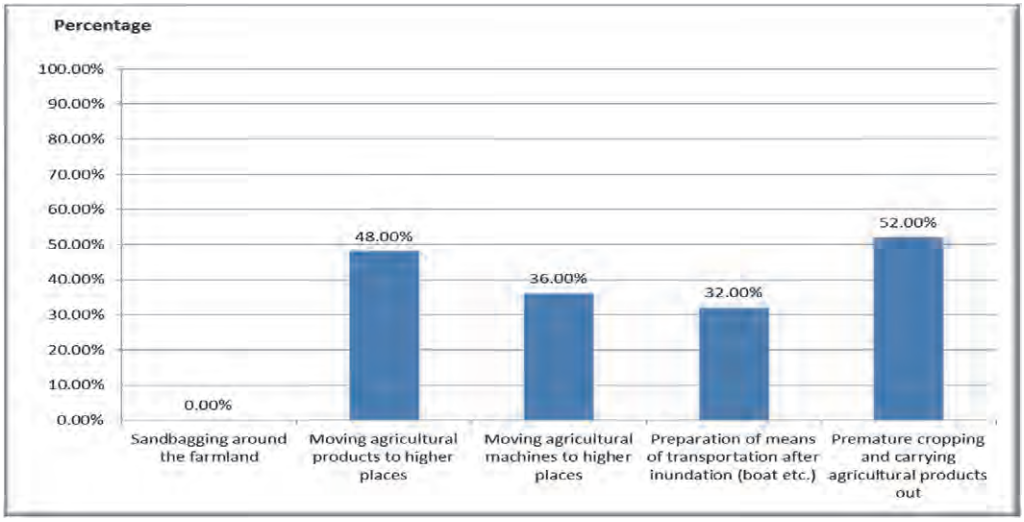


Figure 47 Farmers in Lopburi: Action when Inundation Area Approached

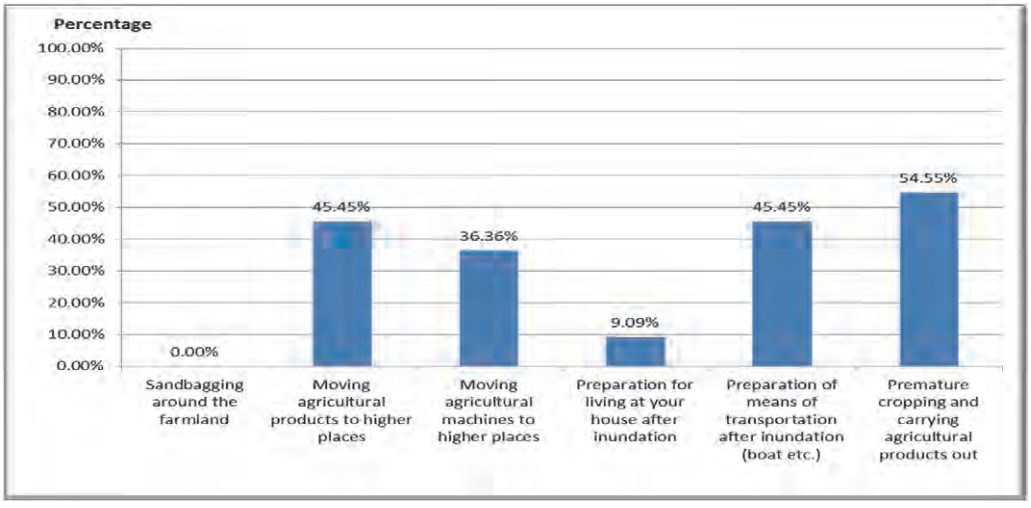


Figure 48 Farmers in Lopburi: Action for Agricultural Products after Inundation

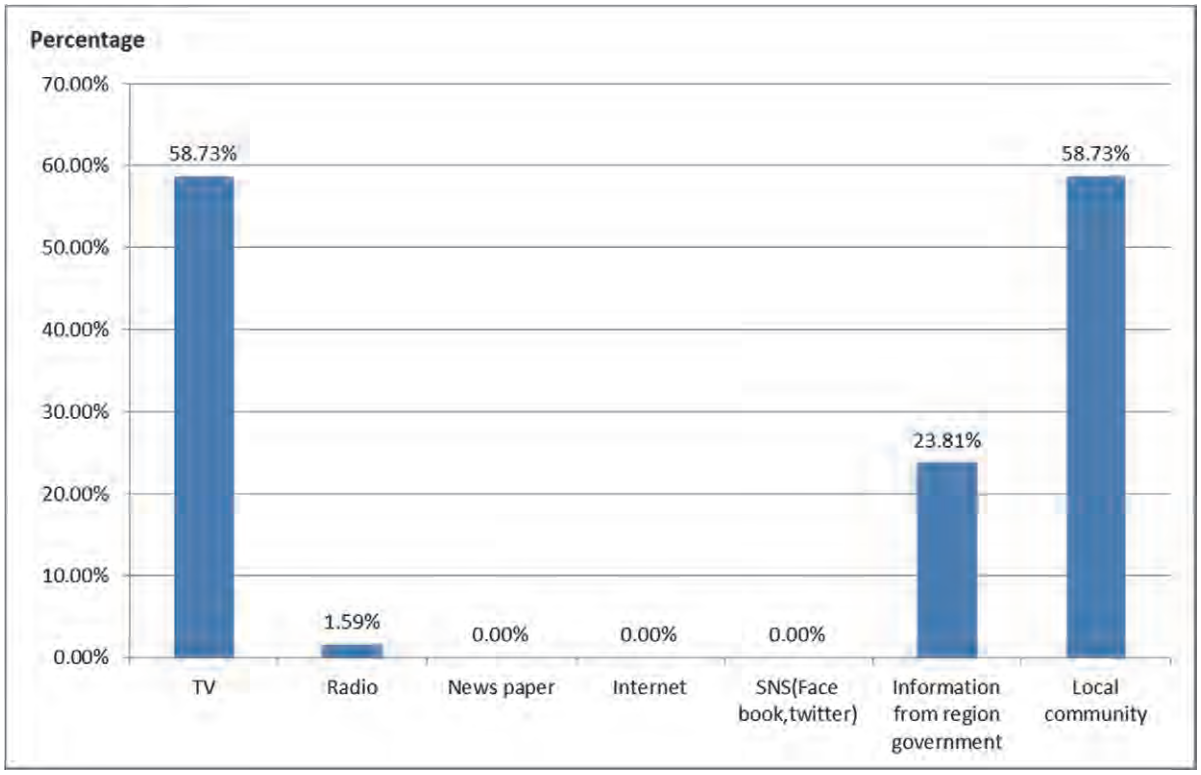


Figure 49 Farmers in Lopburi: Most Effective Means of Information Acquisition for Damage Alleviation Actions

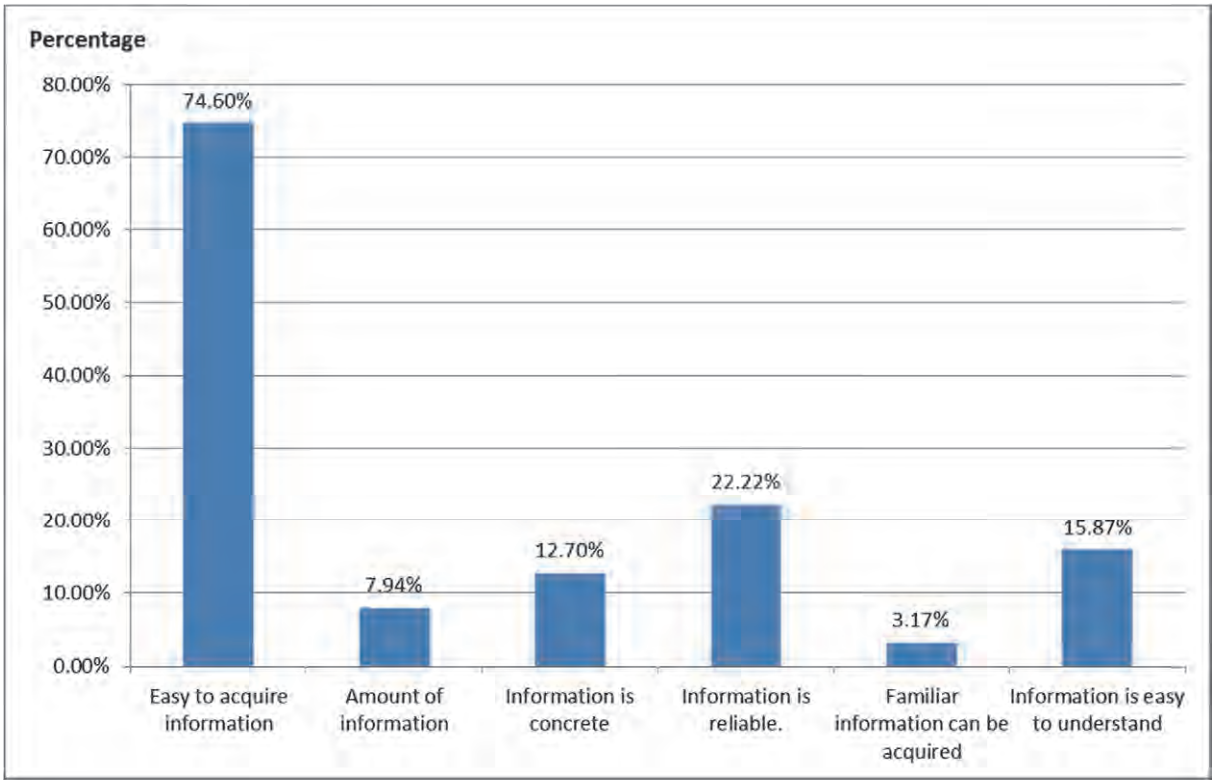


Figure 50 Reasons Support Effectiveness of Means of Information Acquisition (in Figure 49) for Damage Alleviation Actions

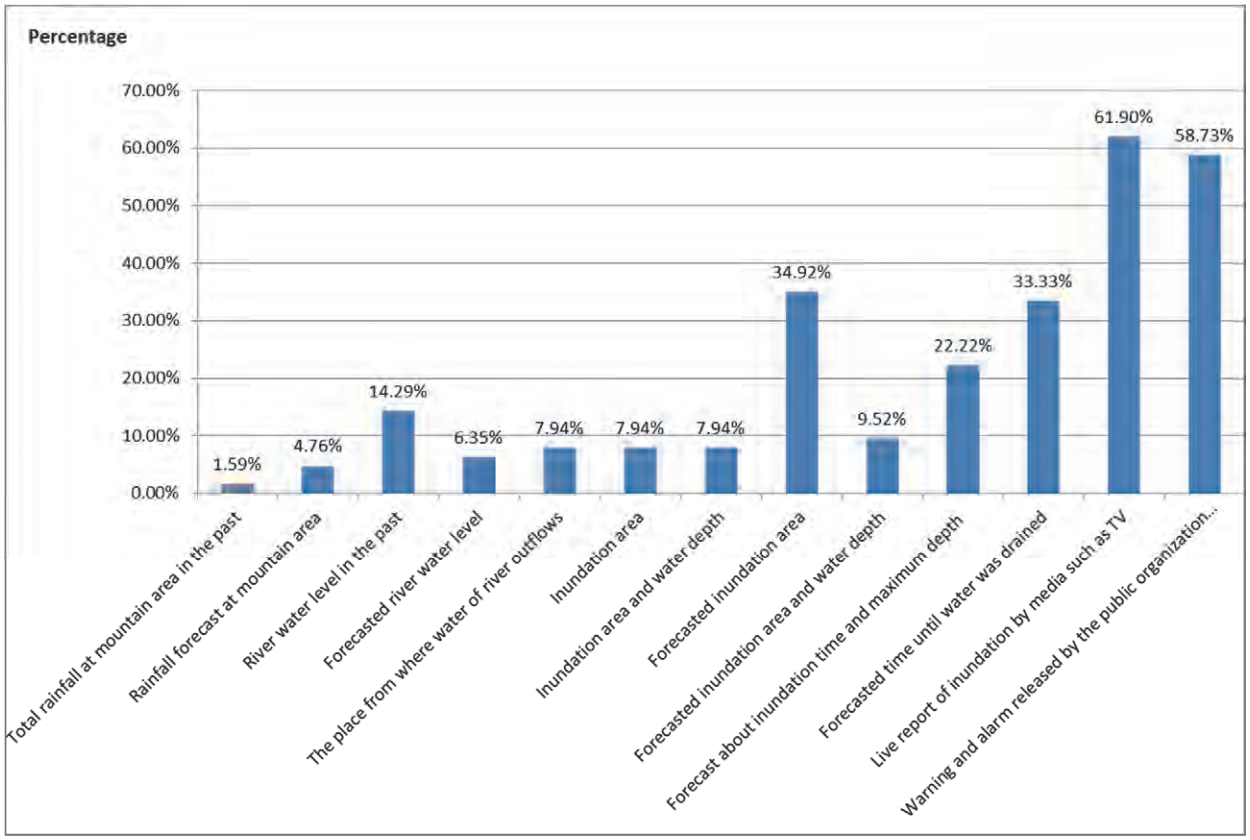


Figure 51 Farmers in Lopburi: Additional Required Information

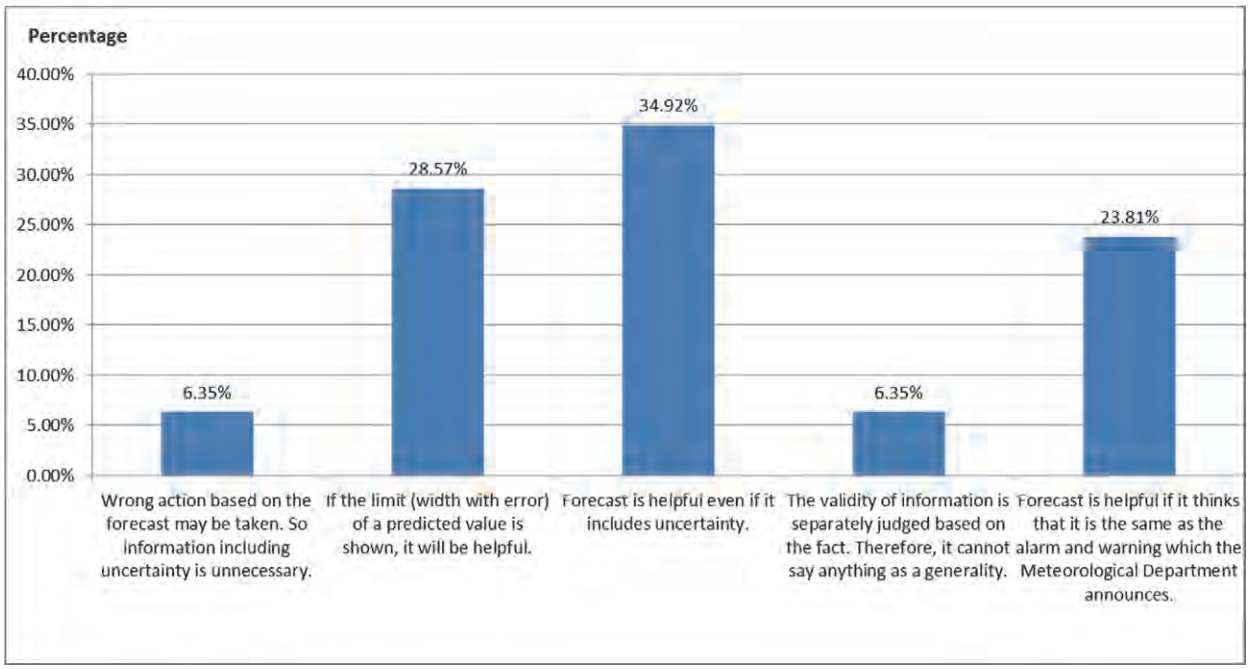


Figure 52 Farmers in Lopburi: Opinions of Respondents on Uncertainty Warning and Forecast

5.2.2 City Residents Interview

The interview results of city residents in 5 provinces are reported in *D.* It could be summarized as follows:-

Ayutthaya Province

The number of city residents from Ayutthaya who answered the questionnaire is 200, which is 40.90% of the total respondents in this group. About a half of them own single story house, in which 73% of the respondents were soaked in water under the floor and about 15% were soaked in water above the floor. It seems that the city residents in Ayutthaya had time to take damage alleviation action since 80% of them realized that their places would be submerged at least 4-6 days before the flood. Thus, 78.50% of respondents took damage alleviation action before inundation by 59% in this group moved household items to higher places, 41% moved cars to higher places and 27% prepared means of transportation after inundation, the number shown in *Figure 53*. However, among 21.50% of respondents who did not take any damage alleviation action before inundation, 49% of them said that there was no information and they thought that their houses would not be inundated while 26% thought that they had enough time. When inundation area approached, 85.50% took damage alleviation actions; i.e. 63% prepared food, water, etc. for living at their houses after inundation, 55% moved household items to higher places and 39% prepared means of transportation after inundation, as presented in *Figure 54.* Then, after the inundation, the respondents from Ayutthaya city seems to concerned about the living since 63.50% of the respondents took some action by 70% of this group prepared of long-term evacuation place, 61% prepared for living at their houses after inundation and 53% evacuated to safe places, as the results shown in *Figure 55*.

The questionnaires revealed that most of respondents, 67% of them, got flood information from TV, 58% from local community and 54% from regional government. In which the useful data were warning and alarm released by the public organization such as Meteorological department or local government, inundation area and water depth, forecasted time until the area around your house gets dry and live report of inundation by media such as TV. *Figure 56* and *57* present the respondents' opinion about effective means of information distribution and the supported reasons. It indicates that the respondents prefer the means that are easy to acquire information. Moreover, they respondents think that they needed information, other than the acquired ones, which are warning and alarm, live report of inundation by media, forecasted time until water was drained and forecasted inundation area and water depth, as shown in *Figure 58.*

About the warning and forecast processes, although the forecast of inundation area includes the prediction error of a natural phenomenon, and the prediction error of the simulation, cause the uncertainty, but 34% of respondents think that the forecast is helpful even if it includes uncertainty, 26% think that if the limit (width with error) of a predicted value is shown, it will be helpful. Besides, 24% think that the forecast is helpful similar to the alarm and warning from the Meteorological Department. However, 13% of respondents feel that wrong action based on the forecast may be taken. Thus, the information including uncertainty is unnecessary. The questionnaire result related with forecasting is shown in *Figure 59.*

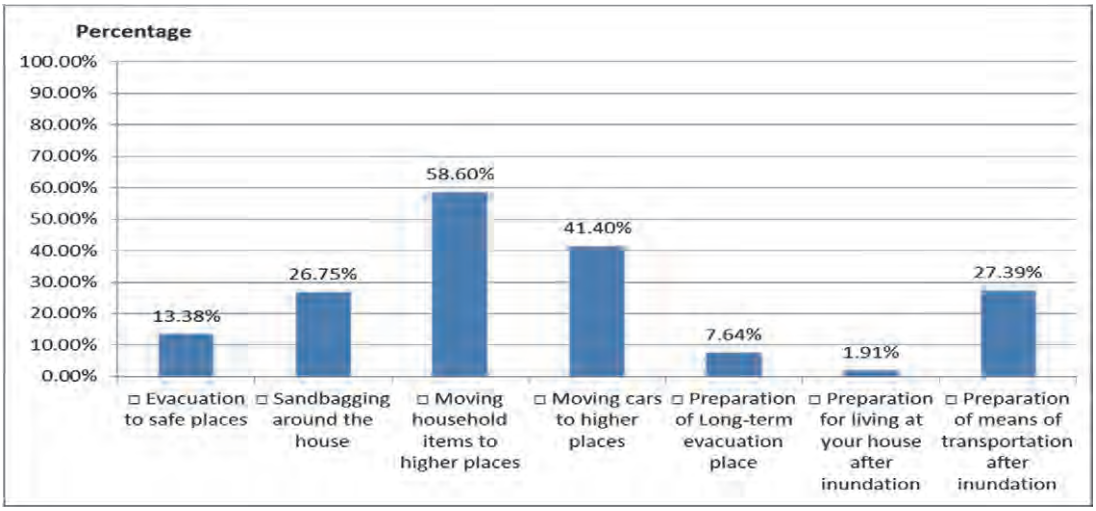


Figure 53 City Residents in Ayutthaya: Actions before Inundation

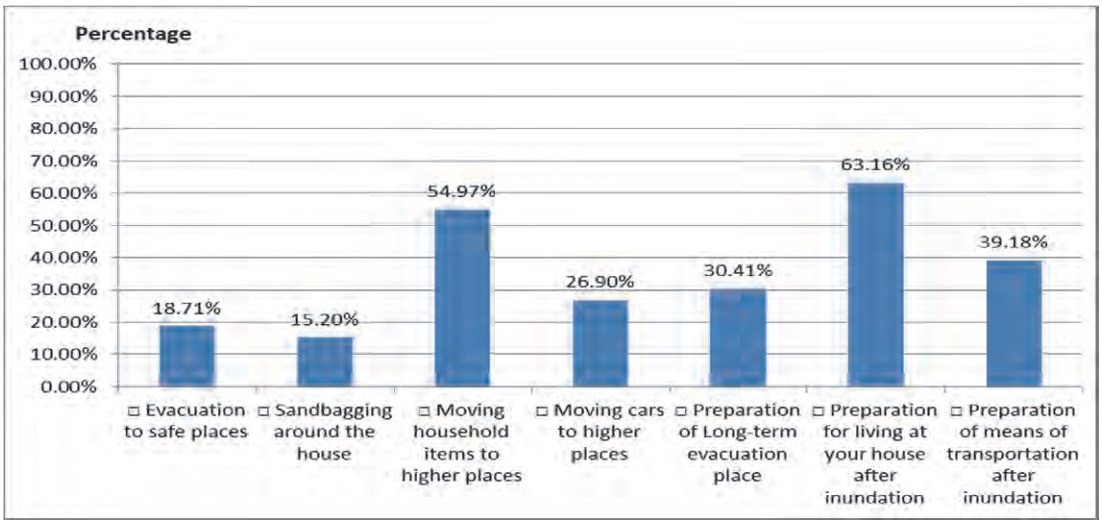


Figure 54 City Residents in Ayutthaya: Actions when Inundation Area Approached

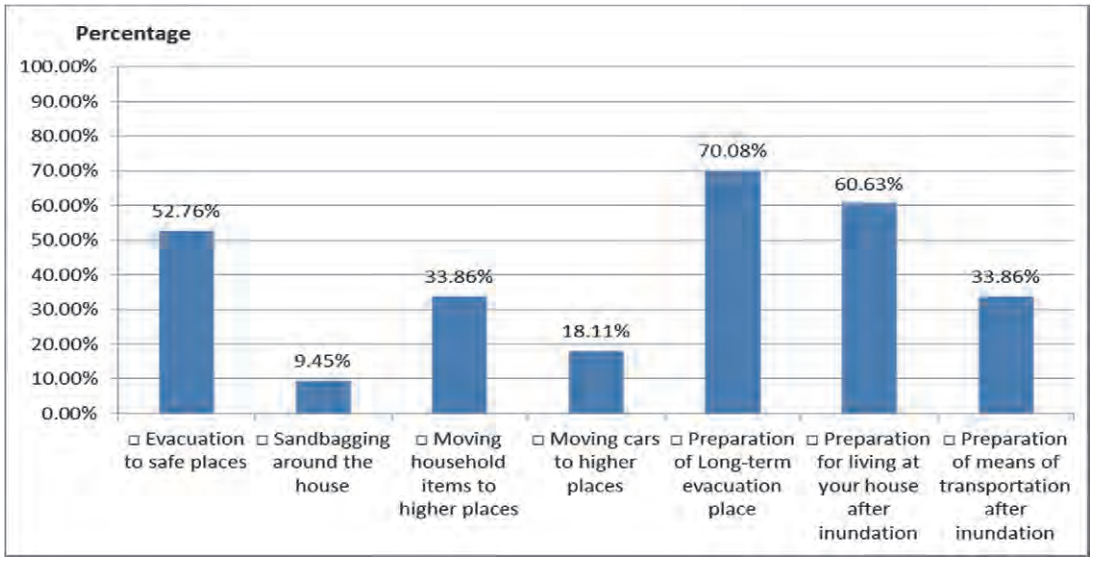


Figure 55 City Residents in Ayutthaya: Actions after Inundation

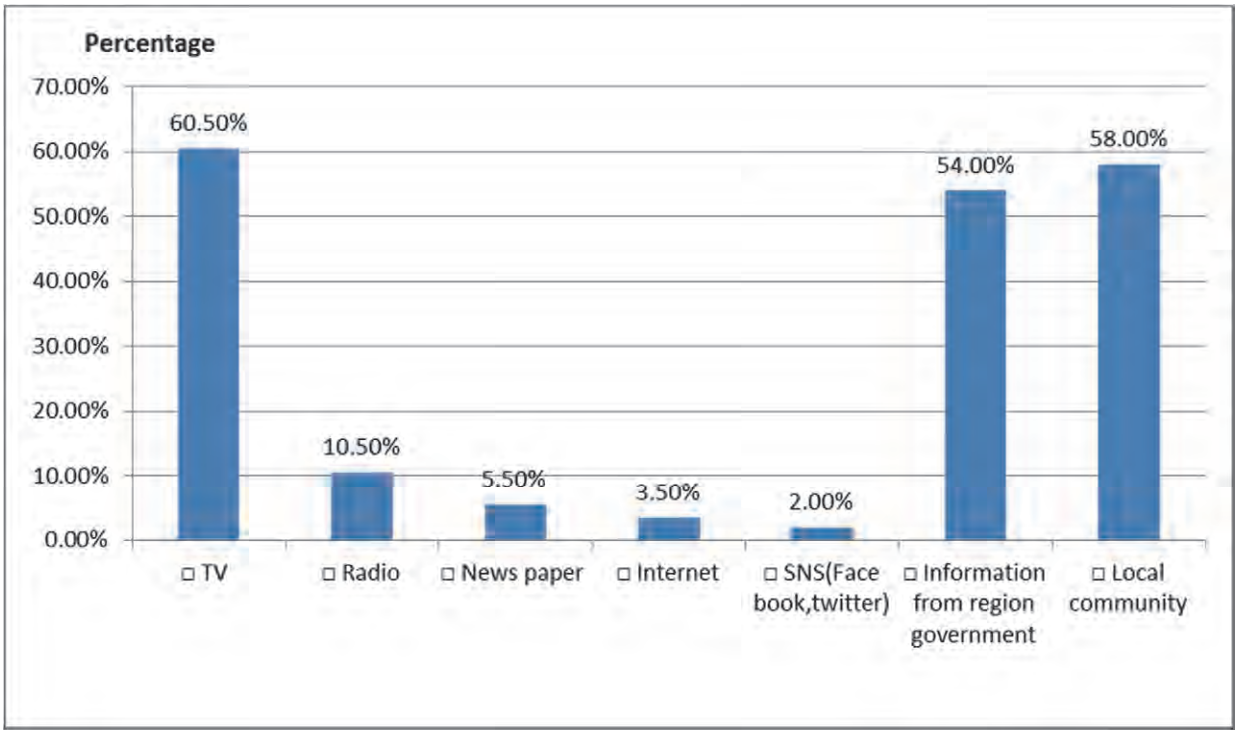


Figure 56 City Residents in Ayutthaya: Most Effective Means of Information Acquisition for Damage Alleviation Actions

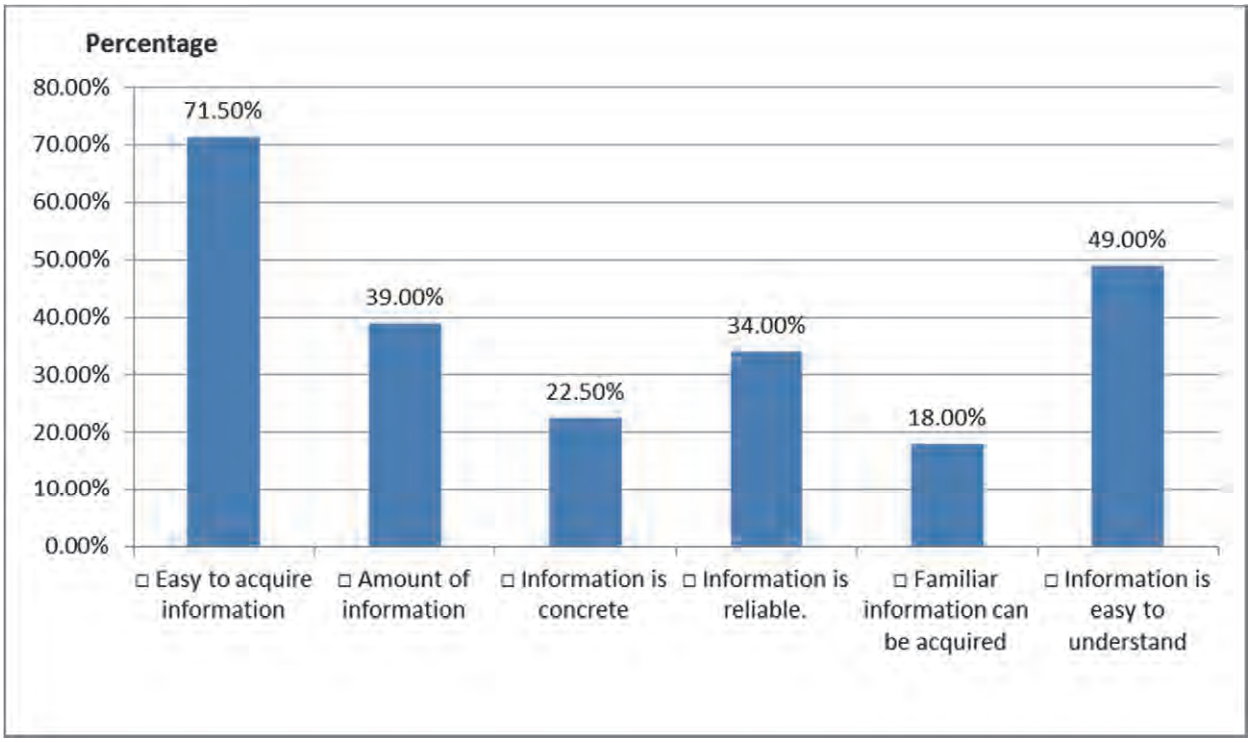


Figure 57 Reasons Support Effectiveness of Means of Information Acquisition (in Figure 56) for Damage Alleviation Actions

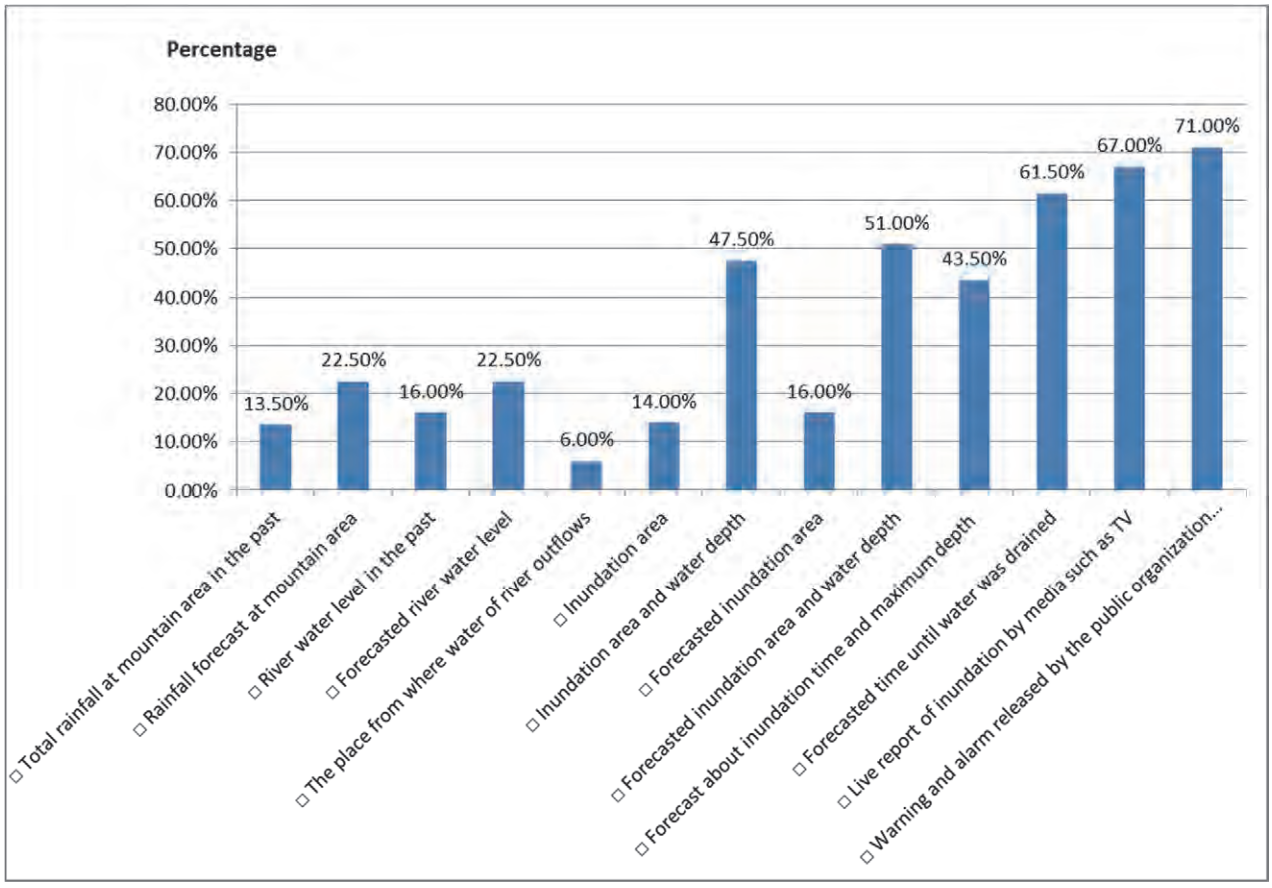


Figure 58 City Residents in Ayutthaya: Additional Required Information

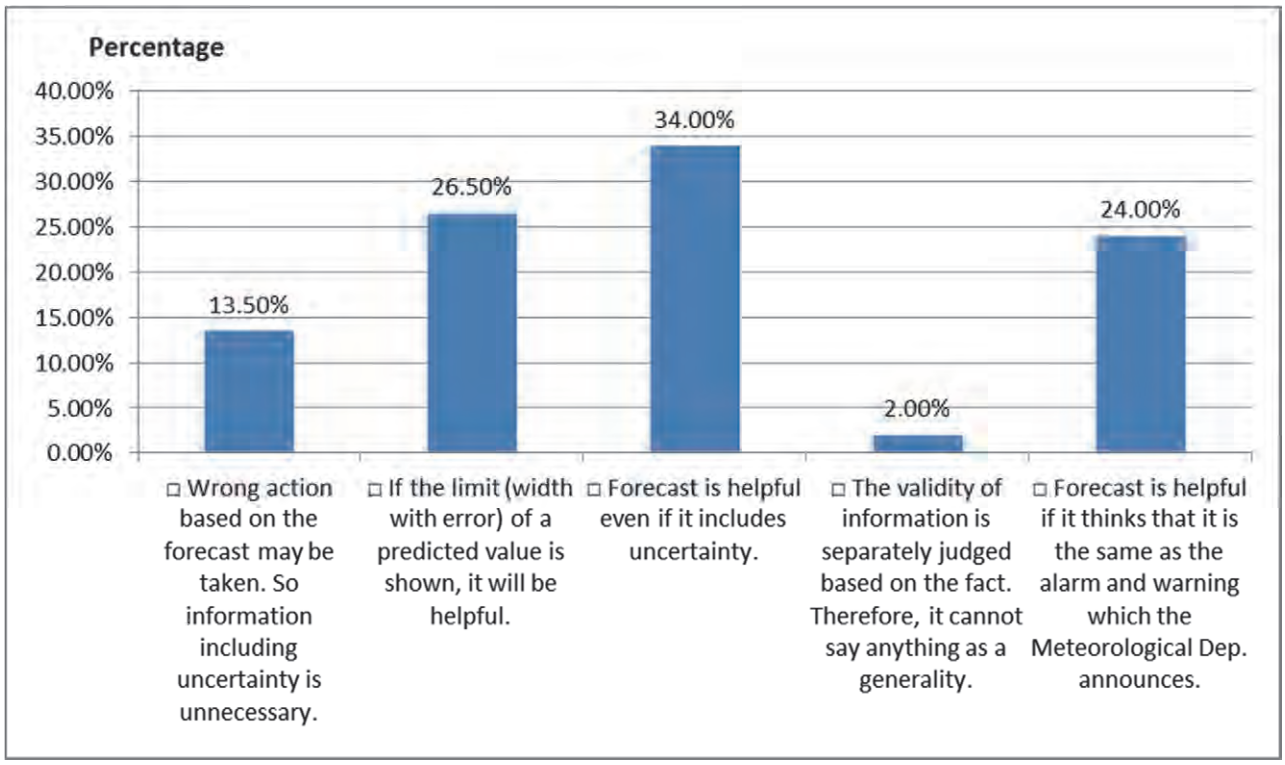


Figure 59 City Residents in Ayutthaya: Opinions of Respondents on Uncertainty Warning and Forecast

Ang Thong

The number of Ang Thong city respondents is 92, which is 18.81% of total residents in this group. Most of the respondents are 30 – 60 years old and about half of all respondents own two or more -story building. 68% of the sampling city residents said that the flood water took more than 12 hours from the beginning to the maximum depth, which was under the floor. However, there was some area, 10% of the respondents, that the water level was above the floor of their houses. 81% of them understood that their houses would be submerged and got more than a week to prepare before the inundation occurred. 95% of the respondents took damage alleviation actions before inundation by sandbagging around the house, moving household items and cars to higher places, as the questionnaire result shown in *Figure 60.* However, 5% of the respondents did not take any action, in which 40% of them said that they had information, but did not know what to do, others mentioned that there was no information and they thought their houses would not be inundated. Nevertheless, when the flood approached their places, 92% of the respondents took damage alleviation action by moving household items to higher places, sandbagging around the house, and also preparation for living at their houses after inundation, as the result shown in *Figure 61*. Again, the people who did not take any action said that they did not know what to do. Besides one of them said that the prediction was not reliable while after the inundation, 35% of the respondents did not do anything since they though that even if inundated, it was a grade which becomes somehow and there was no effective measure. Among 65% of the city residents who took action, 62% of them still tried to aligned sandbags around their places and 48% tried to moved household items to higher places while 43% of them prepared for living at their houses after the inundation, as the result presented in *Figure 62.*

Ang Thong city residents indicated that the useful information before and during the flood approached were warning and alarm released by the public organization, live report of river by media such as TV and forecasted river water level while the information needed after the inundation was forecasted time until the area around your house gets dry. *Figure 63* presents the questionnaire result of means of information acquisition for damage alleviation actions, in which 79% of the respondents chose TV and 71% also preferred local community due to the reasons shown in *Figure 64*. Additionally, the respondents specified that the information that they needed, other than the acquired ones, are the warning and alarm released by the public organization, forecasted river water level and forecasted time until water was drained, as shown in *Figure 65*, in which should be periodically updated and acquirable when necessary.

About the warning and forecast processes, although the forecast of inundation area includes the prediction error of a natural phenomenon, and the prediction error of the simulation, cause the uncertainty, but 35% of respondents think that if the limit (width with error) of a predicted value is shown, it will be helpful, 29% think that the forecast is helpful even if it includes uncertainty and 22% think that the forecast is helpful similar to the alarm and warning from the Meteorological Department. However, 13% of respondents feel that wrong action based on the forecast may be taken. Thus, the information including uncertainty is unnecessary. The questionnaire result related with forecasting is shown in *Figure 66.*

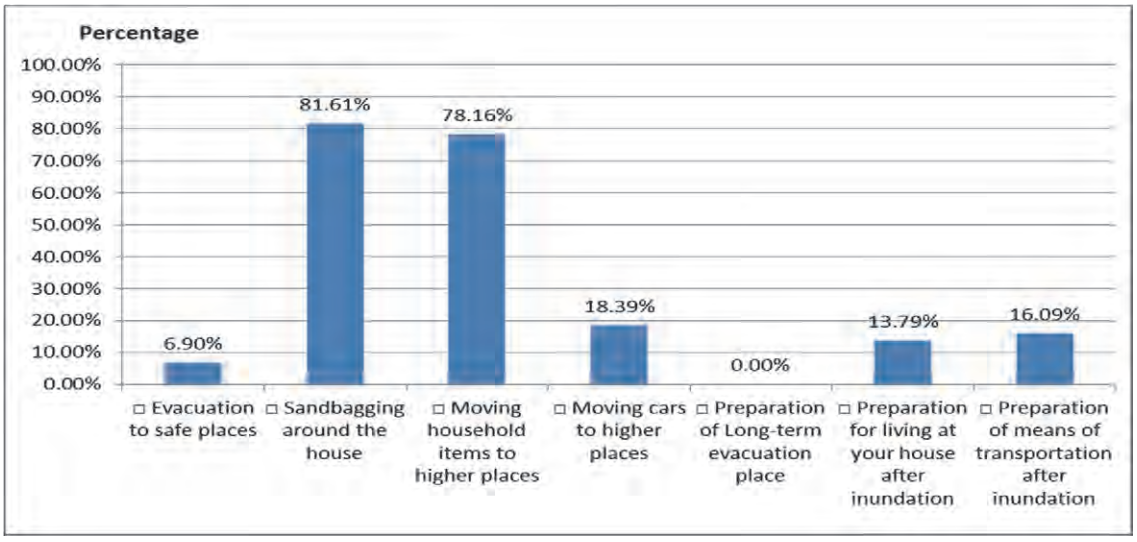


Figure 60 City Residents in Ang Thong: Actions before Inundation

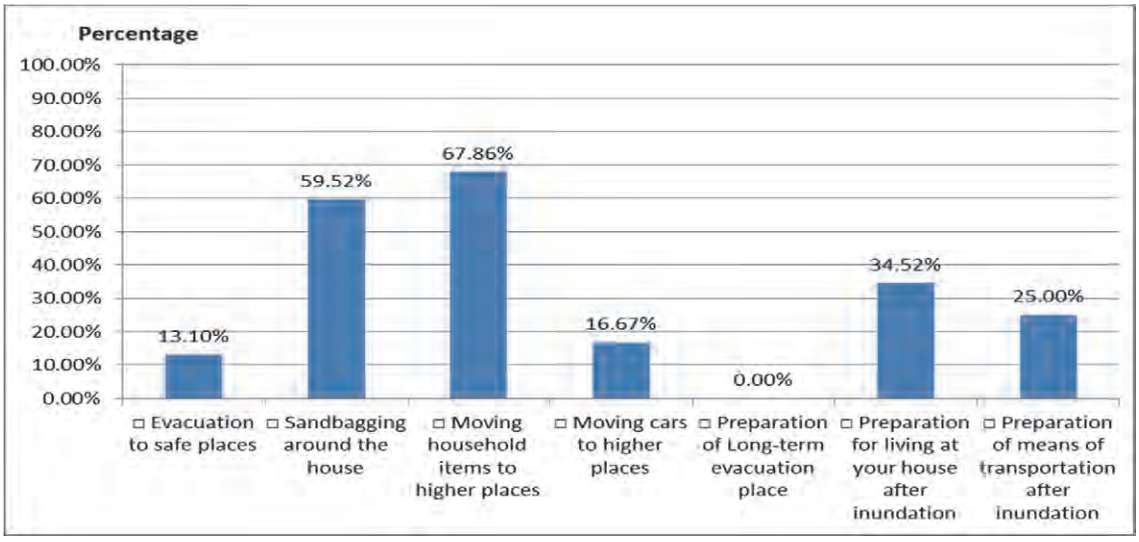


Figure 61 City Residents in Ang Thong: Actions when Inundation Area Approached

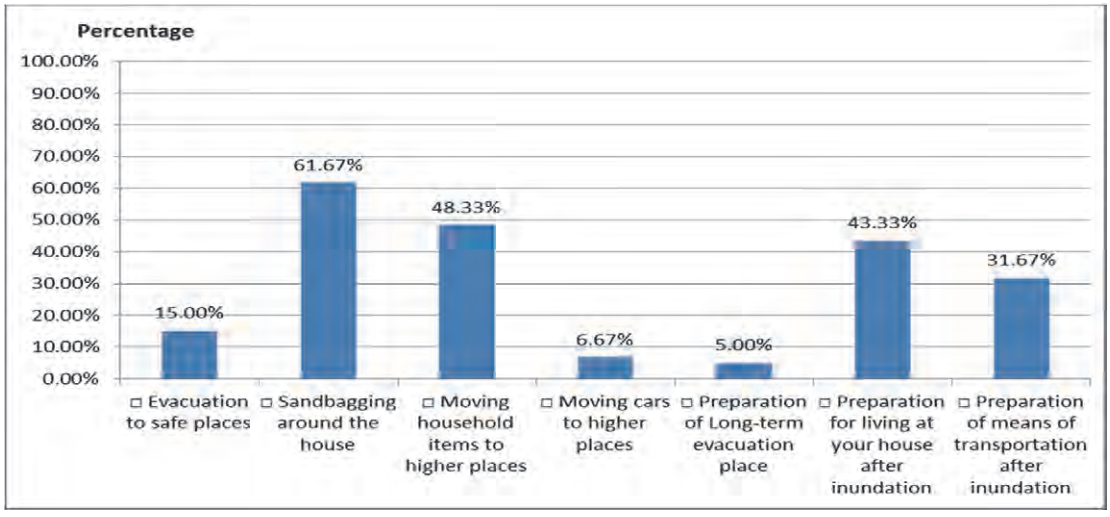


Figure 62 City Residents in Ang Thong: Actions after Inundation

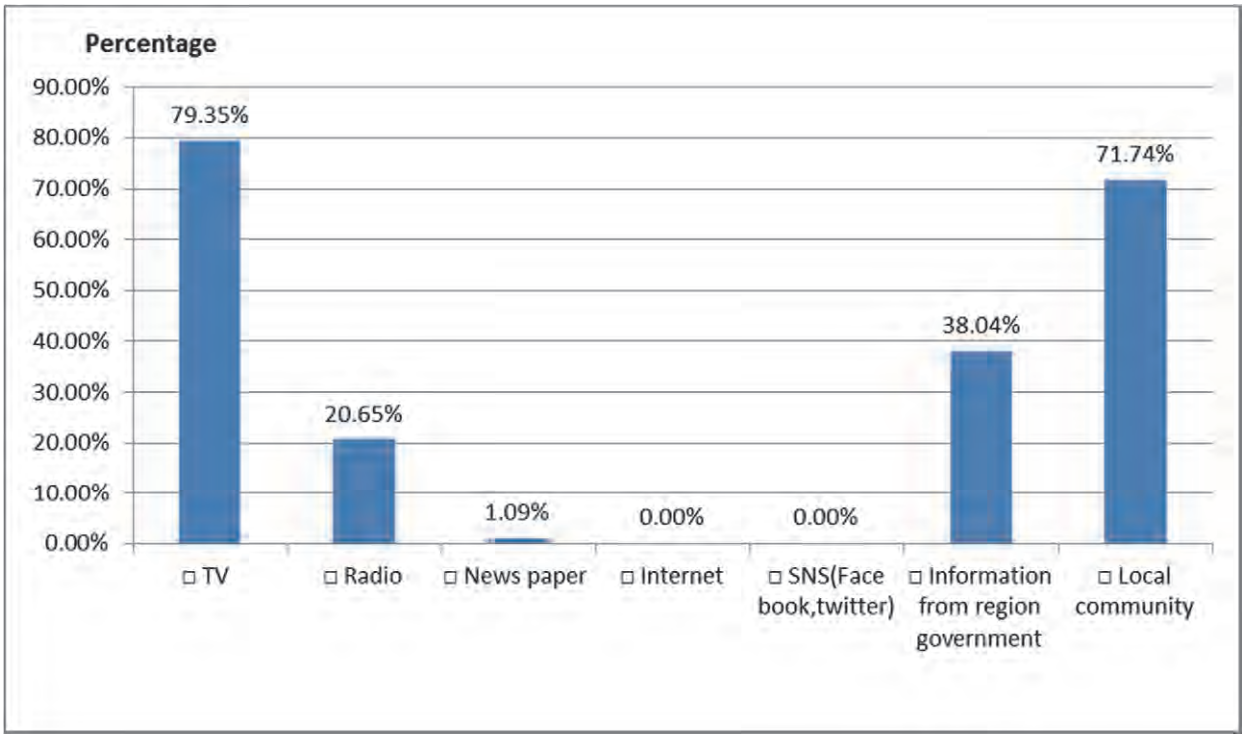


Figure 63 City Residents in Ang Thong: Most Effective Means of Information Acquisition for Damage Alleviation Actions

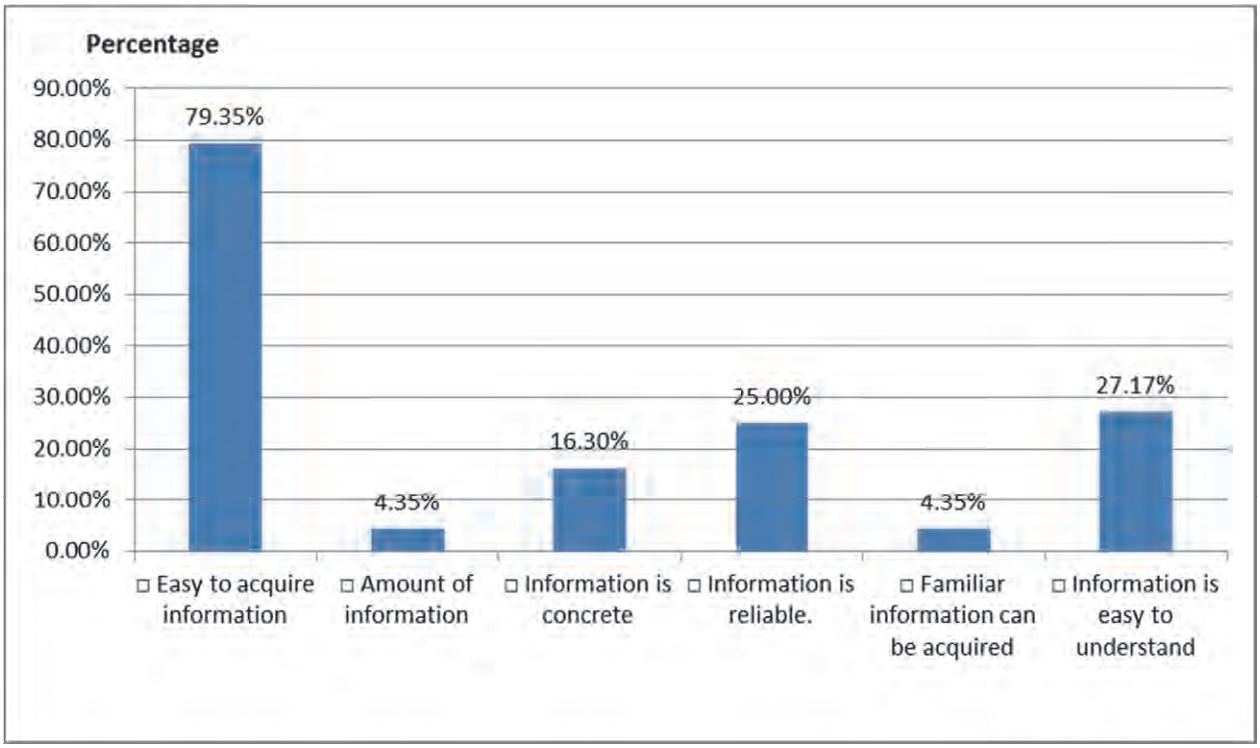


Figure 64 Reasons Support Effectiveness of Means of Information Acquisition (in Figure 63) for Damage Alleviation Actions

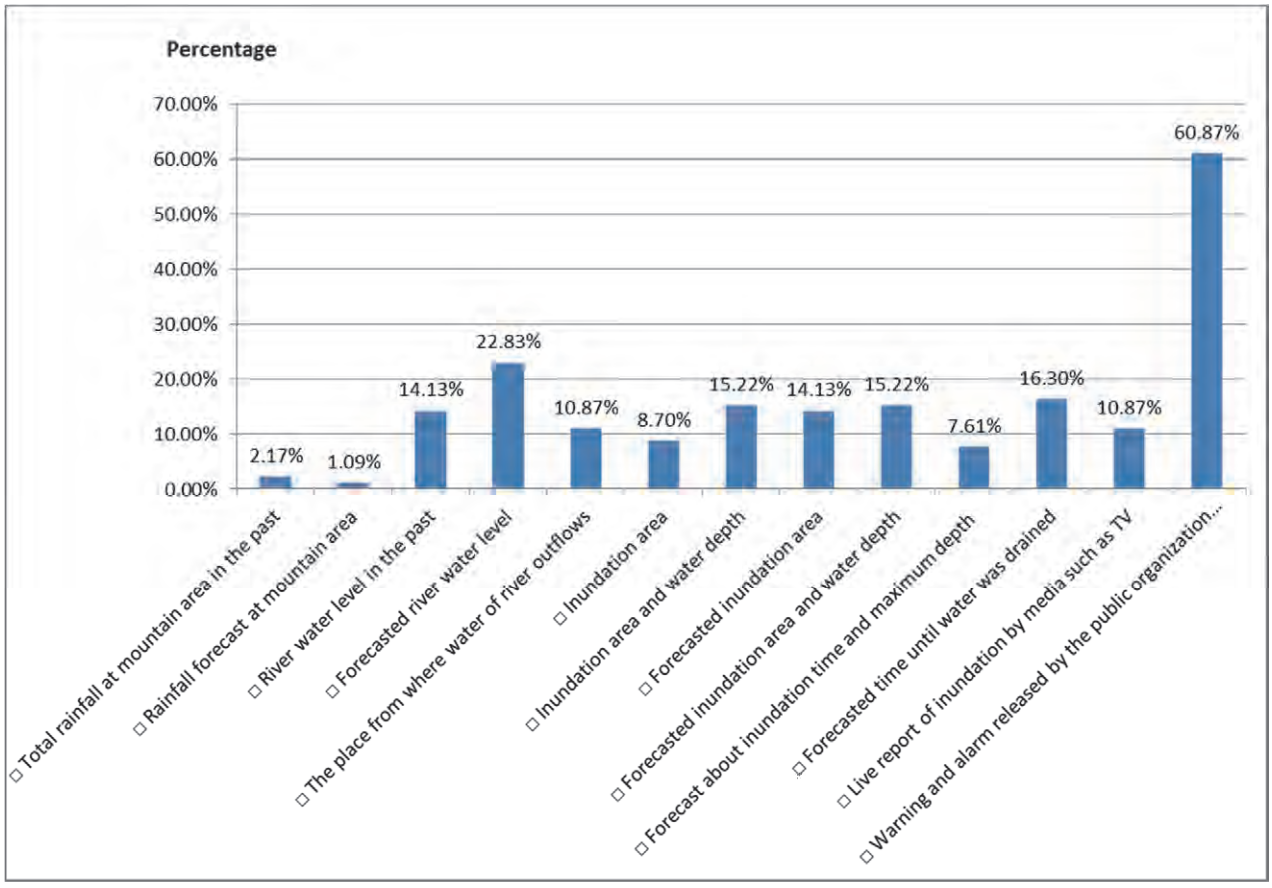


Figure 65 City Residents in Ang Thong: Additional Required Information

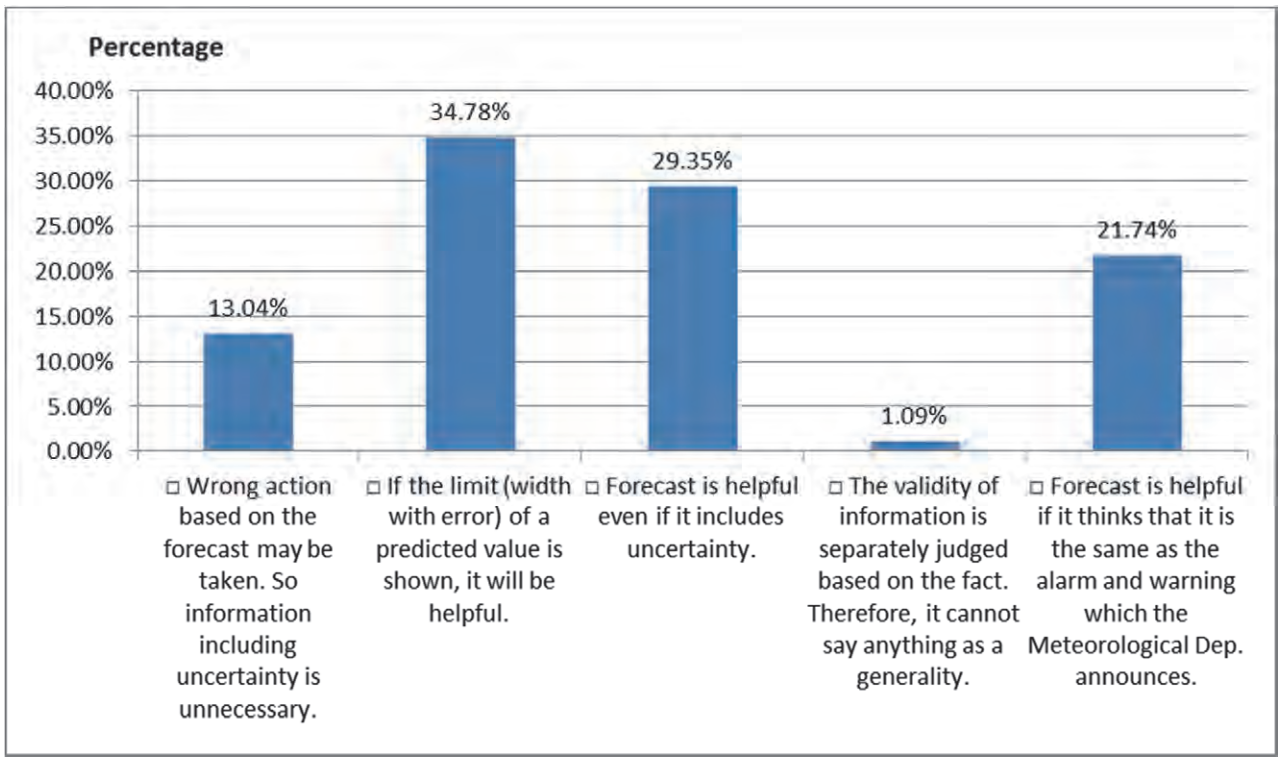


Figure 66 City Residents in Ang Thong: Opinions of Respondents on Uncertainty Warning and Forecast

Sing Buri

The respondents from Sing Buri are 70, in which 14.31% of total city residents who answered the questionnaire. 63% of them own two or more -story building which soaked in the water under the floor. However, the people in Sing Buri city seems to have time to take alleviation actions since 96% of them realized the flood situation about a week before the inundation. Most of them moved household items and cars to higher places, and some of them aligned sandbags around the house, as the questionnaire result shown in *Figure 67.* Moreover, when the flood water approached their houses, all of them took actions; i.e.83% prepared for living at their houses after inundation and 81% prepared means of transportation after inundation as well, as shown in *Figure 68* . After the inundation, 94% of the respondents still had actions by 95% of them prepared food, water, etc., for living at their houses after inundation and 26% prepared means of transportation after inundation meanwhile only 5% of them evacuated to safe places, as the result presented in *Figure 69.*

The questionnaire results indicated that before and during the flood, 91% of the respondents acquired the information from TV, 83% from regional government and 56% from radio. In which the useful information were warning and alarm released by the public organization such as the Meteorological Department and/or local government, live report of inundation by media such as TV with the information about inundation area and water depth. However, after the inundation, most of them needed the forecasted time until the area around their houses gets dry. They think that TV, local community and regional government are the most effective means of information distribution since the information is easy to be acquired and concrete, as the result shown in *Figures* 70 and *71.* Moreover, they respondents mentioned that they needed the information, other than the acquired ones, which are warning and alarm, inundation area and water depth and live report of inundation by media, as shown in *Figure 72.* The data should be intelligible with figure or table and periodically updated also.

About the warning and forecast processes, although the forecast of inundation area includes the prediction error of a natural phenomenon, and the prediction error of the simulation, cause the uncertainty, but 39% of respondents think that the forecast is helpful even if it includes uncertainty, 31% think that it is helpful similar to the alarm and warning from the Meteorological Department, and 20% think that if the limit (width with error) of a predicted value is shown, it will be helpful. However, 9% of respondents feel that wrong action based on the forecast may be taken. Thus, the information including uncertainty is unnecessary. The questionnaire result related with forecasting is shown in *Figure 73.*

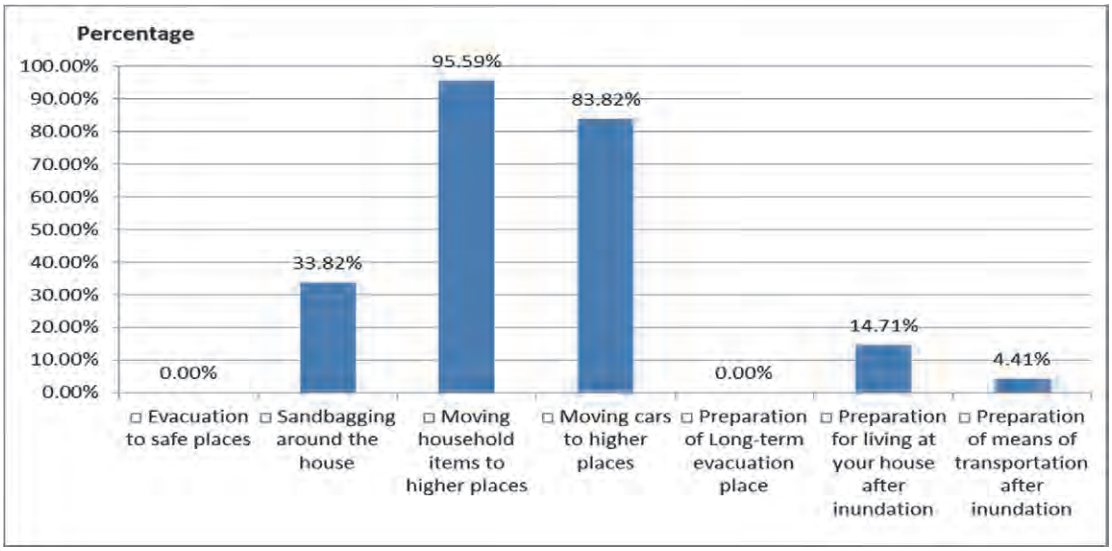


Figure 67 City Residents in Sing Buri: Actions before Inundation

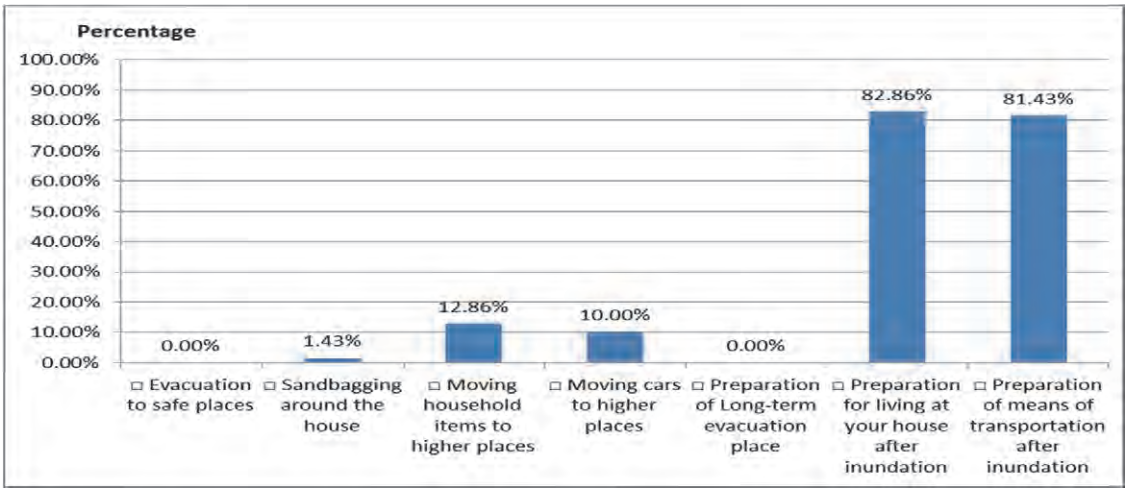


Figure 68 City Residents in Sing Buri: Actions when Inundation Area Approached

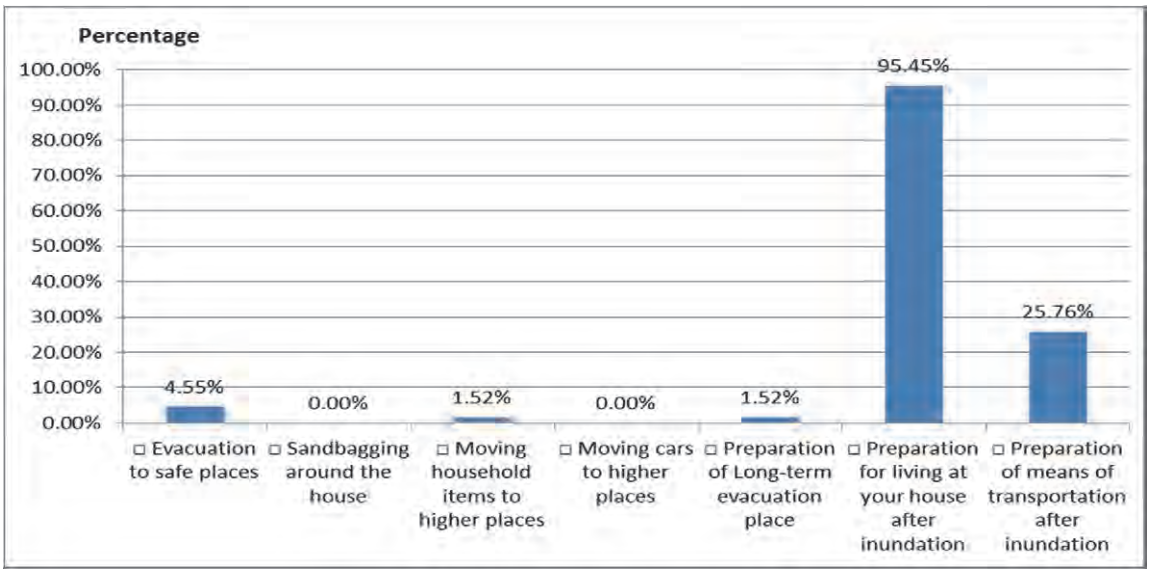


Figure 69 City Residents in Sing Buri: Actions after Inundation

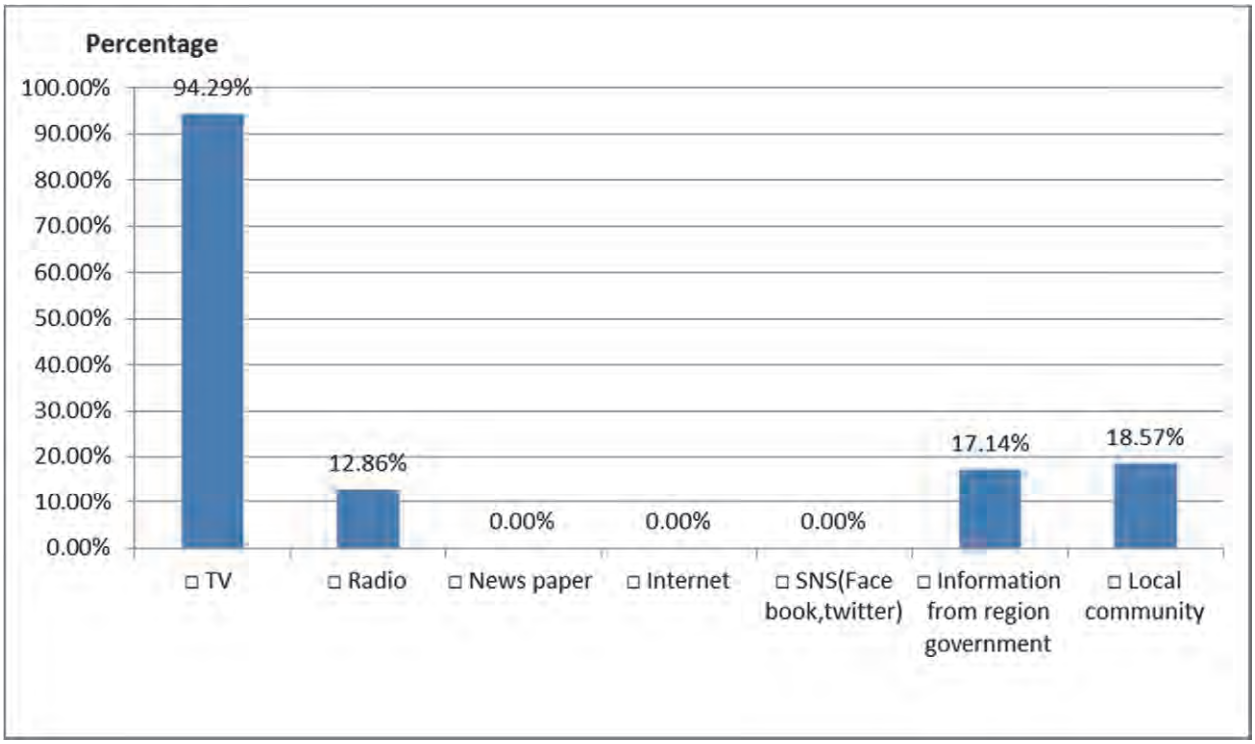


Figure 70 City Residents in Sing Buri: Most Effective Means of Information Acquisition for Damage Alleviation Actions

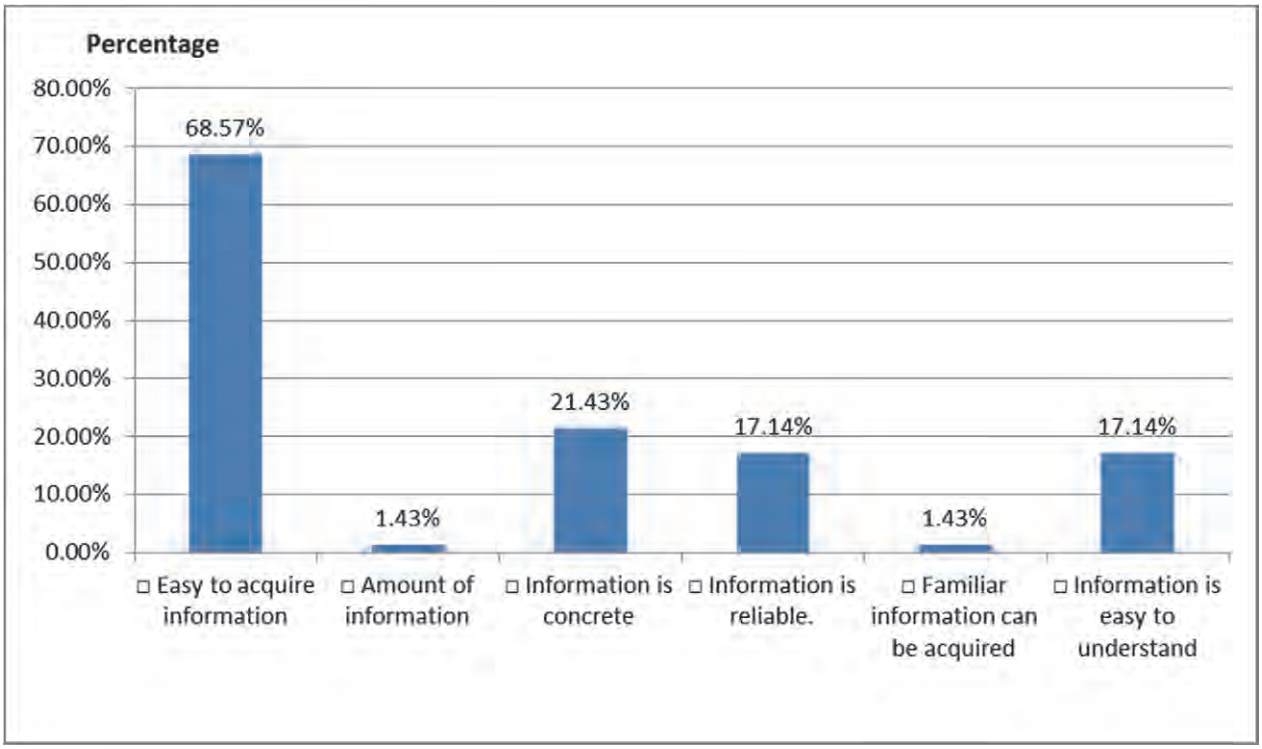


Figure 71 Reasons Support Effectiveness of Means of Information Acquisition (in Figure 70) for Damage Alleviation Actions

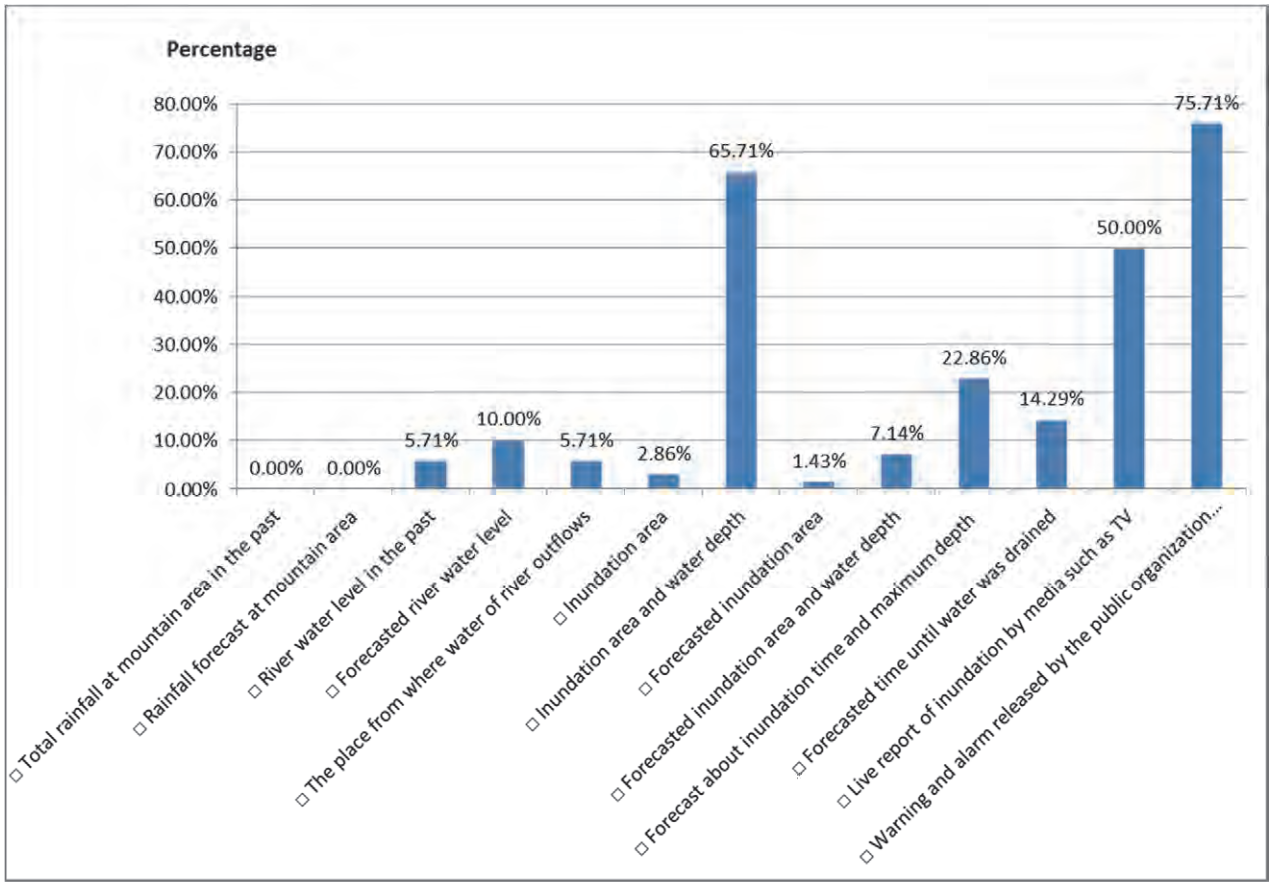


Figure 72 City Residents in Sing Buri: Additional Required Information

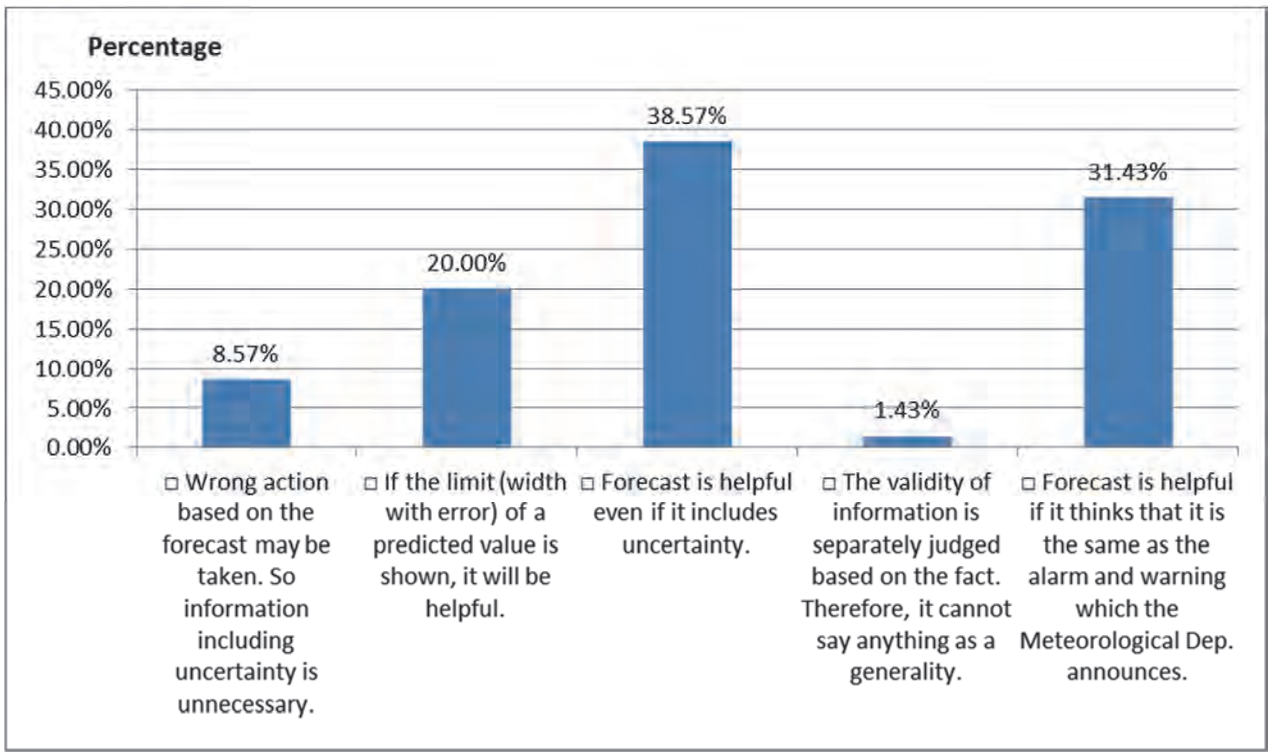


Figure 73 City Residents in Sing Buri: Opinions of Respondents on Uncertainty Warning and Forecast

Chai Nat

The number of respondents in Chai Nat is 60, which is 12.27% of total respondents in city resident group. 60% of them own two or more -story building, while 90% of the respondents indicated that their houses were soaked in water under the floor and the others were soaked in water above the floor. Since the water took more than 12 hours from the beginning to reach the maximum depth, besides 92% of the survey residents understood the situation one week before inundation, thus, they had time to take damage alleviation action. All of the respondents moved household items to higher places, with 48% moved cars to higher places and 41% prepared food and other necessary stuffs for living at their houses after inundation, as the questionnaire result shown in *Figure 74*. After that, when the flood water approached their areas, 95% of the respondents again took some actions; i.e. 96% prepared for living at their house, 49% prepared means of transportation after inundation and 28% kept moving household items to higher places, as the result shown in *Figure 75*. Then, after the inundation, the people seemed keep concerning about their living, thus 93% took damage alleviation action, in which 93% of them prepared for living at their houses and 29% prepared means of transportation, as the result shown in *Figure 76.* However, there were few peoples who did not take any action since they felt that there was no effective measure and/or even if inundated, it was a grade which becomes somehow.

The questionnaire results showed that most of city residents in Chai Nat were alerted and well-prepared for the inundation. Most of them, 88%, got information from TV, 62% from regional government and 60% from local community, in which the useful data before the flood occurred were warning and alarm released by the public organization such as the Meteorological department or local government and live report of river by media such as TV, while the useful information during the period of flood were warning and alarm and inundation area and water depth. After inundation, the respondents preferred the information about the forecasted time until the area around their houses gets dry. Moreover, it was found that in respondents' opinion, they think that the most effective means of information distribution are TV and local community, as shown in *Figure 77* with the supported reasons in *Figure 7*8. However, Chai Nat city residents specified that other than the acquired information, they also needed warning and alarm and inundation area and water depth data, as the result shown in *Figure 79.* The information should be easy to used; i.e. intelligible with figure or table and periodically updated.

About the warning and forecast processes, although the forecast of inundation area includes the prediction error of a natural phenomenon, and the prediction error of the simulation, cause the uncertainty, but 37% of the respondents in Chai Nat think that the forecast is helpful as the alarm and warning from Meteorological Department, while 30% think that the forecast is helpful even if it includes uncertainty and 27% think that if the limit (width with error) of a predicted value is shown, it will be helpful. Only 2% of the respondents think that the uncertainty forecast is unnecessary. The result of this part is shown in *Figure 80.*

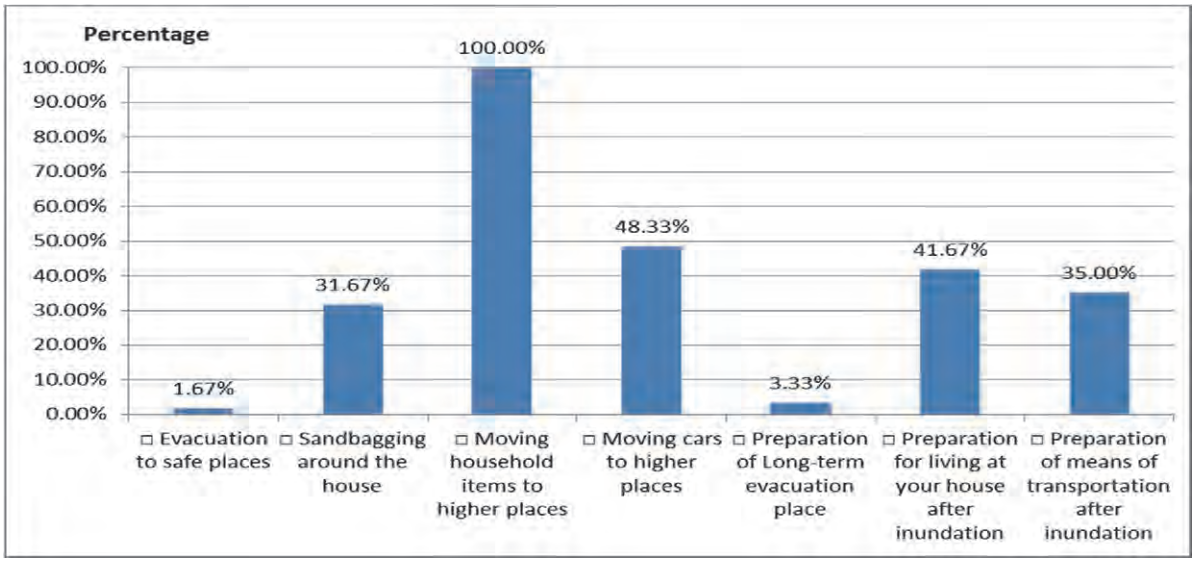


Figure 74 City Residents in Chai Nat: Actions before Inundation

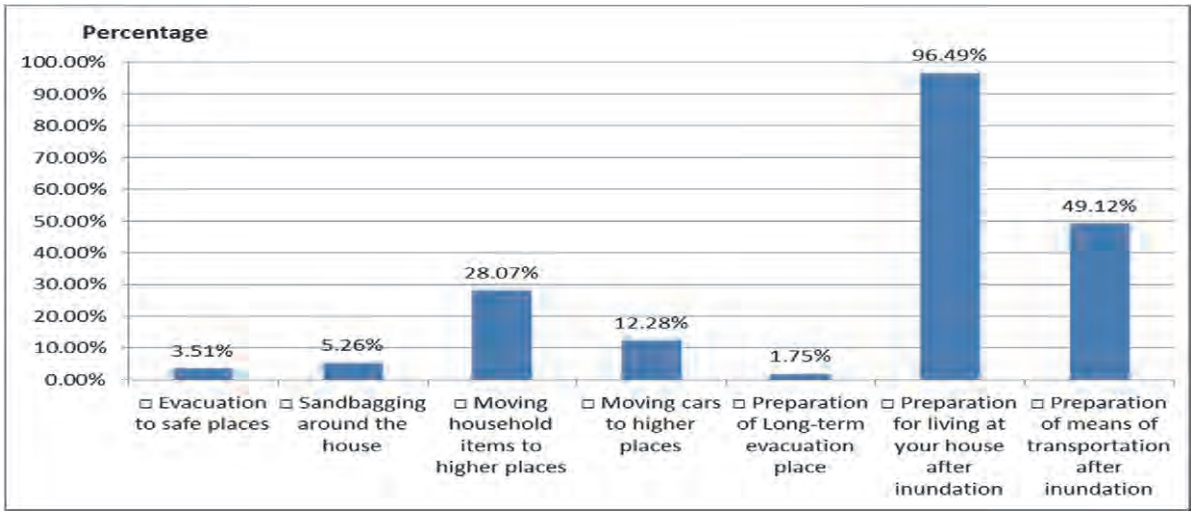


Figure 75 City Residents in Chai Nat: Actions when Inundation Area Approached

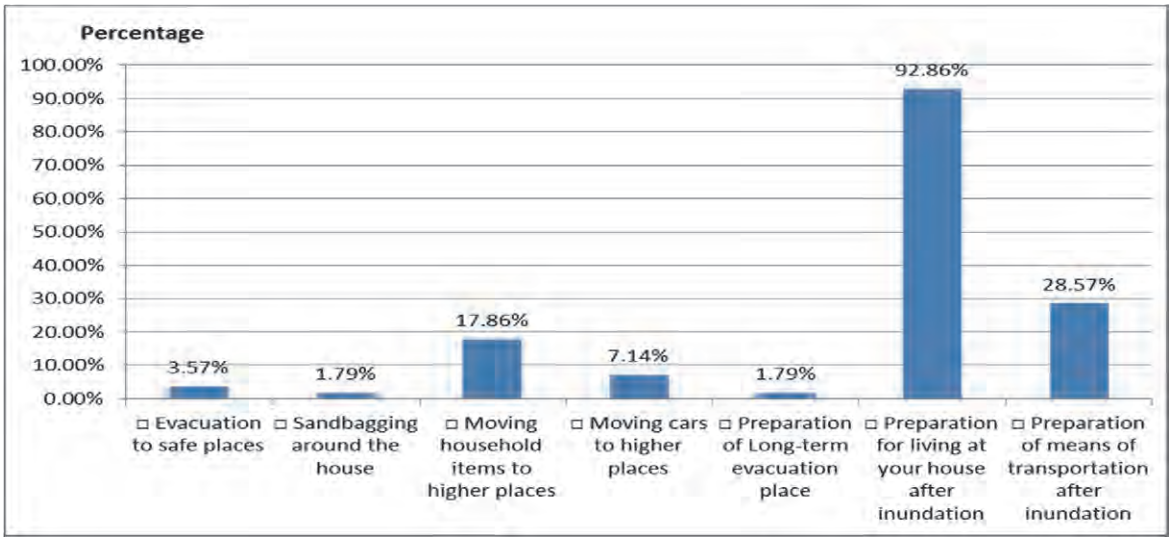


Figure 76 City Residents in Chai Nat: Actions after Inundation

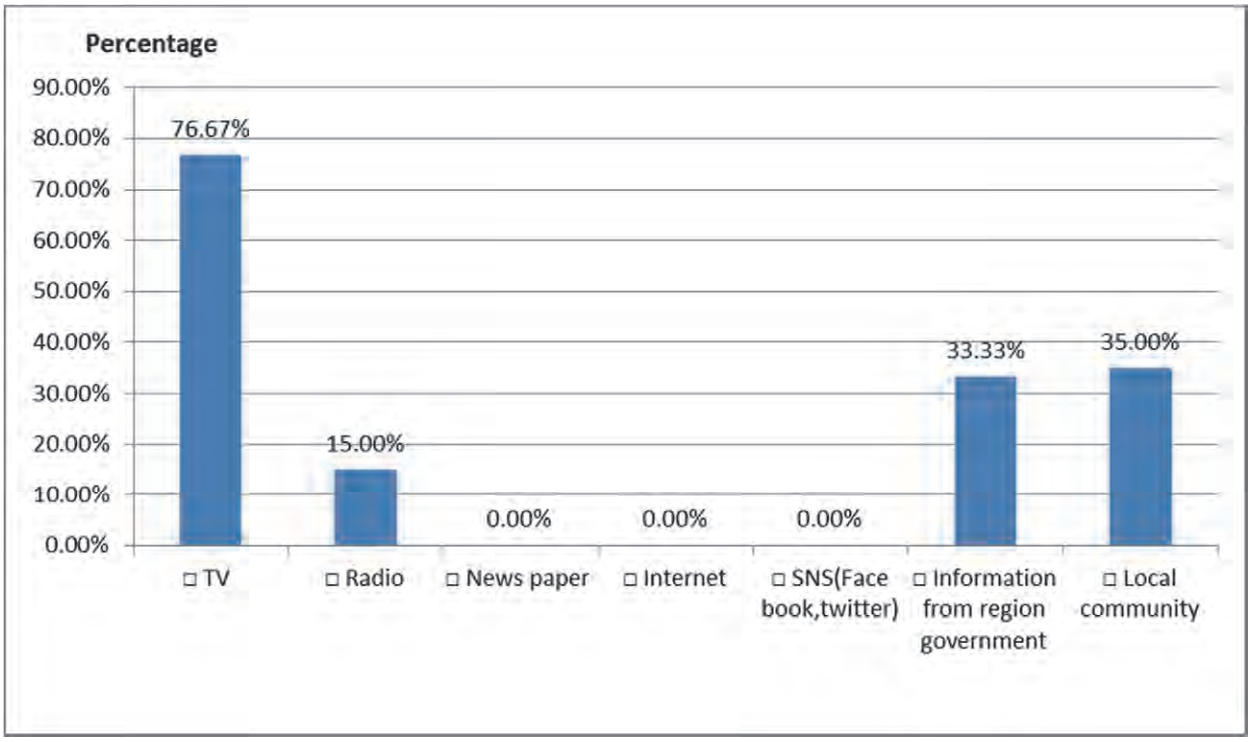


Figure 77 City Residents in Chai Nat: Most Effective Means of Information Acquisition for Damage Alleviation Actions

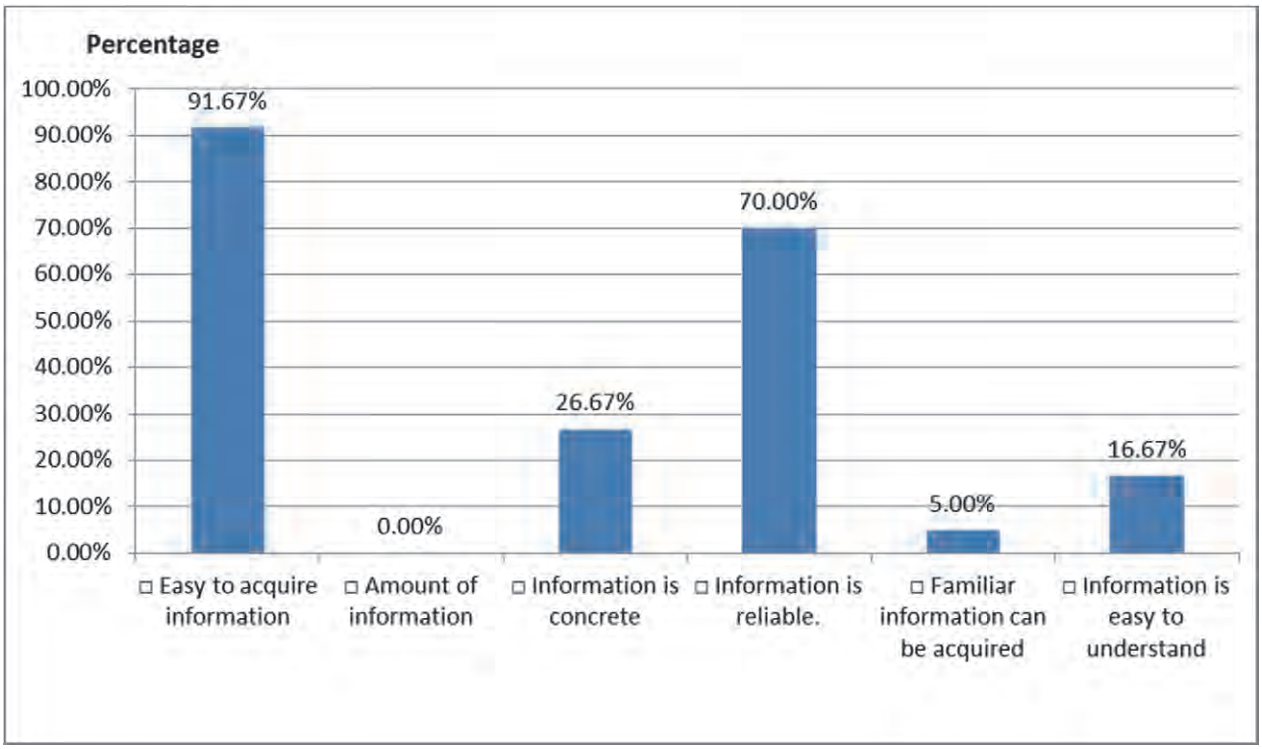


Figure 78 Reasons Support Effectiveness of Means of Information Acquisition (in Figure 77) for Damage Alleviation Actions

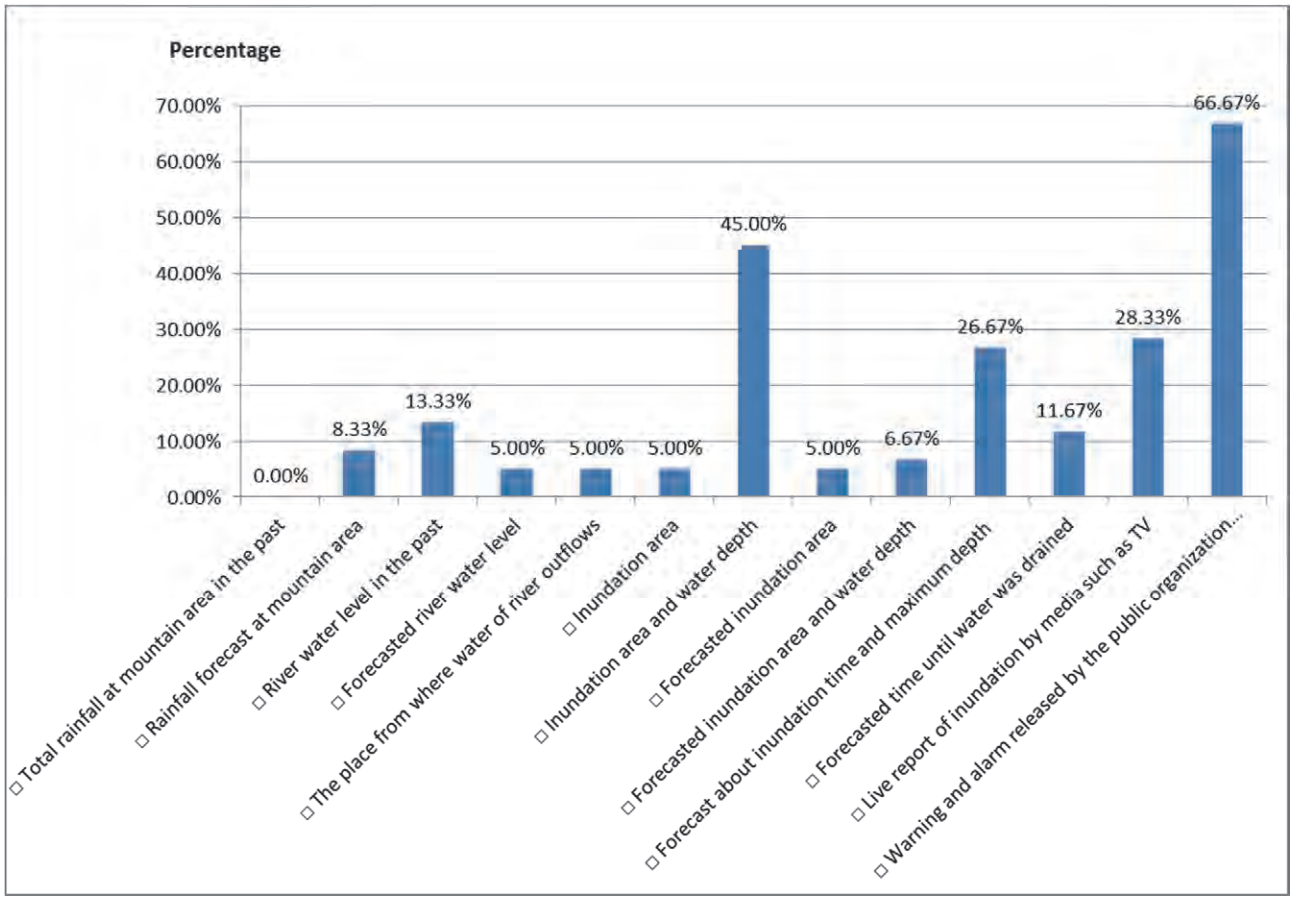


Figure 79 City Residents in Chai Nat Additional Required Information

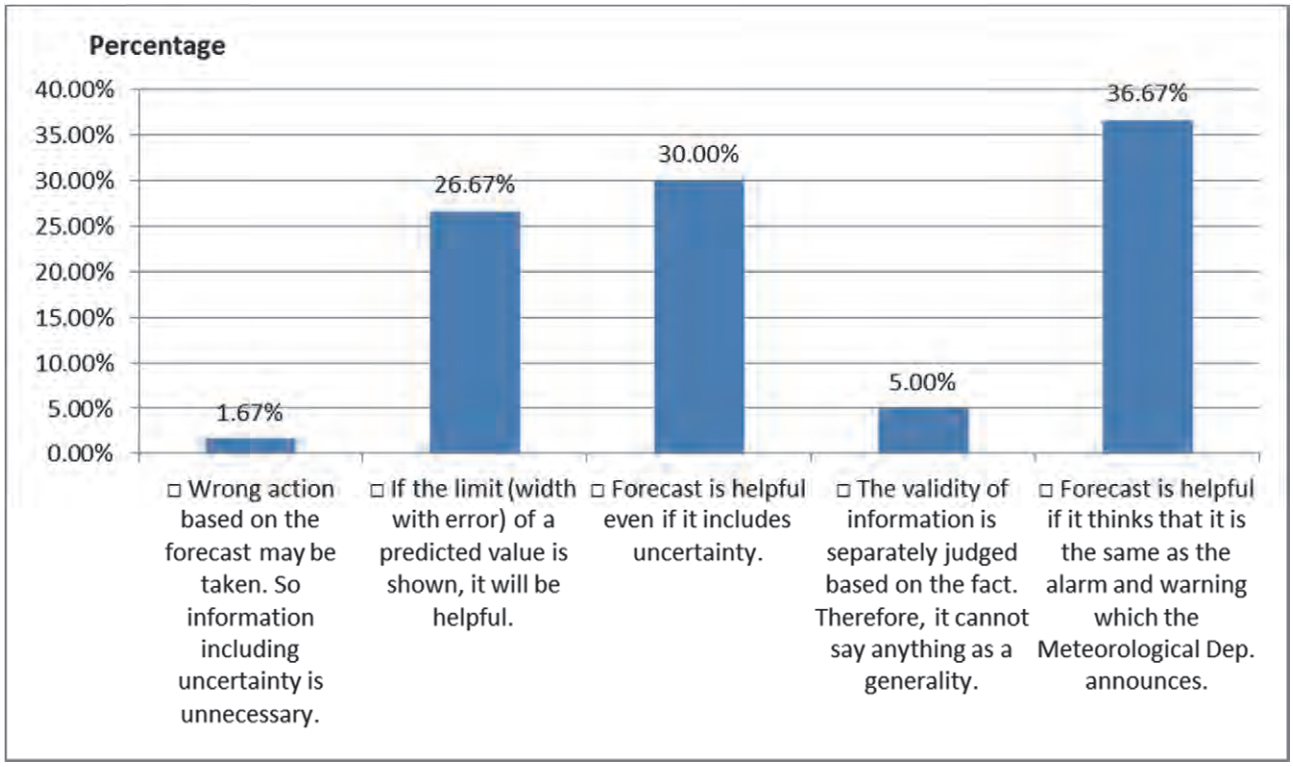


Figure 80 City Residents in Chai Nat: Opinions of Respondents on Uncertainty Warning and Forecast

Lopburi

The number of respondents in Lopburi is 67, which is 13.70% of total respondents in city resident group. Most of the respondents, 70% of them, own single story house, but seemed not so severely suffered with the flood comparing with other 4 provinces in this study since more than 80% of the respondents said that the maximum depth of flood was under the floor and around the houses. 67% of them understood the situation about one week before the water reached their places, while 12% knew the days of inundation and 6% knew when their houses were inundated. The questionnaire result indicates the deficiency of information distribution. However, 24% of the respondents seemed not alert with the inundation since they did not take any damage alleviation actions when they were informed, due to reason that they thought their houses would not be inundated and did not know what to do. By the way, 76% respondents took actions, in order to mitigate the inundation effect, by 88% moved household items to higher places, 33% put sandbags around their houses and 31% evacuated to the safe places, as the result shown in *Figure 81*. Moreover, when the flood approached the area, only a half of respondents took actions; i.e. 74% of them moved household items to higher places and 55% evacuated to safe places, as shown in *Figure 82*. The other respondents who did not take any action, although they realized about the flood, gave the reasons that they did not know what to do while some of them thought there places would not be inundated. They also mentioned that they did not have inundation information and their places had not been inundated before. After the inundation, only 30% of respondents took damage alleviation actions by evacuation to safe places, moving household items to higher places and preparing for living at their houses after inundation, as the result shown in *Figure 83.*

Most of Lopburi city residents, 85%, got inundation information from TV, 72% from local community and 46% from regional government. They indicated that the useful information before and during the flood period was warning and alarm released by the public organization such as Meteorological department or local government, live report of inundation by media such as TV and the forecasted inundation area and water depth. After the inundation, they thought that the data related with forecasted time until the area around your house gets dry was useful, the same as other city residents in other provinces. Besides, they specified that the most effective means of information distribution were TV, local community and regional government, in the percentage of 72, 37 and 27 respectively, as shown in *Figure 84*, with the supported reasons shown in *Figure 85.* Furthermore, the respondents mentioned that other than the acquired information, they also needed the live report of inundation by media, warning and alarm released by the public organization and forecasted time until water was drained, as well, as shown in *Figure 86.*

About the warning and forecast processes, due to the prediction error of a natural phenomenon, and the prediction error of the simulation, in which cause the uncertainty, thus 40% of the respondents in Lopburi think that if the limit (width with error) of a predicted value is shown, it will be helpful meanwhile 24% think that the forecast is helpful anyway, similar to the alarm and warning from the Meteorological Department. The questionnaire result related with forecasting is shown in *Figure 87.*

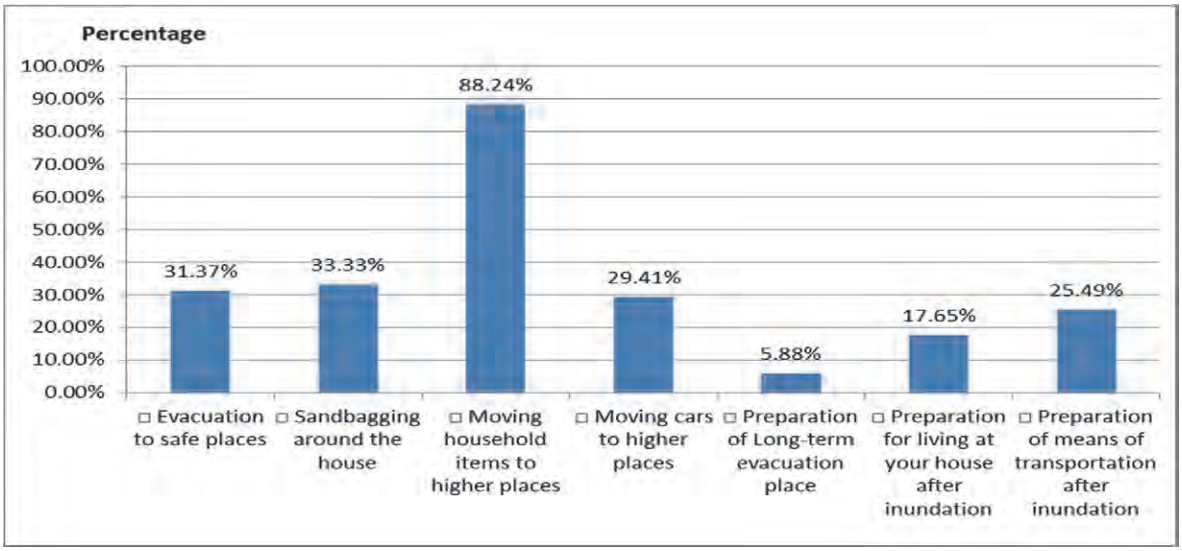


Figure 81 City Residents in Lopburi: Actions before Inundation

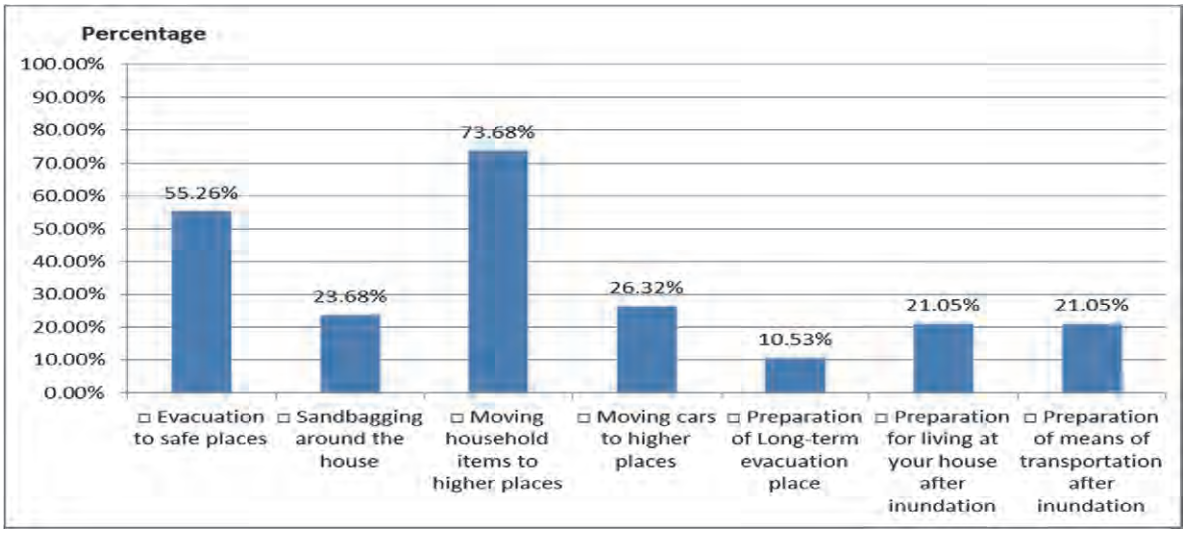


Figure 82 City Residents in Lopburi: Actions when Inundation Area Approached

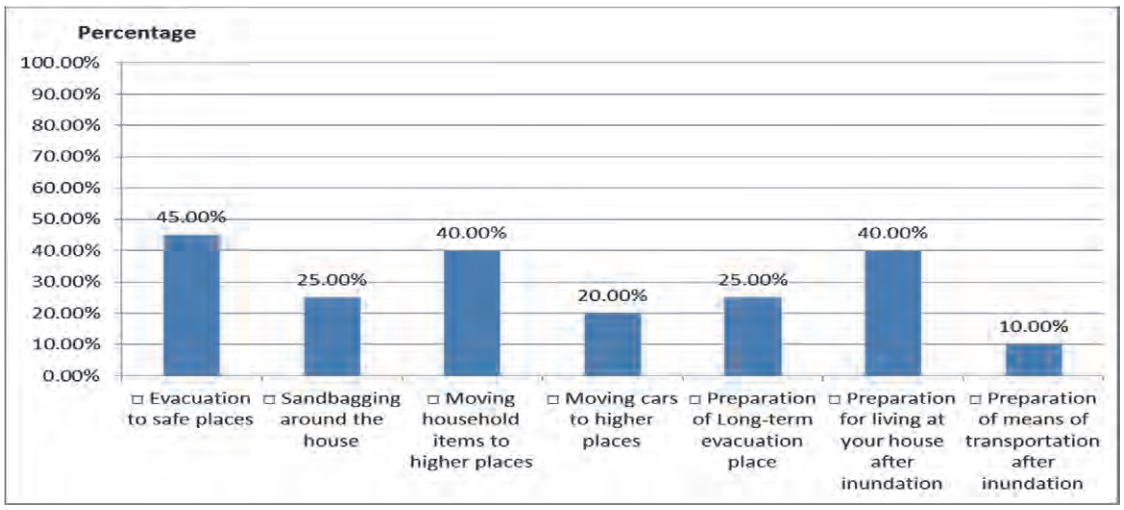


Figure 83 City Residents in Lopburi: Actions after Inundation

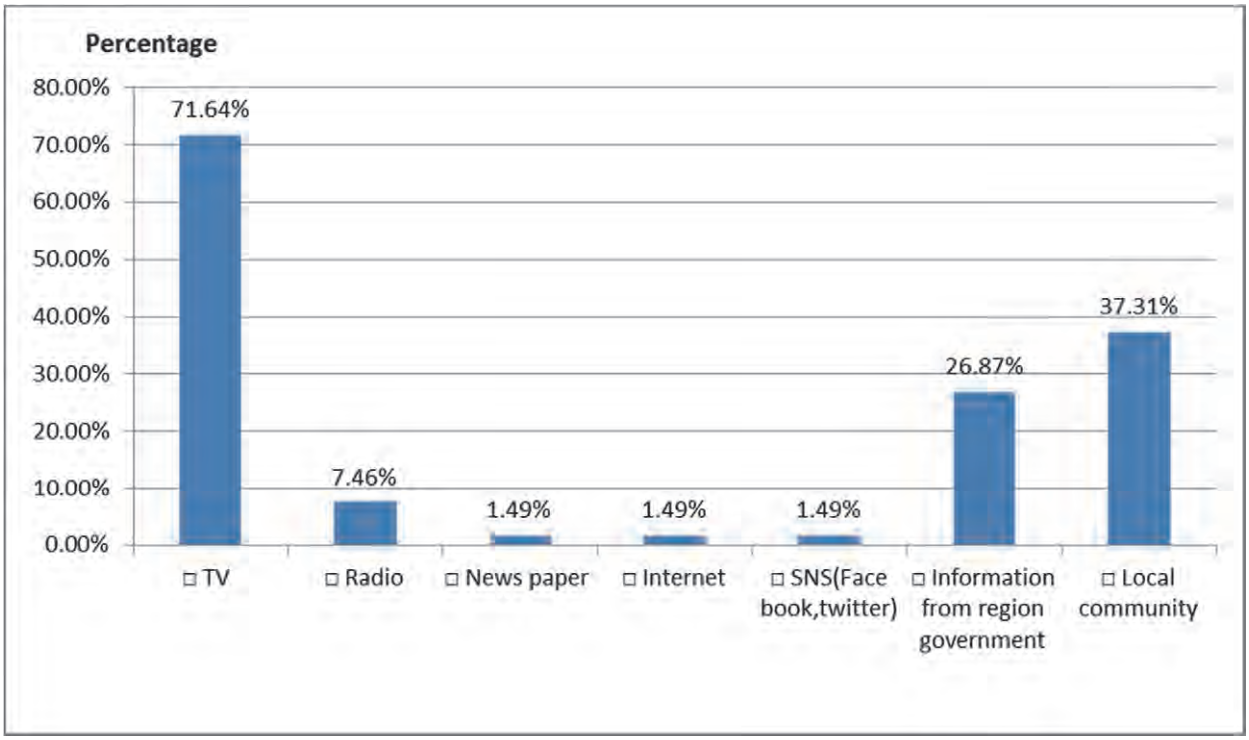


Figure 84 City Residents in Lopburi: Most Effective Means of Information Acquisition for Damage Alleviation Actions

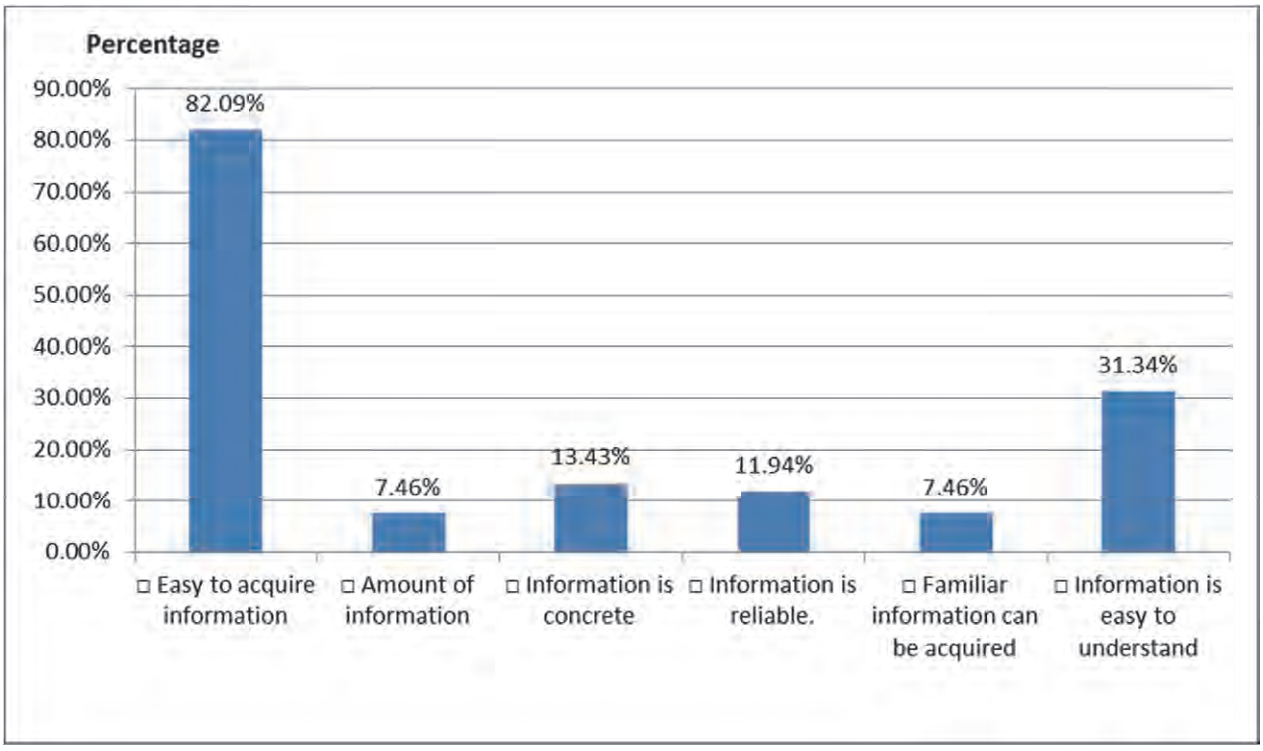


Figure 85 Reasons Support Effectiveness of Means of Information Acquisition (in Figure 84) for Damage Alleviation Actions

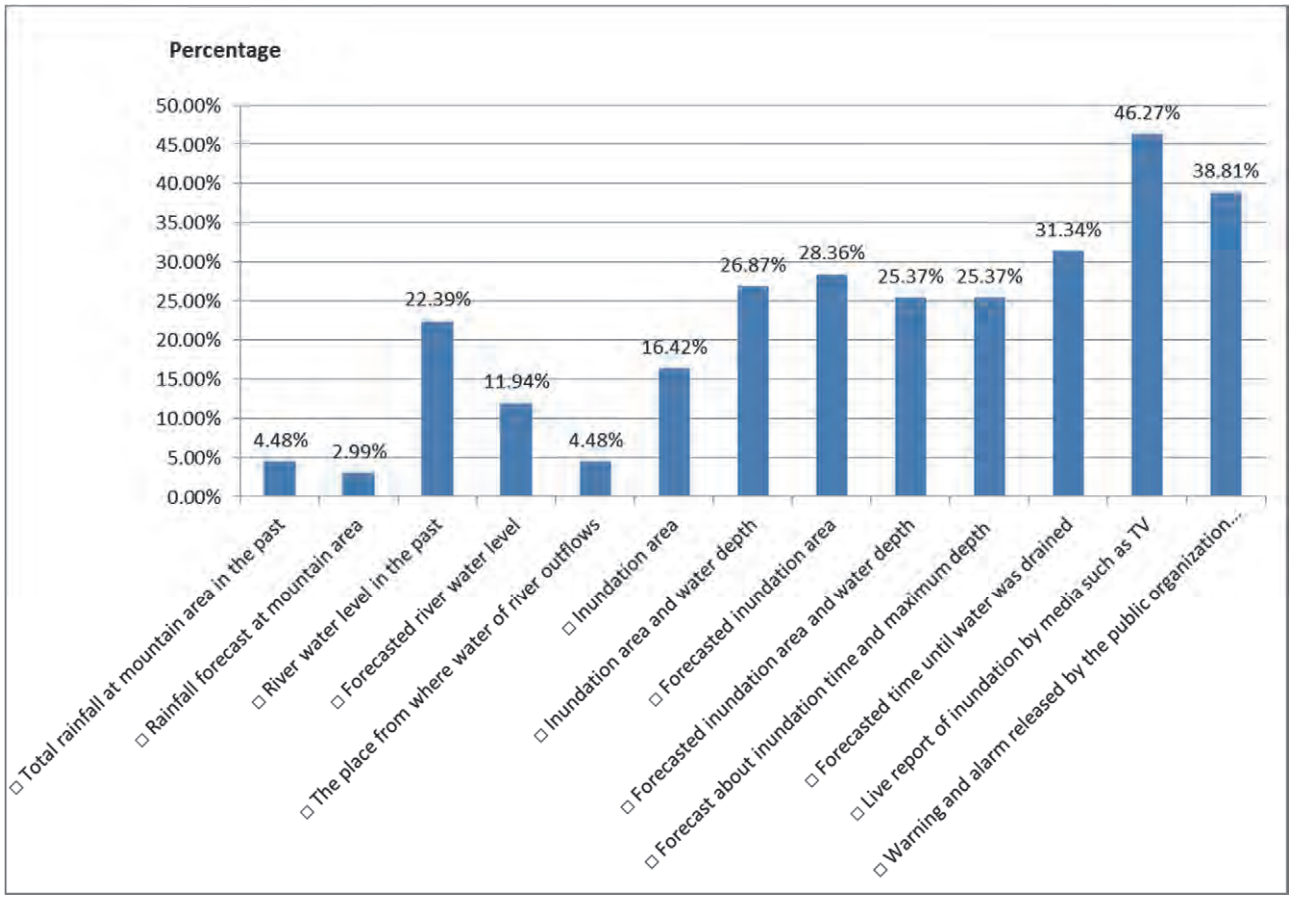


Figure 86 City Residents in Lopburi Additional Required Information

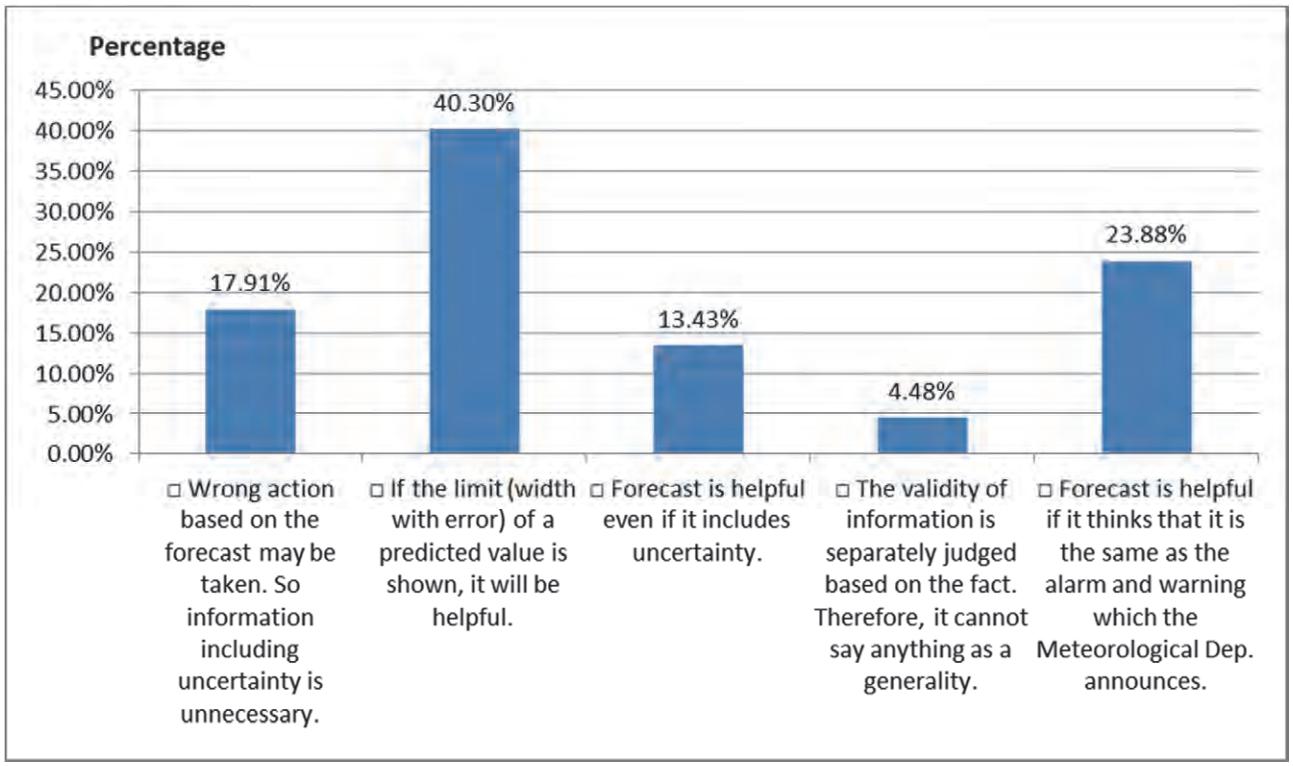


Figure 87 City Residents in Lopburi: Opinions of Respondents on Uncertainty Warning and Forecast

Further from the questions in the questionnaire, many city residents and farmers presented their concerns about the assistance and compensation from the government. They said that they have been confused about the complicated processes and the responsible authorities. Some of them were requested to show the photographs of damages and most of them has low confident in compensation measures of the government and the amount they would get.

5.3 Factory Interview

The flood occurred in 2011 has been described as the worst flood in terms of the amount of water and people affected. The damage was estimated by Federation of Thai Industry (Central region section) at least 185 billion Baht, in which included 25 billion Baht damage on the agriculture, 65 billion Baht damage of the housing in the communities and suburb villages, and 95 billion Baht damage on Thai industry. It was also reported that 930 factories in 28 provinces were affected, including seven industrial estates in Ayutthaya and Pathum Thani provinces.

The brief sequences of the inundation in and around 7 industrial estates, which are Saharattananakorn, Rojjana, Hi-tech, Bang Pa-In, Navanakorn, Factory Land and Bangkadi Industrial Estates, are as follows:-

October 4, 2011, the dyke protecting water around Saharattananakorn Industrial Estate was collapsed due to the sudden current of flood. The water strongly flowed through all area and caused the submergence of 46 major factories, with hundreds of sub-contract factories.

On October 8, 2011, the strong current of flood broke down 10-m high water blockage in Rojjana Industrial Estate. It caused the inaccessible of some major manufacturing plants such as Honda. Accordingly, on October 11, the whole area of Rojjana Industrial Estate, which consisted of 198 factories with 90,000 – 100,000 staffs and investment of about 58,000.00 million Baht, was fully submerged.

October 12, 2011, there was the message from the authority of Bang Pa-In Industrial Estate that the water current seriously flowed through the estate and there was the evacuation warning already. There was the evaluation of tremendous damage since this industrial estate consisted of various hi-tech factories such as Western Digital, which is the world's second largest producer of hard disk drives accounting for approximately 25% of the world's production. During the same time, the staffs and people living in Navanakorn Industrial Park in Pathum Thani were ordered to evacuate immediately. All operations were shut down, after the efforts to prevent the flood water flow into the important factory center failed. The managing director of Navanakorn Plc announced that the water was flowing through an opening between five and eight meter wide in a north dyke.

October 13, 2011, the water approached Hi-tech Industrial Estate. Although the authorities tried to intercept the water, but seemed worthless, but finally, the flood flowed through the South of the industrial estate. The estate announced for the evacuation at about 10 am.

October 14, 2011, the Factory Land Industrial Estate, which is the location of 99 factories, was inundation approached. The maximum depth was more than 1.5 m. It caused temporary closure of all factories.

October 20, 2011, the backside dyke of Bangkadi Industrial Estate in Pathum Thani was failed; accordingly, the flood water continually flowed through all area. The water level increased rapidly and reached 2-m in the next day. Many staffs and authorities were remained in the industrial estate until there was the rescue team arrived.

The damage of more than 800 factories in 7 industrial estates in Ayutthaya and Pathum Thani Provinces were estimated by Ministry of Industry, as shown in *Table 7*.

Table 7 Damage Summary of 7 Industrial Estates hit by 2011 Flood

	Flood-hit industrial estates	**Number of plant**	**Investment (Mil. baht)**	**Number of workers**
Ayutthaya				
	Saharattananakorn	46	9,472	14,696
	Rojjana	213	56,000	90,000
	Hi-tech	143	65,312	51,186
	Bang Pa-In	90	60,000	60,000
	Factory Land	84	8,000	8,500
	Total of Ayutthaya	**576**	**198,784**	**224,382**
Pathum Thani				
	Navanakorn	227	180,000	128,311
	Bangkadi	36	25,000	30,000
	Total of Pathum Thani	**263**	**205,000**	**158,311**
	Total	**839**	**403,784**	**382,693**

Source: Ministry of Industry, August 3, 2012.

The economics of other countries besides Thailand has been significantly affected by the flood as well. Japan is the hardest one since many major Japanese plants such as Toyota, Honda, Hitachi and Canon, were submerged and temporarily shut down for more than a month.

In this study, various Japanese and Thai factories in 7 Industrial Estates have been selected as the questionnaire respondents, as the name list previously shown in *Table 2*. The questionnaire results are shown in *E* and could be summarized as follows:-

Saharattananakorn Industrial Estate

This study chose 3 plants from totally 46 plants in Saharattananakorn to answer the questionnaire, in which are Siam Kensetsu Company Limited, Aqua Nishihara Company Limited and Yamamoto Foundry.

- Siam Kensetsu Company Limited

  Siam Kensetsu occupies one of two-story building, in which the first floor is the production factory with the second floor is the office. The respondent said that the water level was 3-m referred to the road elevation, in which almost up to the second floor of Siam Kensetsu building.

  The flood water reached the industrial estate on October 4, 2011 meanwhile the factory just realized that the plant would be inundated just 1 day before the inundation. Therefore, what they can do to mitigate the damage was just prepared the sandbags around the building. There was no warning and alarm from the industrial management team, seemed that they had no information related with flood as well, until the flood water approached the area during the night time. It took one night for the water to flow through and fully inundated the industrial estate.

  However, during the inundation period, the staffs came by to make a survey, but did not take any action because the water level was so high. Finally, December 5, 2011, the situation was back to the normal condition. The factory staffs with the insurance company staff came to evaluate the damage. They started to clean up the plant on December 10, 2011 and restarted the production line on May, 2011.

  The representative from Siam Kensetsu mentioned that they did not know that the plant would be inundated, thus they did not follow any media. After the water reached the industrial estate, they found related information from TV and social network and discussed with other entrepreneurs. However, most of them are Japanese and did not understand Thai very well, so they watched NHK News, which sometimes gave different information compare with Thai media. Actually, they needed the information of rainfall and runoff data both the real-time and the data in the past, and the forecasted water level with time of inundation. Besides, the information should be easy to use, with figures and tables.

  About the warning and forecast processes, although the forecast of inundation area includes the prediction error of a natural phenomenon, and the prediction error of the simulation, cause the uncertainty, but they think it is helpful the similar way with warning and alarm from Meteorological Department, and if the limit (width with error) of a predicted value is shown, it will be helpful.

- Aqua Nishihara Company Limited

Aqua Nishihara Company Limited occupies one of two-story building, in which the first floor is the production plant with the second floor is the office. The respondent said that the water level was 3-m referred to the road elevation, in which almost up to the second floor of building. It caused damage to production equipment, material, and the difficulty of staffs' attendance, including the stoppage of deliveries of parts.

The flood water reached the industrial estate on October 4, 2011 meanwhile the factory just realized that the plant would be inundated just 1 day before the inundation. Therefore, what they can do to mitigate the damage was just prepared the sandbags around the building. It took just one night for the water to flow through and fully inundated the industrial estate. During the inundation period, the factory could not take any action since the water depth was too high. They just set up the patrol and measure the water depth.

Since the water depth decreased, the beginning of December, 2011, the staffs came to the factory and try to move some machine to the other place, in order to start the production line again. The insurance company came by to evaluate the damage. Then the staffs started cleaning. The factory has operated again in March, 2012.

Before the inundation, the factory got information from TV and social network. They did not think that the area would be inundated, at the first place, because it had not been flooded before. Although, they got the information about the water level upstream and the water depth in the river, but the information seemed rather difficult to understand. They said that they did not know what to do, what to prepare, even when they should evacuate. They need the information that is easy to understand and make them know what they should do clearly.

Additionally, Saharattananakorn Industrial Estate is operated by the private sector, not the industrial authority, thus the management depends on groups of people, not the government. It caused the delay in any decision making. So far, they have no confident in the mitigation measures, thus they have plan to move to Kabinburi Industrial Estate, which is safe from inundation.

About the warning and forecast processes, due to the error and uncertainty of the forecast, they representatives think that if the limit (width with error) of a predicted value is shown, it will be helpful.

- Yamamoto Foundry (Thailand) Company Limited

Yamamoto Foundry (Thailand) Company Limited occupies one of two-story building, in which the first floor is the production plant with the second floor is the office. The respondent said that the water level was 1.8 m from plant floor, thus it caused damage production equipment, material, and the difficulty of staffs' attendance, including the stoppage of deliveries of parts.

The flood water reached the industrial estate on October 4, 2011 meanwhile the factory just realized that the plant would be inundated just 1 day before the inundation via TV live report and warning. Therefore, what they can do to mitigate the damage was just prepared the sandbags around the building. It took just one night for the water to flow through and fully inundated the industrial estate. During the inundation period, the factory could not take any action since the water depth was too high. They just set up the patrol and measure the water depth.

Since the water depth decreased, the beginning of December, 2011, the staffs came to the factory and try to move some machine to the other place, in order to start the production line again. The insurance company came by to evaluate the damage. Then the staffs started cleaning. The factory has operated again in April, 2012.

Before the flood water reached the industrial area, the company did not follow any News since this area had not been inundated before and they did not think that it would be flooded. Till one day before the inundation, they realized about the situation, they could just aligned sandbags around the factory. When the water current approached the area, they moved industrial products to higher places inside the factory, but it was rather difficult because the water depth was too high. They said that during that flood period they needed all information related with flood and water, both rainfall and runoff information, the data in the past, the forecasted ones and all information should be presented in the form of figures and/ or tables.

So far, due to various reasons, the factory has been considering to move to Myanmar or Vietnam. They are in the process of decision making in all related issues.

About the warning and forecast processes, although it has the error and uncertainty of the forecast, but they think the forecast is necessary and helpful the same as the alarm and warning from Meteorological Department. However, if the limit (width with error) of a predicted value is shown, it will be helpful.

Rojjana Industrial Estate

This study chose 3 plants from totally 213 plants in Rojjana Industrial Estate to answer the questionnaire, in which are Nihon Seiki Thai Company Limited, Izumi Industry (Thailand) Company Limited and Thai Horikawa. The summaries from these 3 companies are as follows:-

- Nihon Seiki Thai Company Limited

Nihon Seiki Thai Company Limited occupies two of one-story building, in which one building is the office and another one is the production plant. The respondent said that the water level was about 70 cm from plant floor, thus it caused damage production equipment, material, and the difficulty of staffs' attendance, including the stoppage of deliveries of parts.

Although the company got the flood information 4-6 days before the water reached the area, but they did not take any action because they were informed by the industrial authority that the authority could handle the situation. Till one day before the current flowed through the industrial area, they did not have enough to do anything other than aligned the sandbags around the factory. During the inundation period, from October 10, 2011, they did not take any action since they had never suffered from flooding, thus did not how to deal with it.

The respondent revealed that the useful information before and during flood were warning and alarm, with water level and inundation area data. They also needed various information related with water and flood such as Forecasted river water level, the place from where water of river outflows, inundation area, forecasted inundation area, forecasted inundation time and maximum depth, live report of inundation by media and warning and alarm from public organization via the effectives means such as TV, internet and local community.

Since the water depth decreased, late of November, 2011, the staffs came to the factory and try to move some machine to the other place, in order to start the production line again. The insurance company came by to evaluate the damage. Then the staffs started cleaning. The factory has operated again in March, 2012.

About the warning and forecast processes, although it has the error and uncertainty of the forecast, but they think the forecast is necessary and helpful the same as the alarm and warning from Meteorological Department. However, if the limit (width with error) of a predicted value is shown, it will be helpful.

- Izumi Industry (Thailand) Company Limited

Izumi Industry (Thailand) Company Limited occupies two buildings, in which the front one is the office and another one is the production plant. The respondent said that the water level was about 1.8 m from the plant floor, thus it caused damage production equipment, material, and the difficulty of staffs' attendance, including the stoppage of deliveries of parts.

Although the company got the flood information 4-6 days before the water reached the area, but they did not take any action because they were informed by the industrial authority that the authority could handle the situation. Till one day before the current flowed through the industrial area, they did not have enough to do anything other than aligned the sandbags around the factory. During the inundation period, they came to the plant and tried to move some machines such as mainboard and plastic mold to the higher place outside the factory. Additionally, they had set up the war room at Amporn resident Hotel in Ayutthaya.

Since the water depth decreased, November 22, 2011, the insurance company came by to evaluate the damage. Then the staffs started cleaning in late of December, 2011. The factory has operated again in June, 2012.

The respondent revealed that the useful information before and during flood were warning and alarm, with water level and inundation area data. They also needed various information related with water and flood such as Forecasted river water level, the place from where water of river outflows, inundation area, forecasted inundation area, forecasted inundation time and maximum depth, live report of inundation by media and warning and alarm from public organization via the effectives means such as TV, internet and local community.

About the warning and forecast processes, due to the error and uncertainty of the forecast, if the limit (width with error) of a predicted value is shown, it will be helpful.

- Thai Horikawa Company Limited

Thai Horikawa Company Limited occupies one of one-story buildings, in which the front side is the office and the left part is the production plant. The respondent said that the water level was about 1.5 m from the plant floor, thus it caused damage production equipment, material, and the difficulty of staffs' attendance, including the stoppage of deliveries of parts.

The company representative mentioned that they had dealt with the Rojjana Industrial Estate, on October 7, 2011, to strengthen the dyke and install more pumps around the industrial area. Therefore, the industrial authority had confidence that they could handle the situation. However, the dyke was collapsed, thus the water flowed through the area and the factory. It took only half a day from the beginning till the water reached the maximum depth. The staffs could just move products and some material to safe place outside the plant, but they cannot move the heavy machines.

Unluckily, the company did not have any insurance, thus they did not take any compensation. When the water depth decreased, late November, 2011, the staffs came to make a survey and started cleaning. December, 2011 when the industrial roads got dry, they moved the damaged machines out and did what they have to do.

The respondent revealed that the useful information before and during flood were warning and alarm, with water level and inundation area data. They also needed various information related with water and flood such as Forecasted river water level, the place from where water of river outflows, inundation area, forecasted inundation area, forecasted inundation time and maximum depth, live report of inundation by media and warning and alarm from public organization via the effectives means such as TV, internet and local community.

About the warning and forecast processes, although the forecast of inundation area includes the prediction error of a natural phenomenon, and the prediction error of the simulation, cause the uncertainty, but the respondent think the uncertainty is acceptable and the Forecast is helpful if it thinks that it is the same as the alarm and warning which the Meteorological Department announces.

However, although the forecast could give high accuracy result, but they do not believe in the potential of Rojjana Industrial Estate since the industrial authority could not assure the security of the industrial estate from flood. Therefore, the company has decided to move to other place.

Hi-tech Industrial Estate

This study chose 5 plants from totally 143 plants in Hi-tech Industrial Estate to answer the questionnaire, in which are Hana Semiconductor (Bangkok) Company Limited, Kobe Electronics Material (Thailand) Company Limited, Chiyoda Integre (Thailand) Company Limited, Mikuni (Thailand) Company Limited and Soode Nagano (Thailand) Company Limited.

The summaries from these 5 companies are as follows:-

- Hana Semiconductor (Bangkok) Company Limited

Hana Semiconductor (Bangkok) Company Limited occupies three-story building. During the inundation in 2011, the maximum water depth around the company was about 1.8 m and 0.70 m, referred to the plant floor, in the building. The flood caused the damage to production equipment, material, and the difficulty of staffs' attendance, including the stoppage of deliveries of parts.

The flood water started to reach the industrial area on October 13, 2011 at about 1 p.m. from Canon Staff dormitory. The industrial authority tried to block the current and aligned the sandbags. After that, around 6 p.m. more water flowed into the industrial estate from the direction of wastewater treatment plant, west side of the industrial area, in which close to the Chao Phraya river. It took about 12 hours from the beginning to reach the maximum depth. The company representative specified the flow velocity of about the working speed of human.

Before the inundation occurred, they got information from TV, regional government and local community, and then they took actions by sandbagging around the factory, moving industrial products to higher place, preparing drainage pump, etc. During the inundation, they again tried to do some actions. They think that all information related with flood and water was useful and necessary. After the inundation, they tracked the water depth and started cleaning and rehabilitate around the beginning of December, 2011.

About the warning and forecast processes, due to the error and uncertainty of the forecast, if the limit (width with error) of a predicted value is shown, it will be helpful.

- Kobe Electronics Material (Thailand) Company Limited

Kobe Electronics Material (Thailand) Company Limited occupies single story building, in which was submerged about 1.8 m from the plant floor. Thus, it caused the damage to production equipment, material, and the difficulty of staffs' attendance, including the stoppage of deliveries of parts.

The flood water started to reach the industrial area on October 13, 2011 at about 1 p.m. from Canon Staff dormitory. The industrial authority tried to block the current and aligned the sandbags. After that, around 6 p.m. more water flowed into the industrial estate from the direction of wastewater treatment plant, west side of the industrial area, in which close to the Chao Phraya river. It took about 12 hours from the beginning to reach the maximum depth. The company representative specified the flow velocity of about the working speed of human.

Before the inundation occurred, they got information from TV, internet, regional government and information exchanging in industrial estates. Then, they took damage alleviation actions by sandbagging around the factory, moving industrial products to higher places, both inside and outside the factory. When the current flowed through the industrial area, they again tried to move what they can move to the higher places. Besides, they also concerned about means of transportation as well. After the inundation, they just tracked the maximum water depth.

The respondents mentioned about the useful information before the inundation as forecasted river water level, live report by media such as TV, and warning and alarm released by the public organization such as the Meteorological Department or local government. During and after the flood period, they needed more information such as the place which has overflowed inundation area and water depth, forecasted inundation area and water depth, live report and warning and alarm via the effective means such as TV, internet, social network, and local community. Besides, the data should be presented with figures and tables which make it easy to understand.

About the warning and forecast processes, although the forecast of inundation area includes the prediction error of a natural phenomenon, and the prediction error of the simulation, cause the uncertainty, but the respondent think the uncertainty is acceptable and the Forecast is helpful.

- Chiyoda Integre (Thailand) Company Limited

Chiyoda Integre (Thailand) Company Limited occupies single story building, in which was submerged about 2.0 m from the plant floor. Thus, it caused the damage to production equipment, material, and the difficulty of staffs' attendance, including the stoppage of deliveries of parts.

The flood water started to reach the industrial area on October 13, 2011 at about 1 p.m. from Canon Staff dormitory. The industrial authority tried to block the current and aligned the sandbags. After that, around 6 p.m. more water flowed into the industrial estate from the direction of wastewater treatment plant, west side of the industrial area, in which close to the Chao Phraya river. It took about 12 hours from the beginning to reach the maximum depth. The company representative specified the flow velocity of about the working speed of human.

Before the inundation occurred, they got information from TV, internet, social network, regional government and information exchanging in industrial estates. Then, they took damage alleviation actions by sandbagging around the factory. Additionally, when the current flowed through the industrial area, they tried to move industrial products to higher places and prepared means of transportation. After the inundation, they just tracked the maximum water depth.

The respondents mentioned about the useful information before and during the inundation as forecasted river water level, live report by media such as TV, and warning and alarm released by the public organization. They also specified the information, other than the acquired ones are both data in the past and the forecasted information, live report and warning via the effective means such as TV, internet and local community.

About the warning and forecast processes, although the forecast of inundation area includes the prediction error of a natural phenomenon, and the prediction error of the simulation, cause the uncertainty, but the respondent think the uncertainty is acceptable and the forecast is helpful if it thinks that it is the same as the alarm and warning which the Meteorological Department announces.

- Mikuni (Thailand) Company Limited

Mikuni (Thailand) Company Limited occupies single story building, in which was submerged about 2.0 m from the plant floor. Thus, it caused the damage to production equipment, material, and the difficulty of staffs' attendance, including the stoppage of deliveries of parts.

The flood water started to reach the industrial area on October 13, 2011 at about 1 p.m. from Canon Staff dormitory. The industrial authority tried to block the current and aligned the sandbags. After that, around 6 p.m. more water flowed into the industrial estate from the direction of wastewater treatment plant, west side of the industrial area, in which close to the Chao Phraya river. It took about 12 hours from the beginning to reach the maximum depth. The company representative specified the flow velocity of about the working speed of human.

Before the inundation occurred, they got information from TV, regional government and information exchanging in industrial estates. Then, they took damage alleviation actions by sandbagging around the factory. Additionally, when the current flowed through the industrial area, they tried to move industrial products to higher places and prepared means of transportation. After the inundation, they just tracked the maximum water depth.

The respondents mentioned about the useful information before and during the inundation as forecasted river water level, live report by media such as TV, and warning and alarm released by the public organization. They also specified the information, other than the acquired ones are both data in the past and the forecasted information, live report and warning via the effective means such as TV and internet. Besides, the data should be presented with figures and tables, which make it easy to understand, at least 7 days before the inundation

About the warning and forecast processes, although the forecast of inundation area includes the prediction error of a natural phenomenon, and the prediction error of the simulation, cause the uncertainty, but the respondent think the uncertainty is acceptable and the forecast is helpful.

- Soode Nagano (Thailand) Company Limited

Soode Nagano (Thailand) Company Limited occupies two of single story buildings, which one is the office and another one is the production plant. The inundation depth was about 1.8 m from the plant floor. It caused the damage production equipment, material, and the difficulty of staffs' attendance, including the stoppage of deliveries of parts.

The representative said that they knew before the inundation occurred just 4-6 days. They were informed by the industrial authority that the situation could be handled and this area had never been inundated before. Thus, they felt relaxed at the first place. However, the flood water started to reach the industrial area on October 13, 2011 at about 1 p.m. from Canon Staff dormitory. The industrial authority tried to block the current and aligned the sandbags. After that, around 6 p.m. more water flowed into the industrial estate from the direction of wastewater treatment plant, west side of the industrial area, in which close to the Chao Phraya river. It took about 12 hours from the beginning to reach the maximum depth.

Before the inundation occurred, they got information from TV, internet, regional government and information exchanging in industrial estates, but they did not take any action because they relied on what the industrial authority informed. During and after the flood, they also did not do anything with the buildings, but they moved to the Factory Land in Wang Noi, Ayutthaya.

The respondents mentioned that they needed the real time and forecasted water level, inundation time and the time to gets dry via the effective means such as TV and internet and local community. Besides, the data should be presented with figures and tables, which make it easy to understand, at least 7 days before the inundation

About the warning and forecast processes, although it has the error and uncertainty of the forecast, but they think the forecast is necessary and helpful the same as the alarm and warning from Meteorological Department. However, if the limit (width with error) of a predicted value is shown, it will be helpful.

Bang Pa-In Industrial Estate

This study chose 3 companies from totally 90 companies in Bang Pa-In Industrial Estate to answer the questionnaire; i.e. Nippon Super Company Limited, Rockworth PLC and Mitsui Precision (Thai).

The summaries from these 3 companies are as follows:-

- Nippon Super Precision Company Limited

  Nippon Super Precision Company Limited occupies three of one-story buildings. The inundation caused damage to production equipment, material, industrial products, stoppage of deliveries of parts, and it also caused the difficulty in of staffs' attendance.

  The water reached Bang Pa-In Industrial Estate on October 12, 2011 and it took only 2 hours since the beginning to the maximum depth, which is above the floor of factory. Although the factory knew that the area would be flooded a week before the inundation and they already took damage alleviation actions by sandbagging around the factory, moving industrial products to higher places (inside and outside the factory), preparation of means of transportation after inundation and preparation of drainage pumps, but they were affected anyway sine the dyke surround was collapsed. During the water approached the factory, they tried to moved industrial products to higher places and also surveyed around their place. They found the difficulty due to the high water depth. Then, November 21, 2011, they set up the war room and started to rehabilitee the factory. It seemed that the situation was back to normal condition around the second week of December. Then, the insurance company came to evaluate the damage. After that, January 2012, the staffs cleaned up the factory and it was ready to restart the production line again in April 2012.

  The respondent in Bang Pa-In said that they had time to take some damage alleviation actions since they knew that the Saharattananakorn and Rojjana Industrial Estates had already inundated before via TV, internet, exchanging information in industrial estate and from regional government. They also mentioned that various information such as the forecasted water level and forecasted inundation area, the inundation area and water depth, live report of inundation by media such as TV and warning and alarm by the public organization were useful. Besides, they suggested that the information should be easy to use by showing figures and/or tables.

  About the warning and forecast processes, since the forecast of inundation area includes the prediction error of a natural phenomenon, and the prediction error of the simulation, causes the uncertainty, so if the limit (width with error) of a predicted value is shown, it will be helpful.

- Rockworth PLC

Rockworth PLC occupies one of two-story building, in which the first floor is the production plant with the second floor is the office. The respondent said that the water depth was 2.5-m referred to the road elevation, in which almost up to the second floor of Rockworth PLC building. It caused damage to production equipment, material, and the difficulty of staffs' attendance, including the stoppage of deliveries of parts.

Although the industrial authority constructed the temporary dyke to prevent the water flow through the area, and the factory also took damage alleviation actions such as Sandbagging around the factory and moving industrial products to higher places (inside factory), but after the dyke collapsed, the water flowed into the industrial area rapidly.

When the flood approached the factory, they tried to prepared means of transportation and moved industrial products to higher places (outside factory). However, they found the difficulty due to the high water depth. After the water depth decreased and the situation was back to the normal condition around the second week of December, Then, the insurance company came to evaluate the damage. After that, January 2012, the staffs cleaned up the factory and it was ready to restart the production line again in May 2012.

The respondent in Bang Pa-In said that they had time to take some damage alleviation actions since they knew that the Saharattananakorn and Rojjana Industrial Estates had already inundated before via TV, internet, exchanging information in industrial estate and from regional government. They also mentioned that various information such as the forecasted water level and forecasted inundation area, the inundation area and water depth, live report of inundation by media such as TV and warning and alarm by the public organization were useful. Besides, they suggested that the information should be available whenever they need.

About the warning and forecast processes, although the forecast of inundation area includes the prediction error of a natural phenomenon, and the prediction error of the simulation, cause the uncertainty, but the respondent think that the Forecast is helpful if it thinks that it is the same as the alarm and warning which the Meteorological Department announces.

- Mitsui Precision Thai Company Limited

Mitsui Precision Thai Company Limited occupies one of two-story building, in which the water depth was 2.5 m, thus the first floor of factory was soaked in the water. It caused damage to production equipment, material, and the difficulty of staffs' attendance, including the stoppage of deliveries of parts.

Since the factory got the information, from TV, internet, regional government and discussed among companies around there, about Saharattananakorn and Rojjana Industrial Estates, the factory had dealt with the industrial estate authority. Accordingly, they constructed temporary dyke with pumps installation around the industrial estate meanwhile the factory also took damage alleviation actions such as sandbagging around the factory, moving industrial products to higher places, both inside and outside the factory, and evacuation to safe place. The factory had high confident that the area would be safe. However, the water current reached the industrial estate after the dyke was collapse. The water depth was about 2.8 m, thus the factory found the difficulty dealing with the situation. Therefore, they just moved some small and light machines to safe place and set up the patrol, then measured the water depth. After the water depth decreased, around the beginning of December, 2011, the staffs started to clean. Then, the insurance company came to evaluate the damage.

However, during the flood, the factory had moved some machines to Saraburi province and started the operation over there. So far, the factory has a plan to move the main production line to somewhere else since they had no confident in the mitigation measures. It is in the process of making decision. Consequently, the factory in Bang Pa-In will be operated as the support line.

The respondent mentioned that before and during the inundation, they needed various information related with flood, so then they could me correct decision. The information that were useful are forecasted river water level, forecasted inundation area with water depth, live report of river by media such as TV, warning and alarm released by the public organization. After the inundation, they needed the information about the place where water of river outflows, forecasted inundation area and water depth, forecasted time until the area round the factory gets dry, live report of inundation and warning and alarm. Moreover, other than the acquired information, they also need the information from government, which they can trust, about inundation.

About the warning and forecast processes, although the forecast of inundation area includes the prediction error of a natural phenomenon, and the prediction error of the simulation, cause the uncertainty, but the respondent think that the forecast is helpful if it thinks that it is the same as the alarm and warning which the Meteorological Department announces.

Navanakorn Industrial Estate

This study chose 3 companies from totally 227 companies in Navanakorn Industrial Estate in Pathum Thani to answer the questionnaire; i.e. Kawasumi Laboratories (Thailand) Company Limited, Panasonic Manufacturing (Thailand) Company Limited, and Tomy Thailand Limited.

The summaries from these 3 companies are as follows:-

- Kawasumi Laboratories (Thailand) Company Limited

Kawasumi Laboratories (Thailand) Company Limited occupies four of two-story buildings. The respondent said that the water depth was 1.8-m from the plant floor. It caused the damage to production equipment, material, and the difficulty of staffs' attendance, including the stoppage of deliveries of parts.

The plant representative mentioned that they knew just about 4-6 days before the flood that their place would be inundated. Thus, what they can do were just sandbagging around the factory and preparing pumps. However, they were informed that the industrial authority could handle the situation. They though that RID operation of Pratunampra-in Watergate caused the inundation since the water could not be drained as usual. They also believed that it was the reason of dyke around the industrial area collapsed in the next stage. The water reached the area during the nighttime of October 16, 2011. It took about one night from the beginning to the maximum depth.

During the inundation period, they came to survey the damage, but cannot do anything since the water depth was too high and caused difficulty in taking any task. Till November 15, 2011, the water level decreased and back to the normal condition. The insurance company came by to evaluate the damage. They started cleaning in mid-December, 2011. After that they have restarted the production line in January, 2013.

Based on the information from TV, internet, social network, other factories nearby, they did not think that the industrial area would be inundated. Besides, they believed in the authority's potential. They think that they needed clearer and understandable information, with figures and tables, related with flood, in which could support their decision making.

About the warning and forecast processes, since the forecast of inundation area includes the prediction error of a natural phenomenon, and the prediction error of the simulation, causes the uncertainty, so if the limit (width with error) of a predicted value is shown, it will be helpful.

- Panasonic Manufacturing (Thailand) Company Limited

Panasonic Manufacturing (Thailand) Company Limited occupies eight of two-story buildings. The respondent said that the water depth was 1.5-m from the plant floor. It caused the damage to production equipment, material, and the difficulty of staffs' attendance, including the stoppage of deliveries of parts.

The plant representative mentioned that before the water reached the place, they were informed by the industrial authority that they can handle the situation. They believed in the authority's potential. Besides, the area had not been inundated before.
However, 4-6 days before the flood, they prepared the sandbags and pumps. The water approached the industrial area and the factory during the nighttime via the channel of collapsed dyke.

During the inundation period, they came to survey the damage, but cannot do anything since the water depth was too high and caused difficulty in taking any task. Till November 22, 2011, the situation was back to the normal condition. The insurance company came by to evaluate the damage. They started cleaning in December, 2011 an started operation again in February, 2012.

Based on the information from TV, internet, and other factories nearby, they think that it was not enough to make the right decision. They information should be clearer and tell them what to do because they did not have inundation experience. Moreover, other than the acquired information, they needed the data of forecasted river water level, the place from where water of river outflows, the inundation area and water depth, the forecasted inundation time and maximum depth, the time for drainage via the effective means such as TV, internet and local community.

About the warning and forecast processes, since the forecast of inundation area includes the prediction error of a natural phenomenon, and the prediction error of the simulation, causes the uncertainty, so if the limit (width with error) of a predicted value is shown, it will be helpful.

- Tomy Thailand Limited

Tomy Thailand Limited occupies two of single-story buildings. The respondent said that the water depth was 1.8-m from the plant floor. It caused the damage to production equipment, material, and the difficulty of staffs' attendance, including the stoppage of deliveries of parts.

The plant representative mentioned that they knew just about 4-6 days before the flood that their place would be inundated. Thus, what they can do were just sandbagging around the factory and preparing pumps. However, they were informed that the industrial authority could handle the situation. They though that RID operation of Pratunampra-in Watergate caused the inundation since the water could not be drained as usual. They also believed that it was the reason of clay dyke around the industrial area collapsed in the next stage. The water reached the area during the nighttime of October 16, 2011. It took about one night from the beginning to the maximum depth.

During the inundation period, they came to survey the damage, but cannot do anything since the water depth was too high and caused difficulty in taking any task. Till November 15, 2011, the water level decreased and back to the normal condition. The insurance company came by to evaluate the damage. They started cleaning in mid-December, 2011. After that they have restarted the production line in January, 2012.

Based on the information from TV, regional government and other factories nearby, they think that it was not enough to make the right decision. They information should be clearer and tell them what to do because they did not have inundation experience. Moreover, other than the acquired information, they needed the data of forecasted river water level, the place from where water of river outflows, the inundation area and water depth, the forecasted inundation time and maximum depth, the time for drainage via the effective means such as TV, internet, regional government and local community.

About the warning and forecast processes, although the forecast of inundation area includes the prediction error of a natural phenomenon, and the prediction error of the simulation, cause the uncertainty, but the respondent think that the forecast is helpful if it thinks that it is the same as the alarm and warning which the Meteorological Department announces.

Factory Land Industrial Estate

This study chose 3 companies from totally 87 companies in Factory Land Industrial Estate in Ayutthaya to answer the questionnaire; i.e. Fuji Autoparts Industry Company Limited, Asada Chemical Company Limited, and Samco Seiki (Thailand) Company Limited.

The summaries from these 3 companies are as follows:-

- Fuji Autoparts Industry Company Limited

Fuji Autoparts Industry Company Limited occupies one of two-story building, in which the front part is the office, the left section of the first floor is the production plant and the second floor is the residence section. The respondent said that the water depth was about one meter from the plant floor. It caused the damage to production equipment, material, and the difficulty of staffs' attendance, including the stoppage of deliveries of parts.

The factory representative said that they got only 2 days to take damage alleviation actions by sandbagging and bricking around the factory. The flood water had entered the industrial area on October 14, 2011. Although they tried to pump the water out, but it was seem hopeless. The building was submerged anyway. Then, they evacuated to the safe place until the beginning of November that the situation was back to the normal condition.

Based on the information from TV, internet, social network and other factories nearby, they think that the useful information were the forecasted river water level, the place which has overflowed, the inundation area and water depth, live report by media and warning and alarm released by the public organization, etc. However, more than the acquired information, they also needed the reliable information from government about inundation, in which the information should be presented in figures and tables. Additionally, for the effective damage alleviation action, the information should be distributed at least 7 days before the inundation.

About the warning and forecast processes, although the forecast of inundation area includes the prediction error of a natural phenomenon, and the prediction error of the simulation, cause the uncertainty, but the respondent think that the forecast is helpful the same as the alarm and warning from the Meteorological Department.

- Asada Chemical Company Limited

Asada Chemical Company Limited occupies one of two-story building, in which the front part is the office, the left section of the first floor is the production plant and the second floor is the residence section. The respondent said that the water depth was about one meter from the plant floor. It caused the damage to production equipment, material, and the difficulty of staffs' attendance, including the stoppage of deliveries of parts.

The factory representative said that although they kept updating the inundation information from the time that there were the situation in other industrial estates, but they did not think that Navanakorn would be inundated. They believed in the authority's potential in preventing the flood approaching. Thus, when they realized that they must do something in order to mitigate the damage; they got only 2 days to align sandbags and bricked around the factory, moved industrial products to higher places and prepared means of transportation. The flood water had entered the industrial area on October 14, 2011. Although they tried to pump the water out, but it was seem hopeless. The building was submerged anyway. Then, they evacuated to the safe place until the beginning of November that the situation was back to the normal condition.

Based on the information from TV, internet, regional government and other factories nearby, they think that the useful information before the inundation occurred were the forecasted river water level, the live report by media such as TV, and warning and alarm released by the public organization such as the Meteorological Department or local government. During the inundation, they needed the useful information such as the inundation area and water depth, the forecasted inundation area and water depth, the live report of inundation and warning and alarm. Other than the acquired information, they also needed to know the place from where water of river outflows, the forecasted time until water was drained, in which the information should be presented in figures and tables. Additionally, for the effective damage alleviation action, the information should be distributed at least 7 days before the inundation.

About the warning and forecast processes, although the forecast of inundation area includes the prediction error of a natural phenomenon, and the prediction error of the simulation, cause the uncertainty, but the respondent think that the forecast is helpful the same as the alarm and warning from the Meteorological Department.

- Samco Seiki (Thailand) Company Limited

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Samco Seiki (Thailand) Company Limited occupies one of two-story building, in which the second floor is the office and the back side section is the production plant. The respondent specified that the water depth was about one meter from the plant floor. It caused the damage to production equipment, material, and the difficulty of staffs' attendance, including the stoppage of deliveries of parts.

The factory representative said that they got about a week to take the mitigation actions by providing 10 pumps, sandbagging and bricking around the factory and moving industrial products to the higher places. However, when the water reached the place, they prepared means of transportation, evacuated to the safe place and stop attendance. After the inundation, they just measured the water depth and started to clean the area in November, 2011.

Based on the information from TV, internet, regional government and other factories nearby, they think that the useful information before the inundation occurred were the forecasted river water level, the live report by media such as TV, and warning and alarm released by the public organization such as the Meteorological Department or local government. During the inundation, they needed the useful information such as the inundation area and water depth, the forecasted inundation area and water depth, the live report of inundation and warning and alarm. Other than the acquired information, they also needed to know the place from where water of river outflows, the forecasted time until water was drained, in which the information should be available whenever they need. Additionally, for the effective damage alleviation action, the information should be distributed at least 7 days before the inundation.

About the warning and forecast processes, although the forecast of inundation area includes the prediction error of a natural phenomenon, and the prediction error of the simulation, cause the uncertainty, but the respondent think that the forecast is helpful the same as the alarm and warning from the Meteorological Department.

However, although they do not have high confidence on the industrial authority's management, but they do not have a plan to move out. They gave the reason that most of the skilled labors are living around there. Besides, training new staffs is costly.

Bangkadi Industrial Estate

- This study chose 3 companies from totally 36 companies in Bangkadi Industrial Estate in Pathum Thani to answer the questionnaire; i.e. Thai Toshiba Lighting Company Limited, Toshiba Semiconductor (Thailand) Company Limited and NIDEC SHIBAURA Electronics (Thailand) Company Limited.

The summaries from these 3 companies are as follows:-

- Thai Toshiba Lighting Company Limited

  Thai Toshiba Lighting Company Limited occupies one of two-story building, in which the first floor is the production plant and the second is the office. The respondent specified that the water depth was 1.5-m from the first floor. It caused the damage to production equipment, material, and the difficulty of staffs' attendance, including the stoppage of deliveries of parts.

  The factory kept updating the inundation information via TV, internet, regional government and exchanging in industrial estates. They dealt with the Bangkadi industrial authority to strengthen the dyke surround the industrial area and provide pumps along the line. The industrial authority cooperated with RID in order to close the Klong Nam-oom Watergate, in which located in the old irrigation canal, north side of the area. They installed more pumps at Watsanchao Watergate. In the west side, they aligned the sandbags up to the high of 1.5 m. In the south side, closed to Rangsit canal, they constructed clay dyke. In the east side, it is closed to Prapa canal, in which the Metropolitan Waterworks Authority informed that they would construct the dyke.

  October 19, 2011, the flood water approached the outside protection line and Prapa canal in the east side. Then, the current flowed inside the industrial area on October 20, 2011. Half a day after that the dyke surrounded the industrial area was collapsed. The water flowed through the plant. It took about 1 night from the beginning to the maximum depth.

  Since there was the Inundation Prevention committee, which was established by factories in Bangkadi Industrial Estate, corporately worked with the industrial authority. Thus the factory had high confidence that they could handle the situation. The factory just prepared sandbags and move the material and industrial products to the higher places outside the factory, but could not move the heavy machines.

  December 9, 2011, the water decreased and the situation became back to the normal condition. The insurance company came by to evaluate the damage. The staffs moved the damaged machines out on December 15, 2011 and started cleaning.

  The respondents mentioned that they needed all information related with flood, both rainfall and runoff, in the past and real-time data with the forecasted ones in the form of figures and tables, which are easy to understand.

  About the warning and forecast processes, although the forecast of inundation area includes the prediction error of a natural phenomenon, and the prediction error of the simulation, cause the uncertainty, but Forecast is helpful even if it includes uncertainty.

- Toshiba Semiconductor (Thailand) Company Limited

Toshiba Semiconductor (Thailand) Company Limited occupies 3 of single-story building, in which the front section is the office. The respondent specified that the water depth was 1.5-m from the first floor. It caused the damage to production equipment, material, and the difficulty of staffs' attendance, including the stoppage of deliveries of parts.

The factory kept updating the inundation information via TV, internet, regional government and exchanging in industrial estates. They dealt with the Bangkadi industrial authority to strengthen the dyke surround the industrial area and provide pumps along the line. The industrial authority cooperated with RID in order to close the Klong Nam-oom Watergate, in which located in the old irrigation canal, north side of the area. They installed more pumps at Watsanchao Watergate. In the west side, they aligned the sandbags up to the high of 1.5 m. In the south side, closed to Rangsit canal, they constructed clay dyke. In the east side, it is closed to Prapa canal, in which the Metropolitan Waterworks Authority informed that they would construct the dyke.

October 19, 2011, the flood water approached the outside protection line and Prapa canal in the east side. Then, the current flowed inside the industrial area on October 20, 2011. Half a day after that the dyke surrounded the industrial area was collapsed. The water flowed through the plant. It took about 1 night from the beginning to the maximum depth.

Since there was the Inundation Prevention committee, which was established by factories in Bangkadi Industrial Estate, corporately worked with the industrial authority. Thus the factory had high confidence that they could handle the situation. The factory just prepared sandbags and move the material and industrial products to the higher places outside the factory, but could not move the heavy machines.

December 9, 2011, the water decreased and the situation became back to the normal condition. The insurance company came by to evaluate the damage. The staffs moved the damaged machines out on December 15, 2011.

The respondents mentioned that they needed all information related with flood, both rainfall and runoff, in the past and real-time data with the forecasted ones and these data should be available whenever they need.

About the warning and forecast processes, although the forecast of inundation area includes the prediction error of a natural phenomenon, and the prediction error of the simulation, cause the uncertainty, but Forecast is helpful the same as the alarm and warning which the Meteorological Department announces.

However, the representative said that although the forecast is accurate, but the company management does not believe in the potential of Bangkadi Industrial Authority in prevention the inundation. Therefore, they decided to move to other industrial estate and it is in the process so far.

- NIDEC SHIBAURA Electronics (Thailand) Company Limited

NIDEC SHIBAURA Electronics (Thailand) Company Limited occupied three of single-story building, in which the front section was the office. The respondent specified that the water depth was 2.8-m from the first floor. It caused the damage to production equipment, material, and the difficulty of staffs' attendance, including the stoppage of deliveries of parts.

The factory kept updating the inundation information via TV, internet, regional government and exchanging in industrial estates. They dealt with the Bangkadi industrial authority to strengthen the dyke surround the industrial area and provide pumps along the line. The industrial authority cooperated with RID in order to close the Klong Nam-oom Watergate, in which located in the old irrigation canal, north side of the area. They installed more pumps at Watsanchao Watergate. In the west side, they aligned the sandbags up to the high of 1.5 m. In the south side, closed to Rangsit canal, they constructed clay dyke. In the east side, it is closed to Prapa canal, in which the Metropolitan Waterworks Authority informed that they would construct the dyke.

October 19, 2011, the flood water approached the outside protection line and Prapa canal in the east side. Then, the current flowed inside the industrial area on October 20, 2011. Half a day after that the dyke surrounded the industrial area was collapsed. The water flowed through the plant. It took about 1 night from the beginning to the maximum depth.

Since there was the Inundation Prevention committee, which was established by factories in Bangkadi Industrial Estate, corporately worked with the industrial authority. Thus the factory had high confidence that they could handle the situation. The factory just prepared sandbags and move the material and industrial products to the higher places outside the factory, but could not move the heavy machines.

December 9, 2011, the water decreased and the situation became back to the normal condition. The insurance company came by to evaluate the damage. The staffs moved the damaged machines out on December 15, 2011.

The respondents mentioned that they needed all information related with flood, both rainfall and runoff, in the past and real-time data with the forecasted ones and these data should be available whenever they need.

About the warning and forecast processes, although the forecast of inundation area includes the prediction error of a natural phenomenon, and the prediction error of the simulation, cause the uncertainty, but Forecast is helpful the same as the alarm and warning which the Meteorological Department announces.

However, the representative said that although the forecast is accurate, but the company management does not believe in the potential of Bangkadi Industrial Authority in prevention the inundation. Therefore, they decided to add up the second floor of the building and moved the light machines over there. They also allocated additional area to be the warehouse, constructed the permanent room in order to prevent the machines from flood and strengthened the factory wall surround.

5.4 Mass Media Interview

Since the 2011 inundation in Thailand, the mass media has played an important role in information distribution. Especially during the time that everyone was confused and panic, most of the people were suspicious whether their places would be inundated or not, what should they do, where to evacuate, etc. Therefore, almost all of the people in the flood risk area and the victims followed News, facts and the truth via TV, social network, internet and other media. Additionally, media took more actions during the disaster period for different purposes, such as to stimulate the awareness, the sympathy, the cooperation, and the help.

It is interesting to know what they did, how they thought or what they wished in the time of before, during and after the inundation. Thus, this study interviewed the mass media agencies such as social network, radio communication, TV, in which the name list was previously shown in *Table 3*.

The interviewed result could be summarized as follows:

Respondent: Mr. Anon Untimanon

Position: CNSA Supreme Commander
Organization: Central on Normalization Society Affairs
Topic: Thai Fight Flood Roles during 2011 Great Flood
Date & Time: November 7, 2012; 09:00 a.m. – 11:00 a.m.

Summary

Mr. Anon is the volunteer in the Thai Fight Flood (TFF) network, which is the cooperated network of more than 40 organizations, including Thai PBS. He takes the responsibility on information acquisition and communication. Actually, the communication job is divided into 2 parts; i.e. the mass communication for information distribution, and backup system maintenance, which is under Mr. Anon's concerned.

He gave the information about Thai Fight Flood as the volunteer network that gathers agencies and helps from various sectors. TFF, itself, has no website, but distributes the information through the network such as krapook.com website. Each member of the network would take care of the task they has expertise without overruling each other. Since the staffs do not have to be verified by sequences of work, it makes the flexibility and rapid.

During the inundation period, TFF had the command base in Thai PBS building. They gathered data and communicated via internet. After they acquired the information and analyzed detail, they forwarded directly to the media. However, when the inundation approached Thai PBS building, they moved the practice base to Ratcha Buri province, with the mobile Operating Broadcasting supported by Thai PBS. Thus, they continually kept communication with the TV station. Besides, TOT and CAT also assisted in internet connection, in which made them more convenient.

There were various incidents during the inundation period such as the breaching of Bangchomsri sluice gate. TFF got problem in data acquisition, such as water level, detailed topographical data due to the unit of measuring. They found that it take such a long time in unit change process.

Mr. Anon described the information needed was:-

- During the inundation: they needed water level (MSL) for specialist analyzed
- When the inundation area had been expanded: they needed the forecasted inundation depth. Besides they had to acknowledged the local community how to read the water level, rainfall runoff, the real height of Watergates, etc., for the model forecasting
- When the inundation approached the urban area: they needed the availability public utility information and the evacuation route.

Other than the acquired information, TFF also needed the information related with the food and living things for the flood victims. Although there were much of stuffs that the people distributed for the victims, but most of them was managed by the government agencies. Besides, the capacity of each evacuation camp was also important, but not available during the great flood.

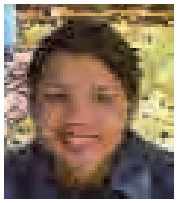
One more problem he found was the way to convince the flood victims to evacuate to the safer places. Some of the villagers did not understand the nature of their places that it would be inundated sooner or later, but they aligned the sandbags or constructed temporary barrier, which were useless.

By the way, during the inundation period, TFF got assistance from the local communities in reporting necessary information through the volunteer network by amateur radio. In Thailand, there are more than 200,000 members in Amateur radio club. In the case that of amateur radio network failure, the spare network would be used instead. They use the repeater, E-ratio through internet (Voice over internet protocol: VOIP) which can be used worldwide. One more system for the crosschecking of the GISTDA satellite data is controlled raptor and parasailing.

TFF gathered necessary information for the citizen and for the Electronic Government Agency; EGA, in order to pool all information from all related agencies. It would make data utilization more convenient.

Finally, Mr. Anon mentioned about the Single Command Center that was established by the government that suitable for the incident management, but not efficient for the local community management. In the local level, the operation should be considered and operated by the villagers since they understand their problem and their needs. Currently, there are various local volunteer groups, such as Ban Namkhem community volunteer, the Tsunami victims. It is one example of the local volunteer that can be mentioned as the prototype.

Respondent: Ms. Nattaporn Artharn



Position: News Reporter / Program Coordinator
Organization: Thai PBS, TV Station
Topic: Thai Fight Flood and Thai PBS Corporation during 2011 Great Flood
Date & Time: November 7, 2012; 12:00 a.m. – 13:00 a.m.

Summary

In the 2011 great flood, Ms. Nattaporn was one of the volunteer of Thai Fight Flood Volunteer Group, TFF. She was in the data acquisition division, thus she had to clarify the flow line of water current and the flood direction. Since the Bangkok Metropolitan Administration (BMA) had been inundation approached, the TFF then moved the operation base to Ratcha Buri province. The strategy during that period was to stimulate the drainage in canals, especially the canal network in the west side of Tha Chin River. Although, this area had not inundated yet, but there was the anticipation of flood, Therefore, the damage alleviation actions had to be taken.

TFF tried to set up and gather the community network in and around the flood risk areas. The staffs had discussed with the local communities and the volunteer network around there. In the case that there was the possibility to prevent and protect the area from inundation, they would set up the small meeting and/or seminar in order to transfer the knowledge and stimulate the awareness of the communities. Various media would corporate and make a record TV program as well.

The people in and around the flood risk area mainly acquired inundation information from TV, which reported the area that was badly suffered from flood, but not suggest what to do or how to deal with the coming inundation. The citizens who live around the inundation area acquired the information inside, but the people who stayed away from the inundation would get about the severity of the situation, in which sometimes the information was distorted.

The main target area of the TFF was the west side of BMA; i.e. Samut Songkhram, Samut Sakhon, Nakhon Pathom and the areas along the Tha Chin River. Most of the area is the farmland, which other people did not pay attention and thought that it would be inundated sooner or later. Thus, what TFF had done is finding information related with inland canals and educating the local communities about the inundation situation. Besides, in the respondent's opinion, she was worried that Rama II Bridge would be affected by the flood. Thus, she and TFF spent attempting to protect it from flood current.

Thai PBS set up the seminar with the government agencies and local communities. They proposed the government, the flood protection plan in order to protect the Rama II road. Moreover, Thai PBS also agreed to launch the community seminar. The local people gathered and shared their information and experience. Although the seminar summary was not so clear, but at least it presented the effort of the community in prevent and protect themselves from flood.

Other than the agricultural area, the industrial zone had been expected to be inundated as well. They have higher potential to drive the prevention and mitigation measures than the farmers. Once, they argued their demand via Ch 3 News Program. They invited the local community to join the discussion. They, they all proposed the mitigation measures that were initiated by community and TFF.

During the great flood, although most of citizen acquired flood information from TV, but some of them felt that the information was distorted and reliable, Thai PBS had tried to convince the public by reporting the truth and fact. They tried not to cause the panic and frighten. They intended to find out the solution for the social. Moreover, they corporated with the local people and motivated them to express their opinion. It made the people aware to take the damage alleviation actions.

Thai PBS obtained inundation information via various sources; the local network, the community, the governmental agency, including researcher and academics. Afterward, Thai PBS implied and reported the easy-to-understand information, with maps and figures, to the community.

Respondent: Ms. Aruchita Uttamaphokin

Position: News Reporter / Program Coordinator
Organization: Thai PBS, TV Station
Topic:
Date & Time: November 7, 2012: 13:00 p.m. – 14:00 p.m.

Summary

Thai PBS is the media that presents various programs through TV, online radio, website and sometimes also launch the seminar on special issues such as the inundation situation in several areas.

Due to the water crisis situation in 2011, Thai PBS gave the chance of help request and the participation in inundation information sharing by flood victims. It had established the call center at the Station base before the inundation occurred. The call center had been operated with the assist from volunteers and 10-permanent officers, via 20 phone lines, 24-hour a day. It gave the information about the fact and real time information, the prediction and forecast by the academics and related government agencies. Then, suggested how to deal and how to live during the crisis.

Most of the people were curious about when the flood would approach, the location of help desk center, the immigration camps, etc. In the case that the call center had no detail, it would be the media of request sending to the related agency.

Before the inundation approached, there was the flood risk area evaluation. Then the News reporter would go there, beware and report the situation information. Sometimes the news reporter network in and around the area would take action, instead of the staff from the base. Afterward, it would let the specialist, such as Dr. Seree Suphagratid, Dr.Arnon Sanitwong Na Ayutthaya, analyze the information and suggest the advantage measures to the citizen.

The information that media needed before the approaching of flood were the flood factors such as storm, which affect the rainfall and runoff. The specialist would give the information to the News reporter, and then it would be transferred to the Flood forecast expert.

When the inundation had been occurring, Thai PBS cancelled the usual program, but presented the inundation reports instead, for about 3 months. However, during the flood period, the data that was needed, but had not gotten, was the updated situation information from the government such as the water depth, the action of the citizen who never experienced the flood. But, the warning and damage alleviation actions were suggested by other private sectors, NGO, local agencies, not the central government.

During the inundation period, Thai PBS acquired the information from the news reporters, local news reporters, both the station's staffs and the volunteers, the academics staffs and the specialists. In addition, they also searched the information via official website of related agencies such as TMD, RID, Disaster Prevention Institute. It sometimes called that agency

for the information confirmation as well. Moreover, there was the volunteer named Thai Flood.com supported the information of help request from inundation areas. Then Thai PBS would take actions by corporation with the rescue team.

The respondent expressed her opinion that although the information from the government was inadequate, but with the supports from private sectors and the community network, it was sufficient in taking action. The information that should be distributed is the information that support the life living and evacuation, including the rescue channel.

The interviewee summarized the causes of inundation as:
1. released water at the water gates, and
2. flowing current at the broken water gates or sluice gates.

If the media could reach the area and inform the communities in time, the damage would be controllable. However, the problem was the media staffs acquired the information so late and could not give any warning.

She thought that the inundation in Thailand seems not so terrible compare with other countries, but the tremendous damage was due to the inexperience of citizens in dealing with great flood. Besides, the citizen had no confident in government action, thus they attempted to protect themselves such as temporary barrier construction. Eventually, the temporary barrier caused the problem of inundation level increasing and the unusual flowing of current through the area that had never been inundated.

Ms. Aruchita mentioned about the problems that were happened during inundation period are the electrical short-circuit, which caused death, and the food and water preparation. These 2 issues should be informed to the citizen. Besides, she found difficulties when she tried to convince those affected to evacuate while they still were worried about their properties.

Eventually, she suggested that the government should prepare sufficient useful information for the citizen, in order to take damage alleviation actions, including the proper water resources management plan. The local community will then be able to handle whatever happens.

Respondent: Ms. Anunta Intra-aksorn

Position: Volunteer / Coordinator
Organization: Thai Fight Flood, Social Network
Topic:
Date & Time: November 9, 2012; 13:00 p.m. – 14:00 p.m.

Summary

Ms. Anunta is the volunteer in Thai flight Flood group. In the 2011great flood, she took the responsibility in information distribution in the form of infographic, which was easy to understand through Facebook and Twitter. She said that Facebook is the convenient channel to communicate and distribute the useful information because it is easy to be accessed and updated even in the field or in the inundated area. However, the information receivers should keep consider about the reliability of the source of information. If there is anyone distributes the distorted information, it would cause the confusion and panic.

During the crisis, the volunteer staffs would gather data related with water level, inundation situation and help needs of the flood victims. Moreover, the team also acquired the inundation data from other volunteers who made a survey by helicopter and reported the hi-view inundation scenes every morning, with the assist from specialist such as Dr. Royol Chitradon in data analysis. This information would then be sent to the responsible agencies, media, Thai PBS and other TV stations, including the social media such as Thai Fight Flood and Ru Su Flood Facebook.

The contents in Facebook during the flood period were the real situation from both government agencies and private sectors, including specialist such as Prof. Sasin Chalermlap. In addition, the prevention and mitigation measures were also suggested, with the warning and alarm announcement. However, after the inundation approached, some of the flood victims did not want to evacuate. Therefore, the volunteer group sent the useful information to Thai Graphic Designer Association (ThaiGA). Then the ThaiGA simplified the data and transformed into Inforgraphic, which was easier to understand, then distributed via social media and TV.

She found more problems after she realized that the government authorizes did not give the information of actual situation. They always said that they can handle the flood, without early warning or evacuation announcement. She thought that it caused the delay of citizens in taking any damage alleviation actions. She also mentioned that one of the most important things is the information monitoring system. The news receivers should verify the information acquired from TV, which is the secondary data and could be distorted.

Finally, the evacuation decision making of the flood victims are depends on the information they get, the warning from the government authority and the reliability of the government agencies. The reliable warning and evacuation alarm would alleviate the damage.

Respondent: Ms. Wilawan Boonchan

Position: Communication Advisor, Program Coordinator
Organization: Thai Fight Flood, Social Network, Thai PBS
Topic: Sharing Information
Date & Time: November 9, 2012; 14:30 p.m. – 17:00 p.m.

Ms. Wilawan is a volunteer who has experience of the tsunami relief volunteer in 2004. With a special expertise in communications, she volunteered to help Thai Fight Flood (TFF) as communication consultant. She took responsibility for content simplifying from technical section of TFF and publicized to target citizen.

"Because technical information is hard to understand, so, its need to simplify and convert to any kind of media formats such as infographic, poster, leaflets and others. It's also broadcast to public with television, radio, online media and various ways that we could" Ms. Wilawan said. The technical information that we received was separated for 3 kinds of use; first is the flood forecast which use before flood to warn people in risk area and inform necessary information for preparation, second is the necessary information between flood such as do and don't, dangerous animals, evacuation information and hotline help center, third is after flood i.e. how to clean house after flood.

Source of information were came from volunteer, support organization, media, local network and also from government agencies. There's also rapid unit survey team that sent to flood area to build network, gather information. During operation, survey team found canals that have potential to drain flood to sea and sent this information to related agency, also found serious problem of pomelo's farmer so TFF coordinated with Kasertsart University to help on this issue.

Ms. Wilawan said "The most important information that must be share to people is real information on flood situation. If people do not know real information, people could panic or inactive to prepare themselves." And because of Government cannot provide necessary information to public, so there's volunteer named "Ru Su Flood" made and shared animation about flood's information through social media and later on television.

Even if, Government provide sandbags for people, but they did not provide instructions of use, so there are few people can protect their home with sandbags. Moreover, sandbags are dumped into ditch after flood because people did not know how to abandon its.

Ms. Wilawan also said about Bigbag "It wasn't success because it was too slow to build defensive line with Bigbag and this made more problem than solution. People on the other side of Bigbag was distressed and no one can help them, then they came out to destroy Bigbag"

In her opinion, 2011 flood caused by the inefficient water management of water, low maintenance on ditch, canals and drainage system and Storm surge.

Respondent: Mr. Klit Janepanichayakarn

Position: News Reporter of Sky Report
Organization: Ch3, TV station
Topic: Helicopter News Report
Date & Time: November 12, 2012: 11:30 a.m. – 12:30 a.m.

Summary

Sky News report is appropriate for the incident reports such as real-time traffic condition report and/or there is special occurrence such as drugs transferred, unlawful subjects' transportation, including the natural disaster such as great flood in 2011. The scene recorded on the helicopter covers wide range, thus the News receiver can see the whole picture of the situation clearer. Then, they could understand on what happening and make the right decision.

Chanel 3 has rent 2 helicopters for 3 bases; in Bangkok, Chiang Mai and Phuket. If the Chanel gets special incident information, it will make decision for the helicopter operation and let the Sky Report prepare for 1.5 to 2 hours. During the operation hours, sometimes Sky Report invites the related agencies such as RID authority, the minister, etc., to attend the reports together. However, most of the reported News on TV is not the real-time scene, but it is the edited one.

Normally, the sources of the News are internet, social network, Ch 3 station News Team, Government News Reporter, with the sources in provinces or local agencies, the community leaders, etc. In the cast that the acquired information is not enough, the staffs would call the government authority directly.

During the 2011 great flood, Sky News got information from internet, social network, local communities, government News Center, RID authority, Natural Disaster Warning Center, etc. After the government established the flood victim help desk center, Ch 3 sent the News staffs to be there and 24-hour report. Besides, during the inundation period, Sky Reports got the special approval from Department of Civil Aviation, thus the tam can take action rapidly.

In the live report, they integrated all information from all sources, while in the special report; they reported News from Government Center. Sometimes, they also invited the specialist, such as Dr. Royol Chitradon, RID authority, to analyze and imply the data.

From Mr. Klit's point of view, if there is disaster or special incident in the future, there will not be any problem since there are various sources of information. Besides, if there is good examination of natural warning such as flash flood, landslide, storms, corporate with systematic water resources management, the great flood, like 2011 inundation, would not happen again.

Respondent: Mr. Anuwat Fuengthongdaeng

Position: News Reporter
Organization: Ch7, TV station
Topic: Problems of Information Distribution and 2011 Inundation Facts
Date & Time: November 29, 2012: 16:00 p.m. – 17:00 p.m.

Summary

According to confusion before, during and after the inundation in 2011, Mr. Anuwat summarized the problems of Information distribution as follows:-

- Before the inundation occurred, Thai people acknowledged that there were several storms across the country; however they did not get the information related with Dams operation. The government did not give the data of water contained in the dams and the flow downstream. It coursed the curious of about the flow direction, what to do and whether they be affected or not.
- Since the inundation occurred in various areas along the Chao Phraya river, the government had established the flood victim help desk center, there was the problem of information distortion. The distributed information from the researchers, specialists, Help desk authority and Dr. Plodprasop Surassawadee, as the vice chairman of the Help desk center and the Ministry of Science and Technology, were different. The data was so scattered and rather hard for the public to understand. Besides, sometimes the announced information from Dr. Plodprasop was not related with the facts in the inundation area.
- It was hard for the people to acquire the information since the government tried to conceal the truth such as the water depth in some area was about one meter, but the government announced that the situation was controllable. After the media came to that area, it was found that the inundation was rather bad.
- The government biased in the prevention and mitigation such as the case of Uthai Thani province. Uthai Thani had been inundated for a week, but no one acknowledged till the media entered the area and reported the situation. After the government paid attention on Ayutthaya province and BMA, they just gave the assist to the victims in Uthai Thani.
- The government seemed not so professional in information distribution. It was difficult to acquire and such an academic data, which is hard to understand. Thus, the people felt easier to acquire the information on TV and other media.
- The government caused the panic among people since they had the order to block flowing water in all area. The people were frightened and confused. Besides, the government authorities who were in charge seemed have no expertise in water management. It caused the inundation level higher than the normal food that had been occurred in this area in previous years.
- The government did not give the truth about flow, direction, water depth, thus when the inundation reached any area, the local community was not ready to handle the situation. Besides, in some area, the temporary measures were not effective.
- The government had an order to construct the temporary clay dyke urgently, in which some provincial authorities did not concerned about the strength of the dyke. It could not tolerate the current and water pressure.

- ❖ The people had complained the government due to the flood prevention and management as listed:-
  - The government's distributed information was not correct and not related with what happened in the inundation area.
  - The government distorted the information, in which caused the confusion and panic.
  - The government did not give warning and alarm / or announced in the urgent condition, so the people had no time to take the damage alleviation action.
  - The mitigation measures were not effective and help was not enough,
  - The related government authority could not give the information of about the inundation period and the time of water level decreasing.
  - The government did have any expertise in dealing with the inundation since they established Don Muang Airport as the Help Desk Center. Besides, they announced that Don Muang was the safe place and allowed for car parking. After a while, the flood water approached Don Muang, the Help Desk Center was then moved to the Energy Complex building, which is about 14-km far from Don Muang Airport. Later again that the flood water reached the Energy Complex building. Thus, the authority constructed the temporary elevated road through the building, instead of moving the Help Desk Center again.

He specified the areas that Ch 7 made a survey and reported the fact of inundation situation, in which the areas are in Pichit, Nakhon Sawan, Sukhothai, Pitsanulok provinces. First of all, the target areas were designated and zoned. Then each team would make a survey along the waterway. Sometimes they interviewed the community leaders about the inundation understanding, the flow route and the action plan. Then they integrated all information from all teams and analyzed.

The problems found after the inundation was the garbage management. The flood victims did not know how to do, and then they just left the damaged household along the road or somewhere in the community.

In addition, Mr. Anuwat gave information that during the inundation period, the people acquired reliable information via social network such as Facebook, chat applications or messaging applications (i.e. Line), which were the channels that various media distributed inundation information. Besides, various private agencies and government authorities had prepared the useful application, in order to educate the people and distribute advantage information.

Respondent: Ms. Chada Somboonphol

Position: News Reporter
Organization: Ch7, TV station
Topic: Inundation Information Report
Date & Time: November 29, 2012: 14:00 p.m. – 15:00 p.m.

Summary

Ms. Chada, the news reporter of Ch 7 TV station, mentioned that during the inundation period, she and other Ch 7 staffs were standby at critical points such as Flood Relief Operation Center (FROC), rescue centers, evacuation camps, and the provincial offices of inundation area. The station acquired data and information from various government agencies such as RID, TMD, FROC, etc. However, sometimes this information was not in the same way due to information distorted, thus it caused the confusion and panic for the citizen. Therefore, the News reporters had to verify the information with other volunteers, private help desk centers, including the flood victims in the inundated area.

The information that distributed via Ch 7 TV were the inundation situation, the direction of flow, where it came from and where it would go, the inundation depth, including the evacuation sites of each area. However, she was the difficulty in information distribution as the data acquired from the government agencies were technical data which is hard to understand. The news reporters and/or news receivers had to imply and interpret. Otherwise, the people would not understand and would not give any attention to the warning.

In addition, Ms. Chada specified the information that media should present to the people are data and related information about forecast and warning system. Thai citizen seems not realize the importance and necessity of disaster warning and alarm. Not only they do not believe in the warning, in which the reliability problem, they has not prepare anything and not be ready for situation handling as well. When the disaster occurs, they people panic and do not know what they should do in order to prevent and alleviated the damage. It would cause the tremendous damage to life and properties.

Respondent: Ms. Pracha-on Prayadsap

Position: News Reporter
Organization: Ch7, TV station
Topic:
Date & Time: November 29, 2012: 15:00 p.m. – 16:00 p.m.

Summary

Ms. Pracha-on, the news reporter of Ch 7 TV station mentioned that the distributed information before the inundation occurred was the rainfall-runoff data, the water released from the dams, storms, flow direction and the area that has the possibility to be inundated. When the flood water approached, the media reported the water situation such as the water depth, the forecasted inundation length, the time till dry, etc.

In the inundation period, the media acquired information from various government agencies, related website, flood victims authorities, including local communities. However, there was confusion in information. In some area, the government authority announced the warning and evacuation alarm, but it was not inundated meanwhile in some area which the government did not designate as the floodway, but it was inundated in later stage. It caused damage for the victims who relied on the information released from the government.

Ms. Pracha-on suggested the government to acknowledge the people how to prevent, prepare, and handle whatever happens due to the disaster, in sequence, with used of flow data. For example, with each number of flow, how the responsible agencies divert the flow, how much and where the amount of water that should be retained, how to drain to the river mouth and the sea. Additional, the government should prepared and inform the people about the travel time of flow, the forecast result from the model, the mitigation measures in case of excess water, the possible damage. Moreover, the people should be suggested how to live under the disaster situation as well.

5.5 Flood Defense Organization Interview

In Thailand, there are various organizations and government agencies who take the responsibility on Water Resources management and disaster prevention and mitigation. However, due to the numbers of them, sometimes, there is the confusion about the command order, including the political conflicts between the local, regional and nation authorizes.

It is interesting to know how the flood defense organizations were corporate, how they dealt with the conflicts among related agencies and people, how they communicated, or how they prioritized damage alleviation actions, etc.

This study interviewed with representatives from various flood organizations as listed in *Table 4*. The summaries are as follows:-

Respondent: Dr. Nat Majang

Position: Supporting staff of the flooding expert and strategic advisor from Netherland, working group for FROC
Organization: FROC, Government of Thailand
Topic: Mathematical Model on Flood Forecast
Date & Time: November 7, 2012; 15:00 p.m. – 16:00 p.m.

Summary

Dr. Nat Marjang is an academic staff of Department of Water Resource Engineering at Kasetsart University, who was working closely with Mr. Adri Verwey, a Dutch flooding expert and strategic advisor in hydraulic engineering at Deltares, during the Thailand's great flood of 2011. Mr. Adri Verwey was sent by the government of the Netherlands to assist the Thai government to work in cooperation with the Flood Relief Operation Center, FROC. By using Deltares simulation model SOBEK, simulation data of the speed at which the water would approach Bangkok and the extent to which it would rise were given then advised to FROC as to what measures should be taken.

During the interview, Dr. Nat explained the simulation results and the forecast obtained that for worst case scenario for Bangkok the "extensive areas" of the capital could be submerged under more than 1-m of water, if dykes are breached in many areas. However, it was claimed that the model could realistically simulate the flood behavior. The input data needed included amount of water in/out at each pumping stations, regulators, as well as sandbags, all barriers, rails, roads, dykes, etc. Simulation had been updated as much as possible to be as real-time as possible since October24, 2011 during the flood period.

Nowadays, the Flood Relief Operation Center (FROC) had been changed to a Single-Command Authority, the National Water Policy and Flood Committee (NWPFC).

Respondent: Dr. Surajate Boonya-aroonnet

Position: Head of Hydro Modeling Section
Organization: Hydro and Agro Informatics Institute (HAII),
Topic: The Responsibility of HAII during 2011 Inundation
Date & Time: November 8, 2012; 08:00 a.m. – 09:00 a.m.

Summary

Dr. Surajate as the head of Hydro Modeling Section of Hydro and Agro Informatics Institute (HAII) briefly introduced that HAII is a public organization under the Ministry of Science and Technology with the main responsibilities in developing and applying science and technology to support better agricultural and water resources management. The main duties of the institute are:-

- data gathering and integrating into one database which is 24-hour available for any purpose of use, and
- developing flood forecasting model and scenarios, with use of integrated data, for the decision maker.

For the 2011 inundation, the missions that HAII took the responsibilities were:-

- scanning the water depth in canals by using Eco-sounder, which is the process used to detect the shallow of the channel and indicate the location for Army for the evacuation purpose.
- providing the information related with inundation situation, inundation depth, water level and the weather forecast for FROC and the public,
- field surveying by using UAV (Unman-Aviator), small plane with camera, flew over the inundation area, in order to monitor the dyke (Bigbag barrier line) and then uploaded the video to youtube.com.

However, Dr. Surajate mentioned that other than the information HAII provided, he found the difficulty in making communication with public since they are the researcher and technical specialist. It is rather hard for HAII to make public understand the scientific number. They needed someone to interpret and simplify the data to the citizen.

In the future, HAII plans to increase the reliability of the data by faulting tolerance system and have data quality control, increase 7-days forecast to seasonal forecast, in which this information is useful for the dam operation and agricultural planning. In addition, HAII will increase the speed of calculation rate and the accuracy of weather forecast model and develop the data collection plane to be able to fly longer (from 7 minutes to 1 hour) and improve the photogrammetry system which can merge to the map.

Respondent: Dr. Chukiat Sappaisan

Position: Advisory committee of Governmental Flood Prevention & Mitigation Organization
Organization: Government of Thailand
Topic: Non-structural measures on water and flood management of Thailand during the great flood 2011
Date & Time: November 9, 2012: 16:30 p.m.-18:00 p.m.

Summary

Previously before 2011, Dr. Chukiat was one of the advisory committee in handling the water resources and flood management, especially during many crises of big flood in Thailand, e.g. years 1995, 1996, 2002 and 2006. At that time, all of the information came from the single source – the Royal Irrigation Department – causing no confusion and the implementation of the counterparts and reliefs were set clear. The working groups would be consisting of many agencies and specialists in various fields, Office of the Royal Development Projects Boards together with The Crown Property Bureau and the Privy Council held the meeting with all parties involved such as RID, DWR, Army, BMA, etc. After that, the information would be released to the public updated every day as for the public understanding and support.

For the 2011 Great Flood, the situation was different; there were many inconsistencies in the released information and from many sources, causing confusion and panic. Moreover, the information was not easy to understand, the messages sent to the communities were not clear, evacuation plans and relief measures were scattered. More confusion was added through the media by many speakers from various fields, worse when some of them were not exactly dealing with flood management in their professional. Delay response and mislead information often caused doubt, scare and anger in the society especially when there were floods coming to their living areas.

The Professor mentioned that there were two types of flood, i.e. natural flood disaster and social flood disaster. These two have to be clearly understood and dealt in an appropriate approach.

Further mentioned, for comprehensive flood management, only Bhumibol and Sirikit Dams are not sufficient, there must be implementation of monkey cheek and flood plain management together with other available reservoirs. Planning and city zoning is especially crucial for the protection of the center of economic areas. Fair compensation criteria for land owner used for flood control shall be set.

Respondent: Mr. Lamduan Kraisamrit & Ms. Sarah Visetsak

Position: Chief Executive , and Chief Administrator of Koh Rean Subdistrict Administrative Organization, SAO
Organization: Koh Rean SAO
Topic: Koh Rean SAO Actions during the 2011 Great Flood
Date & Time: November 13, 2012: 11:00 a.m. – 12:30 p.m.

Summary

Koh Rean Subdistrict Administrative Organization, SAO, has responsibility on 3 sub-districts which including;

- Koh Rean (Connected to Chao Phraya River)
- Bann Lun (Connected to Chao Phraya River)
- Klong Suan Plu (Near City Hall)

Around October 2011, flood was coverage on Bann Lun, water level increasing 5-10 cm. per day. After water had been released from Bhumibol and Pasak dams, together with the breach of Bang Chomsri sluice gate, flood came from Rojjana Industrial Estate and City hall to all area of the SAO. The water level rapidly increased 40-50 cm. per day.

Due to The SAO's area is flooding area every year, so. SAO decided to distribute boat to their citizen (1 boat 1 house). There are 5-600 boats gave to citizen and they will return when the flood gone. In addition, the governor made an order to build dirt barrier but use SAO's budget. Thus, there is dirt barrier on route 3477 to prevent flood from Chao Phraya River and maintain road for transportation and supplied route.

Before the flood water approached, the provincial administration and irrigation office launched the meeting and announced warning 2-3 days in advance, however, citizen did not believe. Since then, the SAO announced warning again to the local leaders by phone and broadcast tower in all 14 villages.

When the inundation occurred, on the first stage, citizen requested help from SAO. There was the evacuation to the temple on high ground and the vehicles were moved to the bridge. The SAO bought food supplies. On later stage, the SAO's budget ran out, therefore, SAO sent boat to request supplies from City hall.

During the inundation period, the SAO installed water level measurement at the Chao Phraya River and reported water level data to the district every day at 8.00 a.m. Besides, the SAO acquired the inundation information from internet, RID and TMD and announced the useful information through SAO's website, in which the information was including water level, released water from Pasak and Chao Phraya Dams. Nevertheless, the SAO's officers had less information checking on internet because all officers and staff gone for field operation.

However, other than the acquired information, the SAO needed flood information of upper neighbor area; i.e. water level of Chainat, Sing Buri and Ang Thong, including the problem occurred around the affecting area since during the 2011 flood, the SAO got inform from TV that Bang Chomsri sluice gate breached but there was no official warning from the Government.

The SAO's representatives mentioned that during the confused period in flood, the citizen got information from media such as TV and radio. Most of flood victims did not leave their homes but they needed food and water supply. There were 2 deaths from faint and failed to water. By the way, the SEO has yearly emergency drill for the leader of community i.e. firing drill; however flooding drill is only theoretical seminar.

From the flood experienced, citizen rise up their houses and roads. They seem more aware and active about flood. However, the SAO's officers described that in 2012, the water management is bad since too much water was drained due to the Government's policy. It caused drought accordingly.

Respondent: Mr.Anupab Phusilpa & Mr.Sirunyavat Ampavanon

Position: Chief Administrator and Assistant Public Relations staff of Pak Jun Subdistrict Administrative Organization, SAO
Organization: Pak Jun SAO
Topic: Pak Jun SAO Actions during the 2011 Great Flood
Date & Time: November 13, 2012: 09:00 a.m. – 10:30 p.m.

Summary

Pak Jun Sub-district has 6 villages and is in area of Nakhon Luang district. Moo1 and Moo5 areas are connected to Pasak River. These two areas, especially Moo 1, are always inundated in wet season, in which affect approximate 66 households.

Before the occurrence of 2011 great flood, the community received the flood information in August and September from media, the district and provincial administrations via fax or telephone. The information included the warning, but no technical data. Furthermore, they searched more information from the website of Department of Local Administration and other websites. They found the Department's order in advance for preparation. After the order was sent to the local offices, then the operation was begun. The Local agencies also reported the inundation information to the central, and then the central would evaluate and consider to announce warning for each area. However, there was no evacuation warning in Pak Jun SAO.

During the great flood in 2011, the flood coverage all area of the Pak Jun SAO except the SAO's office which is built on the high ground and there is the concrete barrier beside the road, in front of SAO's office. It was initiated by the government and built by Ministry of Interior budget, without the involvement of SAO.

The water depth was 2-3-m and the water stayed about 1 month. It caused damage to communities, agriculture, and infrastructure. The road was cut by flood, thus the transportation was not so convenient since the people needed large truck. The sheriff ordered to install the water level stick at the river and set up the easy-to–understand method of warning, i.e. if the water level increases and reaches the critical level, the warning would be announced via broadcast tower and make local community be aware.

The representatives suggested that, from experienced of the great flood, the information that citizen need is the correct information of released water from the dams, the consequent water level along the line of flow, and the travel time of current. The information should be presented in figures, graphs and tables, thus it will be understandable. In addition, if there is the water forecast in advance, the infographic would be easier to imply since the digit information is hard to understand. For small communities, the water situation should be forecasted and distribute at least 3 days in advance for preparations.

Respondent: Mr. Supapap Patsinghasanee

Position: Government officer, Supporing Staff of the Single-Command Center
Organization: the Single-Command Center, GOT
Topic: Inundation Information Supporting, during the 2011 Great Flood
Date & Time: November 8, 2012; 14:30 p.m. – 15:30 p.m.

Summary

Mr. Supapop is the governmental official, who was working at the Single-Command Center directly chaired by the Prime minister. Only this agency had an authority to issue warning, in order to avoid confusion and panic.

First he briefly mentioned about the timeline of the 2011 Flood that the first storm had hit Thailand in around June 2011 then by October 2011, huge amount of water mass had reached the central part of Thailand. By the time of the crisis, the Center had to support data and information to the Government and policy makers, in terms of:-

- weather data
- rainfall information
- water level along the major river
- water volume in dams
- tidal water level

All information had to be in easy-to-read-and-understand format. His working team also had to support in preparation of the information to be released to the public, which had to serve what people would like to know, such as

- where and when water was coming
- how deep
- how long
- how much compensation would be given

All of the data must be updated in real time and daily. Steps of working were that the information from many agencies, e.g. Royal Irrigation Department (RID) and Department of Water Resources (DWR) would be supplied to the Hydro and Agro Informatics Institute (HAII), a public organization under the Ministry of Science and Technology having Dr. Royol Chitradon as its Director. HAII then has applied mathematical model in an operational level such as computing water basin, water flow speed, and flooding scale on the river bank. Information would later pass to the Single-Command Center and will be broadcasted to the public in a more simple and easy to understand messages.

Respondent: Dr. Wattana Kanbua

Position: Meteorologist and Director of Marine Meteorological Center
Organization: Thai Meteorological Department, TMD
Topic: TMD Responsibility
Date & Time: November 29, 2012; 09:00 a.m. – 11:00 a.m.

Summary

Dr. Wattana is the meteorologist and, currently, the director of Marine Meteorological Center. This institute has various services as follows:-

- Marine meteorological support
  - to the safety of life at sea,
  - to the safety of shipping and other activities at sea, and
  - to coastal activities
- Ship – meteorological service
  - establishment of ship-meteorological stations,
  - education of ship-observers, making of instructions and accessories,
  - control of ship-meteorological instruments.
- Sea climate
  - climatic data, weather certificates and surveys,
  - climatic analyses, studies and projects,
  - expert analysis.
- Marine meteorological forecasts and warnings
  - marine meteorological bulletins and warnings for ocean-going ships and great coastal trade,
  - marine meteorological bulletins and warnings for coastal trade,
  - marine meteorological bulletins and warnings for anchoring and ports,
  - weather surveys,
  - meteorological consultations,
  - meteorological services for maritime search and rescue,
  - special meteorological information for marinas, shipyards, marine constructions, cargo handling, towing and transportation of special cargo, marine works, exploration and exploitation of sea and seabed, roads, salt works, electric power industry, support to military activities, etc.;

Other than the information of causes of 2011 inundation, in which are 5 storms across north of Thailand and the water resources management problem, Dr. Wattana assigned one of the experts to present the WRF model as well. It is the rainfall-runoff mathematical model, which is the corporate between TMD and Faculty of Engineering, Kasetsart University. The application is for forecasting the rainfall by the use of GISTDA data, DEM data from Japan, with the concerning of climate change.

Respondent: Mr. Uklit Thawornkraikul

Position: Lopburi Regional Project Leader
Organization: Royal Irrigation Department, Regional Division
Topic:
Date & Time: November 13, 2012; 13:30 p.m. – 17:00 a.m.

Summary

Mr. Uklit, as the Project leader of Lopburi RID regional office, presented the problem and mitigation measures under the responsibility of RID regional office, as the presentation document shown in *F*.

He described the causes of inundation as runoff from the upstream, the rainfall runoff within the area, flood in Pasak floodplain area and Chai Nat-Pasak canal and tidal effect. Besides, in 2011, there were 5 storms, which are Haima, Nock-ten, Haithang, Nesad and Nalkae, passes across Thailand and caused heavy rain in the north and northeast of Thailand. The flow during July to September 2011, of the Chao Phraya River at Nakhonsawan measuring station and downstream of Chao Phraya Dam were higher than the previous years.

He presented the inundation map of the left side of the Chai Nat-Pasak canal due to the heavy rain during September 8-10, 2011, with 11 locations of breached barrier. The damages brought the priority projects that have to be done, in order to prevent the inundation, in 2012. Most of the projects are the improvement of the existing irrigation channels, the water gates, the dykes, etc., in Chai Nat, Lopburi, Sara Buri, Sing Buri and Ayutthaya.

Then, he mentioned about the management processes that could be mitigate the inundation affect such as the process of inundation area designation with the compensation measures. He also showed the comparison of flow at various measuring stations along the Chao Phraya River, between and after increasing of retention areas. He, then, summarized that by these mitigation measures, the inundation problem in the Chao Phraya River Basin would be relief.

Respondent: Mr. Suna Konboon

Position: Government Officer
Organization: Office of Disaster Prevention and Mitigation: Saraburi Province
Topic: Provincial OPDM action on Inundation
Date & Time: November 28, 2012; 12:30 p.m.–13:00 p.m.

Summary

Sara Buri Province was inundated on 13 districts. During the inundation period, the Office of Disaster Prevention and Mitigation, which is the provincial level agency, took the responsibility on 2 kinds of job; i.e.

1. Protecting strategic areas of province such as hospital, government agency building, and evacuation point, etc. by constructing the barrier and operating water pumps, and
2. Helping and relieving flood victims, surveying and providing relief by using provincial budget.

The office also assisted the Governor as a secretary, controlled, managed and commanded manpower and resources under provincial administration's authorities. The special administration center was set up to coordinate many working divisions both government agencies and volunteer. The area was separated for district responsibility and main working team (manpower) from Civil Defense Volunteer and Local Foundation.

Additionally, the office also provided the simplified inundation information for citizen through the broadcast tower and local leaders. They realized that media had an important role in communication, thus they, by the governor, informed the inundation situation and News through radio every morning. Although internet channel or social network is the widespread communication method, but less local citizen searched information via internet. Besides, it took time for inputting data; therefore, the officer did not pay intention on internet so much. However, in crisis situation such as close Paholyothin road, there was a live broadcast on cable television to inform and maintain citizen's confident.

The officer mentioned that during the inundation period, the useful information that should inform the citizen was the facts of situation, compensation right after flood, and, the most important one in the respondent' s opinion, the current inundation situation. Sara Buri's administration acquired information from various agencies such as RID, TMD, including the provincial irrigation agency who gave latest information in daily meeting during flood in the morning. Chain of local government command came from provincial administrator through the district, sub-district and village.

After the 2011 great flood, citizens have been more active and well-informed in 2012. The most wanted information was where the flooding area is, how deep the water during the flood was and when the flood goes down. The officer said that during the crisis, the distribution of clear and understandable information is so important.

Respondent: Mr. Noppadol Kamnungnate

Position: Government Officer
Organization: Office of Disaster Prevention and Mitigation: Sing Buri Province
Topic: Provincial OPDM action on Inundation
Date & Time: November 28, 2012: 12:30 – 13:00 p.m.

Summary

Cause of flood in Sing Buri did not come from rain, but came from level of water released from Chao Phraya Dam. If the dam releases water more than 1,800 cubic meters per second, there will be flood situation at Intburi district. If the dam releases water around 2,000 cubic meters per second, there will be flood situation at Promburi district. And if the dam releases water more than 2,000 cubic meters per second, there will be flood situation at Muang district. All 3 districts are connected with Chao Phraya River.

In the 2011 great flood, the water was released continually from the dam and the barrier cannot prevent when water passed under barrier. However, the damage of Bang Chomsri sluice gate at Intburi reduced around 500 cubic meters per second of water downstream which relieve flood effect in Sing Buri. However, Sing Buri set up the emergency flood center in every local level (province, district and sub-district) to analyze the situation and command follow the level of responsibility.

During the inundation period, the Office of Disaster Prevention and Mitigation had 2 main duties, which were;-

- Providing the help, materials, manpower and equipment to local administration, and,
- Providing food, water and medical supply to the local administration.

Moreover, the Office of Disaster Prevention and Mitigation also assisted to the Governor as a secretary and also managed 50 million baht reserved budget on flooding situation

Sine, flooding situation in Sing Buri is up to the amount of water in the Chao Phraya River, therefore, the flood situation can be estimated from water level upper the dam and released water level. When water was released, provincial administrator would announce warning to the citizen in flood risk area for evacuation and preparation. From statistic and flooding experienced in the past, Sing Buri's administration can analyze, evaluate and announce warning flood situation to the local communities under their responsibility (districts and sub-districts) to inform citizen.

During these days, the provincial administration has received water data from RID and TMD through website and acquired the water level and water released data from Irrigation Office area 12 Chao Phraya Dam to analyze and announce warning. Moreover, the information from "Water for Thai" website of Office of the National Water and Flood Management is also

considered and implied too. After the provincial administration received data from all agencies, they set up a daily meeting in the morning and analyze data before announce warning to the citizen, in which internet is one of the most rapid channels, and send the information to other government agencies in Sing Buri as well. The information that the provincial administration distributed to the citizen were:-

- warning depth of flood, and
- quantity of water released from the dam.

There were three kinds of help requested in Sing Buri, which were;

- before flood: requested the construction of barrier and water pump,
- during flood: requested for food, water and medical supply,
- when the flood still and starting decay, requested for water treatment and pump wastewater out of area.

During the inundation period, the citizens did not need any special help, jut the supply and patient evacuation. The victims sent the help request through local leaders; i.e. elder of the village, headman of sub-district, sheriff or requested directly to the provincial administrator. The call center and emergency unit were set up to help and gathered information from citizen. There was less evacuation during flood in Sing Buri because main road still on use. Ones who were affected by the flood decided to move to their nearest relatives.

Normally, Sing Buri confront with the inundation situation during October and November, then the water lower down on December every year. Currently, there are many flood prevention measures. Local administrations use their capabilities to do flood prevention such as dirt barrier, sandbag barrier, etc. In the case that local capability is not enough, province agencies such as local road office or irrigation office would support.

However, the most important information the citizen and the flood victims need to know is the time that the flood water decrease. Therefore, the government and/or the local agency should prepare them the proper answer.

6. Summary

In this study, 5 groups of respondents, which are city residents, farmers, factories, mass media and flood defense organization authorities, from 5 provinces in the Chao Phraya River Basin have been interviewed. The numbers of interviewee are summarized in *Table 8*.

Table 8 Numbers of Respondents of each Category and Surveyed Areas

Respondents Category	Surveyed Area	Numbers of Respondent
City Resident	Ayutthaya	200
	Sing Buri	70
	Ang Thong	92
	Chai Nat	60
	Lopburi	67
Sum		**489**
Farmer	Ayutthaya	180
	Sing Buri	60
	Ang Thong	68
	Chai Nat	60
	Lopburi	63
Sum		**431**
Factory from Industrial Estates	Saharattananakorn	3
	Rojjana	3
	Hi-tech	5
	Bang Pa-In	3
	Nawanakorn	3
	Factory Land	3
	Bangkadi	3
Sum		**23**
Mass Media	Thai Fight Flood (Social Network)	2
	Thai PBS	3
	Ch 7 TV Station	3
	Ch 3 TV Station	1
Sum		**9**
Flood Defense Organization	FROC	3
	HAII	1
	SAO	2
	TMD	1
	DDPM	2
	RID	1
Sum		**10**

The questionnaire results from city residents, farmers and factories interview reveals the problems related with 2011 great flood in various issues. Most of them are about the information acquisition, as it could be summarized in *Table 9.*

Table 9 Questionnaire Results: Problems related with 2011 Inundation

Phase	Respondent	Problem	Needed Information
Before the inundation	City Resident/ Farmer/ Factory	Since the government and the industrial estate authorities did not give information of the actual situation, including the early warning and/or evacuation processes, but tried to convince the people that they can handle the situation, therefore the people:- - did not know what to do because never had inundation experience, - did not alert with the situation because they believed in the government potential and - did not take any damage alleviation action, although acquired the information from government, because they thought the area would not be inundated.	- Water retained in dams - Water released from dam - Water level upstream - Inundation situation of the upstream - Rainfall-runoff upstream - Inundation forecast - Warning and alarm - Evacuation route
During the approaching of inundation	City Resident/ Farmer/ Factory	Due to the problem of "before the inundation", when the current approached the citizen's area, there were the problems as follows:- - did not know what to do, - did not want to evacuate and/or did not know where were the rescue centers or the evacuation camps, etc. - the actions that were done, in order to prevent the damage, were not enough.	- Water level and inundation depth in and around the living area - Forecast of inundation interval and time till dry - Evacuation point - Place where food, drink and medicine are available - Evacuation route

Table 9 Questionnaire Results (Continued)

Phase	Respondent	Problem	Needed Information
After the inundation	City Resident/ Farmer/ Factory	After the inundation, the flood victims presented their problems as follows:- - did not know when the water would dry - did not know where and how to request for the flood compensation, and - compensation from the government was not enough	- Compensation measures from the government

According to the inundation information acquisition, it has been found that the efficient means of information distribution are TV, Social Network, local authority and government agency. In which the information should be presented in figure, table and always available whenever it is needed.

In addition, based on the inundation forecast and warning processes, the related government authority and/or other related agencies should suggest the community clearly “what-when-where-how” to deal with the situation, in order to prevent and mitigate the inundation affect.

However, the most important thing is the Government Policy in Disaster Prevention and Mitigation. The government should honestly inform the truth and fact related with the situation and the disaster that would occur, including the warning and alarm, based on the accurate forecast. Therefore, the citizen can take damage alleviation properly.

Appendix A

Questionnaires in English & Thai

A1.1 Questionnaire to City Resident – English Version

Things to find out
- Information required for the correspondence to a flood
- The time to offer information
- The specific information presentation method

(A) Attribute of respondent

Things to find out
- The difference in the correspondence to the flood according to the respondent's attribute
- Information needs according to the respondent's attribute

A1 Gender

□ male

□ female

A2 The form of your house

□ Single story house

□ Two or more -story building

□ Above the second floor of two or more-story building

A3 Age

□ Less than 20 years old

□ 21-30 years old

□ 31-40 years old

□ 41-50 years old

□ 51-60 years old

□ Over 60 years old

(B) The situation of flood damage

Things to find out
- The precondition corresponding to a flood
- An individual situation about the measures against a flood

B1 How deep was the maximum depth around your house?

□ Around the house was soaked in water

□ Soaked in water under the floor

□ Soaked in water above the floor

□ Soaked in water to the second floor

B2 How long was the time from when your house and around it (area you feel danger) soaked in water to maximum depth?

- □ Less than 2 hours
- □ 2-6 hours
- □ 7-12 hours
- □ more than 12 hours

B3 When did you know that your building or the around your house might be flooded?

- □ One week before inundation
- □ 4-6 days before inundation
- □ 2-3 days before inundation
- □ The days of inundation
- □ When your house inundated

(C) Damage alleviation actions

Things to find out
- How was the action performed according to advance of flood
- The classification of the required information based on the above

C1 Did you take damage alleviation action before inundation?

- □ Yes (> C1.1)
- □ No (didin't do at that time)(> C1.2)

C1.1 What did you do?

- □ Evacuation to safe places
- □ Sandbagging around the house
- □ Moving household items to higher places
- □ Moving cars to higher places
- □ Preparation of Long-term evacuation place
- □ Preparation for living at your house after inundation
- □ Preparation of means of transportation after inundation

(> C.2)

C1.2 Why didn't you do damage alleviation actions?

- □ There is no information and you thought your house wouldn't be inundated
- □ You had information but you didn't know what to do
- □ You had information but you thought you had enough time
- □ You had information but you didn't have enough time

□ You had information but you thought your house would not be inundated (> C1.2.1)

□ You had information but you thought that you would not be affected by inundation(> C1.2.2)

C1.2.1 Why did you think your house would not be inundated?

□ Prediction was not trusted

□ No information about inundate area

□ It has not been inundated (> C.2)

C1.2.2 Why did you think so?

□ You thought that depth of water is shallow

□ Your house has never been damaged by inundation until now

C2 Did you take damage alleviation action when inundation area approached?

□ Yes (> C2.1)

□ No (didn't do at that time) (> C2.2)

C2.1 What did you do?

□ Evacuation to safe places

□ Sandbagging around the house

□ Moving household items to higher places

□ Moving cars to higher places

□ Preparation of Long-term evacuation place

□ Preparation for living at your house after inundation

□ Preparation of means of transportation after inundation

(> C.3)

C2.2 Why didn't you do damage alleviation action?

□ There is no information and you thought your house wouldn't be inundated

□ You had information but you didn't know what to do

□ You had information but you thought you have enough time

□ You had information but you didn't have enough time

□ You had information but you thought your house would not be inundated (>C2.2.1)

□ You had information but you thought that you would not be affected by inundation (>C2.2.2)

C2.2.1 Why didn't you think being inundated?

□ Prediction was not trusted

□ No information about inundate area

□ It has not been inundated (> C.3)

C2.2.2 Why did you think so?

□ You thought that depth of water is shallow

□ You have never suffered from flooding until now

C3 Did you take damage alleviation action after inundation?

□ Yes (> C3.1)

□ No (didn't do at that time)(> C3.2)

C3.1 What did you do?

□ Evacuation to safe places

□ Sandbagging around the house

□ Moving household items to higher places

□ Moving cars to higher places

□ Preparation of Long-term evacuation place

□ Preparation for living at your house after inundation

□ Preparation of means of transportation after inundation

(> D)

C3.2 Why didn't you do damage alleviation actions?

□ There was no effective measure

□ Even if inundated, it was a grade which becomes somehow.

□ There was no time

(D) Acquired information during flood

Things to find out
- Useful information according to damage alleviation actions (by cross-check with reply to question-C)
- Useful information according to advance of flood
- When should we provide information

D1 What kind of information was useful for damage alleviation actions or grasp of flood situation before flood from river?

□ Total rainfall at mountain area in the past

□ Rainfall forecast at mountain area

□ River water level in the past

□ Forecasted river water level

□ Live report of river by media such as TV

□ Warning and alarm released by the public organization (Meteorological dep. or Local gov.)

D2 What kind of information was useful for damage alleviation actions or grasp of flood situation when inundation area approached?

□ Total rainfall at mountain area in the past

□ Rainfall forecast at mountain area

□ River water level in the past

□ Forecasted river water level

□ The place which has overflowed

□ Inundation area

□ Inundation area and water depth

□ Forecasted inundation area

□ Forecasted inundation area and water depth

□ Live report of inundation by media such as TV

□ Warning and alarm released by the public organization (Meteorological dep. or Local gov.)

D3 What kind of information was useful for damage alleviation actions or grasp of flood situation after inundation?

□ Total rainfall at mountain area in the past

□ Rainfall forecast at mountain area

□ River water level in the past

□ Forecasted river water level

□ The place where water of river outflows

□ Inundation area

□ Inundation area and water depth

□ Forecasted inundation area

□ Forecasted inundation area and water depth

□ Forecasted time until the area around your house gets dry

□ Live report of inundation by media such as TV

□ Warning and alarm released by the public organization (Meteorological dep. or Local gov.)

(E) Means of information acquisition and contents of information

Things to find out
- Flood information providing means in Thailand
- Effective providing means according to the type of information

E1 How did you acquire disaster information for damage alleviation actions during 2011 flood? What were the contents of the information?

□ TV

□ Radio

□ News paper

□ Internet

□ SNS(Face book,twitter)

□ Information from region government

□ Local community

Contents of information

1) Total rainfall at mountain area in the past

2) Rainfall forecast at mountain area

3) River water level in the past

4) Forecasted river water level

5) The place from where water of river outflows

6) Inundation area

7) Inundation area and water depth

8) Forecasted inundation area

9) Forecasted inundation area and water depth

10) Forecast about inundation time and maximum depth

11) Forecasted time until water was drained

12) Live report of inundation by media such as TV(Warning and alarm released by the public organization (Meteorological dep. or Local gov.)

E2 What was the most effective means of information acquisition for damage alleviation actions?

□ TV

□ Radio

□ News paper

□ Internet

□ SNS(Face book,twitter)

□ Information from region government

□ Local community

E2.1 What is the reason you think so?

□ Easy to acquire information

□ Amount of information

□ Information is concrete

□ Information is reliable.

□ Familiar information can be acquired

□ Information is easy to understand

(F) Request about information acquisition

Things to find out
- What kind of information was insufficient
- Required information for damage alleviation action

F1 What kind of information did you want other than the acquired information?

□ Total rainfall at mountain area in the past

□ Rainfall forecast at mountain area

□ River water level in the past

□ Forecasted river water level

□ The place from where water of river outflows

□ Inundation area

□ Inundation area and water depth

□ Forecasted inundation area

□ Forecasted inundation area and water depth

□ Forecast about inundation time and maximum depth

□ Forecasted time until water was drained

□ Live report of inundation by media such as TV

□ Warning and alarm released by the public organization (Meteorological dep. or Local gov.)

F2 What is easy-to-use information?

□ Periodical updated information

□ Information that you can acquire when necessary

- □ Intelligible information with figure or table
- □ Information which is explained in the text
- □ Information which is not fragmentary and shows a global image

F3 When do you need information of inundation for effective damage alleviation action?

- □ 7 days before inundation
- □ 4-6 days before inundation
- □ 3-2 days before inundation
- □ 1 day before inundation

(G) Others

G1 The forecast of a inundation area etc. includes the prediction error of a natural phenomenon, and the prediction error of the simulation. So the forecast includes uncertainty. And you should perform action based on a forecast on your responsibility. What do you think about such a forecast?

- □ Wrong action based on the forecast may be taken. So information including uncertainty is unnecessary.
- □ If the limit (width with error) of a predicted value is shown, it will be helpful.
- □ Forecast is helpful even if it includes uncertainty.
- □ The validity of information is separately judged based on the fact. Therefore, it cannot say anything as a generality.
- □ Forecast is helpful if it thinks that it is the same as the alarm and warning which the Meteorological Dep. announces.

A1.2 - Questionnaire to City Resident – Thai Version

สิ่งที่ต้องการ

- ข้อมูลที่เกี่ยวกับน้ำท่วม
- เวลาในการนำเสนอข้อมูลข่าวสาร
- ข้อมูลเฉพาะที่ได้จากการนำเสนอ

(A) คุณลักษณะของผู้ตอบคำถาม

สิ่งที่ต้องการ

- ความแตกต่างของผู้ตอบแบบสอบถามที่เกี่ยวข้องกับอุทกภัยปี 2011
- ความสอดคล้องของข้อมูลที่ต้องการจากคุณลักษณะของผู้ตอบคำถาม

(A1) เพศ

☐ ชาย

☐ หญิง

(A2) รูปแบบของที่พักอาศัย

☐ บ้านเดี่ยว

☐ อาคารสองชั้น

☐ อาคารที่มากกว่าสองชั้น

(A3) อายุ

☐ อายุน้อยกว่า 20 ปี

☐ 21-30 ปี

☐ 31-40 ปี

☐ 41-50 ปี

☐ 51-60 ปี

☐ มากกว่า 60 ปี

(B) สภาพความเสียหายจากน้ำท่วม

(B1) ความลึกน้ำท่วมสูงสุดของบริเวณบ้าน

☐ น้ำท่วมรอบๆบริเวณบ้านเท่านั้น

- ☐ น้ำท่วมสูงไม่เกินชั้นหนึ่งของบ้าน
- ☐ น้ำท่วมสูงกว่าชั้นหนึ่งของบ้าน
- ☐ น้ำท่วมสูงกว่าชั้นสองของบ้าน

(B2) ระยะเวลาที่น้ำท่วมขณะมีความลึกน้ำสูงสุด

- ☐ น้อยกว่า 2 ชั่วโมง
- ☐ 2-6 ชั่วโมง
- ☐ 7-12 ชั่วโมง
- ☐ มากกว่า 12 ชั่วโมง

(B3) คุณทราบว่าบ้าน/ที่พักของคุณอาจจะถูกน้ำท่วมเมื่อไหร่

- ☐ 1 อาทิตย์ก่อนน้ำท่วม
- ☐ 4-6 วันก่อนน้ำท่วม
- ☐ 2-3 วันก่อนน้ำท่วม
- ☐ 1 วันก่อนน้ำท่วม
- ☐ เมื่อน้ำท่วมบ้านแล้ว

(C) การป้องกันความเสียหายจากน้ำท่วม

สิ่งที่ต้องการ

- มีวิธีการป้องกันน้ำท่วมอย่างไร
- การจำแนกข้อมูลจากวิธีป้องกันน้ำท่วมดังกล่าว

(C1) ก่อนน้ำท่วม คุณได้ป้องกันหรือไม่

- ☐ ป้องกัน (> C1.1)
- ☐ ไม่ได้ป้องกัน (> C1.2)

(C1.1) คุณได้ป้องกันอย่างไร

- ☐ อพยพไปอยู่ที่ปลอดภัย
- ☐ ใช้กระสอบทรายป้องกัน
- ☐ ย้ายของมีค่าขึ้นที่สูง
- ☐ ย้ายรถขึ้นที่สูง

☐ เตรียมอพยพในระยะยาว

☐ เตรียมสิ่งของที่จำเป็นเมื่อต้องอาศัยอยู่ในบ้าน

☐ เตรียมยานพาหนะ เช่น เรือ หลังจากต้องอยู่กับสภาพน้ำท่วม (> C.2)

(C1.2) ทำไมคุณถึงไม่ป้องกันความเสียหายที่อาจเกิดขึ้นจากน้ำท่วม

☐ ไม่ทราบข้อมูล และคิดว่าน้ำไม่น่าจะท่วมบ้าน

☐ ทราบข้อมูลแต่ไม่รู้ว่าจะต้องทำอย่างไร

☐ ทราบข้อมูลแต่คิดว่ามีเวลาเตรียมตัวพอ

☐ ทราบข้อมูลแต่ไม่มีเวลาเตรียมตัวพอ

☐ ทราบข้อมูลแต่คิดว่าน้ำไม่น่าจะท่วมบ้าน (> C1.2.1)

☐ ทราบข้อมูลแต่คิดว่าไม่น่าจะได้รับผลกระทบจากน้ำท่วม (> C1.2.2)

(C1.2.1) ทำไมคุณถึงคิดว่าน้ำจะไม่ท่วมบ้าน

☐ การคาดการณ์ไม่น่าเชื่อถือ

☐ ไม่ทราบข้อมูลเกี่ยวกับพื้นที่น้ำท่วม

☐ ไม่เชื่อว่าน้ำจะท่วม (> C.2)

(C1.2.2) ทำไมคุณถึงคิดอย่างนั้น

☐ คิดว่าระดับน้ำท่วมคงไม่สูงมาก

☐ บ้านของคุณไม่เคยถูกน้ำท่วมจนถึงปัจจุบัน

(C2) เมื่อเกิดน้ำท่วม คุณได้ป้องกันน้ำท่วมหรือไม่

☐ ป้องกัน (> C2.1)

☐ ไม่ได้ป้องกัน (> C2.2)

(C2.1) คุณได้ป้องกันอย่างไร

☐ อพยพไปอยู่ที่ปลอดภัย

☐ ใช้กระสอบทรายป้องกัน

☐ ย้ายของมีค่าขึ้นที่สูง

☐ ย้ายรถขึ้นที่สูง

☐ เตรียมอพยพในระยะยาว

☐ เตรียมสิ่งของที่จำเป็นเมื่อต้องอาศัยอยู่ในบ้าน

☐ เตรียมยานพาหนะ เช่น เรือ หลังจากต้องอยู่กับสภาพน้ำท่วม

(> C.3)

(C2.2) ทำไมคุณไม่ป้องกันความเสียหายที่อาจเกิดขึ้นจากน้ำท่วม

☐ ไม่ทราบข้อมูลและคิดว่าน้ำไม่น่าจะท่วมบ้าน

☐ ทราบข้อมูลแต่ไม่รู้ว่าจะต้องทำอย่างไร

☐ ทราบข้อมูลแต่คิดว่ามีเวลาเตียมตัวพอ

☐ ทราบข้อมูลแต่ไม่มีเวลาเตรียมตัวพอ

☐ ทราบข้อมูลแต่คิดว่าน้ำไม่น่าจะท่วมบ้าน (>C2.2.1)

☐ ทราบข้อมูลแต่คิดว่าไม่น่าจะได้รับผลกระทบจากน้ำท่วม (>C2.2.2)

(C2.2.1) ทำไมคุณถึงคิดว่าน้ำจะไม่ท่วมบ้าน

☐ การคาดการณ์ไม่น่าเชื่อถือ

☐ ไม่ทราบข้อมูลเกี่ยวกับพื้นที่น้ำท่วม

☐ ไม่เชื่อว่าน้ำจะท่วม (> C.3)

(C2.2.2) ทำไมคุณถึงคิดอย่างนั้น

☐ คิดว่าระดับน้ำท่วมคงไม่สูงมาก

☐ บ้านของคุณไม่เคยถูกน้ำท่วมจนถึงปัจจุบัน

(C3) หลังจากเกิดน้ำท่วมแล้ว คุณได้ป้องกันน้ำท่วมหรือไม่

☐ ป้องกัน (> C3.1)

☐ ไม่ได้ป้องกัน (> C3.2)

(C3.1) คุณได้ป้องกันอย่างไร

☐ อพยพไปอยู่ที่ปลอดภัย

☐ ใช้กระสอบทรายป้องกัน

☐ ย้ายของมีค่าขึ้นที่สูง

☐ ย้ายรถขึ้นที่สูง

☐ เตรียมอพยพในระยะยาว

☐ เตรียมสิ่งของที่จำเป็นเมื่อต้องอาศัยอยู่ในบ้าน

☐ เตรียมยานพาหนะ เช่น เรือ หลังจากต้องอยู่กับสภาพน้ำท่วม

(> D)

(C3.2) ทำไมคุณไม่ป้องกันความเสียหายที่เกิดขึ้นจากน้ำท่วม

☐ คิดว่าวิธีป้องกันไม่ได้ผล

☐ เมื่อน้ำท่วมแล้ว คิดว่าระดับน้ำจะคงระดับเท่าเดิม

☐ ไม่มีเวลาที่จะป้องกัน

(D) ข้อมูลที่ได้จากช่วงน้ำท่วม

(D1) ชนิดของข้อมูลที่เป็นประโยชน์ในการป้องกัน
และเข้าใจสถานการณ์น้ำท่วม ก่อนเกิดน้ำจะท่วม

☐ ปริมาณฝนที่ตกในบริเวณต้นน้ำที่ผ่านมา

☐ การคาดการณ์ปริมาณฝนล่วงหน้า

☐ ความสูงของระดับน้ำในแม่น้ำที่ผ่านมา

☐ การคาดการณ์ความสูงของระดับน้ำในแม่น้ำ

☐ รายงานสดสถานการณ์น้ำท่วมต่างๆ ผ่านทางสื่อโทรทัศน์

☐ การเตือนภัย และการส่งสัญญาณแจ้งเตือนโดยองค์กรของรัฐ
(กรมอุตุนิยมวิทยา หรือ หน่วยงานท้องถิ่น)

(D2) ชนิดของข้อมูลที่เป็นประโยชน์ในการป้องกัน
และเข้าใจสถานการณ์น้ำท่วม เมื่อน้ำท่วมมาถึง

☐ ปริมาณฝนที่ตกในบริเวณต้นน้ำที่ผ่านมา

☐ การคาดการณ์ปริมาณฝนล่วงหน้า

☐ ความสูงของระดับน้ำในแม่น้ำที่ผ่านมา

☐ การคาดการณ์ความสูงของระดับน้ำในแม่น้ำ

☐ จุดที่น้ำล้นตลิ่ง

☐ พื้นที่น้ำท่วม

☐ พื้นที่น้ำท่วมและความลึกน้ำท่วม

☐ การคาดการณ์พื้นที่น้ำท่วม

- ☐ การคาดการณ์พื้นที่น้ำท่วมและความลึกน้ำท่วม
- ☐ รายงานสดสถานการณ์น้ำท่วมต่างๆ ผ่านทางสื่อโทรทัศน์
- ☐ การเตือนภัย และการส่งสัญญาณแจ้งเตือนโดยองค์กรของรัฐ (กรมอุตุนิยมวิทยา หรือ หน่วยงานท้องถิ่น)

(D3) ชนิดของข้อมูลที่เป็นประโยชน์ในการป้องกันและเข้าใจสถานการณ์น้ำท่วม หลังเกิดน้ำท่วม

- ☐ ปริมาณฝนที่ตกในบริเวณต้นน้ำที่ผ่านมา
- ☐ การคาดการณ์ปริมาณฝนล่วงหน้า
- ☐ ความสูงของระดับน้ำในแม่น้ำที่ผ่านมา
- ☐ การคาดการณ์ความสูงของระดับน้ำในแม่น้ำ
- ☐ จุดที่น้ำล้นตลิ่ง
- ☐ พื้นที่น้ำท่วม
- ☐ พื้นที่น้ำท่วมและความลึกน้ำท่วม
- ☐ การคาดการณ์พื้นที่น้ำท่วม
- ☐ การคาดการณ์พื้นที่น้ำท่วมและความลึกน้ำท่วม
- ☐ การคาดการณ์เวลาที่ระดับน้ำลดลง
- ☐ รายงานสดสถานการณ์น้ำท่วมต่างๆ ผ่านทางสื่อโทรทัศน์
- ☐ การเตือนภัย และการส่งสัญญาณแจ้งเตือนโดยองค์กรของรัฐ (กรมอุตุนิยมวิทยา หรือ หน่วยงานท้องถิ่น)

(E) ความหมาย และสาระสำคัญของข้อมูลที่ได้รับ

(E1) คุณได้รับข้อมูลการเกิดอุทกภัย 2011 ผ่านทางใด

- ☐ ทีวี
- ☐ วิทยุ
- ☐ หนังสือพิมพ์
- ☐ อินเตอร์เน็ต
- ☐ สังคมออนไลน์ (Social Network)

☐ ข้อมูลจากหน่วยงานท้องถิ่นของรัฐ

☐ องค์การบริหารส่วนท้องถิ่น

โปรดเลือกชนิดข้อมูลที่ได้รับ

1) ปริมาณน้ำฝน
2) การคาดการณ์ปริมาณฝน
3) ระดับน้ำในแม่น้ำที่ผ่านมา
4) การคาดการณ์ระดับน้ำในแม่น้ำ
5) บริเวณที่น้ำไหลล้นตลิ่ง
6) พื้นที่น้ำท่วม
7) พื้นที่น้ำท่วม และความลึกน้ำท่วม
8) การคาดการณ์พื้นที่น้ำท่วม
9) การคาดการณ์พื้นที่น้ำท่วม และความลึกน้ำท่วม
10) การคาดการณ์ระยะเวลาน้ำท่วม และความลึกน้ำท่วมสูงสุด
11) การคาดการณ์ระยะเวลาก่อนน้ำท่วมถึง
12) ข่าวเกี่ยวกับน้ำท่วม เช่น ข่าวจากสื่อโทรทัศน์
13) การเตือนภัย และการส่งสัญญาณแจ้งเตือนจากองค์กรของรัฐ

(E2) สื่อใด ที่มีประสิทธิภาพที่สุด ในการป้องกัน และการเตรียมตัวจากน้ำท่วม

☐ ทีวี

☐ วิทยุ

☐ หนังสือพิมพ์

☐ อินเตอร์เน็ต

☐ สังคมออนไลน์ (Social Network)

☐ ข้อมูลจากหน่วยงานท้องถิ่นของรัฐ

☐ องค์การบริหารส่วนท้องถิ่น

(E2.1) เหตุผลใดที่ทำให้คุณคิดเช่นนั้น

☐ เข้าถึงข้อมูลได้ง่าย

☐ ปริมาณของข้อมูล

☐ ข้อมูลเป็นรูปธรรม

☐ ข้อมูลเชื่อถือได้

☐ เป็นข้อมูลที่เคยได้รับมาก่อนหน้า

☐ ข้อมูลเข้าใจได้ง่าย

(F) เกี่ยวกับข้อมูลที่ได้รับมา

(F1) ชนิดของข้อมูลใด ที่คุณต้องการมากกว่าข้อมูลอื่นๆ

☐ ปริมาณฝนที่ตกในบริเวณต้นน้ำที่ผ่านมา

☐ การคาดการณ์ปริมาณฝนล่วงหน้า

☐ ความสูงของระดับน้ำในแม่น้ำที่ผ่านมา

☐ การคาดการณ์ความสูงของระดับน้ำในแม่น้ำ

☐ จุดที่น้ำล้นตลิ่ง

☐ พื้นที่น้ำท่วม

☐ พื้นที่น้ำท่วมและความลึกน้ำท่วม

☐ การคาดการณ์พื้นที่น้ำท่วม

☐ การคาดการณ์พื้นที่น้ำท่วมและความลึกน้ำท่วม

☐ การคาดการณ์ระยะเวลาน้ำท่วมและความลึกน้ำท่วมสูงสุด

☐ การคาดการณ์เวลาที่ระดับน้ำลดลง

☐ รายงานสดสถานการณ์น้ำท่วมต่างๆ ผ่านทางสื่อโทรทัศน์

☐ การเตือนภัย และการส่งสัญญาณแจ้งเตือนโดยองค์กรของรัฐ (กรมอุตุนิยมวิทยา หรือ หน่วยงานท้องถิ่น)

(F2) อะไรที่มีผลทำให้ข้อมูลง่ายต่อการนำไปใช้

☐ การปรับปรุงข้อมูลให้ทันสมัย

☐ การได้รับข้อมูลที่มีความจำเป็น

☐ ข้อมูลที่เข้าใจได้ง่าย เช่น รูป ตาราง

☐ ข้อมูลที่อธิบายด้วยตัวอักษร

☐ ข้อมูลที่ไม่เจาะจงและแสดงในภาพรวมเท่านั้น

(F3) คุณต้องการข้อมูลในการเตรียมตัวเพื่อป้องกันน้ำท่วมเมื่อไร

☐ 7 วันก่อนน้ำท่วม

☐ 4-6 วันก่อนน้ำท่วม

☐ 2-3 วันก่อนน้ำท่วม

☐ 1 วันก่อนน้ำท่วม

(G) อื่นๆ

(G1) การคาดการณ์พื้นที่น้ำท่วมจากปรากฏการณ์ธรรมชาติ
ซึ่งอาจมีความผิดพลาดทั้งจากข้อมูลและแบบจำลอง
ดังนั้นผลการคาดการณ์ที่รวมความไม่แน่นอนดังกล่าวนั้น
คุณมีความคิดเห็นเกี่ยวกับผลการคาดการณ์น้ำท่วมอย่างไร

☐ ข้อผิดพลาดจากการคาดการณ์สามารถเกิดขึ้น ดังนั้นข้อมูลจึงไม่แน่นอน

☐ ถึงแม้ว่าจะมีข้อจำกัดทางข้อมูล แต่หากสามารถลดความผิดพลาดให้น้อยลง
การคาดการณ์ก็เป็นประโยชน์

☐ การคาดการณ์มีประโยชน์ แม้ข้อมูลดังกล่าวจะมีความไม่แน่นอน

☐ การตรวจสอบข้อมูล โดยการพิจารณาจากข้อมูลจริง
จึงอาจไม่ต้องใช้แบบจำลอง

☐ การคาดการณ์มีประโยชน์ ถ้ามีการเตือนภัย
และส่งสัญญาณแจ้งเตือนตามที่กรมอุตุนิยมวิทยาติดตั้ง และประกาศไว้

A2.1 - Questionnaire to Farmer – English Version

Things to find out
- Information required for the correspondence to a flood
- The time to offer information
- The specific information presentation method

(A) Attribute of respondent

Things to find out
- The difference in the correspondence to the flood according to the respondent's attribute
- Information needs according to the respondent's attribute

(A1) Gender
□ male
□ female

(A2) The form of your house
□ Single story house
□ Two or more -story building
□ Above the second floor of two or more-story building

(A3) The kind of agricultural products
□ Rice
□ Vegetables
□ Fruits

(A4) Age
□ Less than 20 years old
□ 21-30 years old
□ 31-40 years old
□ 41-50 years old
□ 51-60 years old
□ Over 60 years old

(B) The situation of flood damage

Things to find out
- The precondition corresponding to a flood
- An individual situation about the measures against a flood

(B1) How deep was the maximum depth around your house?
□ Not soaked
□ Soaked in water under the floor
□ Soaked in water above the floor
□ Soaked in water to the second floor

(B2) How long was the time from when your house or around it (area you feel danger) soaked in water to maximum depth?
□ Less than 2 hours
□ 2-6 hours
□ 7-12 hours
□ more than 12 hours

(B3) When did you know that your house might be flooded?
□ One week before inundation
□ 4-6 days before inundation
□ 2-3 days before inundation
□ The days of inundation
□ When your house inundated

(C) Farmland damage by inundation
Things to find out
- The precondition corresponding to a flood
- An individual situation about the measures against a flood

(C1) How was maximum depth at your farmland?
□ Agricultural products weren't soaked
□ All of agricultural products were soaked
□ At the foot of agricultural products was soaked

(C2) How long was the time from when soaked in water to maximum depth?
□ Less than 2 hours
□ 2-6 hours
□ 7-12 hours
□ more than 12 hours

(C3) When did you know that your farmland might be flooded?
□ One week before inundation
□ 4-6 days before inundation
□ 2-3 days before inundation
□ The days of inundation
□ When your house inundated

(D) Damage alleviation actions
Things to find out
- How was the action performed according to advance of flood
- The classification of the required information based on the above

(D1) Did you take damage alleviation action for agricultural products before inundation?
□ Yes (→D1.1)
□ No (didn't do at that time) (→D1.2)

(D1.1) What did you do?
□ Sandbagging around the farmland
□ Moving agricultural products to higher places
□ Moving agricultural machines to higher places
□ Preparation of means of transportation after inundation (boat etc.)
□ Premature cropping and carrying agricultural products out
(→D.2)

(D1.2) Why didn't you do damage alleviation actions?
□ There is no information and you thought your farmland wouldn't be inundated
□ You had information but you didn't know what to do
□ You had information but you thought you have enough time
□ You had information but you didn't have enough time
□ You had information but you thought your farmland would not be inundated (→D1.2.1)
□ You had information but you thought that you would not be affected by inundation
(→D1.2.2)

(D1.2.1) Why did you think your house would not be inundated?
□ Prediction was not trusted
□ No information about inundate area
□ It has not been inundated (→D.2)

(D1.2.2) Why did you think so?
□ You thought that depth of water is shallow
□ Your house has never been damaged by inundation until now

(D2) Did you take damage alleviation action <u>when inundation area approached</u>?
□ Yes (→D2.1)
□ No (didn't do at that time) (→D2.2)

(D2.1) What did you do?
□ Sandbagging around the farmland
□ Moving agricultural products to higher places
□ Moving agricultural machines to higher places
□ Preparation of means of transportation after inundation (boat etc.)
□ Premature cropping and carrying agricultural products out
(→D.3)

(D2.2) Why didn't you do damage alleviation action?
□ There is no information and you thought your farmland wouldn't be inundated
□ You had information but you didn't know what to do
□ You had information but you thought you have enough time
□ You had information but you didn't have enough time
□ You had information but you thought your house would not be inundated (→C2.2.1)
□ You had information but you thought that you would not be affected by inundation
(→C2.2.2)

(D2.2.1) Why didn't you think being inundated?
□ Prediction was not trusted
□ No information about inundate area

□ It has not been inundated (→D.3)

(D2.2.2) Why did you think so?
□ You thought that depth of water is shallow
□ You have never suffered from flooding until now

(D3) Did you take damage alleviation action for agricultural products after inundation?
□ Yes (→D3.1)
□ No (didn't do at that time) (→D3.2)

(D3.1) What did you do?
□ Sandbagging around the farmland
□ Moving agricultural products to higher places
□ Moving agricultural machines to higher places
□ Preparation for living at your house after inundation (for example Preparation of water and food)
□ Preparation of means of transportation after inundation (boat etc.)
□ Premature cropping and carrying agricultural products out
(→E)

(D3.2) Why didn't you do damage alleviation actions?
□ There was no effective measure
□ Even if inundated, it was a grade which becomes somehow.
□ There was no time

(E) Acquired information during flood

Things to find out
- Useful information according to damage alleviation actions (by cross-check with reply to question-D)
- Useful information according to advance of flood
- When should we provide information

(E1) What kind of information was useful for damage alleviation actions or grasp of flood situation before flood from river?
□ Total rainfall at mountain area in the past
□ Rainfall forecast at mountain area
□ River water level in the past
□ Forecasted river water level
□ Live report of river by media such as TV
□ Warning and alarm released by the public organization (Meteorological department or Local government)

(E2) What kind of information was useful for damage alleviation actions or grasp of flood situation when inundation area approached?
□ Total rainfall at mountain area in the past
□ Rainfall forecast at mountain area
□ River water level in the past
□ Forecasted river water level
□ The place which has overflowed

□ Inundation area
□ Inundation area and water depth
□ Forecasted inundation area
□ Forecasted inundation area and water depth
□ Live report of inundation by media such as TV
□ Warning and alarm released by the public organization (Meteorological department or Local government)

(E3) What kind of information was useful for damage alleviation actions or grasp of flood situation after inundation?
□ Total rainfall at mountain area in the past
□ Rainfall forecast at mountain area
□ River water level in the past
□ Forecasted river water level
□ The place where water of river outflows
□ Inundation area
□ Inundation area and water depth
□ Forecasted inundation area
□ Forecasted inundation area and water depth
□ Forecasted time until the area around your house gets dry
□ Live report of inundation by media such as TV
□ Warning and alarm released by the public organization (Meteorological department or Local government)

(F) Means of information acquisition and contents of information

Things to find out
- Flood information providing means in Thailand
- Effective providing means according to the type of information

(F1) How did you acquire disaster information for damage alleviation actions during 2011 flood? What were the contents of the information?
□ TV (→select contents of information from the following)
□ Radio (→select contents of information from the following)
□ Newspaper (→select contents of information from the following)
□ Internet (→select contents of information from the following)
□ SNS(Face book,twitter) (→select contents of information from the following)
□ Information from region government (→select contents of information from the following)
□ Local community (→select contents of information from the following)

Contents of information
1) Total rainfall at mountain area in the past
2) Rainfall forecast at mountain area
3) River water level in the past
4) Forecasted river water level
5) The place from where water of river outflows
6) Inundation area
7) Inundation area and water depth
8) Forecasted inundation area
9) Forecasted inundation area and water depth

10) Forecast about inundation time and maximum depth
11) Forecasted time until water was drained
12) Live report of inundation by media such as TV
13) Warning and alarm released by the public organization (Meteorological department or Local government)

(F2) What was the most effective means of information acquisition for damage alleviation actions?
□ TV
□ Radio
□ News paper
□ Internet
□ SNS(Face book,twitter)
□ Information from region government
□ Local community

(F2.1) What is the reason you think so?
□ Easy to acquire information
□ Amount of information
□ Information is concrete
□ Information is reliable.
□ Familiar information can be acquired
□ Information is easy to understand

(G) Request about information acquisition

Things to find out
- What kind of information was insufficient
- Required information for damage alleviation action

(G1) What kind of informations did you want other than the acquired information?
□ Total rainfall at mountain area in the past
□ Rainfall forecast at mountain area
□ River water level in the past
□ Forecasted river water level
□ The place from where water of river outflows
□ Inundation area
□ Inundation area and water depth
□ Forecasted inundation area
□ Forecasted inundation area and water depth
□ Forecast about inundation time and maximum depth
□ Forecasted time until water was drained
□ Live report of inundation by media such as TV
□ Warning and alarm released by the public organization (Meteorological department or Local government)

(G2) What is easy-to-use information?
□ Periodical updated information
□ Information that you can acquire when necessary
□ Intelligible information with figure or table

□ Information which is explained in the text
□ Information which is not fragmentary and shows a global image

(G3) When do you need information of inundation for effective damage alleviation action?
□ 7 days before inundation
□ 4-6 days before inundation
□ 3-2 days before inundation
□ 1 day before inundation

(H) Others
(H1) The forecast of a inundation area etc. includes the prediction error of a natural phenomenon, and the prediction error of the simulation. So the forecast includes uncertainty. And you should perform action based on a forecast on your responsibility. What do you think about such a forecast?
□ Wrong action based on the forecast may be taken. So information including uncertainty is unnecessary.
□ If the limit (width with error) of a predicted value is shown, it will be helpful.
□ Forecast is helpful even if it includes uncertainty.
□ The validity of information is separately judged based on the fact. Therefore, it cannot say anything as a generality.
□ Forecast is helpful if it thinks that it is the same as the alarm and warning which the Meteorological Department announces.

A2.2 - Questionnaire to Farmer – Thai Version

สิ่งที่ต้องการ

- ข้อมูลที่เกี่ยวกับน้ำท่วม
- เวลาในการนำเสนอข้อมูลข่าวสาร
- ข้อมูลเฉพาะที่ได้จากการนำเสนอ

(A) คุณลักษณะของผู้ตอบคำถาม

สิ่งที่ต้องการ

- ความแตกต่างของผู้ตอบแบบสอบถามที่เกี่ยวข้องกับอุทกภัยปี 2011
- ความสอดคล้องของข้อมูลที่ต้องการจากคุณลักษณะของผู้ตอบคำถาม

(A1) เพศ

☐ ชาย

☐ หญิง

(A2) รูปแบบของที่พักอาศัย

☐ บ้านเดี่ยว

☐ อาคารสองชั้น

☐ อาคารที่มากกว่าสองชั้น

(A3) ชนิดของผลผลิตทางการเกษตร

☐ ข้าว

☐ ผัก

☐ ผลไม้

(A4) อายุ

☐ อายุน้อยกว่า 20 ปี

☐ 21-30 ปี

☐ 31-40 ปี

☐ 41-50 ปี

☐ 51-60 ปี

☐ มากกว่า 60 ปี

(B) สภาพความเสียหายจากน้ำท่วม

(B1) ความลึกน้ำท่วมสูงสุดของบริเวณบ้าน

☐ น้ำไม่ท่วม

☐ น้ำท่วมสูงไม่เกินชั้นหนึ่งของบ้าน

☐ น้ำท่วมสูงกว่าชั้นหนึ่งของบ้าน

☐ น้ำท่วมสูงกว่าชั้นสองของบ้าน

(B2) ระยะเวลาที่น้ำท่วมขณะมีความลึกน้ำสูงสุด

☐ น้อยกว่า 2 ชั่วโมง

☐ 2-6 ชั่วโมง

☐ 7-12 ชั่วโมง

☐ มากกว่า 12 ชั่วโมง

(B3) คุณทราบว่าบ้าน/ที่พักของคุณอาจจะถูกน้ำท่วมเมื่อไหร่

☐ 1 อาทิตย์ก่อนน้ำท่วม

☐ 4-6 วันก่อนน้ำท่วม

☐ 2-3 วันก่อนน้ำท่วม

☐ 1 วันก่อนน้ำท่วม

☐ เมื่อน้ำท่วมบ้านแล้ว

(C) ความเสียหายทางเกษตรกรรมที่เกิดจากน้ำท่วม

<u>สิ่งที่ต้องการ</u>

- เงื่อนไขก่อนเกิดน้ำท่วม
- วิธีการรับมือน้ำท่วมในสถานการณ์ต่างๆ

(C1) ระดับความลึกน้ำท่วมสูงสุดในพื้นที่การเกษตร

☐ น้ำไม่ท่วม

☐ น้ำท่วมทั้งหมด

☐ น้ำท่วมเล็กน้อย

(C2) ระยะเวลาที่น้ำท่วมขณะมีความลึกน้ำสูงสุด

☐ น้อยกว่า 2 ชั่วโมง

☐ 2-6 ชั่วโมง

☐ 7-12 ชั่วโมง

☐ มากกว่า 12 ชั่วโมง

(C3) คุณทราบว่าพื้นที่การเกษตรของคุณอาจจะถูกน้ำท่วมเมื่อไหร่

☐ 1 อาทิตย์ก่อนน้ำท่วม

☐ 4-6 วันก่อนน้ำท่วม

☐ 2-3 วันก่อนน้ำท่วม

☐ 1 วันก่อนน้ำท่วม

☐ เมื่อน้ำท่วมบ้านแล้ว

(D) การป้องกันความเสียหายจากน้ำท่วม

สิ่งที่ต้องการ

- มีวิธีการป้องกันน้ำท่วมอย่างไร
- การจำแนกข้อมูลจากวิธีป้องกันน้ำท่วมดังกล่าว

(D1) ก่อนน้ำท่วม คุณได้ป้องกันหรือไม่

☐ ป้องกัน (> D1.1)

☐ ไม่ได้ป้องกัน (> D1.2)

(D1.1) คุณได้ป้องกันอย่างไร

☐ ใช้กระสอบทรายป้องกันรอบๆพื้นที่

☐ ย้ายผลผลิตขึ้นที่สูง

☐ ย้ายเครื่องมือ/เครื่องจักรการเกษตรขึ้นที่สูง

☐ เตรียมยานพาหนะ เช่น เรือ หลังจากต้องอยู่กับสภาพน้ำท่วม

☐ เก็บเกี่ยวและย้ายผลผลิตออกจากพื้นที่

(> D.2)

(D1.2) ทำไมคุณถึงไม่ป้องกันความเสียหายที่อาจเกิดขึ้นจากน้ำท่วม

☐ ไม่ทราบข้อมูล และคิดว่าน้ำไม่น่าจะท่วม

☐ ทราบข้อมูลแต่ไม่รู้ว่าจะต้องทำอย่างไร

☐ ทราบข้อมูลแต่คิดว่ามีเวลาเตรียมตัวพอ

☐ ทราบข้อมูลแต่ไม่มีเวลาเตรียมตัวพอ

☐ ทราบข้อมูลแต่คิดว่าน้ำไม่น่าจะท่วม (> D1.2.1)

☐ ทราบข้อมูลแต่คิดว่าไม่น่าจะได้รับผลกระทบจากน้ำท่วม (> D1.2.2)

(D1.2.1) ทำไมคุณถึงคิดว่าน้ำจะไม่ท่วมบ้าน

☐ การคาดการณ์ไม่น่าเชื่อถือ

☐ ไม่ทราบข้อมูลเกี่ยวกับพื้นที่น้ำท่วม

☐ ไม่เชื่อว่าน้ำจะท่วม (> D.2)

(D1.2.2) ทำไมคุณถึงคิดอย่างนั้น

☐ คิดว่าระดับน้ำท่วมคงไม่สูงมาก

☐ บ้านของคุณไม่เคยถูกน้ำท่วมจนถึงปัจจุบัน

(D2) <u>เมื่อเกิดน้ำท่วม</u> คุณได้ป้องกันน้ำท่วมหรือไม่

☐ ป้องกัน (> D2.1)

☐ ไม่ได้ป้องกัน (> D2.2)

(D2.1) คุณได้ป้องกันอย่างไร

☐ ใช้กระสอบทรายป้องกันรอบๆพื้นที่

☐ ย้ายผลผลิตขึ้นที่สูง

☐ ย้ายเครื่องมือ/เครื่องจักรการเกษตรขึ้นที่สูง

☐ เตรียมยานพาหนะ เช่น เรือ หลังจากต้องอยู่กับสภาพน้ำท่วม

☐ เก็บเกี่ยวและย้ายผลผลิตออกจากพื้นที่

(> D.3)

(D2.2) ทำไมคุณไม่ป้องกันความเสียหายที่อาจเกิดขึ้นจากน้ำท่วม

☐ ไม่ทราบข้อมูลและคิดว่าน้ำไม่น่าจะท่วมพื้นที่การเกษตร

☐ ทราบข้อมูลแต่ไม่รู้ว่าจะต้องทำอย่างไร

☐ ทราบข้อมูลแต่คิดว่ามีเวลาเตรียมตัวพอ

☐ ทราบข้อมูลแต่ไม่มีเวลาเตรียมตัวพอ

☐ ทราบข้อมูลแต่คิดว่าน้ำไม่น่าจะท่วมบ้าน (>D2.2.1)

☐ ทราบข้อมูลแต่คิดว่าไม่น่าจะได้รับผลกระทบจากน้ำท่วม (>D2.2.2)

(D2.2.1) ทำไมคุณถึงคิดว่าน้ำจะไม่ท่วมบ้าน

☐ การคาดการณ์ไม่น่าเชื่อถือ

☐ ไม่ทราบข้อมูลเกี่ยวกับพื้นที่น้ำท่วม

☐ ไม่เชื่อว่าน้ำจะท่วม (> D.3)

(D2.2.2) ทำไมคุณถึงคิดอย่างนั้น

☐ คิดว่าระดับน้ำท่วมคงไม่สูงมาก

☐ ไม่เคยถูกน้ำท่วมจนถึงปัจจุบัน

(D3) <u>หลังจากเกิดน้ำท่วมแล้ว</u> คุณได้ป้องกันน้ำท่วมหรือไม่

☐ ป้องกัน (> D3.1)

☐ ไม่ได้ป้องกัน (> D3.2)

(D3.1) คุณได้ป้องกันอย่างไร

☐ ใช้กระสอบทรายป้องกันรอบๆพื้นที่

☐ ย้ายผลผลิตขึ้นที่สูง

☐ ย้ายเครื่องมือ/เครื่องจักรการเกษตรขึ้นที่สูง

☐ เตรียมสิ่งของที่จำเป็นเมื่อต้องอาศัยอยู่ในบ้าน

☐ เตรียมยานพาหนะ เช่น เรือ หลังจากต้องอยู่กับสภาพน้ำท่วม

☐ เก็บเกี่ยวและย้ายผลผลิตออกจากพื้นที่

(>E)

(D3.2) ทำไมคุณไม่ป้องกันความเสียหายที่เกิดขึ้นจากน้ำท่วม

☐ คิดว่าวิธีป้องกันไม่ได้ผล

☐ เมื่อน้ำท่วมแล้ว คิดว่าระดับน้ำจะคงระดับเท่าเดิม

☐ ไม่มีเวลาที่จะป้องกัน

(E) ข้อมูลที่ได้จากช่วงน้ำท่วม

(E1) ชนิดของข้อมูลที่เป็นประโยชน์ในการป้องกันและเข้าใจสถานการณ์น้ำท่วม ก่อนเกิดน้ำจะท่วม

- ☐ ปริมาณฝนที่ตกในบริเวณต้นน้ำที่ผ่านมา
- ☐ การคาดการณ์ปริมาณฝนล่วงหน้า
- ☐ ความสูงของระดับน้ำในแม่น้ำที่ผ่านมา
- ☐ การคาดการณ์ความสูงของระดับน้ำในแม่น้ำ
- ☐ รายงานสดสถานการณ์น้ำท่วมต่างๆ ผ่านทางสื่อโทรทัศน์
- ☐ การเตือนภัย และการส่งสัญญาณแจ้งเตือนโดยองค์กรของรัฐ (กรมอุตุนิยมวิทยา หรือ หน่วยงานท้องถิ่น)

(E2) ชนิดของข้อมูลที่เป็นประโยชน์ในการป้องกันและเข้าใจสถานการณ์น้ำท่วม เมื่อน้ำท่วมมาถึง

- ☐ ปริมาณฝนที่ตกในบริเวณต้นน้ำที่ผ่านมา
- ☐ การคาดการณ์ปริมาณฝนล่วงหน้า
- ☐ ความสูงของระดับน้ำในแม่น้ำที่ผ่านมา
- ☐ การคาดการณ์ความสูงของระดับน้ำในแม่น้ำ
- ☐ จุดที่น้ำล้นตลิ่ง
- ☐ พื้นที่น้ำท่วม
- ☐ พื้นที่น้ำท่วมและความลึกน้ำท่วม
- ☐ การคาดการณ์พื้นที่น้ำท่วม
- ☐ การคาดการณ์พื้นที่น้ำท่วมและความลึกน้ำท่วม
- ☐ รายงานสดสถานการณ์น้ำท่วมต่างๆ ผ่านทางสื่อโทรทัศน์
- ☐ การเตือนภัย และการส่งสัญญาณแจ้งเตือนโดยองค์กรของรัฐ (กรมอุตุนิยมวิทยา หรือ หน่วยงานท้องถิ่น)

(E3) ชนิดของข้อมูลที่เป็นประโยชน์ในการป้องกัน และเข้าใจสถานการณ์น้ำท่วม หลังเกิดน้ำท่วม

- ☐ ปริมาณฝนที่ตกในบริเวณต้นน้ำที่ผ่านมา

- ☐ การคาดการณ์ปริมาณฝนล่วงหน้า
- ☐ ความสูงของระดับน้ำในแม่น้ำที่ผ่านมา
- ☐ การคาดการณ์ความสูงของระดับน้ำในแม่น้ำ
- ☐ จุดที่น้ำล้นตลิ่ง
- ☐ พื้นที่น้ำท่วม
- ☐ พื้นที่น้ำท่วมและความลึกน้ำท่วม
- ☐ การคาดการณ์พื้นที่น้ำท่วม
- ☐ การคาดการณ์พื้นที่น้ำท่วมและความลึกน้ำท่วม
- ☐ การคาดการณ์เวลาที่ระดับน้ำลดลง
- ☐ รายงานสดสถานการณ์น้ำท่วมต่างๆ ผ่านทางสื่อโทรทัศน์
- ☐ การเตือนภัย และการส่งสัญญาณแจ้งเตือนโดยองค์กรของรัฐ (กรมอุตุนิยมวิทยา หรือ หน่วยงานท้องถิ่น)

(F) ความหมาย และสาระสำคัญของข้อมูลที่ได้รับ

(F1) คุณได้รับข้อมูลการเกิดอุทกภัย 2011 ผ่านทางใด

☐ ทีวี

☐ วิทยุ

☐ หนังสือพิมพ์

☐ อินเตอร์เน็ต

☐ สังคมออนไลน์ (Social Network)

☐ ข้อมูลจากหน่วยงานท้องถิ่นของรัฐ

☐ องค์การบริหารส่วนท้องถิ่น

โปรดเลือกชนิดข้อมูลที่ได้รับ

14) ปริมาณน้ำฝน

15) การคาดการณ์ปริมาณฝน

16) ระดับน้ำในแม่น้ำที่ผ่านมา

17) การคาดการณ์ระดับน้ำในแม่น้ำ

18) บริเวณที่น้ำไหลล้นตลิ่ง

19) พื้นที่น้ำท่วม

20) พื้นที่น้ำท่วม และความลึกน้ำท่วม

21) การคาดการณ์พื้นที่น้ำท่วม

22) การคาดการณ์พื้นที่น้ำท่วม และความลึกน้ำท่วม

23) การคาดการณ์ระยะเวลาน้ำท่วม และความลึกน้ำท่วมสูงสุด

24) การคาดการณ์ระยะเวลาก่อนน้ำท่วมถึง

25) ข่าวเกี่ยวกับน้ำท่วม เช่น ข่าวจากสื่อโทรทัศน์

26) การเตือนภัย และการส่งสัญญาณแจ้งเตือนจากองค์กรของรัฐ

(F2) สื่อใด ที่มีประสิทธิภาพที่สุด ในการป้องกัน และการเตรียมตัวจากน้ำท่วม

☐ ทีวี

☐ วิทยุ

☐ หนังสือพิมพ์

☐ อินเตอร์เน็ต

☐ สังคมออนไลน์ (Social Network)

☐ ข้อมูลจากหน่วยงานท้องถิ่นของรัฐ

☐ องค์การบริหารส่วนท้องถิ่น

(F2.1) เหตุผลใดที่ทำให้คุณคิดเช่นนั้น

☐ เข้าถึงข้อมูลได้ง่าย

☐ ปริมาณของข้อมูล

☐ ข้อมูลเป็นรูปธรรม

☐ ข้อมูลเชื่อถือได้

☐ เป็นข้อมูลที่เคยได้รับมาก่อนหน้า

☐ ข้อมูลเข้าใจได้ง่าย

(G) เกี่ยวกับข้อมูลที่ได้รับมา

(G1) ชนิดของข้อมูลใด ที่คุณต้องการมากกว่าข้อมูลอื่นๆ

☐ ปริมาณฝนที่ตกในบริเวณต้นน้ำที่ผ่านมา

☐ การคาดการณ์ปริมาณฝนล่วงหน้า

☐ ความสูงของระดับน้ำในแม่น้ำที่ผ่านมา

☐ การคาดการณ์ความสูงของระดับน้ำในแม่น้ำ

☐ จุดที่น้ำล้นตลิ่ง

☐ พื้นที่น้ำท่วม

☐ พื้นที่น้ำท่วมและความลึกน้ำท่วม

☐ การคาดการณ์พื้นที่น้ำท่วม

☐ การคาดการณ์พื้นที่น้ำท่วมและความลึกน้ำท่วม

☐ การคาดการณ์ระยะเวลาน้ำท่วมและความลึกน้ำท่วมสูงสุด

☐ การคาดการณ์เวลาที่ระดับน้ำลดลง

☐ รายงานสดสถานการณ์น้ำท่วมต่างๆ ผ่านทางสื่อโทรทัศน์

☐ การเตือนภัย และการส่งสัญญาณแจ้งเตือนโดยองค์กรของรัฐ (กรมอุตุนิยมวิทยา หรือ หน่วยงานท้องถิ่น)

(G2) อะไรที่มีผลทำให้ข้อมูลง่ายต่อการนำไปใช้

☐ การปรับปรุงข้อมูลให้ทันสมัย

☐ การได้รับข้อมูลที่มีความจำเป็น

☐ ข้อมูลที่เข้าใจได้ง่าย เช่น รูป ตาราง

☐ ข้อมูลที่อธิบายด้วยตัวอักษร

☐ ข้อมูลที่ไม่เจาะจงและแสดงในภาพรวมเท่านั้น

(G3) คุณต้องการข้อมูลในการเตรียมตัวเพื่อป้องกันน้ำท่วมเมื่อไร

☐ 7 วันก่อนน้ำท่วม

☐ 4-6 วันก่อนน้ำท่วม

☐ 2-3 วันก่อนน้ำท่วม

☐ 1 วันก่อนน้ำท่วม

(H) อื่นๆ

(H1) การคาดการณ์พื้นที่น้ำท่วมจากปรากฏการณ์ธรรมชาติ
ซึ่งอาจมีความผิดพลาดทั้งจากข้อมูลและแบบจำลอง
ดังนั้นผลการคาดการณ์ที่รวมความไม่แน่นอนดังกล่าวนั้น
คุณมีความคิดเห็นเกี่ยวกับผลการคาดการณ์น้ำท่วมอย่างไร

☐ ข้อผิดพลาดจากการคาดการณ์สามารถเกิดขึ้น ดังนั้นข้อมูลจึงไม่แน่นอน

☐ ถึงแม้ว่าจะมีข้อจำกัดทางข้อมูล แต่หากสามารถลดความผิดพลาดให้น้อยลง
การคาดการณ์ก็เป็นประโยชน์

☐ การคาดการณ์มีประโยชน์ แม้ข้อมูลดังกล่าวจะมีความไม่แน่นอน

☐ การตรวจสอบข้อมูล โดยการพิจารณาจากข้อมูลจริง
จึงอาจไม่ต้องใช้แบบจำลอง

☐ การคาดการณ์มีประโยชน์ ถ้ามีการเตือนภัย
และส่งสัญญาณแจ้งเตือนตามที่กรมอุตุนิยมวิทยาติดตั้ง และประกาศไว้

Appendix B

List of sub-district surveyed areas, with information of distance from the Chao Phraya River and the number of respondents

Table B1 List of sub-district surveyed areas, with information of distance from the Chao Phraya River and the number of respondents in Ayutthaya Province

District	Sub-district	Distance (Km.)	Number of Questionaires	
			City residences	Famers
Nakhon Luang	Nakhon Luang	14.20	6	1
	Tha Chang	19.60	6	5
	Phra Non	18.00	6	6
	Pak Chan	14.40	1	-
	Sam Thai	18.20	2	-
	Khlong Sakae	9.30	6	-
Bang Pahan	Khwan Mueang	5.40	3	-
	Bang Nang Ra	7.30	4	-
	Phut Lao	2.60	3	3
	Bang Pahan	8.10	2	-
	Tanim	7.25	3	-
	Thang Klang	8.01	1	5
	Sao Thong	10.30	3	7
Tha Ruea	Tha Ruea	28.38	7	2
	Champa	30.55	6	2
	Tha Luang	31.53	1	2
Bang Ban	Bang Hak	3.30	3	1
	Phra Khao	6.70	3	-
	Saphan Thai	4.92	5	2
	Bang Luang Dot	3.85	3	5
Bang Pa-In	Talat Kriap	2.55	1	-
	Ban Pho	0.70	-	1
	Bang Pradaeng	2.15	-	1
	Ban Krot	3.50	1	1
	Sam Ruean	7.30	2	3
	Ban Len	1.30	3	-
	Khlong Chik	2.92	2	-
	Ban Sang	9.15	5	3
	Khung Lan	5.60	3	2
Wang Noi	Wang Noi	11.20	4	10
	Lam Ta Sao	12.51	4	3
Sena	Sam Ko	15.25	4	-
	Chao Chet	15.75	4	1
	Ban Thaeo	19.30	1	3
	Ban Pho	11.75	1	1
Phak Hai	Ta Lan	8.75	1	1
	Tha Din Daeng	9.60	6	7
	Ban Yai	9.55	3	2
Maharat	Chao Pluk	8.50	4	5
	Hua Phai	6.25	-	4
	Kathum	10.80	-	5
	Phit Phian	8.30	3	7
	Maharat	8.45	3	4
	Namtao	9.60	1	-
Lat Bua Luang	Phraya Banlue	12.30	5	6
	Khu Salot	12.35	1	3
	Singhanat	9.75	2	-
Bang Sai	Ban Ma	2.75	5	8
	Mai Tra	3.50	3	1
	Khok Chang	2.53	5	7
	Bang Sai	2.00	3	2
	Chang Lek	10.01	1	-
	Ban Ko	6.30	1	-
Bang Zai	Kaeo Fa	21.00	2	1
	Bang Zai	22.88	4	1
	Tao Lao	19.68	2	2
Uthai	Uthai	10.35	7	5
	Ban Chang	11.70	3	4
	Sena	14.00	1	8
	Khan Ham	6.70	2	5
Phra Nakhon Si Ayu	Ko Rian	0.90	5	-
	Khlong Suan Phlu	2.75	4	1
	Han Tra	3.75	2	2
	Pratu Chai	0.90	1	-
	Ban Mai	0.35	2	5
Ban Phraek	Ban Phraek	12.32	2	4
	Sam Phaniang	11.10	3	3
	Phai Ling	2.20	3	2
Phachi	Krachio	14.10	1	5
		Sum	200	180

Table B2 List of sub-district surveyed areas, with information of distance from the Chao Phraya River and the number of respondents in Ang Thong Province

District	Sub-district	Distance (Km.)	Number of Questionaires	
			City residences	Famers
Wiset Chai Chan	Lak Kaeo	17.50	4	-
	San Chao Rong Thong	11.50	7	4
	Tha Chang	11.57	4	2
	Phai Chamsin	8.58	5	3
	Yi Lon	15.80	2	1
Muang Angthong	Yan Sue	1.20	7	3
Chaiyo	Ratsathit	0.90	6	5
	Chaiyo	0.65	4	3
	Thewarat	0.68	6	5
Sam Ko	Sam Ko	22.20	3	3
	Ratsadon Phatthana	18.10	2	2
	Optom	22.30	2	1
	Pho Muang Phan	19.70	2	-
Pho Thong	Khok Phutsa	6.85	6	7
	Inthapramun	3.45	7	5
Pa Mok	Norasing	1.75	1	1
	Ekkarat	2.58	2	1
	Rong Chang	2.42	1	1
	Phong Pheng	1.70	5	11
	Pa Mok	0.30	2	2
Sawaeng Ha	Sawaeng Ha	13.70	9	5
	Chamlong	7.95	2	1
	Ban Phran	15.50	3	2
		Sum	92	68

Table B3 List of sub-district surveyed areas, with information of distance from the Chao Phraya River and the number of respondents in Sing Buri Province

District	Sub-district	Distance (Km.)	Number of Questionaires	
			City residences	Famers
Phrom Buri	Hua Pa	0.77	-	2
	Rong Chang	0.42	2	-
	Phra Ngam	1.18	3	3
	Bang Nam Chiao	0.70	3	2
	Ban Paeng	1.40	3	2
	Ban Mo	1.38	2	2
Muang Singburi	Bang Krabue	0.75	3	3
	Phok Ruam	2.80	3	3
	Hua Phai	6.75	3	2
	Ton Pho	1.05	3	2
	Bang Man	1.25	3	2
	Chaksi	2.77	2	2
	Muang Mu	2.05	2	2
In Buri	Prasuk	1.45	4	3
	Chi Nam Rai	2.15	-	2
	Thap Ya	1.70	3	3
	Ngio Rai	4.75	4	3
	In Buri	0.70	3	3
	Namtan	1.85	4	2
Tha Chang	Phikun Thong	3.75	2	2
	Thon Samo	5.45	3	2
	Wihan Khao	4.83	2	2
	Pho Prachak	7.20	3	3
Khai Bang Rachan	Bang Rachan	11.75	2	1
	Tha Kham	4.73	2	2
	Mai Dat	7.80	2	1
	Sing	4.70	2	2
	Mae La	3.30	2	2
		Sum	70	60

Table B4 List of sub-district surveyed areas, with information of distance from the Chao Phraya River and the number of respondents in Chai Nat Province

District	Sub-district	Distance (Km.)	Number of Questionaires	
			City residences	Famers
Muang Chainat	Hat Tha Sao	0.75	2	2
	Ban Kluai	1.75	2	2
	Tha Chai	1.15	3	2
	Khao Tha Phra	3.50	3	4
	Suea Hok	8.02	2	2
	Thammamun	2.00	3	3
Han Kha	Sam Ngam Tha Bot	14.55	2	1
	Huai Ngu	11.20	2	1
	Wang Kai Thuean	19.30	3	3
	Han Kha	22.10	3	3
Manorom	U Taphao	9.90	2	2
	Khung Samphao	1.58	5	5
	Hang Nam Sakhon	8.75	2	3
	Wat Khok	4.10	3	3
	Tha Chanuan	3.00	1	1
Sapphaya	Pho Nang Dam Tok	2.10	4	4
	Sapphaya	1.52	2	2
	Taluk	0.92	2	2
	Pho Nang Dam Ok	0.60	2	2
Noen Kham	Suk Duean Ha	36.42	1	1
	Noen Kham	31.90	2	4
	Kabok Tia	36.53	2	1
Wat Sing	Makham Thao	4.05	4	4
	Bo Rae	11.17	3	3
		Sum	60	60

Table B5 List of sub-district surveyed areas, with information of distance from the Chao Phraya River and the number of respondents in Lopburi Province

District	Sub-district	Distance (Km.)	Number of Questionaires	
			City residences	Famers
Muang Lopburi	Phrommat	15.55	6	-
	Ban Khoi	7.68	1	1
	Ngio Rai	15.20	2	4
	Kong Thanu	14.35	3	5
	Talung	16.58	1	2
Tha Wung	Khao Samo Khon	7.58	9	10
	Bang Khu	8.65	10	16
	Pho Talat Kaeo	12.10	4	-
	Tha Wung	4.50	8	-
	Bang Nga	3.70	5	9
	Lat Sali	9.80	-	7
Ban Mi	Ban Mi	20.92	1	-
	Mahason	13.55	1	-
	Phon Thong	22.29	1	-
	Ban Chi	11.30	6	-
	Bang Phueng	14.35	8	9
	Bang Kham	8.10	1	
		Sum	67	63

Appendix C

Questionnaire Result: Farmer

Questionnaire Result: Farmers

	Issues	Choices	Ayutthaya		Ang thong		Sing Buri		Chai Nat		Lopburi	
			Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
A1	Gender											
		male	109	60.56%	45	66.18%	37	61.67%	38	63.33%	29	46.03%
		female	71	39.44%	23	33.82%	23	38.33%	22	36.67%	34	53.97%
A2	The form of your house											
		Single story house	163	90.56%	53	77.94%	41	68.33%	46	76.67%	56	88.89%
		Two or more -story building	17	9.44%	15	22.06%	19	31.67%	14	23.33%	7	11.11%
		Above the second floor of two or more-story building	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%
A3	The kind of agricultural products											
		Rice	174	96.67%	62	91.18%	58	96.67%	46	76.67%	58	92.06%
		Vegetables	1	0.56%	2	2.94%	0	0.00%	3	5.00%	2	3.17%
		Fruits	5	2.78%	4	5.88%	2	3.33%	11	18.33%	3	4.76%
A4	Age											
		Less than 20 years old	0	0.00%	0	0.00%	0	0.00%	1	1.67%	0	0.00%
		21-30 years old	10	5.56%	1	1.47%	5	8.33%	0	0.00%	2	3.17%
		31-40 years old	42	23.33%	19	27.94%	11	18.33%	16	26.67%	13	20.63%
		41-50 years old	73	40.56%	35	51.47%	19	31.67%	23	38.33%	37	58.73%
		51-60 years old	47	26.11%	11	16.18%	13	21.67%	16	26.67%	10	15.87%
		Over 60 years old	8	4.44%	2	2.94%	2	3.33%	4	6.67%	1	1.59%
B1	How deep was the maximum depth around your house?											
		Not soaked	1	0.56%	0	0.00%	0	0.00%	0	0.00%	1	1.59%
		Soaked in water under the floor	146	81.11%	23	33.82%	50	83.33%	55	91.67%	48	76.19%
		Soaked in water above the floor	30	16.67%	35	51.47%	10	16.67%	5	8.33%	14	22.22%
		Soaked in water to the second floor	3	1.67%	10	14.71%	0	0.00%	0	0.00%	0	0.00%

	Issues	Choices	Ayutthaya		Ang thong		Sing Buri		Chai Nat		Lopburi	
			Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
B2	How long was the time from when your house or around it (area you feel danger) soaked in water to maximum depth?											
		Less than 2 hours	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%
		2-6 hours	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%
		7-12 hours	3	1.67%	8	11.76%	0	0.00%	0	0.00%	0	0.00%
		more than 12 hours	177	98.33%	60	88.24%	60	100.00%	60	100.00%	63	100.00%
B3	When did you know that your house might be flooded?											
		One week before inundation	108	60.00%	53	77.94%	54	90.00%	60	100.00%	43	68.25%
		4-6 days before inundation	21	11.67%	1	1.47%	4	6.67%	0	0.00%	5	7.94%
		2-3 days before inundation	12	6.67%	10	14.71%	1	1.67%	0	0.00%	5	7.94%
		The days of inundation	7	3.89%	2	2.94%	0	0.00%	0	0.00%	1	1.59%
		When your house inundated	32	17.78%	2	2.94%	1	1.67%	0	0.00%	9	14.29%
C1	How was maximum depth at your farmland?											
		Agricultural products weren't soaked	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%
		All of agricultural products were soaked	168	93.33%	66	97.06%	60	100.00%	60	100.00%	62	98.41%
		At the foot of agricultural products was soaked	12	6.67%	2	2.94%	0	0.00%	0	0.00%	1	1.59%

	Issues	Choices	Ayutthaya		Ang thong		Sing Buri		Chai Nat		Lopburi	
			Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
C2	How long was the time from when soaked in water to maximum depth?											
		Less than 2 hours	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%
		2-6 hours	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%
		7-12 hours	4	2.22%	0	0.00%	0	0.00%	0	0.00%	0	0.00%
		more than 12 hours	176	97.78%	68	100.00%	60	100.00%	60	100.00%	63	100.00%
C3	When did you know that your farmland might be flooded?											
		One week before inundation	119	66.11%	55	80.88%	54	90.00%	57	95.00%	43	68.25%
		4-6 days before inundation	5	2.78%	2	2.94%	5	8.33%	3	5.00%	5	7.94%
		2-3 days before inundation	19	10.56%	7	10.29%	0	0.00%	0	0.00%	5	7.94%
		The days of inundation	12	6.67%	1	1.47%	1	1.67%	0	0.00%	1	1.59%
		When your house inundated	25	13.89%	3	4.41%	0	0.00%	0	0.00%	9	14.29%
D1	Did you take damage alleviation action for agricultural products before inundation?											
		Yes -->D1.1)	124	68.89%	53	77.94%	59	98.33%	60	100.00%	44	69.84%
		No (didn't do at that time) (-->D1.2)	56	31.11%	15	22.06%	1	1.67%	0	0.00%	19	30.16%

	Issues	Choices	Ayutthaya		Ang thong		Sing Buri		Chai Nat		Lopburi	
			Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
D1.1	What did you do?											
		Sandbagging around the farmland	32	25.81%	11	20.75%	9	15.25%	11	18.33%	1	2.27%
		Moving agricultural products to higher places	75	60.48%	9	16.98%	7	11.86%	1	1.67%	17	38.64%
		Moving agricultural machines to higher places	86	69.35%	19	35.85%	9	15.25%	9	15.00%	13	29.55%
		Preparation of means of transportation after inundation	26	20.97%	10	18.87%	5	8.47%	2	3.33%	8	18.18%
		Premature cropping and carrying agricultural products out	118	95.16%	46	86.79%	46	77.97%	57	95.00%	39	88.64%
		-->D.2)										
D1.2	Why didn't you do damage alleviation actions?											
		There is no information and you thought your farmland wouldn't be inundated	6	10.71%	3	20.00%	1	100.00%	0	N/A	4	21.05%
		You had information but you didn't know what to do	12	21.43%	10	66.67%	0	0.00%	0	N/A	8	42.11%
		You had information but you thought you have enough time	0	0.00%	1	6.67%	0	0.00%	0	N/A	0	0.00%
		You had information but you didn't have enough time	21	37.50%	1	6.67%	0	0.00%	0	N/A	4	21.05%
		You had information but you thought your farmland would not be inundated (-->1.2.1)	8	14.29%	0	0.00%	0	0.00%	0	N/A	3	15.79%
		You had information but you thought that you would not be affected by inundation (-->1.2.2)	9	16.07%	0	0.00%	0	0.00%	0	N/A	0	0.00%

	Issues	Choices	Ayutthaya		Ang thong		Sing Buri		Chai Nat		Lopburi	
			Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
D1.2.1	Why did you think your house would not be inundated?											
		Prediction was not trusted	2	25.00%	0	0.00%	0	N/A	0	N/A	0	0.00%
		No information about inundate area	3	37.50%	0	0.00%	0	N/A	0	N/A	0	0.00%
		It has not been inundated (àD.2)	3	37.50%	0	0.00%	0	N/A	0	N/A	3	100.00%
D1.2.2	Why did you think so?											
		You thought that depth of water is shallow	5	55.56%	0	0.00%	0	N/A	0	N/A	0	N/A
		Your house has never been damaged by inundation until now	4	44.44%	0	0.00%	0	N/A	0	N/A	0	N/A
D2	Did you take damage alleviation action when inundation area approached?											
		Yes (-->2.1)	83	46.11%	21	30.88%	60	100.00%	58	96.67%	25	39.68%
		No (didn't do at that time) (-->D2.2)	97	53.89%	47	69.12%	0	0.00%	2	3.33%	38	60.32%
D2.1	What did you do?											
		Sandbagging around the farmland	31	37.35%	7	33.33%	0	0.00%	1	1.72%	0	0.00%
		Moving agricultural products to higher places	49	59.04%	4	19.05%	17	28.33%	3	5.17%	12	48.00%
		Moving agricultural machines to higher places	71	85.54%	6	28.57%	25	41.67%	36	62.07%	9	36.00%
		Preparation of means of transportation after inundation	56	67.47%	10	47.62%	44	73.33%	47	81.03%	8	32.00%
		Premature cropping and carrying agricultural products out	62	74.70%	8	38.10%	8	13.33%	1	1.72%	13	52.00%
		(-->D.3)										

	Issues	Choices	Ayutthaya		Ang thong		Sing Buri		Chai Nat		Lopburi	
			Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
D2.2	Why didn't you do damage alleviation action?											
		There is no information and you thought your farmland wouldn't be inundated	19	19.59%	2	4.26%	0	N/A	0	0.00%	3	7.89%
		You had information but you didn't know what to do	31	31.96%	38	80.85%	0	N/A	2	100.00%	21	55.26%
		You had information but you thought you have enough time	9	9.28%	2	4.26%	0	N/A	0	0.00%	1	2.63%
		You had information but you didn't have enough time	25	25.77%	5	10.64%	0	N/A	0	0.00%	7	18.42%
		You had information but you thought your house would not be inundated (-->C2.2.1)	7	7.22%	0	0.00%	0	N/A	0	0.00%	3	7.89%
		You had information but you thought that you would not be affected by inundation (-->2.2.2)	6	6.19%	0	0.00%	0	N/A	0	0.00%	3	7.89%
D2.2.1	Why didn't you think being inundated?											
		Prediction was not trusted	2	28.57%	0	0.00%	0	N/A	0	N/A	0	0.00%
		No information about inundate area	4	57.14%	0	0.00%	0	N/A	0	N/A	2	66.67%
		It has not been inundated (-->.3)	1	14.29%	0	0.00%	0	N/A	0	N/A	1	33.33%
D2.2.2	Why did you think so?											
		You thought that depth of water is shallow	4	66.67%	0	0.00%	0	N/A	0	N/A	2	66.67%
		You have never suffered from flooding until now	2	33.33%	0	0.00%	0	N/A	0	N/A	1	33.33%

	Issues	Choices	Ayutthaya		Ang thong		Sing Buri		Chai Nat		Lopburi	
			Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
D3	Did you take damage alleviation action for agricultural products after inundation?											
		Yes (-->3.1)	72	40.00%	14	20.59%	56	93.33%	55	91.67%	11	17.46%
		No (didn't do at that time) (-->D3.2)	108	60.00%	54	79.41%	4	6.67%	5	8.33%	52	82.54%
D3.1	What did you do?											
		Sandbagging around the farmland	3	4.17%	7	50.00%	0	0.00%	0	0.00%	0	0.00%
		Moving agricultural products to higher places	17	23.61%	1	7.14%	7	12.50%	0	0.00%	5	45.45%
		Moving agricultural machines to higher places	12	16.67%	10	71.43%	8	14.29%	0	0.00%	4	36.36%
		Preparation for living at your house after inundation	62	86.11%	11	78.57%	44	78.57%	52	94.55%	1	9.09%
		Preparation of means of transportation after inundation	54	75.00%	11	78.57%	15	26.79%	5	9.09%	5	45.45%
		Premature cropping and carrying agricultural products out	27	37.50%	1	7.14%	3	5.36%	2	3.64%	6	54.55%
		(--> E)										
D3.2	Why didn't you do damage alleviation actions?											
		There was no effective measure	33	30.56%	37	68.52%	4	100.00%	1	20.00%	34	65.38%
		Even if inundated, it was a grade which becomes somehow.	58	53.70%	11	20.37%	0	0.00%	4	80.00%	8	15.38%
		There was no time	17	15.74%	6	11.11%	0	0.00%	0	0.00%	10	19.23%

	Issues	Choices	Ayutthaya		Ang thong		Sing Buri		Chai Nat		Lopburi	
			Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
E1	What kind of information was useful for damage alleviation actions or grasp of flood situation before flood from river?											
		Total rainfall at mountain area in the past	5	2.78%	0	0.00%	1	1.67%	0	0.00%	0	0.00%
		Rainfall forecast at mountain area	18	10.00%	0	0.00%	2	3.33%	0	0.00%	2	3.17%
		River water level in the past	39	21.67%	11	16.18%	12	20.00%	6	10.00%	13	20.63%
		Forecasted river water level	47	26.11%	26	38.24%	10	16.67%	11	18.33%	12	19.05%
		Live report of river by media such as TV	81	45.00%	43	63.24%	35	58.33%	48	80.00%	40	63.49%
		Warning and alarm released by the public organization (Meteorological dep. or Local gov.)	145	80.56%	48	70.59%	42	70.00%	56	93.33%	36	57.14%
E2	What kind of information was useful for damage alleviation actions or grasp of flood situation when inundation area approached?											
		Total rainfall at mountain area in the past	2	1.11%	0	0.00%	4	6.67%	0	0.00%	3	4.76%
		Rainfall forecast at mountain area	8	4.44%	0	0.00%	1	1.67%	1	1.67%	3	4.76%
		River water level in the past	25	13.89%	7	10.29%	3	5.00%	2	3.33%	14	22.22%
		Forecasted river water level	78	43.33%	22	32.35%	39	65.00%	28	46.67%	20	31.75%

			Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
E2	What kind of information was useful for damage alleviation actions or grasp of flood situation when inundation area approached?	The place which has overflowed	12	6.67%	8	11.76%	4	6.67%	0	0.00%	2	3.17%
		Inundation area	23	12.78%	6	8.82%	1	1.67%	4	6.67%	4	6.35%
		Inundation area and water depth	56	31.11%	3	4.41%	14	23.33%	25	41.67%	2	3.17%
		Forecasted inundation area	11	6.11%	3	4.41%	2	3.33%	2	3.33%	11	17.46%
		Forecasted inundation area and water depth	34	18.89%	8	11.76%	5	8.33%	5	8.33%	11	17.46%
		Live report of inundation by media such as TV	95	52.78%	38	55.88%	43	71.67%	27	45.00%	38	60.32%
		Warning and alarm released by the public organization (Meteorological dep. or Local gov.)	123	68.33%	44	64.71%	41	68.33%	43	71.67%	31	49.21%
E3	What kind of information was useful for damage alleviation actions or grasp of flood situation after inundation?											
		Total rainfall at mountain area in the past	21	11.67%	0	0.00%	6	10.00%	0	0.00%	2	3.17%
		Rainfall forecast at mountain area	12	6.67%	0	0.00%	1	1.67%	0	0.00%	0	0.00%
		River water level in the past	28	15.56%	2	2.94%	5	8.33%	0	0.00%	9	14.29%
		Forecasted river water level	39	21.67%	10	14.71%	15	25.00%	2	3.33%	5	7.94%
		The place where water of river outflows	12	6.67%	7	10.29%	3	5.00%	1	1.67%	1	1.59%

	Issues	Choices	Ayutthaya		Ang thong		Sing Buri		Chai Nat		Lopburi	
			Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
E3		Inundation area	32	17.78%	7	10.29%	0	0.00%	4	6.67%	8	12.70%
		Inundation area and water depth	67	37.22%	7	10.29%	21	35.00%	20	33.33%	10	15.87%
		Forecasted inundation area	34	18.89%	6	8.82%	0	0.00%	0	0.00%	12	19.05%
		Forecasted inundation area and water depth	36	20.00%	7	10.29%	15	25.00%	6	10.00%	10	15.87%
		Forecasted time until the area around your house gets dry	118	65.56%	19	27.94%	16	26.67%	46	76.67%	18	28.57%
		Live report of inundation by media such as TV	95	52.78%	36	52.94%	27	45.00%	11	18.33%	35	55.56%
		Warning and alarm released by the public organization (Meteorological dep. or Local gov.)	137	76.11%	34	50.00%	29	48.33%	30	50.00%	34	53.97%
F1	How did you acquire disaster information for damage alleviation actions during 2011 flood? What were the contents of the information?											
		TV	159	88.33%	51	75.00%	55	91.67%	55	91.67%	58	92.06%
		Radio	88	48.89%	11	16.18%	18	30.00%	41	68.33%	9	14.29%
		Newspaper	12	6.67%	2	2.94%	0	0.00%	3	5.00%	0	0.00%
		Internet	8	4.44%	0	0.00%	1	1.67%	0	0.00%	0	0.00%
		SNS(Face book,twitter)	3	1.67%	0	0.00%	1	1.67%	0	0.00%	0	0.00%
		Information from region government	128	71.11%	23	33.82%	37	61.67%	58	96.67%	25	39.68%
		Local community	136	75.56%	58	85.29%	36	60.00%	46	76.67%	55	87.30%

	Issues	Choices	Ayutthaya		Ang thong		Sing Buri		Chai Nat		Lopburi	
			Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
	Contents of information											
		Total rainfall at mountain area in the past	10	5.56%	0	0.00%	3	5.00%	0	0.00%	1	1.59%
		Rainfall forecast at mountain area	18	10.00%	0	0.00%	0	0.00%	1	1.67%	0	0.00%
		River water level in the past	26	14.44%	6	8.82%	10	16.67%	2	3.33%	2	3.17%
		Forecasted river water level	45	25.00%	13	19.12%	20	33.33%	11	18.33%	9	14.29%
		The place from where water of river outflows	19	10.56%	10	14.71%	11	18.33%	7	11.67%	4	6.35%
		Inundation area	51	28.33%	12	17.65%	6	10.00%	19	31.67%	15	23.81%
		Inundation area and water depth	129	71.67%	25	36.76%	45	75.00%	38	63.33%	34	53.97%
		Forecasted inundation area	12	6.67%	1	1.47%	0	0.00%	0	0.00%	2	3.17%
		Forecasted inundation area and water depth	30	16.67%	5	7.35%	0	0.00%	3	5.00%	2	3.17%
		Forecast about inundation time and maximum depth	34	18.89%	0	0.00%	4	6.67%	4	6.67%	6	9.52%
		Forecasted time until water was drained	48	26.67%	10	14.71%	2	3.33%	1	1.67%	10	15.87%
		Live report of inundation by media such as TV	95	52.78%	40	58.82%	33	55.00%	5	8.33%	37	58.73%
		Warning and alarm released by the public organization (Meteorological dep. or Local gov.)	132	73.33%	43	63.24%	41	68.33%	23	38.33%	38	60.32%

	Issues	Choices	Ayutthaya		Ang thong		Sing Buri		Chai Nat		Lopburi	
			Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
F2	What was the most effective means of information acquisition for damage alleviation actions?											
		TV	148	82.22%	50	73.53%	50	83.33%	32	53.33%	37	58.73%
		Radio	57	31.67%	21	30.88%	7	11.67%	4	6.67%	1	1.59%
		News paper	24	13.33%	2	2.94%	1	1.67%	0	0.00%	0	0.00%
		Internet	12	6.67%	0	0.00%	1	1.67%	0	0.00%	0	0.00%
		SNS(Face book,twitter)	3	1.67%	0	0.00%	1	1.67%	0	0.00%	0	0.00%
		Information from region government	89	49.44%	20	29.41%	12	20.00%	31	51.67%	15	23.81%
		Local community	127	70.56%	49	72.06%	16	26.67%	4	6.67%	37	58.73%
F2.1	What is the reason you think so?											
		Easy to acquire information	131	72.78%	47	69.12%	19	31.67%	16	26.67%	47	74.60%
		Amount of information	43	23.89%	5	7.35%	2	3.33%	0	0.00%	5	7.94%
		Information is concrete	38	21.11%	5	7.35%	9	15.00%	8	13.33%	8	12.70%
		Information is reliable.	75	41.67%	9	13.24%	38	63.33%	51	85.00%	14	22.22%
		Familiar information can be acquired	14	7.78%	2	2.94%	1	1.67%	1	1.67%	2	3.17%
		Information is easy to understand	82	45.56%	28	41.18%	2	3.33%	5	8.33%	10	15.87%
G1	What kind of informations did you want other than the acquired information?											
		Total rainfall at mountain area in the past	11	6.11%	2	2.94%	7	11.67%	1	1.67%	1	1.59%
		Rainfall forecast at mountain area	8	4.44%	4	5.88%	2	3.33%	0	0.00%	3	4.76%
		River water level in the past	30	16.67%	9	13.24%	3	5.00%	1	1.67%	9	14.29%
		Forecasted river water level	27	15.00%	6	8.82%	11	18.33%	3	5.00%	4	6.35%
		The place from where water of river outflows	13	7.22%	6	8.82%	9	15.00%	2	3.33%	5	7.94%

	Issues	Choices	Ayutthaya		Ang thong		Sing Buri		Chai Nat		Lopburi	
			Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
G1		Inundation area	21	11.67%	14	20.59%	2	3.33%	6	10.00%	5	7.94%
		Inundation area and water depth	52	28.89%	8	11.76%	14	23.33%	27	45.00%	5	7.94%
		Forecasted inundation area	27	15.00%	8	11.76%	3	5.00%	0	0.00%	22	34.92%
		Forecasted inundation area and water depth	39	21.67%	5	7.35%	6	10.00%	3	5.00%	6	9.52%
		Forecast about inundation time and maximum depth	42	23.33%	6	8.82%	30	50.00%	33	55.00%	14	22.22%
		Forecasted time until water was drained	88	48.89%	20	29.41%	3	5.00%	5	8.33%	21	33.33%
		Live report of inundation by media such as TV	129	71.67%	38	55.88%	22	36.67%	7	11.67%	39	61.90%
		Warning and alarm released by the public organization (Meteorological dep. or Local gov.)	157	87.22%	50	73.53%	24	40.00%	25	41.67%	37	58.73%
G2	What is easy-to-use information?											
		Periodical updated information	149	82.78%	35	51.47%	22	36.67%	22	36.67%	46	73.02%
		Information that you can acquire when necessary	82	45.56%	33	48.53%	6	10.00%	5	8.33%	28	44.44%
		Intelligible information with figure or table	56	31.11%	7	10.29%	33	55.00%	44	73.33%	4	6.35%
		Information which is explained in the text	23	12.78%	2	2.94%	0	0.00%	0	0.00%	0	0.00%
		Information which is not fragmentary and shows a global image	48	26.67%	8	11.76%	16	26.67%	5	8.33%	1	1.59%

	Issues	Choices	Ayutthaya		Ang thong		Sing Buri		Chai Nat		Lopburi	
			Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
G3	When do you need information of inundation for effective damage alleviation action?											
		7 days before inundation	176	97.78%	68	100.00%	59	98.33%	59	98.33%	63	100.00%
		4-6 days before inundation	3	1.67%	0	0.00%	1	1.67%	1	1.67%	0	0.00%
		3-2 days before inundation	1	0.56%	0	0.00%	0	0.00%	0	0.00%	0	0.00%
		1 day before inundation	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%
H1	The forecast of a inundation area etc. includes the prediction error of a natural phenomenon, and the prediction error of the simulation. So the forecast includes uncertainty. And you should perform action based on a forecast on your responsibility. What do you think about such a forecast?											
		Wrong action based on the forecast may be taken. So information including uncertainty is unnecessary.	22	12.22%	11	16.18%	4	6.67%	6	10.00%	4	6.35%
		If the limit (width with error) of a predicted value is shown, it will be helpful.	49	27.22%	20	29.41%	14	23.33%	11	18.33%	18	28.57%
		Forecast is helpful even if it includes uncertainty.	72	40.00%	25	36.76%	11	18.33%	20	33.33%	22	34.92%
		The validity of information is separately judged based on the fact. Therefore, it cannot say anything as a generality.	10	5.56%	2	2.94%	2	3.33%	1	1.67%	4	6.35%
		Forecast is helpful if it thinks that it is the same as the alarm and warning which the Meteorological Dep. announces.	27	15.00%	10	14.71%	29	48.33%	22	36.67%	15	23.81%

Appendix D

Questionnaire Result: City Resident

Questionnaire Result: City Residents

	Issues	Choices	Ayutthaya		Ang thong		Sing Buri		Chai Nat		Lopburi	
			Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
A1	Gender											
		□ male	84	42.00%	51	55.43%	37	52.86%	35	58.33%	26	38.81%
		□ female	116	58.00%	41	44.57%	33	47.14%	25	41.67%	41	61.19%
A2	The form of your house											
		□ Single story house	111	55.50%	45	48.91%	26	37.14%	24	40.00%	47	70.15%
		□ Two or more -story building	82	41.00%	47	51.09%	44	62.86%	36	60.00%	20	29.85%
		□ Above the second floor of two or more-story building	7	3.50%	0	0.00%	0	0.00%	0	0.00%	0	0.00%
A3	Age											
		□ Less than 20 years old	3	1.50%	0	0.00%	6	8.57%	1	1.67%	0	0.00%
		□ 21-30 years old	27	13.50%	7	7.61%	27	38.57%	6	10.00%	7	10.45%
		□ 31-40 years old	68	34.00%	38	41.30%	19	27.14%	22	36.67%	26	38.81%
		□ 41-50 years old	54	27.00%	34	36.96%	10	14.29%	15	25.00%	25	37.31%
		□ 51-60 years old	33	16.50%	13	14.13%	8	11.43%	10	16.67%	7	10.45%
		□ Over 60 years old	15	7.50%	0	0.00%	0	0.00%	6	10.00%	2	2.99%
B1	How deep was the maximum depth around your house?											
		□ Around the house was soaked in water	22	11.00%	19	20.65%	0	0.00%	0	0.00%	8	11.94%
		□ Soaked in water under the floor	146	73.00%	63	68.48%	61	87.14%	54	90.00%	47	70.15%
		□ Soaked in water above the floor	30	15.00%	10	10.87%	9	12.86%	6	10.00%	11	16.42%
		□ Soaked in water to the second floor	2	1.00%	0	0.00%	0	0.00%	0	0.00%	1	1.49%
B2	How long was the time from when your house and around it (area you feel danger) soaked in water to maximum depth?											
		□ Less than 2 hours	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%
		□ 2-6 hours	0	0.00%	1	1.09%	0	0.00%	0	0.00%	0	0.00%
		□ 7-12 hours	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%
		□ more than 12 hours	200	100.00%	91	98.91%	70	100.00%	60	100.00%	67	100.00%
B3	When did you know that your building or the around your house might be flooded?											
		□ One week before inundation	126	63.00%	75	81.52%	67	95.71%	55	91.67%	45	67.16%
		□ 4-6 days before inundation	34	17.00%	6	6.52%	2	2.86%	3	5.00%	4	5.97%
		□ 2-3 days before inundation	6	3.00%	5	5.43%	0	0.00%	1	1.67%	6	8.96%
		□ The days of inundation	6	3.00%	1	1.09%	0	0.00%	0	0.00%	8	11.94%
		□ When your house inundated	28	14.00%	5	5.43%	1	1.43%	1	1.67%	4	5.97%

	Issues	Choices	Ayutthaya		Ang thong		Sing Buri		Chai Nat		Lopburi	
			Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
C1	Did you take damage alleviation action before inundation?											
		□ Yes (> C1.1)	157	78.50%	87	94.57%	68	97.14%	60	100.00%	51	76.12%
		□ No (didin't do at that time)(> C1.2)	43	21.50%	5	5.43%	2	2.86%	0	0.00%	16	23.88%
C1.1	What did you do?											
		□ Evacuation to safe places	21	13.38%	6	6.90%	0	0.00%	1	1.67%	16	31.37%
		□ Sandbagging around the house	42	26.75%	71	81.61%	23	33.82%	19	31.67%	17	33.33%
		□ Moving household items to higher places	92	58.60%	68	78.16%	65	95.59%	60	100.00%	45	88.24%
		□ Moving cars to higher places	65	41.40%	16	18.39%	57	83.82%	29	48.33%	15	29.41%
		□ Preparation of Long-term evacuation place	12	7.64%	0	0.00%	0	0.00%	2	3.33%	3	5.88%
		□ Preparation for living at your house after inundation	3	1.91%	12	13.79%	10	14.71%	25	41.67%	9	17.65%
		□ Preparation of means of transportation after inundation	43	27.39%	14	16.09%	3	4.41%	21	35.00%	13	25.49%
		(> C.2)										
C1.2	Why didn't you do damage alleviation actions?											
		□ There is no information and you thought your house wouldn't be inundated	21	48.84%	1	20.00%	1	50.00%	0		3	18.75%
		□ You had information but you didn't know what to do	5	11.63%	2	40.00%	0	0.00%	0		3	18.75%
		□ You had information but you thought you had enough time	11	25.58%	1	20.00%	1	50.00%	0		1	6.25%
		□ You had information but you didn't have enough time	6	13.95%	1	20.00%	0	0.00%	0		2	12.50%
		□ You had information but you thought your house would not be inundated (> C1.2.1)	0	0.00%	0	0.00%	0	0.00%	0		5	31.25%
		□ You had information but you thought that you would not be affected by inundation(> C1.2.2)	0	0.00%	0	0.00%	0	0.00%	0		2	12.50%
		□ It has not been inundated (> C.2)	0		0		0		0		2	40.00%

	Issues	Choices	Ayutthaya		Ang thong		Sing Buri		Chai Nat		Lopburi	
			Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
C1.2.2	Why did you think so?											
		□ You thought that depth of water is shallow	0		0		0		0		2	100.00%
		□ Your house has never been damaged by inundation until now	0		0		0		0		0	0.00%
C2	Did you take damage alleviation action when inundation area approached?											
		□ Yes (> C2.1)	171	85.50%	84	91.30%	70	100.00%	57	95.00%	38	56.72%
		□ No (didn't do at that time) (> C2.2)	29	14.50%	8	8.70%	0	0.00%	3	5.00%	29	43.28%
C2.1	What did you do?											
		□ Evacuation to safe places	32	18.71%	11	13.10%	0	0.00%	2	3.51%	21	55.26%
		□ Sandbagging around the house	26	15.20%	50	59.52%	1	1.43%	3	5.26%	9	23.68%
		□ Moving household items to higher places	94	54.97%	57	67.86%	9	12.86%	16	28.07%	28	73.68%
		□ Moving cars to higher places	46	26.90%	14	16.67%	7	10.00%	7	12.28%	10	26.32%
		□ Preparation of Long-term evacuation place	52	30.41%	0	0.00%	0	0.00%	1	1.75%	4	10.53%
		□ Preparation for living at your house after inundation	108	63.16%	29	34.52%	58	82.86%	55	96.49%	8	21.05%
		□ Preparation of means of transportation after inundation	67	39.18%	21	25.00%	57	81.43%	28	49.12%	8	21.05%
		(> C.3)										
C2.2	Why didn't you do damage alleviation action?											
		□ There is no information and you thought your house wouldn't be inundated	13	44.83%	1	12.50%	0		0	0.00%	2	6.90%
		□ You had information but you didn't know what to do	7	24.14%	6	75.00%	0		0	0.00%	13	44.83%
		□ You had information but you thought you have enough time	6	20.69%	0	0.00%	0		0	0.00%	0	0.00%
		□ You had information but you didn't have enough time	0	0.00%	0	0.00%	0		2	66.67%	4	13.79%
		□ You had information but you thought your house would not be inundated (>C2.2.1)	2	6.90%	1	12.50%	0		0	0.00%	7	24.14%
		□ You had information but you thought that you would not be affected by inundation (>C2.2.2)	1	3.45%	0	0.00%	0		1	33.33%	3	10.34%

	Issues	Choices	Ayutthaya		Ang thong		Sing Buri		Chai Nat		Lopburi	
			Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
C2.2.1	Why didn't you think being inundated?											
		□ Prediction was not trusted	0	0.00%	1	100.00%	0		0		0	0.00%
		□ No information about inundate area	2	100.00%	0	0.00%	0		0		4	57.14%
		□ It has not been inundated (> C.3)	0	0.00%	0	0.00%	0		0		3	42.86%
C2.2.2	Why did you think so?											
		□ You thought that depth of water is shallow	0	0.00%	0		0		1	100.00%	2	66.67%
		□ You have never suffered from flooding until now	1	100.00%	0		0		0	0.00%	1	33.33%
C3	Did you take damage alleviation action after inundation?											
		□ Yes (> C3.1)	127	63.50%	60	65.22%	66	94.29%	56	93.33%	20	29.85%
		□ No (didn't do at that time)(> C3.2)	73	36.50%	32	34.78%	4	5.71%	4	6.67%	47	70.15%
C3.1	What did you do?											
		□ Evacuation to safe places	67	52.76%	9	15.00%	3	4.55%	2	3.57%	9	45.00%
		□ Sandbagging around the house	12	9.45%	37	61.67%	0	0.00%	1	1.79%	5	25.00%
		□ Moving household items to higher places	43	33.86%	29	48.33%	1	1.52%	10	17.86%	8	40.00%
		□ Moving cars to higher places	23	18.11%	4	6.67%	0	0.00%	4	7.14%	4	20.00%
		□ Preparation of Long-term evacuation place	89	70.08%	3	5.00%	1	1.52%	1	1.79%	5	25.00%
		□ Preparation for living at your house after inundation	77	60.63%	26	43.33%	63	95.45%	52	92.86%	8	40.00%
		□ Preparation of means of transportation after inundation	43	33.86%	19	31.67%	17	25.76%	16	28.57%	2	10.00%
		(> D)										
C3.2	Why didn't you do damage alleviation actions?											
		□ There was no effective measure	24	32.88%	15	46.88%	2	50.00%	2	50.00%	36	76.60%
		□ Even if inundated, it was a grade which becomes somehow.	36	49.32%	17	53.13%	2	50.00%	2	50.00%	6	12.77%
		□ There was no time	13	17.81%	0	0.00%	0	0.00%	0	0.00%	5	10.64%

	Issues	Choices	Ayutthaya		Ang thong		Sing Buri		Chai Nat		Lopburi	
			Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
D1	What kind of information was useful for damage alleviation actions or grasp of flood situation before flood from river?											
		□ Total rainfall at mountain area in the past	35	17.50%	8	8.70%	0	0.00%	1	1.67%	5	7.46%
		□ Rainfall forecast at mountain area	27	13.50%	5	5.43%	4	5.71%	6	10.00%	0	0.00%
		□ River water level in the past	79	39.50%	25	27.17%	25	35.71%	8	13.33%	0	0.00%
		□ Forecasted river water level	109	54.50%	40	43.48%	8	11.43%	12	20.00%	18	26.87%
		□ Live report of river by media such as TV	159	79.50%	52	56.52%	57	81.43%	39	65.00%	47	70.15%
		□ Warning and alarm released by the public organization (Meteorological dep. or Local gov.)	131	65.50%	65	70.65%	64	91.43%	50	83.33%	32	47.76%
D2	What kind of information was useful for damage alleviation actions or grasp of flood situation when inundation area approached?											
		□ Total rainfall at mountain area in the past	15	7.50%	6	6.52%	0	0.00%	1	1.67%	4	5.97%
		□ Rainfall forecast at mountain area	34	17.00%	3	3.26%	0	0.00%	3	5.00%	2	2.99%
		□ River water level in the past	45	22.50%	16	17.39%	4	5.71%	5	8.33%	11	16.42%
		□ Forecasted river water level	67	33.50%	29	31.52%	10	14.29%	13	21.67%	8	11.94%
		□ The place which has overflowed	27	13.50%	15	16.30%	6	8.57%	6	10.00%	2	2.99%
		□ Inundation area	35	17.50%	8	8.70%	1	1.43%	7	11.67%	12	17.91%
		□ Inundation area and water depth	125	62.50%	14	15.22%	51	72.86%	32	53.33%	11	16.42%
		□ Forecasted inundation area	63	31.50%	6	6.52%	0	0.00%	2	3.33%	16	23.88%
		□ Forecasted inundation area and water depth	108	54.00%	18	19.57%	6	8.57%	5	8.33%	14	20.90%
		□ Live report of inundation by media such as TV	121	60.50%	56	60.87%	44	62.86%	18	30.00%	43	64.18%
		□ Warning and alarm released by the public organization (Meteorological dep. or Local gov.)	143	71.50%	60	65.22%	63	90.00%	44	73.33%	41	61.19%

	Issues	Choices	Ayutthaya		Ang thong		Sing Buri		Chai Nat		Lopburi	
			Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
D3	What kind of information was useful for damage alleviation actions or grasp of flood situation after inundation?											
		□ Total rainfall at mountain area in the past	21	10.50%	3	3.26%	0	0.00%	0	0.00%	7	10.45%
		□ Rainfall forecast at mountain area	15	7.50%	6	6.52%	1	1.43%	1	1.67%	2	2.99%
		□ River water level in the past	32	16.00%	10	10.87%	2	2.86%	7	11.67%	9	13.43%
		□ Forecasted river water level	68	34.00%	28	30.43%	11	15.71%	5	8.33%	5	7.46%
		□ The place where water of river outflows	54	27.00%	11	11.96%	6	8.57%	5	8.33%	3	4.48%
		□ Inundation area	34	17.00%	8	8.70%	3	4.29%	3	5.00%	12	17.91%
		□ Inundation area and water depth	89	44.50%	9	9.78%	7	10.00%	26	43.33%	16	23.88%
		□ Forecasted inundation area	32	16.00%	5	5.43%	2	2.86%	0	0.00%	11	16.42%
		□ Forecasted inundation area and water depth	47	23.50%	8	8.70%	4	5.71%	4	6.67%	15	22.39%
		□ Forecasted time until the area around your house gets dry	121	60.50%	44	47.83%	62	88.57%	51	85.00%	38	56.72%
		□ Live report of inundation by media such as TV	101	50.50%	41	44.57%	13	18.57%	11	18.33%	26	38.81%
		□ Warning and alarm released by the public organization (Meteorological dep. or Local gov.)	146	73.00%	37	40.22%	9	12.86%	10	16.67%	24	35.82%
E1	How did you acquire disaster information for damage alleviation actions during 2011 flood? What were the contents of the information?											
		□ TV	134	67.00%	81	88.04%	64	91.43%	53	88.33%	57	85.07%
		□ Radio	34	17.00%	20	21.74%	39	55.71%	33	55.00%	10	14.93%
		□ News paper	23	11.50%	4	4.35%	1	1.43%	0	0.00%	6	8.96%
		□ Internet	5	2.50%	1	1.09%	1	1.43%	1	1.67%	4	5.97%
		□ SNS(Face book,twitter)	3	1.50%	1	1.09%	0	0.00%	0	0.00%	3	4.48%
		□ Information from region government	108	54.00%	48	52.17%	58	82.86%	37	61.67%	31	46.27%
		□ Local community	116	58.00%	77	83.70%	25	35.71%	36	60.00%	48	71.64%

	Issues	Choices	Ayutthaya		Ang thong		Sing Buri		Chai Nat		Lopburi	
			Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
E1	Contents of information											
		1) Total rainfall at mountain area in the past	13	6.50%	6	6.52%	1	1.43%	0	0.00%	3	4.48%
		2) Rainfall forecast at mountain area	22	11.00%	4	4.35%	0	0.00%	1	1.67%	2	2.99%
		3) River water level in the past	31	15.50%	19	20.65%	3	4.29%	5	8.33%	7	10.45%
		4) Forecasted river water level	43	21.50%	25	27.17%	12	17.14%	11	18.33%	6	8.96%
		5) The place from where water of river outflows	28	14.00%	18	19.57%	13	18.57%	7	11.67%	5	7.46%
		6) Inundation area	45	22.50%	13	14.13%	5	7.14%	6	10.00%	12	17.91%
		7) Inundation area and water depth	109	54.50%	18	19.57%	46	65.71%	42	70.00%	17	25.37%
		8) Forecasted inundation area	43	21.50%	14	15.22%	2	2.86%	0	0.00%	13	19.40%
		9) Forecasted inundation area and water depth	82	41.00%	10	10.87%	7	10.00%	2	3.33%	13	19.40%
		10) Forecast about inundation time and maximum depth	45	22.50%	6	6.52%	11	15.71%	7	11.67%	16	23.88%
		11) Forecasted time until water was drained	32	16.00%	15	16.30%	8	11.43%	6	10.00%	25	37.31%
		12) Live report of inundation by media such as TV	123	61.50%	57	61.96%	57	81.43%	25	41.67%	40	59.70%
		□ Warning and alarm released by the public organization (Meteorological dep. or Local gov.)	139	69.50%	72	78.26%	66	94.29%	50	83.33%	38	56.72%
E2	What was the most effective means of information acquisition for damage alleviation actions?											
		□ TV	121	60.50%	73	79.35%	66	94.29%	46	76.67%	48	71.64%
		□ Radio	21	10.50%	19	20.65%	9	12.86%	9	15.00%	5	7.46%
		□ News paper	11	5.50%	1	1.09%	0	0.00%	0	0.00%	1	1.49%
		□ Internet	7	3.50%	0	0.00%	0	0.00%	0	0.00%	1	1.49%
		□ SNS(Face book,twitter)	4	2.00%	0	0.00%	0	0.00%	0	0.00%	1	1.49%
		□ Information from region government	108	54.00%	35	38.04%	12	17.14%	20	33.33%	18	26.87%
		□ Local community	116	58.00%	66	71.74%	13	18.57%	21	35.00%	25	37.31%

	Issues	Choices	Ayutthaya		Ang thong		Sing Buri		Chai Nat		Lopburi	
			Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
E2.1	What is the reason you think so?											
		□ Easy to acquire information	143	71.50%	73	79.35%	48	68.57%	55	91.67%	55	82.09%
		□ Amount of information	78	39.00%	4	4.35%	1	1.43%	0	0.00%	5	7.46%
		□ Information is concrete	45	22.50%	15	16.30%	15	21.43%	16	26.67%	9	13.43%
		□ Information is reliable.	68	34.00%	23	25.00%	12	17.14%	42	70.00%	8	11.94%
		□ Familiar information can be acquired	36	18.00%	4	4.35%	1	1.43%	3	5.00%	5	7.46%
		□ Information is easy to understand	98	49.00%	25	27.17%	12	17.14%	10	16.67%	21	31.34%
F1	What kind of informations did you want other than the acquired information?											
		□ Total rainfall at mountain area in the past	27	13.50%	2	2.17%	0	0.00%	0	0.00%	3	4.48%
		□ Rainfall forecast at mountain area	45	22.50%	1	1.09%	0	0.00%	5	8.33%	2	2.99%
		□ River water level in the past	32	16.00%	13	14.13%	4	5.71%	8	13.33%	15	22.39%
		□ Forecasted river water level	45	22.50%	21	22.83%	7	10.00%	3	5.00%	8	11.94%
		□ The place from where water of river outflows	12	6.00%	10	10.87%	4	5.71%	3	5.00%	3	4.48%
		□ Inundation area	28	14.00%	8	8.70%	2	2.86%	3	5.00%	11	16.42%
		□ Inundation area and water depth	95	47.50%	14	15.22%	46	65.71%	27	45.00%	18	26.87%
		□ Forecasted inundation area	32	16.00%	13	14.13%	1	1.43%	3	5.00%	19	28.36%
		□ Forecasted inundation area and water depth	102	51.00%	14	15.22%	5	7.14%	4	6.67%	17	25.37%
		□ Forecast about inundation time and maximum depth	87	43.50%	7	7.61%	16	22.86%	16	26.67%	17	25.37%
		□ Forecasted time until water was drained	123	61.50%	15	16.30%	10	14.29%	7	11.67%	21	31.34%
		□ Live report of inundation by media such as TV	134	67.00%	10	10.87%	35	50.00%	17	28.33%	31	46.27%
		□ Warning and alarm released by the public organization (Meteorological dep. or Local gov.)	142	71.00%	56	60.87%	53	75.71%	40	66.67%	26	38.81%
F2	What is easy-to-use information?											
		□ Peridical updated information	147	73.50%	55	59.78%	17	24.29%	26	43.33%	47	70.15%
		□ Information that you can acquire when necessary	124	62.00%	33	35.87%	9	12.86%	13	21.67%	20	29.85%
		□ Intelligible information with figure or table	74	37.00%	14	15.22%	46	65.71%	31	51.67%	15	22.39%
		□ Information which is explained in the text	21	10.50%	0	0.00%	2	2.86%	1	1.67%	2	2.99%
		□ Information which is not fragmentary and shows a global image	32	16.00%	10	10.87%	14	20.00%	6	10.00%	2	2.99%

	Issues	Choices	Ayutthaya		Ang thong		Sing Buri		Chai Nat		Lopburi	
			Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
F3	When do you need information of inundation for effective damage alleviation action?											
		□ 7 days before inundation	178	89.00%	90	97.83%	69	98.57%	60	100.00%	66	98.51%
		□ 4-6 days before inundation	17	8.50%	2	2.17%	1	1.43%	0	0.00%	0	0.00%
		□ 3-2 days before inundation	5	2.50%	0	0.00%	0	0.00%	0	0.00%	1	1.49%
		□ 1 day before inundation	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%
G1	The forecast of a inundation area etc. includes the prediction error of a natural phenomenon, and the prediction error of the simulation. So the forecast includes uncertainty. And you should perform action based on a forecast on your responsibility. What do you think about such a forecast?											
		□ Wrong action based on the forecast may be taken. So information including uncertainty is unnecessary.	27	13.50%	12	13.04%	6	8.57%	1	1.67%	12	17.91%
		□ If the limit (width with error) of a predicted value is shown, it will be helpful.	53	26.50%	32	34.78%	14	20.00%	16	26.67%	27	40.30%
		□ Forecast is helpful even if it includes uncertainty.	68	34.00%	27	29.35%	27	38.57%	18	30.00%	9	13.43%
		□ The validity of information is separately judged based on the fact. Therefore, it cannot say anything as a generality.	4	2.00%	1	1.09%	1	1.43%	3	5.00%	3	4.48%
		□ Forecast is helpful if it thinks that it is the same as the alarm and warning which the Meteorological Dep. announces.	48	24.00%	20	21.74%	22	31.43%	22	36.67%	16	23.88%

Appendix E

Questionnaire Result: Factory

Questionnaire Result: Factories in 7 Industrial Estates

	Issue	Choice	Saharattananakorn			Rojjana		
(A1)	Name of industrial estates		Siam Kensetsu	Aqua Nishihara	Yamamoto Foundry	Nihon Seiki Thai	Izumi Industry	Thai Horikawa
(A2)	The form of factory							
		□ Single story building	/	/	/	/		/
		□ Two story building					/	
		□ Two or more-story building						
(B1)	How deep was the maximum depth around your factory?							
		□ Around the factory was soaked in water						
		□ Soaked in water under the floor of factory						
		□ Soaked in water above the floor of factory	/	/	/	/	/	/
		□ Soaked in water to the second floor of factory						
(B2)	What was damage of your factory?							
		□ Inundation of production equipment	/	/	/	/	/	/
		□ Inundation of material	/	/	/	/	/	/
		□ Inundation of industrial products	/	/	/	/	/	/
		□ Employee's attendance difficulty	/	/	/	/	/	/
		□ Stoppage of deliveries of parts	/	/	/	/	/	/
(B3)	How long was the time from when your factory or around it (area you feel danger) soaked in water to maximum depth?							
		□ Less than 2 hours	/	/	/			
		□ 2-6 hours				/	/	/
		□ 7-12 hours						
		□ more than 12 hours						
(B4)	When did you know that your factory or the around your factory might be flooded?							
		□ One week before inundation						
		□ 4-6 days before inundation				/	/	/
		□ 2-3 days before inundation						
		□ The days of inundation	/	/	/			
		□ When your house inundated						
(C1)	Did you take damage alleviation action before inundation?							
		□ Yes (-->1.1)	/	/	/	/	/	/
		□ No (didn't do at that time) (-->C1.2)						
(C1.1)	What did you do?							
		□ Evacuation to safe place, Stop attendance						/
		□ Sandbagging around the factory	/	/	/	/	/	/
		□ Moving industrial products to higher places(inside factory)						
		□ Moving industrial products to higher places(outside factory)						
		□ Preparation of means of transportation after inundation (boat etc.)						
		□ Production line adjustment (acceleration)						
		□ Preparation of drainage pumps						
		□ You (or your company) went to see upstream water level in river						
		(-->C.2)						
(C1.2)	Why didn't you do damage alleviation actions?							
		□ There is no information and you thought your factory wouldn't be inundated						
		□ You had information but you didn't know what to do						
		□ You had information but you thought you have enough time						
		□ You had information but you didn't have enough time						
		□ You had information but you thought your factory would not be inundated (--> C1.2.1)						
		□ You had information but you thought that you will not be affected by inundation (--> C1.2.2)						

	Issue	Choice	Saharattananakorn			Rojjana		
(A1)	Name of industrial estates		Siam Kensetsu	Aqua Nishihara	Yamamoto Foundry	Nihon Seiki Thai	Izumi Industry	Thai Horikawa
(C1.2.1)	Why did you think your house would not be inundated?							
		□ Prediction was not trusted						
		□ No information about inundate area						
		□ It has not been inundated (--> C.2)						
(C1.2.2)	Why did you think so?							
		□ You thought that depth of water is shallow						
		□ Your house has never been damaged by inundation until now						
(C2)	Did you take damage alleviation action when inundation area approached?							
		□ Yes (-->2.1)					/	/
		□ No (didn’t do at that time) (-->2.2)	/	/	/	/		
(C2.1)	What did you do?							
		□ Evacuation to safe place, Stop attendance						
		□ Sandbagging around the factory						
		□ Moving industrial products to higher places(inside factory)						
		□ Moving industrial products to higher places(outside factory)					/	/
		□ Preparation of means of transportation after inundation (boat etc.)						
		□ Production line adjustment (acceleration)						
		□ Preparation of drainage pumps						
		□ You (or your company) went to see upstream inundation situation water level in river						
		(--> C.3)						
(C2.2)	Why didn't you do damage alleviation action?							
		□ There is no information and you thought your factory wouldn’t be inundated						
		□ You had information but you didn’t know what to do		/	/	/		
		□ You had information but you thought you have enough time	/					
		□ You had information but you didn’t have enough time		/				
		□ You had information but you thought your house would not be inundated (--> 2.2.1)						
		□ You had information but you thought that you would not be affected by inundation (--> C2.2.2)						
		□ Prediction was not trusted						
		□ No information about inundate area						
		□ It has not been inundated (--> C.3)						
(C2.2.2)	Why did you think so?							
		□ You thought that depth of water is shallow	/					
		□ You have never suffered from flooding until now			/	/		
(C3)	Did you take damage alleviation action for industrial products after inundation?							
		□ Yes (--> C3.1)	/	/	/	/	/	/
		□ No (didn’t do at that time) (--> C3.2)						
(C3.1)	What did you do?							
		□ Sandbagging around the farmland						
		□ Moving agricultural products to higher places			/	/		/
		□ Moving agricultural machines to higher places	/	/		/	/	/
		□ Preparation for living at your house after inundation (for example Preparation of water and food)						
		□ Preparation of means of transportation after inundation (boat etc.)	/					
		□ Premature cropping and carrying agricultural products out						
		□ Inundation depth in your factory your company measured						
		(--> D)						

	Issue	Choice	Saharattananakorn			Rojjana		
(A1)	Name of industrial estates		Siam Kensetsu	Aqua Nishihara	Yamamoto Foundry	Nihon Seiki Thai	Izumi Industry	Thai Horikawa
(C3.2)	Why didn't you do damage alleviation actions?							
		□ There was no effective measure						
		□ Even if inundated, it was a grade which becomes somehow.						
		□ There was no time						
(D1)	What kind of information was useful for damage alleviation actions or grasp of flood situation before flood from river?							
		□ Total rainfall at mountain area in the past						
		□ Rainfall forecast at mountain area						
		□ River water level in the past						
		□ Forecasted river water level	/	/		/	/	/
		□ Live report of river by media such as TV	/	/	/	/	/	/
		□ Warning and alarm released by the public organization (Meteorological department or Local government)	/	/	/	/	/	/
		□ Water level in canal						
		□ Tide level						
		□ Upstream water level in river you made sure						
(D2)	What kind of information was useful for damage alleviation actions or grasp of flood situation when inundation area approached?							
		□ Total rainfall at mountain area in the past						
		□ Rainfall forecast at mountain area						
		□ River water level in the past						
		□ Forecasted river water level	/	/	/	/	/	/
		□ The place which has overflowed	/	/	/	/	/	/
		□ Inundation area						
		□ Inundation area and water depth	/	/	/	/	/	/
		□ Forecasted inundation area						
		□ Forecasted inundation area and water depth	/	/	/	/	/	/
		□ Live report of inundation by media such as TV	/	/	/	/	/	/
		□ Warning and alarm released by the public organization (Meteorological department or Local government)	/	/	/	/	/	/
		□ Water level in canal						
		□ Tide level						
		□ Upstream inundation situation you made sure.						
(D3)	What kind of information was useful for damage alleviation actions or grasp of flood situation after inundation?							
		□ Total rainfall at mountain area in the past						
		□ Rainfall forecast at mountain area						
		□ River water level in the past						
		□ Forecasted river water level	/		/	/	/	/
		□ The place where water of river outflows	/	/		/	/	/
		□ Inundation area						
		□ Inundation area and water depth	/	/	/	/	/	/
		□ Forecasted inundation area						
		□ Forecasted inundation area and water depth	/	/	/	/	/	/
		□ Forecasted time until the area around your house gets dry	/	/	/	/	/	/
		□ Live report of inundation by media such as TV	/		/	/	/	/
		□ Warning and alarm released by the public organization (Meteorological department or Local government)	/	/	/	/	/	/
		□ Water level in canal						
		□ Tide level						
		□ Inundation depth in your factory your company measured						

	Issue	Choice	Saharattananakorn			Rojjana		
(A1)	Name of industrial estates		Siam Kensetsu	Aqua Nishihara	Yamamoto Foundry	Nihon Seiki Thai	Izumi Industry	Thai Horikawa
(E1)	How did you acquire disaster information for damage alleviation actions during 2011 flood? What were the contents of the information?							
		□ TV	/	/	/	/	/	/
		□ Radio						
		□ News paper						
		□ Internet	/	/	/	/	/	/
		□ SNS(Face book,twitter)						
		□ Information from region government	/	/	/	/	/	/
		□ Information exchanging in industrial estates	/	/	/	/	/	/
	Contents of information	1) Total rainfall at mountain area in the past						
		2) Rainfall forecast at mountain area						
		3) River water level in the past						
		4) Forecasted river water level	/		/	/	/	/
		5) The place from where water of river outflows	/	/		/	/	/
		6) Inundation area						
		7) Inundation area and water depth	/	/	/	/	/	/
		8) Forecasted inundation area						
		9) Forecasted inundation area and water depth				/	/	/
		10) Forecast about inundation time and maximum depth				/	/	/
		11) Forecasted time until water was drained						
		12) Live report of inundation by media such as TV	/	/	/	/	/	/
		13) Warning and alarm released by the public organization (Meteorological department or Local government)	/	/	/	/	/	/
(E2)	What was the most effective means of information acquisition for damage alleviation actions?							
		□ TV	/	/	/	/	/	/
		□ Radio						
		□ News paper						
		□ Internet	/	/	/	/	/	/
		□ SNS(Face book,twitter)						
		□ Information from region government				/	/	/
		□ Local community	/	/	/	/	/	/
		□ Information you (or your company) made sure by yourself						
(E2.1)	What is the reason you think so?							
		□ Easy to acquire information	/	/	/	/	/	/
		□ Amount of information						
		□ Information is concrete						
		□ Information is reliable.						
		□ Familiar information can be acquired						
		□ Information is easy to understand						
(F1)	What kind of informations did you want other than the acquired information?							
		□ Total rainfall at mountain area in the past						
		□ Rainfall forecast at mountain area						
		□ River water level in the past						
		□ Forecasted river water level	/		/	/	/	
		□ The place from where water of river outflows	/	/	/	/	/	
		□ Inundation area						
		□ Inundation area and water depth	/	/	/	/	/	
		□ Forecasted inundation area						
		□ Forecasted inundation area and water depth	/	/	/	/	/	/
		□ Forecast about inundation time and maximum depth	/	/	/	/	/	
		□ Forecasted time until water was drained	/	/	/	/	/	
		□ Live report of inundation by media such as TV	/	/	/	/	/	
		□ Warning and alarm released by the public organization (Meteorological department or Local government)	/		/	/		
		□ Information from government (organization you can trust) about inundation						/

	Issue	Choice	Saharattananakorn			Rojjana		
(A1)	Name of industrial estates		Siam Kensetsu	Aqua Nishihara	Yamamoto Foundry	Nihon Seiki Thai	Izumi Industry	Thai Horikawa
(F2)	What is easy-to-use information?							
		□ Peridical updated information						
		□ Information that you can acquire when necessary						/
		□ Intelligible information with figure or table	/	/	/	/	/	
		□ Information which is explained in the text						
		□ Information which is not fragmentary and shows a global image						
(F3)	When do you need information of inundation for effective damage alleviation action?							
		□ 7 days before inundation	/	/	/	/	/	/
		□ 4-6 days before inundation						
		□ 3-2 days before inundation						
		□ 1 day before inundation						
(G1)	The forecast of a inundation area etc. includes the prediction error of a natural phenomenon, and the prediction error of the simulation. So the forecast includes uncertainty. And you should perform action based on a forecast on your responsibility. What do you think about such a forecast?							
		□ Wrong action based on the forecast may be taken. So information including uncertainty is unnecessary.						
		□ If the limit (width with error) of a predicted value is shown, it will be helpful.	/	/	/		/	
		□ Forecast is helpful even if it includes uncertainty.						
		□ The validity of information is separately judged based on the fact. Therefore, it cannot say anything as a generality.						
		□ Forecast is helpful if it thinks that it is the same as the alarm and warning which the Meteorological Department announces.	/		/	/		/

	Issue	Choice	Bang Pa-In			Navanakorn		
(A1)	Name of industrial estates		Nippon Super	Rockworth	Mitsui Precision Thai	Kawasumi Laboratories	Panasonic Manufacuring (Thailand)	Tomy Thailand
(A2)	The form of factory							
		□ Single story building	/	/	/			/
		□ Two story building				/	/	
		□ Two or more-story building						
(B1)	How deep was the maximum depth around your factory?							
		□ Around the factory was soaked in water						
		□ Soaked in water under the floor of factory						
		□ Soaked in water above the floor of factory	/	/	/	/	/	/
		□ Soaked in water to the second floor of factory						
(B2)	What was damage of your factory?							
		□ Inundation of production equipment	/	/	/	/	/	/
		□ Inundation of material	/	/	/	/	/	/
		□ Inundation of industrial products	/	/	/	/	/	/
		□ Employee's attendance difficulty	/	/	/	/	/	/
		□ Stoppage of deliveries of parts	/	/	/	/	/	/
(B3)	How long was the time from when your factory or around it (area you feel danger) soaked in water to maximum depth?							
		□ Less than 2 hours	/	/	/			
		□ 2-6 hours						
		□ 7-12 hours						
		□ more than 12 hours				/	/	/
(B4)	When did you know that your factory or the around your factory might be flooded?							
		□ One week before inundation	/	/	/			
		□ 4-6 days before inundation				/	/	/
		□ 2-3 days before inundation						
		□ The days of inundation						
		□ When your house inundated						
(C1)	Did you take damage alleviation action before inundation?							
		□ Yes (-->1.1)	/	/	/	/	/	/
		□ No (didn't do at that time) (-->C1.2)						
(C1.1)	What did you do?							
		□ Evacuation to safe place, Stop attendance			/			
		□ Sandbagging around the factory	/	/	/	/	/	/
		□ Moving industrial products to higher places(inside factory)	/	/	/	/	/	/
		□ Moving industrial products to higher places(outside factory)	/		/	/	/	
		□ Preparation of means of transportation after inundation (boat etc.)	/				/	
		□ Production line adjustment (acceleration)						
		□ Preparation of drainage pumps	/			/	/	
		□ You (or your company) went to see upstream water level in river						
		(-->C.2)						
(C1.2)	Why didn't you do damage alleviation actions?							
		□ There is no information and you thought your factory wouldn't be inundated						
		□ You had information but you didn't know what to do						
		□ You had information but you thought you have enough time						
		□ You had information but you didn't have enough time						
		□ You had information but you thought your factory would not be inundated (--> C1.2.1)						
		□ You had information but you thought that you will not be affected by inundation (--> C1.2.2)						

	Issue	Choice	Bang Pa-In			Navanakorn		
(A1)	Name of industrial estates		Nippon Super	Rockworth	Mitsui Precision Thai	Kawasumi Laboratories	Panasonic Manufacuring (Thailand)	Tomy Thailand
(C1.2.1)	Why did you think your house would not be inundated?							
		□ Prediction was not trusted						
		□ No information about inundate area						
		□ It has not been inundated (--> C.2)						
(C1.2.2)	Why did you think so?							
		□ You thought that depth of water is shallow						
		□ Your house has never been damaged by inundation until now						
(C2)	Did you take damage alleviation action when inundation area approached?							
		□ Yes (-->2.1)	/	/	/			
		□ No (didn’t do at that time) (-->2.2)				/	/	/
(C2.1)	What did you do?							
		□ Evacuation to safe place, Stop attendance						
		□ Sandbagging around the factory						
		□ Moving industrial products to higher places(inside factory)						
		□ Moving industrial products to higher places(outside factory)	/	/	/			
		□ Preparation of means of transportation after inundation (boat etc.)	/	/				
		□ Production line adjustment (acceleration)						
		□ Preparation of drainage pumps						
		□ You (or your company) went to see upstream inundation situation water level in river						
		(--> C.3)						
(C2.2)	Why didn't you do damage alleviation action?							
		□ There is no information and you thought your factory wouldn’t be inundated						
		□ You had information but you didn’t know what to do				/	/	/
		□ You had information but you thought you have enough time						
		□ You had information but you didn’t have enough time						
		□ You had information but you thought your house would not be inundated (--> 2.2.1)						
		□ You had information but you thought that you would not be affected by inundation (--> C2.2.2)						
		□ Prediction was not trusted						
		□ No information about inundate area						
		□ It has not been inundated (--> C.3)						
(C2.2.2)	Why did you think so?							
		□ You thought that depth of water is shallow						
		□ You have never suffered from flooding until now						
(C3)	Did you take damage alleviation action for industrial products after inundation?							
		□ Yes (--> C3.1)	/	/	/	/	/	/
		□ No (didn’t do at that time) (--> C3.2)						
(C3.1)	What did you do?							
		□ Sandbagging around the farmland						
		□ Moving agricultural products to higher places						
		□ Moving agricultural machines to higher places	/	/				
		□ Preparation for living at your house after inundation (for example Preparation of water and food)						
		□ Preparation of means of transportation after inundation (boat etc.)	/					
		□ Premature cropping and carrying agricultural products out						
		□ Inundation depth in your factory your company measured			/	/	/	/
		(--> D)						

	Issue	Choice	Bang Pa-In			Navanakorn		
(A1)	Name of industrial estates		Nippon Super	Rockworth	Mitsui Precision Thai	Kawasumi Laboratories	Panasonic Manufacuring (Thailand)	Tomy Thailand
(C3.2)	Why didn't you do damage alleviation actions?							
		□ There was no effective measure						
		□ Even if inundated, it was a grade which becomes somehow.						
		□ There was no time						
(D1)	What kind of information was useful for damage alleviation actions or grasp of flood situation before flood from river?							
		□ Total rainfall at mountain area in the past						
		□ Rainfall forecast at mountain area						
		□ River water level in the past						
		□ Forecasted river water level	/	/	/	/	/	/
		□ Live report of river by media such as TV	/	/	/	/	/	/
		□ Warning and alarm released by the public organization (Meteorological department or Local government)	/	/	/	/	/	/
		□ Water level in canal						
		□ Tide level						
		□ Upstream water level in river you made sure						
(D2)	What kind of information was useful for damage alleviation actions or grasp of flood situation when inundation area approached?							
		□ Total rainfall at mountain area in the past						
		□ Rainfall forecast at mountain area						
		□ River water level in the past						
		□ Forecasted river water level	/		/	/	/	/
		□ The place which has overflowed	/	/	/	/	/	/
		□ Inundation area						
		□ Inundation area and water depth				/	/	
		□ Forecasted inundation area						
		□ Forecasted inundation area and water depth	/	/	/	/	/	/
		□ Live report of inundation by media such as TV	/	/	/	/	/	/
		□ Warning and alarm released by the public organization (Meteorological department or Local government)	/	/	/	/	/	/
		□ Water level in canal						
		□ Tide level						
		□ Upstream inundation situation you made sure.						
(D3)	What kind of information was useful for damage alleviation actions or grasp of flood situation after inundation?							
		□ Total rainfall at mountain area in the past						
		□ Rainfall forecast at mountain area						
		□ River water level in the past						
		□ Forecasted river water level	/			/	/	
		□ The place where water of river outflows	/	/	/	/	/	/
		□ Inundation area						
		□ Inundation area and water depth	/			/	/	
		□ Forecasted inundation area				/		
		□ Forecasted inundation area and water depth	/	/	/		/	/
		□ Forecasted time until the area around your house gets dry	/	/	/	/	/	/
		□ Live report of inundation by media such as TV	/	/	/	/	/	/
		□ Warning and alarm released by the public organization (Meteorological department or Local government)	/	/	/	/	/	/
		□ Water level in canal						
		□ Tide level						
		□ Inundation depth in your factory your company measured						

	Issue	Choice	Bang Pa-In			Navanakorn		
(A1)	Name of industrial estates		Nippon Super	Rockworth	Mitsui Precision Thai	Kawasumi Laboratories	Panasonic Manufacuring (Thailand)	Tomy Thailand
(E1)	How did you acquire disaster information for damage alleviation actions during 2011 flood? What were the contents of the information?							
		□ TV	/	/	/	/	/	/
		□ Radio						
		□ News paper						
		□ Internet	/	/	/	/	/	
		□ SNS(Face book,twitter)				/		
		□ Information from region government	/	/	/		/	/
		□ Information exchanging in industrial estates	/	/	/	/	/	/
	Contents of information	1) Total rainfall at mountain area in the past						
		2) Rainfall forecast at mountain area						
		3) River water level in the past						
		4) Forecasted river water level	/	/	/	/	/	/
		5) The place from where water of river outflows						
		6) Inundation area	/			/		
		7) Inundation area and water depth		/				
		8) Forecasted inundation area						
		9) Forecasted inundation area and water depth	/					
		10) Forecast about inundation time and maximum depth						
		11) Forecasted time until water was drained						
		12) Live report of inundation by media such as TV	/	/	/	/	/	/
		13) Warning and alarm released by the public organization (Meteorological department or Local government)	/	/	/	/	/	/
(E2)	What was the most effective means of information acquisition for damage alleviation actions?							
		□ TV	/	/	/	/	/	/
		□ Radio						
		□ News paper						
		□ Internet	/	/	/	/	/	/
		□ SNS(Face book,twitter)						
		□ Information from region government			/	/		/
		□ Local community	/	/	/	/	/	/
		□ Information you (or your company) made sure by yourself						
(E2.1)	What is the reason you think so?							
		□ Easy to acquire information	/	/	/	/		/
		□ Amount of information						
		□ Information is concrete						
		□ Information is reliable.						
		□ Familiar information can be acquired						
		□ Information is easy to understand					/	
(F1)	What kind of informations did you want other than the acquired information?							
		□ Total rainfall at mountain area in the past						
		□ Rainfall forecast at mountain area						
		□ River water level in the past						
		□ Forecasted river water level	/			/	/	
		□ The place from where water of river outflows	/	/			/	
		□ Inundation area						
		□ Inundation area and water depth	/			/	/	
		□ Forecasted inundation area						
		□ Forecasted inundation area and water depth	/	/		/		
		□ Forecast about inundation time and maximum depth	/	/		/	/	/
		□ Forecasted time until water was drained	/	/		/	/	/
		□ Live report of inundation by media such as TV	/			/		
		□ Warning and alarm released by the public organization (Meteorological department or Local government)		/				
		□ Information from government (organization you can trust) about inundation		/	/			/

	Issue	Choice	Bang Pa-In			Navanakorn		
(A1)	Name of industrial estates		Nippon Super	Rockworth	Mitsui Precision Thai	Kawasumi Laboratories	Panasonic Manufacuring (Thailand)	Tomy Thailand
(F2)	What is easy-to-use information?							
		□ Peridical updated information						
		□ Information that you can acquire when necessary		/			/	/
		□ Intelligible information with figure or table	/		/	/		
		□ Information which is explained in the text						
		□ Information which is not fragmentary and shows a global image						
(F3)	When do you need information of inundation for effective damage alleviation action?							
		□ 7 days before inundation	/	/	/	/	/	/
		□ 4-6 days before inundation						
		□ 3-2 days before inundation						
		□ 1 day before inundation						
(G1)	The forecast of a inundation area etc. includes the prediction error of a natural phenomenon, and the prediction error of the simulation. So the forecast includes uncertainty. And you should perform action based on a forecast on your responsibility. What do you think about such a forecast?							
		□ Wrong action based on the forecast may be taken. So information including uncertainty is unnecessary.						
		□ If the limit (width with error) of a predicted value is shown, it will be helpful.	/			/	/	
		□ Forecast is helpful even if it includes uncertainty.						
		□ The validity of information is separately judged based on the fact. Therefore, it cannot say anything as a generality.						
		□ Forecast is helpful if it thinks that it is the same as the alarm and warning which the Meteorological Department announces.		/	/			/

	Issue	Choice	Factory land			Bangkadi		
(A1)	Name of industrial estates		Fuji Autopart	Asada Chemical	Samco Seiki (Thailand)	Toshiba Lighting	Toshiba Semiconductor	Nidec Shibaru
(A2)	The form of factory							
		□ Single story building	/	/	/	/	/	/
		□ Two story building						
		□ Two or more-story building						
(B1)	How deep was the maximum depth around your factory?							
		□ Around the factory was soaked in water						
		□ Soaked in water under the floor of factory						
		□ Soaked in water above the floor of factory	/	/	/	/	/	/
		□ Soaked in water to the second floor of factory						
(B2)	What was damage of your factory?							
		□ Inundation of production equipment	/	/	/	/	/	/
		□ Inundation of material	/	/	/	/	/	/
		□ Inundation of industrial products	/	/	/	/	/	/
		□ Employee's attendance difficulty	/	/	/	/	/	/
		□ Stoppage of deliveries of parts	/	/	/	/	/	/
(B3)	How long was the time from when your factory or around it (area you feel danger) soaked in water to maximum depth?							
		□ Less than 2 hours						
		□ 2-6 hours	/	/	/			
		□ 7-12 hours						
		□ more than 12 hours				/	/	/
(B4)	When did you know that your factory or the around your factory might be flooded?							
		□ One week before inundation				/	/	/
		□ 4-6 days before inundation						
		□ 2-3 days before inundation	/	/	/			
		□ The days of inundation						
		□ When your house inundated						
(C1)	Did you take damage alleviation action before inundation?							
		□ Yes (-->1.1)	/	/	/	/	/	/
		□ No (didn't do at that time) (-->C1.2)						
(C1.1)	What did you do?							
		□ Evacuation to safe place, Stop attendance						
		□ Sandbagging around the factory	/	/	/	/	/	/
		□ Moving industrial products to higher places(inside factory)		/	/		/	/
		□ Moving industrial products to higher places(outside factory)		/	/	/	/	/
		□ Preparation of means of transportation after inundation (boat etc.)		/			/	
		□ Production line adjustment (acceleration)						
		□ Preparation of drainage pumps			/	/	/	
		□ You (or your company) went to see upstream water level in river (-->C.2)						
(C1.2)	Why didn't you do damage alleviation actions?							
		□ There is no information and you thought your factory wouldn't be inundated						
		□ You had information but you didn't know what to do						
		□ You had information but you thought you have enough time						
		□ You had information but you didn't have enough time						
		□ You had information but you thought your factory would not be inundated (--> C1.2.1)						
		□ You had information but you thought that you will not be affected by inundation (--> C1.2.2)						

	Issue	Choice	Factory land			Bangkadi		
(A1)	Name of industrial estates		Fuji Autopart	Asada Chemical	Samco Seiki (Thailand)	Toshiba Lighting	Toshiba Semiconductor	Nidec Shibaru
(C1.2.1)	Why did you think your house would not be inundated?							
		□ Prediction was not trusted						
		□ No information about inundate area						
		□ It has not been inundated (--> C.2)						
(C1.2.2)	Why did you think so?							
		□ You thought that depth of water is shallow						
		□ Your house has never been damaged by inundation until now						
(C2)	Did you take damage alleviation action when inundation area approached?							
		□ Yes (-->2.1)	/	/	/	/	/	/
		□ No (didn’t do at that time) (-->2.2)						
(C2.1)	What did you do?							
		□ Evacuation to safe place, Stop attendance	/		/	/	/	/
		□ Sandbagging around the factory						
		□ Moving industrial products to higher places(inside factory)		/				
		□ Moving industrial products to higher places(outside factory)		/				
		□ Preparation of means of transportation after inundation (boat etc.)		/	/			/
		□ Production line adjustment (acceleration)						
		□ Preparation of drainage pumps	/					
		□ You (or your company) went to see upstream inundation situation water level in river						
		(--> C.3)						
(C2.2)	Why didn't you do damage alleviation action?							
		□ There is no information and you thought your factory wouldn’t be inundated						
		□ You had information but you didn’t know what to do						
		□ You had information but you thought you have enough time						
		□ You had information but you didn’t have enough time						
		□ You had information but you thought your house would not be inundated (--> 2.2.1)						
		□ You had information but you thought that you would not be affected by inundation (--> C2.2.2)						
		□ Prediction was not trusted						
		□ No information about inundate area						
		□ It has not been inundated (--> C.3)						
(C2.2.2)	Why did you think so?							
		□ You thought that depth of water is shallow						
		□ You have never suffered from flooding until now						
(C3)	Did you take damage alleviation action for industrial products after inundation?							
		□ Yes (--> C3.1)	/	/	/	/	/	/
		□ No (didn’t do at that time) (--> C3.2)						
(C3.1)	What did you do?							
		□ Sandbagging around the farmland						
		□ Moving agricultural products to higher places	/	/				
		□ Moving agricultural machines to higher places		/				
		□ Preparation for living at your house after inundation (for example Preparation of water and food)						
		□ Preparation of means of transportation after inundation (boat etc.)						
		□ Premature cropping and carrying agricultural products out						
		□ Inundation depth in your factory your company measured			/	/	/	/
		(--> D)						

	Issue	Choice	Factory land			Bangkadi		
(A1)	Name of industrial estates		Fuji Autopart	Asada Chemical	Samco Seiki (Thailand)	Toshiba Lighting	Toshiba Semiconductor	Nidec Shibaru
(C3.2)	Why didn't you do damage alleviation actions?							
		□ There was no effective measure						
		□ Even if inundated, it was a grade which becomes somehow.						
		□ There was no time						
(D1)	What kind of information was useful for damage alleviation actions or grasp of flood situation before flood from river?							
		□ Total rainfall at mountain area in the past						
		□ Rainfall forecast at mountain area						
		□ River water level in the past						
		□ Forecasted river water level	/	/	/	/	/	/
		□ Live report of river by media such as TV	/	/	/	/	/	/
		□ Warning and alarm released by the public organization (Meteorological department or Local government)	/	/	/	/	/	/
		□ Water level in canal						
		□ Tide level						
		□ Upstream water level in river you made sure						
(D2)	What kind of information was useful for damage alleviation actions or grasp of flood situation when inundation area approached?							
		□ Total rainfall at mountain area in the past						
		□ Rainfall forecast at mountain area						
		□ River water level in the past						
		□ Forecasted river water level	/			/	/	/
		□ The place which has overflowed	/		/	/	/	/
		□ Inundation area						
		□ Inundation area and water depth	/	/	/		/	/
		□ Forecasted inundation area						
		□ Forecasted inundation area and water depth	/	/	/	/	/	/
		□ Live report of inundation by media such as TV	/	/	/	/	/	/
		□ Warning and alarm released by the public organization (Meteorological department or Local government)	/	/	/	/	/	/
		□ Water level in canal						
		□ Tide level						
		□ Upstream inundation situation you made sure.						
(D3)	What kind of information was useful for damage alleviation actions or grasp of flood situation after inundation?							
		□ Total rainfall at mountain area in the past						
		□ Rainfall forecast at mountain area						
		□ River water level in the past						
		□ Forecasted river water level	/					/
		□ The place where water of river outflows	/		/	/	/	/
		□ Inundation area						
		□ Inundation area and water depth	/	/		/	/	/
		□ Forecasted inundation area						
		□ Forecasted inundation area and water depth	/	/	/	/	/	/
		□ Forecasted time until the area around your house gets dry	/	/	/	/	/	/
		□ Live report of inundation by media such as TV	/	/	/	/	/	/
		□ Warning and alarm released by the public organization (Meteorological department or Local government)	/	/	/	/	/	/
		□ Water level in canal						
		□ Tide level						
		□ Inundation depth in your factory your company measured						

	Issue	Choice	Factory land			Bangkadi		
(A1)	Name of industrial estates		Fuji Autopart	Asada Chemical	Samco Seiki (Thailand)	Toshiba Lighting	Toshiba Semiconductor	Nidec Shibaru
(E1)	How did you acquire disaster information for damage alleviation actions during 2011 flood? What were the contents of the information?							
		□ TV	/	/	/	/	/	/
		□ Radio						
		□ News paper						
		□ Internet	/	/	/	/	/	/
		□ SNS(Face book,twitter)	/					
		□ Information from region government		/	/	/	/	/
		□ Information exchanging in industrial estates	/	/	/	/	/	/
	Contents of information	1) Total rainfall at mountain area in the past				/		
		2) Rainfall forecast at mountain area						
		3) River water level in the past						
		4) Forecasted river water level	/	/	/	/	/	/
		5) The place from where water of river outflows						
		6) Inundation area			/	/	/	/
		7) Inundation area and water depth			/	/	/	/
		8) Forecasted inundation area						
		9) Forecasted inundation area and water depth	/					
		10) Forecast about inundation time and maximum depth						
		11) Forecasted time until water was drained						
		12) Live report of inundation by media such as TV	/	/	/	/	/	/
		13) Warning and alarm released by the public organization (Meteorological department or Local government)	/	/	/	/	/	/
(E2)	What was the most effective means of information acquisition for damage alleviation actions?							
		□ TV	/	/	/	/	/	/
		□ Radio						
		□ News paper						
		□ Internet	/		/	/	/	/
		□ SNS(Face book,twitter)						
		□ Information from region government	/	/			/	/
		□ Local community	/	/	/	/	/	/
		□ Information you (or your company) made sure by yourself						
(E2.1)	What is the reason you think so?							
		□ Easy to acquire information	/	/	/	/	/	/
		□ Amount of information						
		□ Information is concrete						
		□ Information is reliable.						
		□ Familiar information can be acquired						
		□ Information is easy to understand						
(F1)	What kind of informations did you want other than the acquired information?							
		□ Total rainfall at mountain area in the past				/	/	/
		□ Rainfall forecast at mountain area				/	/	/
		□ River water level in the past				/	/	/
		□ Forecasted river water level	/			/	/	/
		□ The place from where water of river outflows	/	/	/	/	/	/
		□ Inundation area				/	/	/
		□ Inundation area and water depth				/	/	/
		□ Forecasted inundation area	/			/	/	/
		□ Forecasted inundation area and water depth	/	/	/	/	/	/
		□ Forecast about inundation time and maximum depth	/	/		/	/	/
		□ Forecasted time until water was drained	/	/		/	/	/
		□ Live report of inundation by media such as TV	/		/	/	/	/
		□ Warning and alarm released by the public organization (Meteorological department or Local government)	/		/	/	/	/
		□ Information from government (organization you can trust) about inundation	/			/	/	/

	Issue	Choice	Factory land			Bangkadi		
(A1)	Name of industrial estates		Fuji Autopart	Asada Chemical	Samco Seiki (Thailand)	Toshiba Lighting	Toshiba Semiconductor	Nidec Shibaru
(F2)	What is easy-to-use information?							
		□ Peridical updated information						
		□ Information that you can acquire when necessary			/		/	
		□ Intelligible information with figure or table	/	/		/		/
		□ Information which is explained in the text						
		□ Information which is not fragmentary and shows a global image						
(F3)	When do you need information of inundation for effective damage alleviation action?							
		□ 7 days before inundation	/	/	/	/	/	/
		□ 4-6 days before inundation						
		□ 3-2 days before inundation						
		□ 1 day before inundation						
(G1)	The forecast of a inundation area etc. includes the prediction error of a natural phenomenon, and the prediction error of the simulation. So the forecast includes uncertainty. And you should perform action based on a forecast on your responsibility. What do you think about such a forecast?							
		□ Wrong action based on the forecast may be taken. So information including uncertainty is unnecessary.						
		□ If the limit (width with error) of a predicted value is shown, it will be helpful.						
		□ Forecast is helpful even if it includes uncertainty.				/		
		□ The validity of information is separately judged based on the fact. Therefore, it cannot say anything as a generality.						
		□ Forecast is helpful if it thinks that it is the same as the alarm and warning which the Meteorological Department announces.	/	/	/		/	/

	Issue	Choice	Hi-tech				
(A1)	Name of industrial estates		Hana Semiconductor	Kobe Electronics Material	Chiyoda Integra	Mikuni (Thailand)	Soode Nagano
(A2)	The form of factory						
		□ Single story building		/	/	/	/
		□ Two story building					
		□ Two or more-story building	/				
(B1)	How deep was the maximum depth around your factory?						
		□ Around the factory was soaked in water					
		□ Soaked in water under the floor of factory					
		□ Soaked in water above the floor of factory	/	/	/	/	/
		□ Soaked in water to the second floor of factory					
(B2)	What was damage of your factory?						
		□ Inundation of production equipment	/	/	/	/	/
		□ Inundation of material	/	/	/	/	/
		□ Inundation of industrial products	/	/	/	/	/
		□ Employee's attendance difficulty	/	/	/	/	/
		□ Stoppage of deliveries of parts	/	/	/	/	/
(B3)	How long was the time from when your factory or around it (area you feel danger) soaked in water to maximum depth?						
		□ Less than 2 hours					
		□ 2-6 hours					
		□ 7-12 hours	/	/	/	/	/
		□ more than 12 hours					
(B4)	When did you know that your factory or the around your factory might be flooded?						
		□ One week before inundation					
		□ 4-6 days before inundation	/	/	/	/	/
		□ 2-3 days before inundation					
		□ The days of inundation					
		□ When your house inundated					
(C1)	Did you take damage alleviation action before inundation?						
		□ Yes (-->1.1)	/	/	/	/	
		□ No (didn’t do at that time) (-->C1.2)					/
(C1.1)	What did you do?						
		□ Evacuation to safe place, Stop attendance	/				
		□ Sandbagging around the factory	/	/	/	/	
		□ Moving industrial products to higher places(inside factory)	/	/			
		□ Moving industrial products to higher places(outside factory)	/	/			
		□ Preparation of means of transportation after inundation (boat etc.)	/				
		□ Production line adjustment (acceleration)					
		□ Preparation of drainage pumps	/				
		□ You (or your company) went to see upstream water level in river	/				
		(-->C.2)					
(C1.2)	Why didn’t you do damage alleviation actions?						
		□ There is no information and you thought your factory wouldn’t be inundated					
		□ You had information but you didn’t know what to do					
		□ You had information but you thought you have enough time					
		□ You had information but you didn’t have enough time					
		□ You had information but you thought your factory would not be inundated (--> C1.2.1)					/
		□ You had information but you thought that you will not be affected by inundation (--> C1.2.2)					

	Issue	Choice	Hi-tech				
(A1)	Name of industrial estates		Hana Semiconductor	Kobe Electronics Material	Chiyoda Integra	Mikuni (Thailand)	Soode Nagano
(C1.2.1)	Why did you think your house would not be inundated?						
		□ Prediction was not trusted					
		□ No information about inundate area					
		□ It has not been inundated (--> C.2)					/
(C1.2.2)	Why did you think so?						
		□ You thought that depth of water is shallow					
		□ Your house has never been damaged by inundation until now					
(C2)	Did you take damage alleviation action when inundation area approached?						
		□ Yes (-->2.1)	/	/	/	/	
		□ No (didn't do at that time) (-->2.2)					/
(C2.1)	What did you do?						
		□ Evacuation to safe place, Stop attendance					
		□ Sandbagging around the factory					
		□ Moving industrial products to higher places(inside factory)	/		/	/	
		□ Moving industrial products to higher places(outside factory)	/	/	/	/	
		□ Preparation of means of transportation after inundation (boat etc.)	/	/	/	/	
		□ Production line adjustment (acceleration)					
		□ Preparation of drainage pumps	/				
		□ You (or your company) went to see upstream inundation situation water level in river					
		(--> C.3)					
(C2.2)	Why didn't you do damage alleviation action?						
		□ There is no information and you thought your factory wouldn't be inundated					
		□ You had information but you didn't know what to do					
		□ You had information but you thought you have enough time					
		□ You had information but you didn't have enough time					
		□ You had information but you thought your house would not be inundated (--> 2.2.1)					
		□ You had information but you thought that you would not be affected by inundation (--> C2.2.2)					/
		□ Prediction was not trusted					
		□ No information about inundate area					
		□ It has not been inundated (--> C.3)					
(C2.2.2)	Why did you think so?						
		□ You thought that depth of water is shallow					/
		□ You have never suffered from flooding until now					
(C3)	Did you take damage alleviation action for industrial products after inundation?						
		□ Yes (--> C3.1)	/	/	/	/	
		□ No (didn't do at that time) (--> C3.2)					/
(C3.1)	What did you do?						
		□ Sandbagging around the farmland					
		□ Moving agricultural products to higher places					
		□ Moving agricultural machines to higher places			/		
		□ Preparation for living at your house after inundation (for example Preparation of water and food)					
		□ Preparation of means of transportation after inundation (boat etc.)					
		□ Premature cropping and carrying agricultural products out					
		□ Inundation depth in your factory your company measured	/	/	/	/	/
		(--> D)					

	Issue	Choice	Hi-tech				
(A1)	Name of industrial estates		Hana Semiconductor	Kobe Electronics Material	Chiyoda Integra	Mikuni (Thailand)	Soode Nagano
(C3.2)	Why didn't you do damage alleviation actions?						
		□ There was no effective measure					/
		□ Even if inundated, it was a grade which becomes somehow.					
		□ There was no time					
(D1)	What kind of information was useful for damage alleviation actions or grasp of flood situation before flood from river?						
		□ Total rainfall at mountain area in the past	/				
		□ Rainfall forecast at mountain area	/				
		□ River water level in the past	/				
		□ Forecasted river water level	/	/	/	/	/
		□ Live report of river by media such as TV	/	/	/		/
		□ Warning and alarm released by the public organization (Meteorological department or Local government)	/	/	/	/	/
		□ Water level in canal	/				
		□ Tide level	/				
		□ Upstream water level in river you made sure	/				
(D2)	What kind of information was useful for damage alleviation actions or grasp of flood situation when inundation area approached?						
		□ Total rainfall at mountain area in the past	/				
		□ Rainfall forecast at mountain area	/				
		□ River water level in the past	/				
		□ Forecasted river water level	/	/	/	/	/
		□ The place which has overflowed	/	/	/	/	/
		□ Inundation area	/				
		□ Inundation area and water depth	/	/	/	/	/
		□ Forecasted inundation area	/				
		□ Forecasted inundation area and water depth	/	/	/	/	/
		□ Live report of inundation by media such as TV	/	/	/	/	/
		□ Warning and alarm released by the public organization (Meteorological department or Local government)	/	/	/	/	/
		□ Water level in canal	/				
		□ Tide level	/				
		□ Upstream inundation situation you made sure.	/				
(D3)	What kind of information was useful for damage alleviation actions or grasp of flood situation after inundation?						
		□ Total rainfall at mountain area in the past	/				
		□ Rainfall forecast at mountain area	/				
		□ River water level in the past	/				
		□ Forecasted river water level	/	/	/	/	/
		□ The place where water of river outflows	/	/	/	/	/
		□ Inundation area	/				
		□ Inundation area and water depth	/	/	/	/	/
		□ Forecasted inundation area	/				
		□ Forecasted inundation area and water depth	/	/	/	/	/
		□ Forecasted time until the area around your house gets dry	/	/	/	/	/
		□ Live report of inundation by media such as TV	/	/	/	/	/
		□ Warning and alarm released by the public organization (Meteorological department or Local government)	/	/	/	/	/
		□ Water level in canal	/				
		□ Tide level	/				
		□ Inundation depth in your factory your company measured	/				

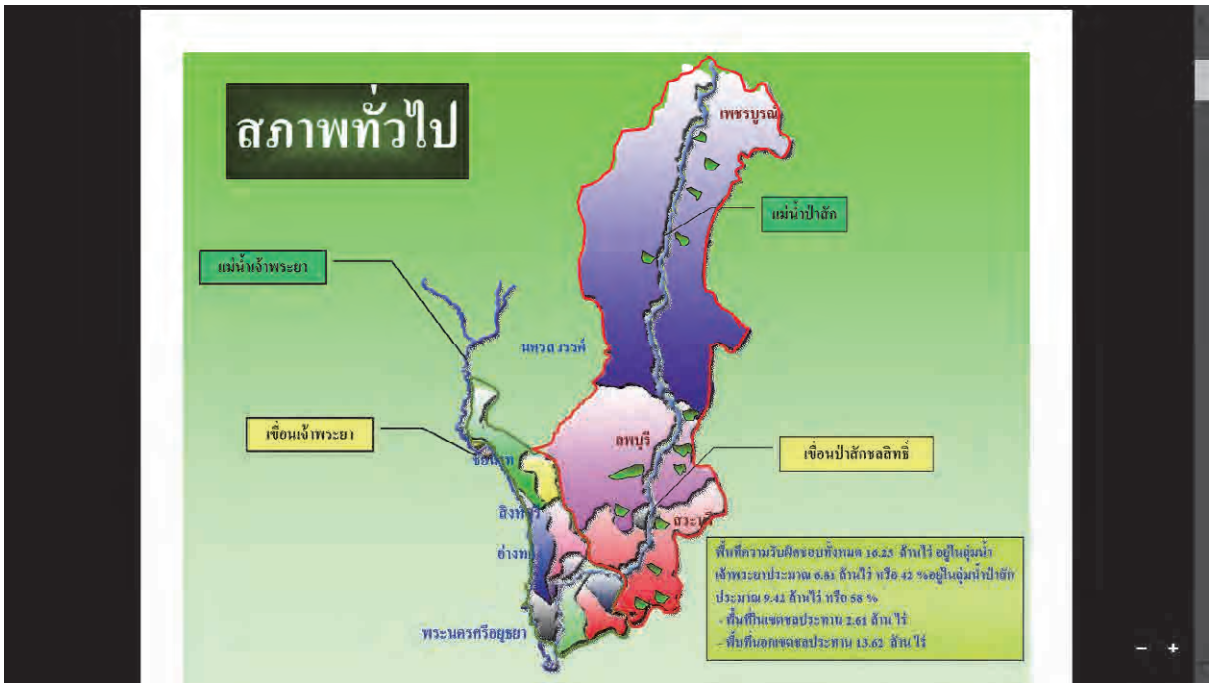
	Issue	Choice	Hi-tech				
(A1)	Name of industrial estates		Hana Semiconductor	Kobe Electronics Material	Chiyoda Integra	Mikuni (Thailand)	Soode Nagano
(E1)	How did you acquire disaster information for damage alleviation actions during 2011 flood? What were the contents of the information?						
		□ TV	/	/	/	/	/
		□ Radio					
		□ News paper					
		□ Internet		/	/		/
		□ SNS(Face book,twitter)			/		
		□ Information from region government	/	/	/	/	/
		□ Information exchanging in industrial estates	/	/	/	/	/
	Contents of information	1) Total rainfall at mountain area in the past					
		2) Rainfall forecast at mountain area					
		3) River water level in the past					
		4) Forecasted river water level	/	/	/	/	/
		5) The place from where water of river outflows		/	/	/	
		6) Inundation area					
		7) Inundation area and water depth					
		8) Forecasted inundation area					
		9) Forecasted inundation area and water depth					
		10) Forecast about inundation time and maximum depth					
		11) Forecasted time until water was drained					
		12) Live report of inundation by media such as TV	/	/	/	/	/
		13) Warning and alarm released by the public organization (Meteorological department or Local government)	/	/	/	/	/
(E2)	What was the most effective means of information acquisition for damage alleviation actions?						
		□ TV	/	/	/	/	/
		□ Radio					
		□ News paper					
		□ Internet		/	/	/	/
		□ SNS(Face book,twitter)		/			
		□ Information from region government	/				
		□ Local community	/	/	/		/
		□ Information you (or your company) made sure by yourself					
(E2.1)	What is the reason you think so?						
		□ Easy to acquire information	/	/	/	/	/
		□ Amount of information					
		□ Information is concrete					
		□ Information is reliable.					
		□ Familiar information can be acquired					
		□ Information is easy to understand					
(F1)	What kind of informations did you want other than the acquired information?						
		□ Total rainfall at mountain area in the past	/				
		□ Rainfall forecast at mountain area	/				
		□ River water level in the past	/				
		□ Forecasted river water level	/	/	/	/	/
		□ The place from where water of river outflows	/	/	/	/	/
		□ Inundation area	/				
		□ Inundation area and water depth	/	/	/	/	/
		□ Forecasted inundation area	/				
		□ Forecasted inundation area and water depth	/	/	/	/	
		□ Forecast about inundation time and maximum depth	/	/	/	/	/
		□ Forecasted time until water was drained	/	/	/	/	/
		□ Live report of inundation by media such as TV	/	/	/		
		□ Warning and alarm released by the public organization (Meteorological department or Local government)	/	/	/		/
		□ Information from government (organization you can trust) about inundation	/				

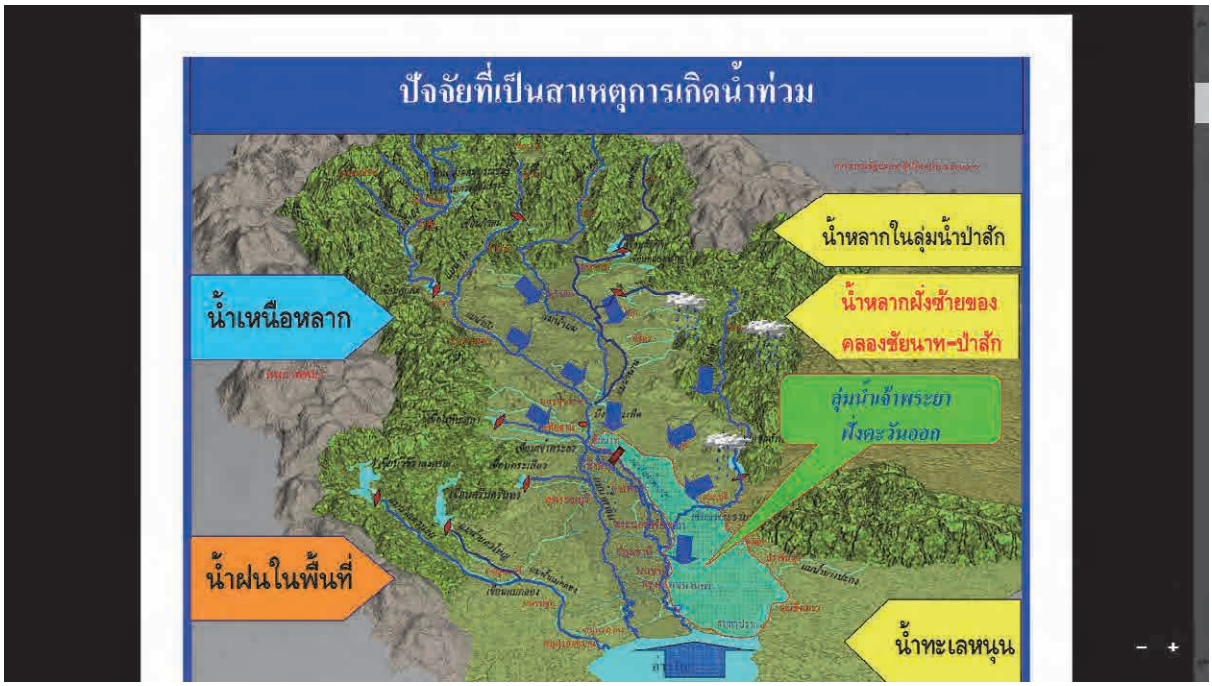
	Issue	Choice	Hi-tech				
(A1)	Name of industrial estates		Hana Semiconductor	Kobe Electronics Material	Chiyoda Integra	Mikuni (Thailand)	Soode Nagano
(F2)	What is easy-to-use information?						
		□ Peridical updated information					
		□ Information that you can acquire when necessary			/		
		□ Intelligible information with figure or table	/	/		/	/
		□ Information which is explained in the text					
		□ Information which is not fragmentary and shows a global image					
(F3)	When do you need information of inundation for effective damage alleviation action?						
		□ 7 days before inundation	/	/	/	/	/
		□ 4-6 days before inundation					
		□ 3-2 days before inundation					
		□ 1 day before inundation					
(G1)	The forecast of a inundation area etc. includes the prediction error of a natural phenomenon, and the prediction error of the simulation. So the forecast includes uncertainty. And you should perform action based on a forecast on your responsibility. What do you think about such a forecast?						
		□ Wrong action based on the forecast may be taken. So information including uncertainty is unnecessary.					
		□ If the limit (width with error) of a predicted value is shown, it will be helpful.	/				/
		□ Forecast is helpful even if it includes uncertainty.		/		/	
		□ The validity of information is separately judged based on the fact. Therefore, it cannot say anything as a generality.					
		□ Forecast is helpful if it thinks that it is the same as the alarm and warning which the Meteorological Department announces.			/		/

Appendix F

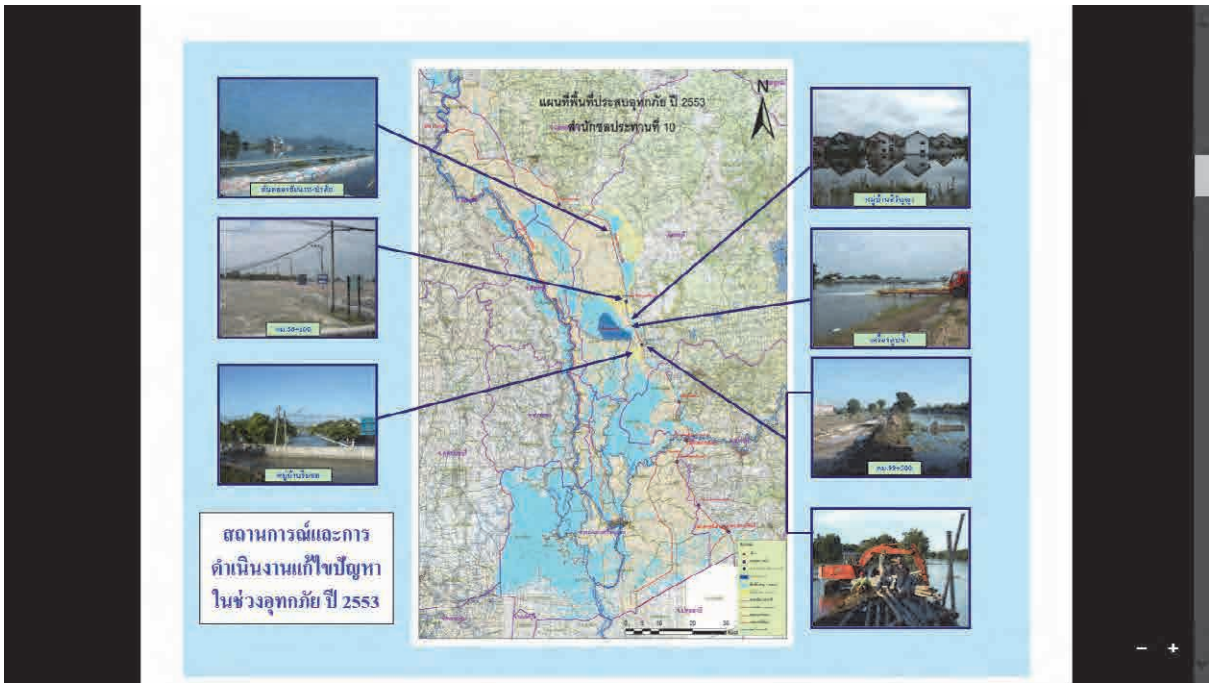
The Presentation File by Lopburi RID Regional Office

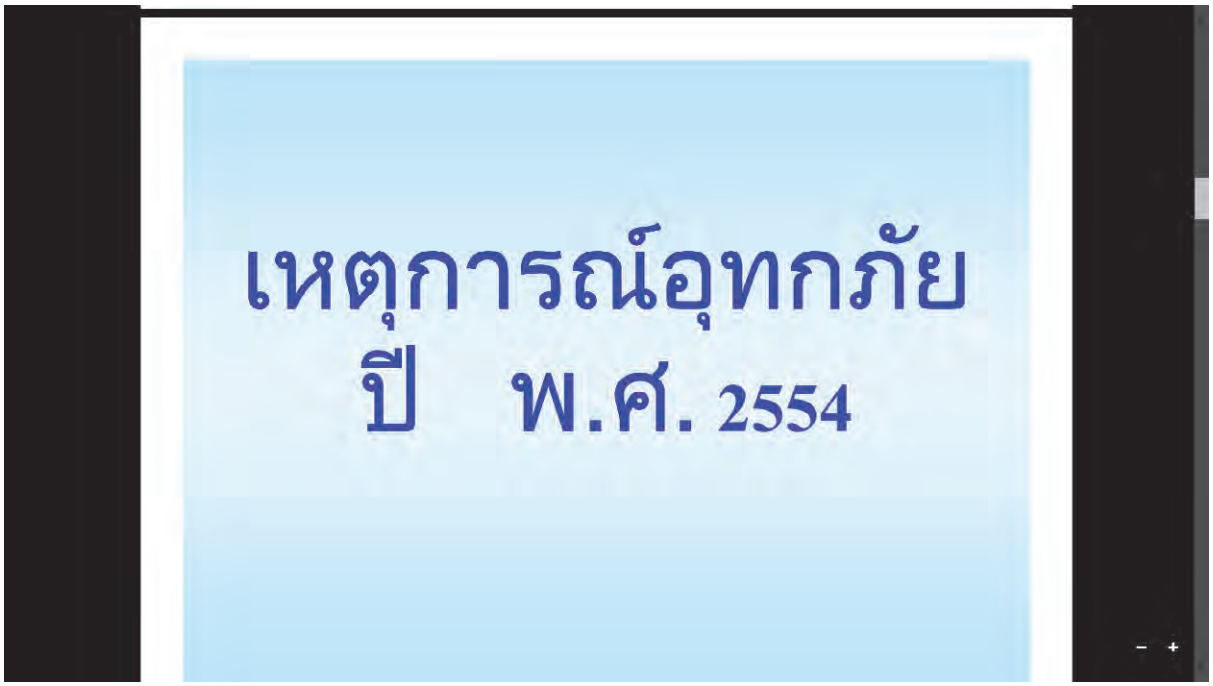
The Presentation File by Lopburi RID Regional Office

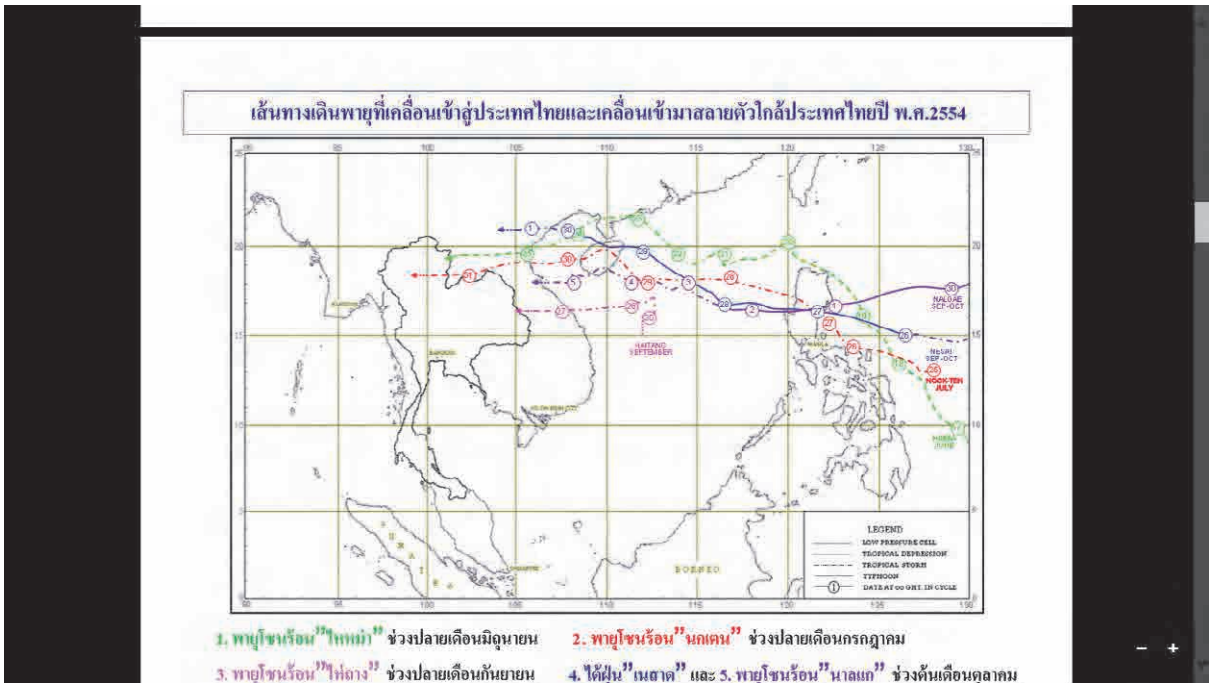


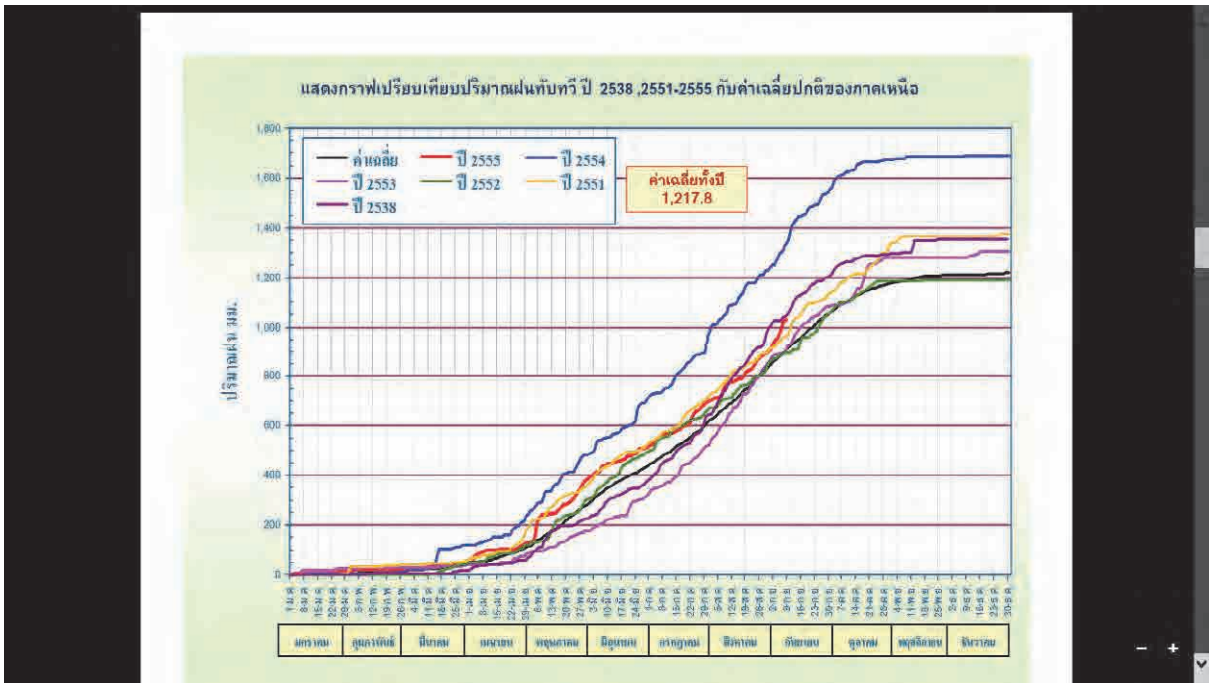

ปัจจัยที่เป็นสาเหตุการเกิดน้ำท่วม
น้ำหลากในลุ่มน้ำป่าสัก
น้ำเหนือหลาก
น้ำหลากฝั่งซ้ายของ
คลองชัยนาท-ป่าสัก
ลุ่มน้ำเจ้าพระยา
ฝั่งตะวันออก
น้ำฝนในพื้นที่
น้ำทะเลหนุน

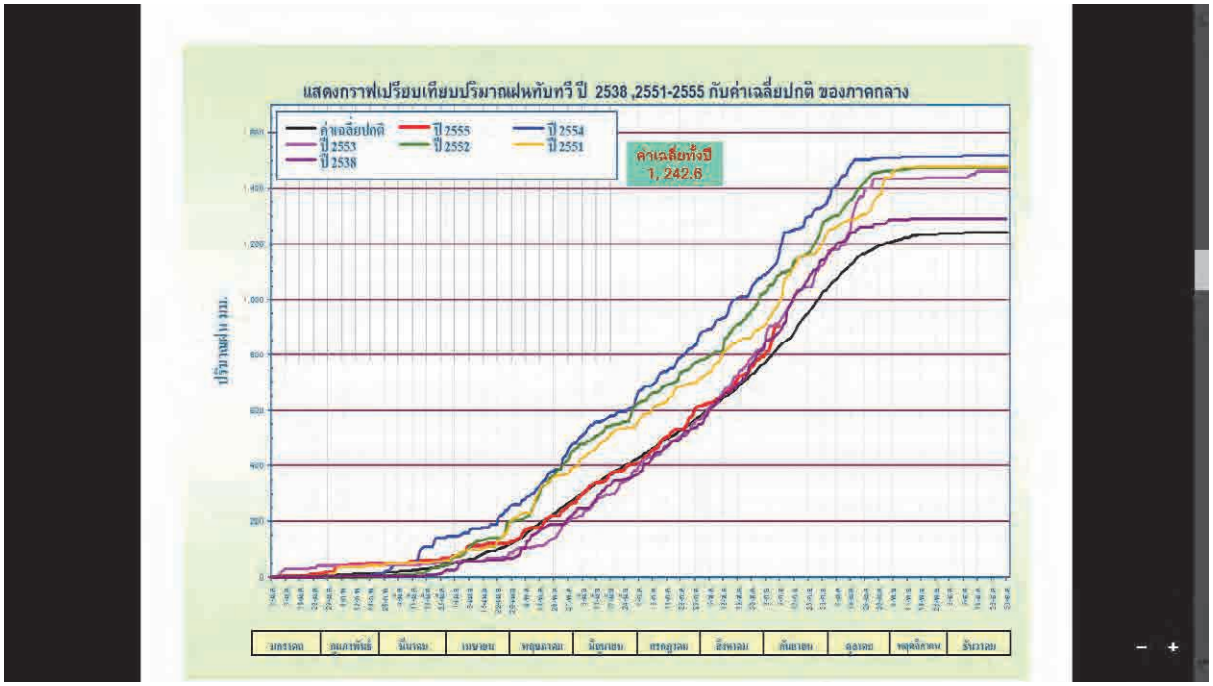

บริเวณพื้นที่ฝั่งซ้ายของคลองชัยนาท-ป่าสัก ปี พ.ศ.2553
คลองชัยนาท-ป่าสัก
เขื่อนเจ้าพระยา
ปตร.ช่องแค
ปตร.มหาราช
ปตร.บางโฉมศรี
บึงบอระเพ็ด
ปตร.บางขาม
ปตร.โคกกะเทียม
ปตร.บางกแม่น้ำลพบุรี
ปตร.บางขุ
ปตร.บางคู้
ปตร.ลำนารายณ์
ปตร.วัดหมื่นจันทร์
ปตร.ท่าหลาย
ปตร.ลำลายคลองมหาราช
ปตร.วัดอุโมง
ปตร.กระทุ่ม
พื้นที่น้ำท่วมขัง
เขื่อนป่าสักชลสิทธิ์
ฝนตกหนักช่วงวันที่ 13-17 ต.ค.53 วัดได้ที่ อ.ตาคลี และ
อ.ตากฟ้า จ.นครสวรรค์ 185.6 มม., ในพื้นที่อ.โคกสำโรง
อ.สระโบสถ์ อ.โคกเจริญ อ.หนองม่วง และอ.เมือง
จ.ลพบุรี 196.3-310 มม. จนเกิดน้ำป่าไหลหลากประมาณ
400 ล้านลบ.ม.เข้าท่วมพื้นที่ อ.ตาคลี จ.นครสวรรค์,
อ.โคกสำโรง อ.ชัยบาดาล และ อ.เมือง จ.ลพบุรี
เขื่อนพระรามหก

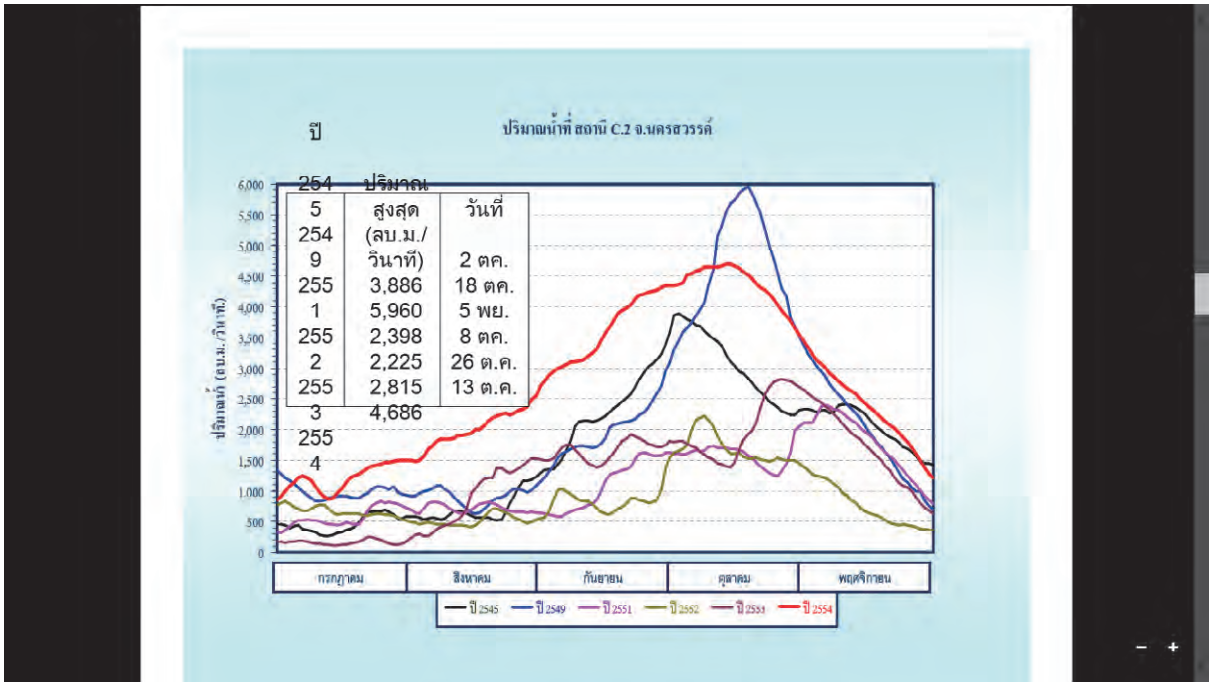

แผนที่พื้นที่ประสบอุทกภัย ปี 2553
สำนักชลประทานที่ 10
N
สถานการณ์และการ
ดำเนินงานแก้ไขปัญหา
ในช่วงอุทกภัย ปี 2553

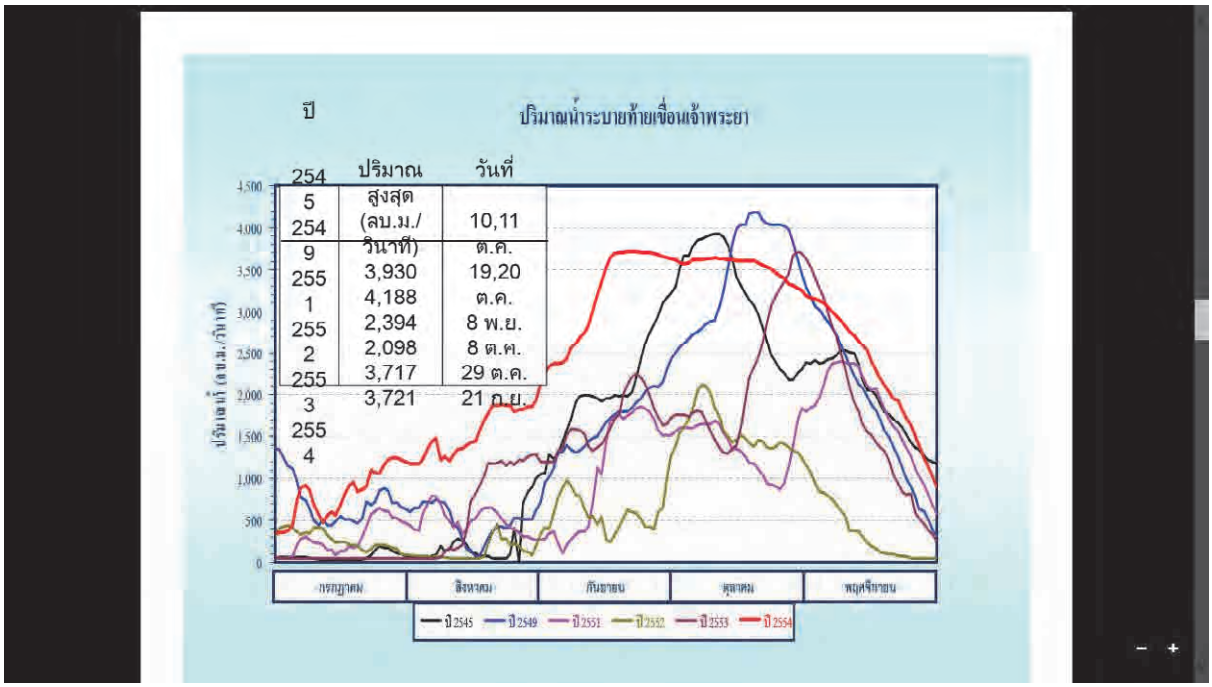

เหตุการณ์อุทกภัย
ปี พ.ศ. 2554


เส้นทางเดินพายุที่เคลื่อนเข้าสู่ประเทศไทยและเคลื่อนเข้ามาสลายตัวใกล้ประเทศไทยปี พ.ศ.2554
LEGEND
1. พายุโซนร้อน"ไหหม่า" ช่วงปลายเดือนมิถุนายน
2. พายุโซนร้อน"นกเตน" ช่วงปลายเดือนกรกฎาคม
3. พายุโซนร้อน"ไห่ถาง" ช่วงปลายเดือนกันยายน
4. ไต้ฝุ่น"เนสาด" และ 5. พายุโซนร้อน"นาลแก" ช่วงต้นเดือนตุลาคม


แสดงกราฟเปรียบเทียบปริมาณฝนทับทวี ปี 2538 ,2551-2555 กับค่าเฉลี่ยปกติของภาคเหนือ
ค่าเฉลี่ย
ปี 2555
ปี 2554
ปี 2553
ปี 2552
ปี 2551
ปี 2538
ค่าเฉลี่ยทั้งปี
1,217.8
ปริมาณน้ำฝน มม.

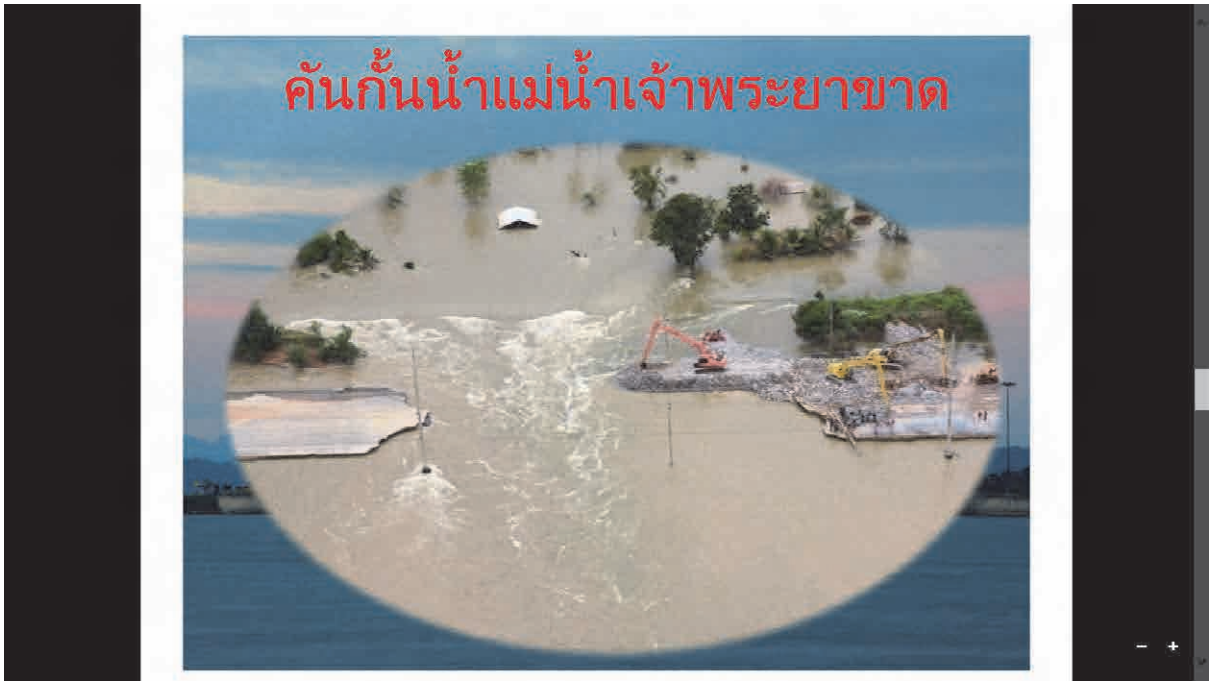

แสดงกราฟเปรียบเทียบปริมาณฝนทับทวี ปี 2538 ,2551-2555 กับค่าเฉลี่ยปกติ ของภาคกลาง
ค่าเฉลี่ยปกติ
ปี 2555
ปี 2554
ปี 2553
ปี 2552
ปี 2551
ปี 2538
ค่าเฉลี่ยทั้งปี
1, 242.6
ปริมาณฝน มม.


ปริมาณน้ำที่ สถานี C.2 จ.นครสวรรค์
ปี
ปริมาณสูงสุด (ลบ.ม./วินาที)
วันที่
2545 5,960 5 พย.
2549 4,686 13 ต.ค.
2551 3,886 18 ตค.
2552 2,225 26 ต.ค.
2553 2,815 13 ต.ค.
2554 3,721 21 ก.ย.
ปริมาณน้ำ (ลบ.ม./วินาที)
กรกฎาคม
สิงหาคม
กันยายน
ตุลาคม
พฤศจิกายน
ปี 2545
ปี 2549
ปี 2551
ปี 2552
ปี 2553
ปี 2554


ปริมาณน้ำระบายท้ายเขื่อนเจ้าพระยา
ปี
ปริมาณสูงสุด (ลบ.ม./วินาที)
วันที่
2545 4,188 ต.ค.
2549 3,930 19,20 ต.ค.
2551 2,394 8 พ.ย.
2552 2,098 8 ต.ค.
2553 3,717 29 ต.ค.
2554 3,721 21 ก.ย.
10,11 ต.ค.
ปริมาณน้ำ (ลบ.ม./วินาที)
กรกฎาคม
สิงหาคม
กันยายน
ตุลาคม
พฤศจิกายน
ปี 2545
ปี 2549
ปี 2551
ปี 2552
ปี 2553
ปี 2554


แผนที่แสดง น้ำท่วมฝั่งซ้ายของคลองชัยนาท-ป่าสัก
แผนที่แสดง
น้ำฝั่งซ้ายของคลองชัยนาท-ป่าสัก
ฝนตกหนักช่วงวันที่ 8-10 ก.ย.54วัดได้ที่อ.ไพศาลี
อ.ตาคลี อ.ลาดฟ้า และอ.ท่าตะโก จ.นครสวรรค์
อ.โพทะเล อ.สระโบสถ์ อ.โพธิ์ประทับช้าง
อ.หนองม่วงและอ.เมือง จ.ลพบุรี 136.6-375.0 มม.
จนเกิดน้ำป่าไหลหลากประมาณ 430 ล้านลบ.ม.เข้า
ท่วมพื้นที่ อ.ตาคลี จ.นครสวรรค์ อ.โคกสำโรง
อ.บ้านหมี่ และ อ.เมือง จ.ลพบุรี


แผนที่แสดงจุดคันกั้นน้ำขาด 11 แห่ง


คันกั้นน้ำแม่น้ำเจ้าพระยาขาด

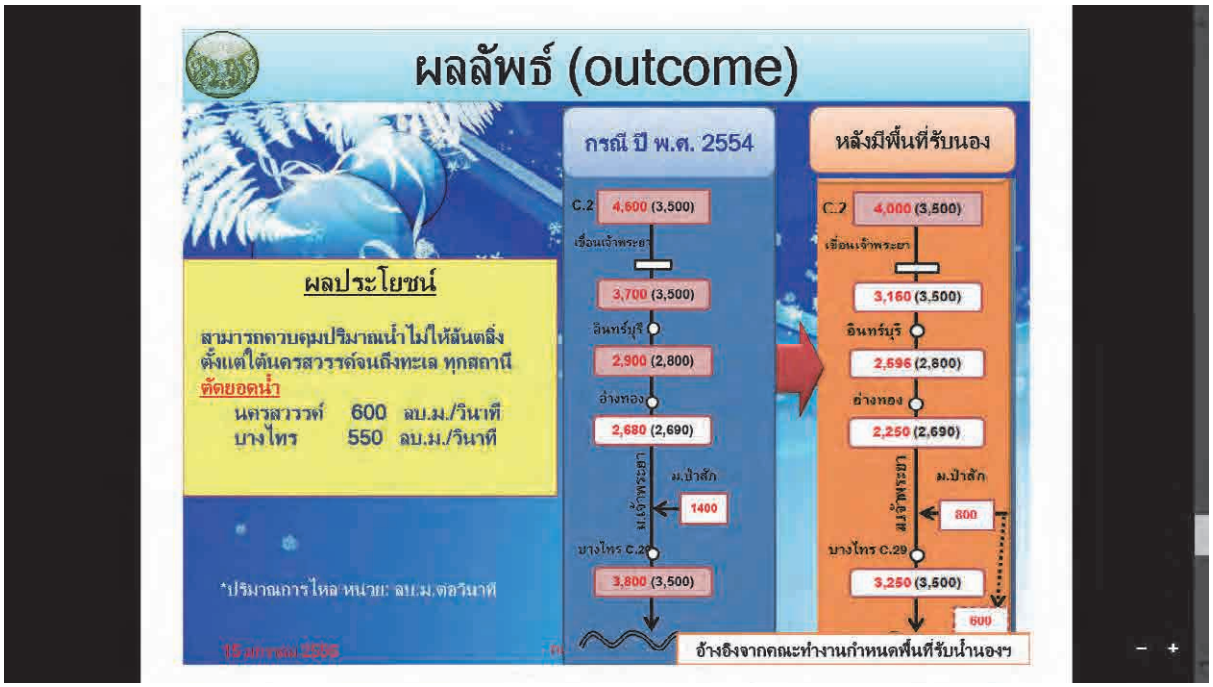

คันคลองชัยนาท-อยุธยาขาด

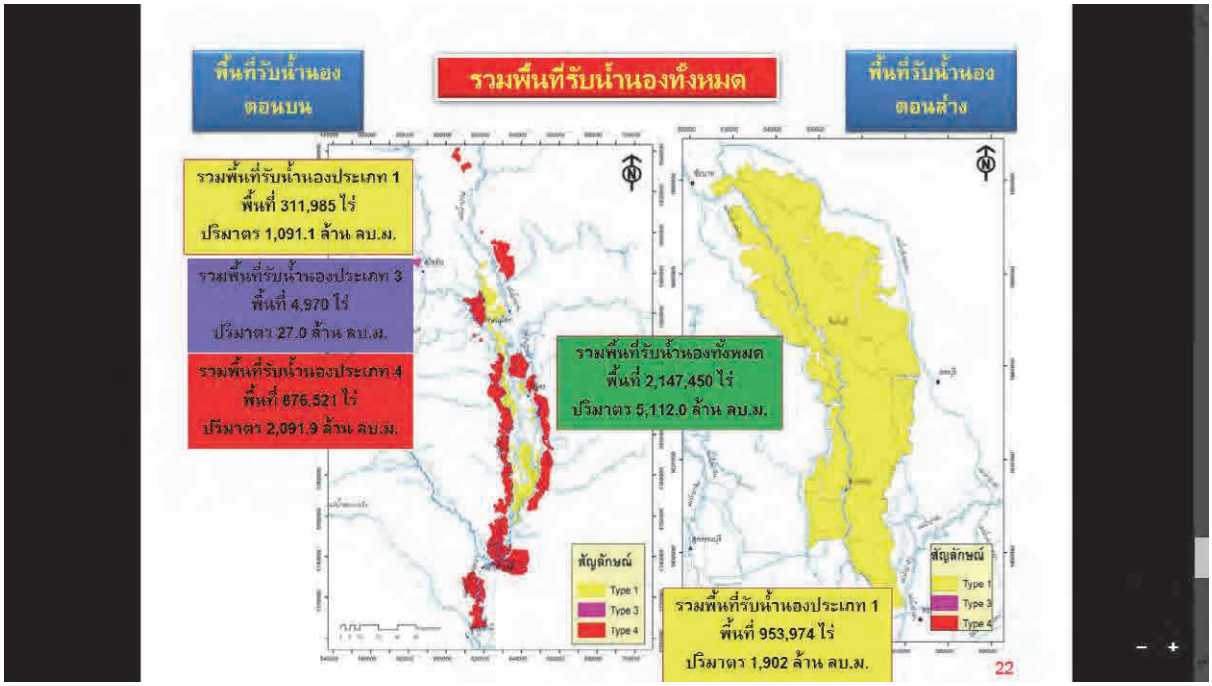

บางโฉมศรี


แผนที่แสดงโครงการที่ต้องเร่งดำเนินการเพื่อเตรียมความ
พร้อมในการป้องกันและแก้ไขปัญหาอุทกภัย ปี2555

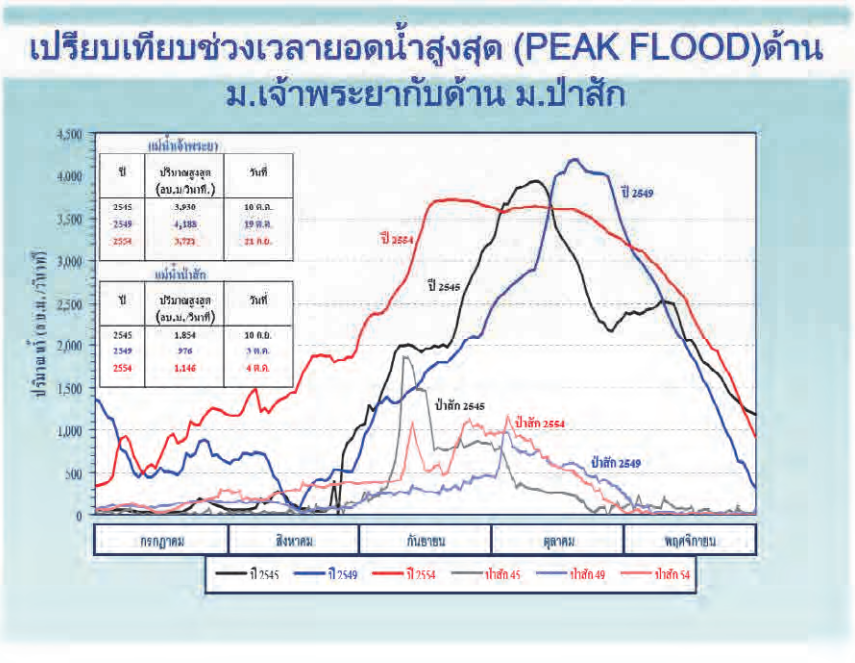

การกำหนดพื้นที่รับน้ำนองและมาตรการช่วยเหลือ
ผู้ได้รับผลกระทบจากการใช้พื้นที่รับน้ำ


การกำหนดพื้นที่รับน้ำนอง
วิธีดำเนินการ
-กำหนดพื้นที่รับน้ำนอง พิจารณาสภาพน้ำท่วมที่เคยเกิดขึ้นไม่เดือดร้อนชุมชนฯ
-จัดทำแผนการบริหารจัดการน้ำ
-วิเคราะห์สภาพท่วมด้วยแบบจำลองคณิตศาสตร์
-กำหนดมาตรการชดเชยเยียวยา
ระยะเวลา
3 เดือน (ก.ย.-พ.ย. 55)
สรุปพื้นที่รับน้ำนอง
เหนือนครสวรรค์
พื้นที่ 1.19 ล้านไร่
ความจุ 3,210 ล้าน ลบ.ม.
ใต้นครสวรรค์
พื้นที่ 0.95 ล้านไร่
ความจุ 1,902 ล้าน ลบ.ม.
รวมทั้งสิ้น
(315 ตำบล 55 อำเภอ 11 จังหวัด)
พื้นที่ 2.14 ล้านไร่
ความจุ 5,112 ล้าน ลบ.ม.
หมายเหตุ :
มีพื้นที่รับน้ำนองประเภท 1 (222 ตำบล 36 อำเภอ 8 จังหวัด)
(พื้นที่เกษตรกรรมในเขตชลประทาน) 1.26 ล้านไร่
ปริมาตร 2,993 ล้าน ลบ.ม.
พื้นที่รับน้ำนองตอนบน
คณะทำงานน้ำนอง
อ้างอิงจากคณะทำงานกำหนดพื้นที่รับน้ำนองฯ


ผลลัพธ์ (outcome)
ผลประโยชน์
สามารถควบคุมปริมาณน้ำไม่ให้ล้นตลิ่งตั้งแต่ใต้นครสวรรค์จนถึงทะเล ทุกสถานี
ตัดยอดน้ำ
นครสวรรค์ 600 ลบ.ม./วินาที
บางไทร 550 ลบ.ม./วินาที
*ปริมาณการไหล หน่วย: ลบ.ม.ต่อวินาที
กรณี ปี พ.ศ. 2554
หลังมีพื้นที่รับน้ำนอง
C.2
4,600 (3,500)
เขื่อนเจ้าพระยา
3,700 (3,500)
อินทร์บุรี
2,900 (2,800)
อ่างทอง
2,680 (2,690)
แม่น้ำน้อย
ม.ป่าสัก
1400
บางไทร C.29
3,800 (3,500)
4,000 (3,500)
3,160 (3,500)
2,596 (2,800)
2,250 (2,690)
800
3,250 (3,500)
600
อ้างอิงจากคณะทำงานกำหนดพื้นที่รับน้ำนองฯ


พื้นที่รับน้ำนองตอนบน
รวมพื้นที่รับน้ำนองทั้งหมด
พื้นที่รับน้ำนองตอนล่าง
รวมพื้นที่รับน้ำนองประเภท 1
พื้นที่ 311,985 ไร่
ปริมาตร 1,091.1 ล้าน ลบ.ม.
รวมพื้นที่รับน้ำนองประเภท 3
พื้นที่ 4,970 ไร่
ปริมาตร 27.0 ล้าน ลบ.ม.
รวมพื้นที่รับน้ำนองประเภท 4
พื้นที่ 876,521 ไร่
ปริมาตร 2,091.9 ล้าน ลบ.ม.
รวมพื้นที่รับน้ำนองทั้งหมด
พื้นที่ 2,147,450 ไร่
ปริมาตร 5,112.0 ล้าน ลบ.ม.
รวมพื้นที่รับน้ำนองประเภท 1
พื้นที่ 953,974 ไร่
ปริมาตร 1,902 ล้าน ลบ.ม.
สัญลักษณ์
Type 1
Type 3
Type 4
22


ลุ่มน้ำเจ้าพระยาและลุ่มน้ำป่าสัก
เขื่อนภูมิพล
ความจุ 13,462 ล้าน ลบ.ม.
เขื่อนสิริกิติ์
ความจุ 9,510 ล้าน ลบ.ม.
เขื่อนแควน้อย
ความจุ 939 ล้าน ลบ.ม.
เขื่อนป่าสัก ความจุ 785 ล้าน ลบ.ม.
เขื่อนพระรามหก


เปรียบเทียบช่วงเวลายอดน้ำสูงสุด (PEAK FLOOD)ด้าน
ม.เจ้าพระยากับด้าน ม.ป่าสัก
ปี 2549
ปี 2554
ปี 2545
ป่าสัก 2545
ป่าสัก 2554
ป่าสัก 2549
กรกฎาคม
สิงหาคม
กันยายน
ตุลาคม
พฤศจิกายน


สำนักชลประทานที่ ๑๐
ขอบคุณ

Appendix G

Figures of Respondents and Flood Area

during Questionnaire Surveying

Figure F1 Questionnaire survey and interview, city resident group

Figure F2 Questionnaire survey and interview, farmer group

Figure F3 Questionnaire survey and interview, factory group

Figure F4 Some of flood marks at Sub-district Organization Office in Ayutthaya Province, in which recorded both flood peak level and time of flood peak.

Figure F5 The piers of railway bridge, which is one obstacle for water draining (Ayutthaya Province).

Figure F6 The dredging projects are generally proposed for flood protection in Thailand; such the sign of channel dredging project by Royal Thai Army

Figure F7 Flood event pictures recorded by Siam Kensetsu Co., Ltd. in Bang Pa-In Industrial Estate, Ayutthaya Province

Figure F8 Comparison between “during flood” and “non-flood” at Siam Kensetsu Co., Ltd. Bang Pa-In Industrial Estate, Ayutthaya Province

Figure F9 Flood walls at Bang Pa-In Industrial Estate, the height was added after flood in 2011, Ayutthaya Province

Figure F10 Flood level on the doors at a house located in Kung Samphao Sub-district, Manorom District, Chai Nat Province

Figure F11 A house near to the rice field was affected from rapid flood in Chai Nat Province

Figure F12 The existing ground was filled as a berm, therefore the flood level in the house is smaller than the outside (Tachai Sub-district, Muang District, Chai Nat Province)

Figure F13 Water level on the walls, the best information for flood model calibration and verification in Chai Nat Province

Figure F14 The flood height is around 2-m from existing road in in Kung Samphao Sub-district, Manorom District, Chai Nat Province.

Figure F15 The flood water level in some area in Tachai Sub-district, Muang District, Chai Nat Province was smaller than beside area since the ground level is quite high due to the land fill

Figure F16 Wat Maneechonlakhan Regulator: The tail regulator of main drainage canal of Pasak Tai Irrigation Project, which is the important flood control structure for Muang District, Lopburi Province

Figure F17 Over 2-m flood level in Khok Kateam Sub-district, Muang District, Lopburi Province

Figure F18 Comparison of damages between two-story houses in (a) and (b), which have different style of the lower story, and one-story house in (c)

Figure F19 The flood walls by using concrete barriers; they are generally constructed along the road in flooded area in Chao Phraya River Basin

Figure F20 The back side of concrete barrier flood walls is an irrigation canal which use as a drainage canal in flood period; the households on the left hand side of the canal will obtain more flood level