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Progress Report on Flood Hazard Mapping in Asian Countries

February 2010

International Centre for Water Hazard and Risk Management
under the auspices of UNESCO (ICHARM)
Public Works Research Institute(PWRI)

United Nations
Educational, Scientific and
Cultural Organization

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Progress Report on Flood Hazard Mapping in Asian Countries

By

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Mr. Daisuke Kuribayashi

ICHARM conducted the JICA training course “Flood Hazard Mapping” as a region-focused training course for East and Southeast Asia from FY2004 to FY2008. The training course aimed at flood damage mitigation by enhancing the technical level of flood countermeasures and promoting flood hazard mapping.

In addition to that, ICHARM hold three follow-up seminars in 2007, 2008 and 2009. The seminars were expected to be opportunities for former trainees to enhance knowledge and skills related to flood hazard mapping and strengthen the network between former trainees as well as between them and ICHARM.

This is a report to describe the contents of the seminars and progress related to flood hazard mapping in Asian countries.

Key Word：Flood hazard map, Follow-up, Progress report

Progress Report on Flood Hazard Mapping in Asian Countries

－Content－

Chapter 1　Background and Objectives　・・・1

1.1　“Flood Hazard Map (FHM)” as a flood countermeasure　・・・1

1.2　Relationship with JICA Training course “Flood Hazard Mapping”　・・・2

1.3　Significance of “Follow-up seminars”　・・・3

Chapter 2　Seminar overview　・・・5

2.1　First follow-up seminar　・・・5

2.1.1　Seminar overview

2.1.2　Seminar results

2.2　Second follow-up seminar　・・・8

2.2.1　Seminar overview

2.2.2　Seminar results

2.3　Third follow-up seminar　・・・12

Chapter 3　Progress of FHM-related activities in Asian countries　・・・16

3.1　Current status of flood hazard mapping　・・・16

3.2　Current efforts in flood hazard mapping in each country　・・・20

3.3　Needs for FHMs　・・・23

3.4　Conclusion　*–For Community based flood hazard map activities-*　・・・25

Chapter 4　Conclusion　・・・27

- Acknowledgements -

【Appendix】

Appendix 2-1	Program of the first seminar
Appendix 2-2	Participant List of the first seminar
Appendix 2-3	Article of local newspapers
Appendix 2-4	Program of the second seminar
Appendix 2-5	Participant List of the second seminar
Appendix 2-6	Program of the third seminar
Appendix 2-7	Participant List of the third seminar
Appendix 3-1	Contents of “Progress Report”

Chapter 1　Background and Objectives

1.1　“Flood Hazard Map (FHM)” as a flood countermeasure

The Asia monsoon region, such as Southeast Asia, annually suffers from frequent floods, and human lives and property are damaged to a considerable extent. Although structural measures, such as levees, are effective to mitigate such flood damage, it is equally important to distribute flood-related information to residents in the form of “flood hazard maps (FHM)” in normal times. Flood hazard maps can inform residents of past inundations, anticipated inundation areas, evacuation routes and sites and other relevant information, which are all useful to prepare for future flood events. In developing countries that are struggling to make progress in implementation of structural flood countermeasures due to lack of financial and human resources, this type of non-structural measures is particularly effective and should be promptly put into use to alleviate flood damage.

Flood hazard maps are produced principally to mitigate human loss during flooding due to levee breaches and other causes. They typically provide such information as anticipated inundation areas and depths as well as evacuation sites and their phone numbers (Figure 1-1). In Japan, local municipalities produce and distribute their own local flood hazard maps produced based on anticipated inundation area maps prepared by the Ministry of Land, Infrastructure, Transport and Tourism (MLIT). As of November 2009, a total of 993 municipalities have produced and published local flood hazard maps (according to the Hazard Map Survey conducted in November 2009 posted at the “MLIT Hazard Map Portal Site
(available in Japanese at http://www1.gsi.go.jp/geowww/disapotal/).”

However, there are issues to be addressed. Even though a local government has provided flood hazard maps to every household, their effective use is left totally up to residents. In many cases, the mere distribution of the maps does not lead to the expected results. Residents still need to be informed of how they can effectively use them.

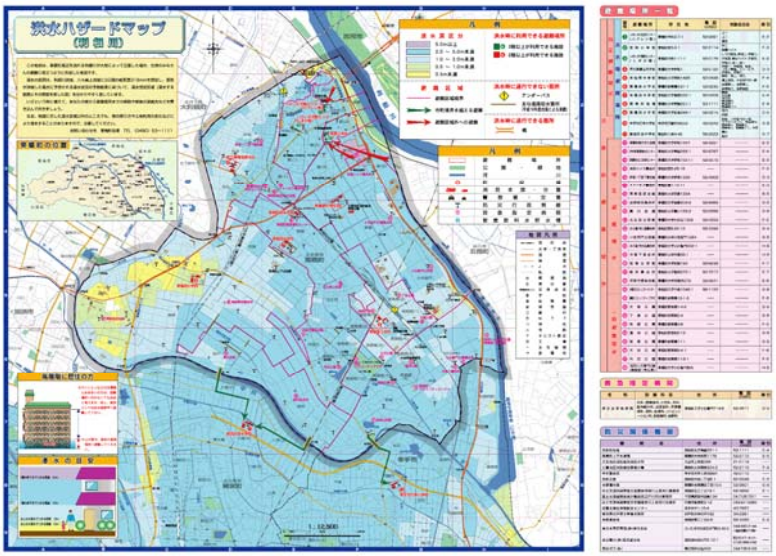


Figure 1-1 Flood hazard map (Kurihashi, Saitama Prefecture)

1.2 Relationship with JICA Training course “Flood Hazard Mapping”

Photo 1-1 Group discussion in “Flood Hazard Mapping” Training Course

Established in March 2006 as an integral part of the Public Works Research Institute (PWRI), the International Centre for Water Hazard and Risk Management (ICHARM) has been engaged in a wide range of activities organized around the centre’s three principal pillars – “research,” “training,” and “information networking.” ICHARM first started conducting the “Flood Hazard Mapping” training course as a region-focused training course for East and Southeast Asia in cooperation with the Japan International Cooperation Agency (JICA). It was in 2004 when it was still the Secretariat for Preparatory Activities of ICHARM, the centre’s predecessor. The training course was conducted for five years from FY2004 to 2008.

The training course aimed at flood damage mitigation by enhancing the technical level of flood countermeasures and promoting flood hazard mapping in Southeast Asian countries. Table 1-1 shows the outline of this five-year training course. The PWRI Technical Note No. 4162 should be referred to for a more detailed description of the course.

Table 1-1 Outline of the Region-focused Training Course “Flood Hazard Mapping”

Course title	Region-focused Training Course “Flood Hazard Mapping”		
Implementing organizations	Japan International Cooperation Agency (JICA) International Centre for Water Hazard and Risk Management (ICHARM) of the Public Works Research Institute (PWRI)		
Target countries	Eight countries (China, Cambodia, Indonesia, Laos, Vietnam, Thailand, the Philippines, Malaysia)		
No. of trainees	Two trainees per country		
Training periods No. of trainees	Fiscal year	Training periods(No. of weeks)	No. of trainees
	FY2004	Jan.31-Feb.18, 2005 (3)	16
	FY2005	Nov.17-Dec.2, 2005 (4)	16
	FY2006	Oct.30-Dec.1, 2006 (5)	16
	FY2007	Oct.29-Nov.30, 2007 (5)	20 (including two from a counterpart training course)
	FY2008	Oct.27-Nov.28, 2008, (5)	10
Target population	Technical managers or engineers in flood or river management		
Language	English		

1.3 Significance of “follow-up seminars”

One of the ultimate objectives of the training program was to reduce damage in flood-prone areas in the participating countries. The program was designed to achieve this objective by requiring the trainees to develop action plans for their countries as the final training project. They are expected to implement such action plans and promote production and dissemination of flood hazard maps in their countries.

Despite such expectations, it was easily predicted that the trainees would face a number of challenges in the process of producing and disseminating flood hazard maps in their countries. They would need to develop plans to produce efficient, effective flood hazard maps. They would have to make difficult decisions in selecting knowledge and technologies suited for their countries’ needs and conditions and still modify them if necessary. They would need to come up with systems to gain public support for and participation in flood hazard mapping projects. To address such challenges, discussion and information sharing with other experts facing similar challenges were thought to be very effective.

An average of 16 trainees participated in training each year. If the trainees of the same year could continue maintain their network, it was expected to help them exchange information, overcome challenges they would face, and effectively promote efforts related to flood hazard maps. If the trainees could build networks with others of different years, it would help them even more.

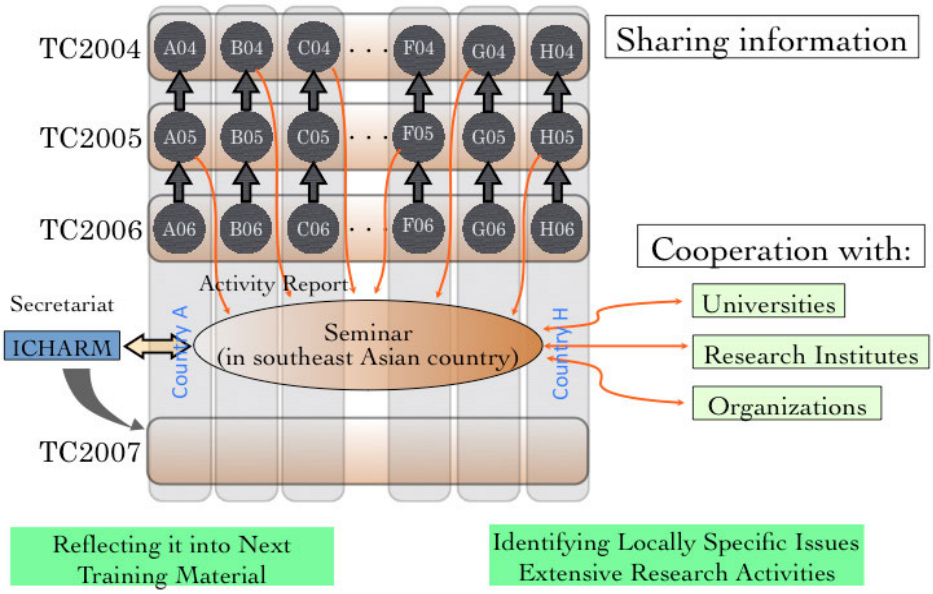


Figure 1-2 Relationship between the training and follow-up seminars

The concept of “follow-up seminars” was devised to facilitate such opportunities as shown in Figure 1-2. Former trainees and other experts working in relevant areas to flood hazard mapping were invited to participate in the seminars, where they made presentations and discussions about

successful cases and new challenges. The seminars were expected to be opportunities for former trainees to enhance knowledge and skills related to flood hazard mapping and strengthen the network between former trainees as well as between them and ICHARM.

Three follow-up seminars were held in total (Table 1-2).

Table 1-2 Venues and dates of the past follow-up seminars

	Venue	Date	Co-organizer
First seminar	Kuala Lumper (Malaysia)	2007.2.7-9	Department of Irrigation and Drainage (DID), Malaysia.
Second seminar	Guangzhou (China)	2008.1.30-2.1	Office of State Control and Drought Relief Headquarter of China (OSFDH)
Third seminar	Manila (the Philippines)	2009.2.17-19	Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA)

The following reports on the three follow-up seminars held previously.

In the third seminar, the participants reported the latest situations of FHMs in each country and discussed issues and challenges about together.

Chapter 2 Seminar overview

2.1 First follow-up seminar

2.1.1 Seminar overview

The first follow-up seminar was held on 7-9 February 2007 at Renaissance Hotel in Kuala Lumper, Malaysia, as a joint effort by ICHARM, the Japan International Cooperation Agency (JICA), and the Department of Irrigation and Drainage (DID), Malaysia. Appendix 2-1 is the seminar program.

Photo 2-1 Greeting by Mr. Y. B. Datok S. Sothinathan, deputy minister of the Natural Resources and Environment Ministry, Malaysia

The seminar invited former trainees of the flood hazard mapping training course held in the fiscal years of 2004, 2005 and 2006. They had to be involved in promotion of flood hazard mapping in their home countries after the training. The seminar offered an opportunity for them to report on activities to produce and disseminate flood hazard maps, share knowledge and experience on successful cases and issues they were facing, and discuss solutions to such issues. In addition, opinions and requests were collected to improve the flood hazard mapping training course for prospective trainees.

Photo 2-2 Greeting by Mr. Yoshinobu Ikura, deputy director of the JICA Malaysia Office

Seventeen former trainees from Cambodia, China, Vietnam, Indonesia, Laos, Malaysia, the Philippines, and Thailand joined the seminar in addition to over 10 engineers from DID. Appendix 2-2 is the list of the seminar participants, including two special lecturers, Dr. Manzul Hazalika of the Asian Institute of Technology (AIT) and Dr. Arun B. Shrestha of the International Centre for Integrated Mountain Development (ICIMOD).

Photo 2-3 Presentation & Discussion

The seminar began with greetings by Mr. Y. B. Datok S. Sothinathan, deputy minister of the Natural Resources and Environment Ministry, Mr. Yoshinobu Ikura, deputy director of the JICA Malaysia Office, Mr. Keizrul bin Abdullah, director of DID. Local media showed high interest in the seminar and sent more than 20 staff members to the opening ceremony.

In a press conference after the seminar, the deputy minister commented on investment in flood countermeasures, saying "Instead of spending RM 1.5 billion every year, it is better to spend a big amount one time to save on future expenses." His comment was reported in local morning newspapers, including THE STAR and NEW STRAITS TIMES (see appendix 2-3), which reflected rising public interest in reduction of flood damage nationwide due to major flood events between December 2006 and January 2007 in Johor Province, located in southern Malay Peninsula. His remark is a proof that the nation is reaching quite a high level of awareness in strengthening flood countermeasures. Such awareness is expected to lead to dissemination of flood hazard maps as a complementary tool to structural measures.

Photo 2-4 Presentation & Discussion

2.1.2 Seminar results

According to participants' reports, in China, Thailand and Malaysia, anticipated inundation area maps and flood hazard maps were produced for pilot districts selected for flood hazard mapping. In the Philippines, community-based flood hazard mapping were attempted. Flood hazard maps were produced through meetings and interviews with residents living in flood-prone areas to reflect their needs in the maps. A similar project was going on in Malaysia. These implementing efforts were also uncovered many challenges to be addressed to further promote flood hazard mapping. Reports explained that there were areas still lacking topographical data necessary for inundation analysis or characterized by low disaster awareness among residents.

Even after producing flood hazard maps, it was reported to be sometimes very difficult to release the maps for the general public because of the opposition from local residents and land owners or lack of appropriate legal frameworks. On-going projects in the Philippines and Malaysia could be model cases which presented possible solutions to those problems through public involvement in flood hazard mapping. Furthermore, participants' reports revealed different views to floods between Japan and other countries. For example, among Malaysian respondents to public questionnaire, 52% answered that they would protect private cars rather than people in case of flooding.

In the seminar, participants also voiced their requests to ICHARM. Many of them hoped for technical support for flood hazard mapping, such as flood analysis and GIS. Based on such feedback, ICHARM improved the 2007 training course and launched "Flood Hazard Map Help Desk" at the ICHARM website in June 2007 for inquiries on flood hazard mapping.

Photo 2-5　Group photo

2.2 Second follow-up seminar

Photo 2-6 Group Photo

2.2.1 Seminar overview

Photo 2-7 Opening Ceremony

The second follow-up seminar was held on 30 January to 1 February 2008 at Fontaine Bleau Hotel in Guangdong, China. ICHARM co-hosted the seminar with the Office of State Control and Drought Relief Headquarter of China (OSFDH) with support from the Japan International Cooperation Agency (JICA). Appendix 2-4 shows the seminar program.

Photo 2-8 Presentation and Discussion

As listed in appendix 2-5, ICHARM invited 12 people for this seminar from seven countries including Cambodia, China, Indonesia, Laos, Malaysia, the Philippines, Thailand and Vietnam (unfortunately, the Vietnamese participant was absent due to other obligations). They were selected from former trainees in the past four years.

The opening ceremony was held on the first day of the seminar. Seminar participants were welcomed and greeted by Mr. TIAN Yitang, vice director of SFDH, Mr. WANG Jiancheng, vice

director of the Guangdong Bureau of Water Resource (GBWR), Mr. Minoru Okada, deputy director of the JICA China Office. The ceremony was followed by presentations and discussions.

On the second day, participants attended a lecture by Dr. Mansul Hazalika of the Asian Institute of Technology (AIT). After that, they took a field trip to the flood control system of the North Pearl River to see levees, water gates, dams and other structures.

Photo 2-9 Presentation and Discussion

On the final day, a round-table discussion was held after a special lecture by Dr. Li Na, senior engineer of the China Institute of Water Resources and Hydropower Research (IWHR). In the afternoon, IWHR presented a pilot project of flood hazard mapping in China, and ICHARM staff answered questions asked by participants about flood hazard mapping. To end the seminar, Dr. CHENG Xiaotao, director of IWHR, made closing remarks, and the participants were awarded with the certificate of seminar participation.

Photo 2-10 Closing remarks by Dr. CHENG Xiaotao

2.2.2 Seminar results

One of the important points in the second follow-up seminar was to find how much progress each country had made in flood hazard mapping projects since the first seminar and what problems they were facing.

China and Malaysia reported the most progress from the previous year. Both countries increased the number of areas with flood hazard maps (China: over 200 locations in 36 areas, Malaysia: several types of map in two areas). They also improved flood simulation necessary to produce anticipated inundation area maps by setting more realistic conditions based on local conditions and past flood records. Furthermore, they were promoting data collection and preparation essential in flood hazard mapping. However, in both countries, flood hazard maps were only for administrative purposes and were not made available for the public.

In Cambodia and Indonesia, flood hazard mapping projects with overseas research institutes were in progress at pilot locations, and anticipated inundation area maps were not produced for those locations. Joint projects of this kind should be a promising option for countries that face financial as well as technical difficulty preparing flood hazard maps independently.

Thailand was another country in which former training course participants were earnestly

promoting flood hazard mapping. Anticipated inundation area maps had already been produced for pilot locations and were going to be posted on large sign boards which would be installed in different places around the locations.

In the Philippines, flood hazard mapping continued being implemented on a community basis. Flood simulation and other advanced techniques had not been employed yet, but there were high expectations that public involvement would result in flood hazard maps that would meet community needs.

Laos was working on data collection and database development for flood hazard mapping, although the efforts had not yet result in tangible achievement.

On the final day of the seminar, all participants attended the round-table discussion and talked about the practical use of flood hazard maps. The discussion topics are listed as follows:

1. Components currently deeded most necessary in flood hazard mapping (besides inadequate topographical data)

- GIS training
- Institutional frameworks
- Financial resources and expertise
- Guidelines, manuals, hydrological data
- Flexibility in selecting community-based or more technically advanced flood hazard maps
- Selection of community-based flood hazard mapping to cope with lack of data (to a certain extent)
- Methods to improve disaster awareness at the community level
- Cooperation among stakeholders and relevant organizations
- Production of flood hazard maps and improvement in administrative issues related to policy making, legal frameworks, legal incentives, policy makers, etc.
- Needs classification for flood hazard maps and development of flood hazard maps to meet specific needs
- Evacuation plans

2. Necessary reference sources and tools

- Dissemination of (international) guidelines and knowledge
- Basic information on flood hazard mapping for policy makers
- Results and research papers on application of run-off modeling and inundation modeling
- Training for leaders
- Comparison of results based on different simulation models

3. Necessary technical advice

-How to acquire necessary information such as GIS data, data source, requirement, etc.

-Numerical models

-Prediction methods for landslides, debris flows and flash floods and training to learn such methods

-Improvement in executable, existing data based on on-site investigation (GPS can be a helpful tool)

-Methods to define the return period of an inundation/flooding

To further improve flood hazard mapping, seminar participants commonly voiced the necessity for developing flood hazard mapping guidelines in addition to database development and acquisition of advanced mapping techniques. ICHARM promised to work on those issues to improve the training course.

Photo2-11 Field survey to flood control system of the North Pearl River

Photo2-12 Welcome board

2.3 Third follow-up seminar

The third follow-up seminar was held in 17-19 February 2009 at Edsa Shangri-la Hotel in Manila, the Philippines. The seminar was co-hosted by ICHARM, JICA and the Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA). Appendix 2-6 is the seminar program. It was attended by 31 participants selected from former trainees in the past five training course at ICHARM as listed in appendix 2-7. They were from 10 different countries including Bangladesh, China, Indonesia, Nepal, Laos, Malaysia, the Philippines, Thailand, Vietnam and Japan. The diversity of the participants' nationalities and viewpoints made discussions interesting and insightful.

Photo 2-13 greeting by Hon. Estrella F. Alabastro

Photo 2-14 Special lecture by Dr. Susan R. Espinueva

This seminar was a special occasion particularly for ICHARM staff because they were meeting again with Dr. Prisco D. Nilo, director of PAGASA, and Dr. Susan R. Espinueva again, whom they had met in November 2004 on their tour to potential target countries for this flood hazard mapping training course at the planning stage.

On the first day, the opening ceremony was held in the presence of honorable guests. Participants sang the Filipino national anthem and were greeted by Dr. Prisco D. Nilo, director of the Department of Science and Technology of PAGASA, and Dr. Jayawardena Amithirigala, research and training advisor of ICHARM. A few other guests, including Mr. Norio Matsuda (manager of JICA Philippine Office), Mr. Hirosato Yoshino (second secretary of the Japanese Embassy), and Hon. Estrella F. Alabastro (secretary of the Department of Science and Technology of PAGASA), also spoke at the ceremony. The seminar on the first day was televised in a local news program.

Photo 2-15, 16 Images of local TV News (Up: Dr. Susan, Under: Dr. Jayawardena Amithirigala)

The opening ceremony was followed by a special lecture by Dr. Susan R. Espinueva of PAGASA on “Community-Based Early Warning System.” She concluded her lecture by saying, “The success of an early warning system is implicit in the operative capability and the response of the community which operates it.” Her remark was of great importance especially to ICHARM, because the concept was exactly in line with the promotion of “Local Practices,” one of ICHARM’s focus areas. It certainly reminded them of the crucial role of the community in disaster management.

Photo 2-17 Problem analysis of “Project Cycle Management”

After the lecture, seminar participants from different countries made 15-minute presentations on progress and issues on flood hazard mapping in their countries and had discussions based on them. (See Chapter 3 for more information on the presentations.)

Photo 2-18 Presentation by Ms. Anabelle L. Cayabyab

On the second day, in the morning session, participants were divided into four groups and tried “Problem Analysis” to clarify their issues related to flood hazard mapping. Problem Analysis was a part of the “Project Cycle Management” exercise. In the afternoon, they visited Kawit City in Cavite Province, located south of Metro Manila, and attended a presentation by Ms. Anabelle L. Cayabyab on community-based flood hazard mapping activities led by JICA. Her presentation revealed that the community was involved in not only hazard mapping itself but also activities to enhance disaster preparedness on a local basis, including the Town Watching exercise as part of the mapping process. Deputy Mayor Orange was also present at the presentation. He greeted the audience and briefly explained the city’s efforts in flood hazard mapping. Seminar participants also learned that community leaders felt grateful for the flood hazard mapping activities. It was a pleasant surprise to find out that flood hazard mapping had made more progress in the Philippines than expected.

Following the field trip to Kawit City, the director of PAGASA invited the seminar participants to a welcome party at PAGASA. The occasion helped seminar participants including ICHARM staff deepen the friendship and partnership.

On the final day, ICHARM staff explained about a flood hazard mapping guideline on which the centre was working. Also, the seminar confirmed the current status of flood hazard mapping and the achievement goal for each country. Finally, five primary issues on flood hazard mapping were given to participants for discussions, which helped them learn more about and gain better

understanding of FHM. (See Chapter 3 for more information on the discussions.)

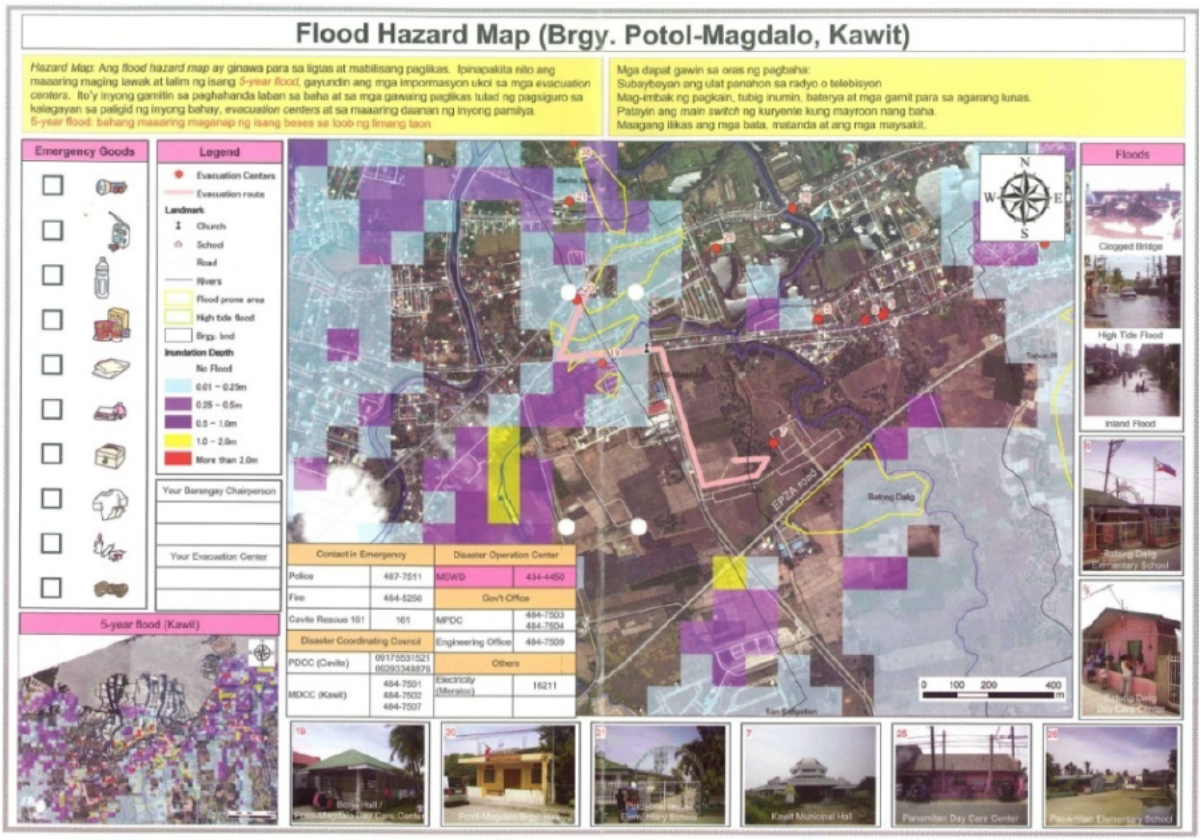


Figure 2-1 Flood Hazard Map in Brgy. Potol-Magdalo, Kawit

Photo 2-19 Overall discussion

Photo 2-20 Dr. Jayawardena shakes hands with Ms. Paridah, moderator of the discussion

The seminar ended successfully with the closing ceremony. Each participant was awarded with a certificate for completing the seminar by PAGASA Director Nilo, ICHARM Advisor Jayawardena and ICHARM Team Leader Shigenobu Tanaka. Ms. Li Na and Ms. Paridah were additionally prized with a special present by ICHARM for their contributions to the seminar as moderators.

Photo 2-21　The participants pose for photos after the opening ceremony.

Chapter 3 Progress of FHM-related activities in Asian countries

3.1 Current status of flood hazard mapping

Before the third seminar, ICHARM requested each participant to make a "Progress Report" to understand the current status of flood hazard mapping in each country and to make a brief presentation on the report at the seminar. The contents of the report are shown Appendix 3-1.

Each presentation needed to categorize the current flood hazard maps by types A-G shown in Table 3-1. Table3-2 in the next page shows each image.

Table 3-1 FHM category according to difficulty of production

Type A	Location map not including elevation data
Type B	Location map including elevation data
Type C	Past inundation area of a single past flood (ex: maximum flood)
Type D	Past inundation areas of several large floods with corresponding rainfall
Type E	Past inundation area based on simulation (ex; design flood is the biggest past flood)
Type F	Inundation area of the design flood bigger than past floods
Type G	Indication forecast by real time analysis

Seminar participants were also asked to make comments on the following items.

- **Comparison between the design return periods of structures and that of FHMs**
- **Whether residents are involved in the development of FHMs or not**

Table 3-3 shows that all the participating countries except Bangladesh had developed some kind of flood hazard maps including JICA-led hazard maps.

In Malaysia, **type-C FHMs** using past inundation depth data were made all over the country. Also, type-F FHMs using hydrological simulation were in progress in seven basins.

In China, the Office of State Flood Control and Drought Relief Headquarters (OSFCH) designated the years 2008-2010 as the second phase to produce effective FHMs. They developed over 300 **FHMs of mainly type E or F** in the first phase and also held two domestic flood hazard mapping seminars.

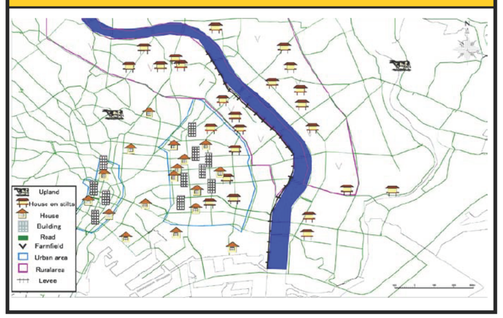
In the Philippines, 165 FHMs of 1/50,000 had already been produced for 236 areas all over the country. Over 10 FHMs of 1/10,000 were in progress as the"PAGASA-UNDP READY PROJECT."

In Thailand, every type of FHMs had already been made. Hydrological and topographical data were available in Thailand and accurate enough for making FHMs.

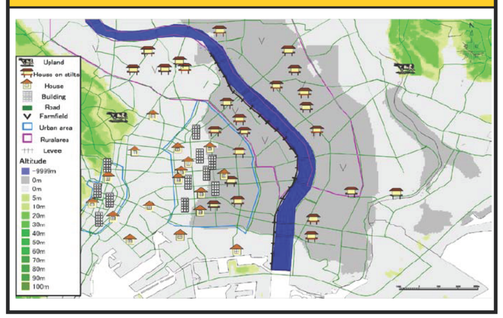
Table 3-2 List of Maps according to the level

Map without inundation area

A: Location map not including elevation data



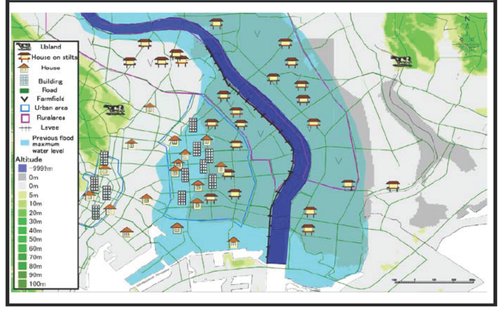
B: Location map including elevation data



Map showing past inundation areas

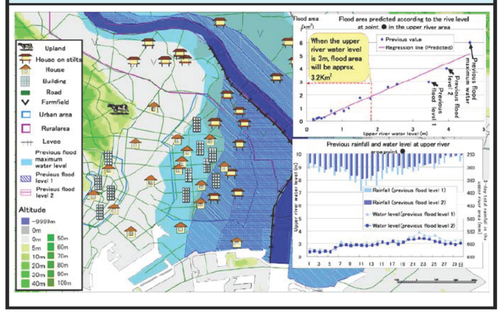
Map without inundation analysis but including past inundation area

C: Past inundation area of a single past flood (ex: maxinum flood)



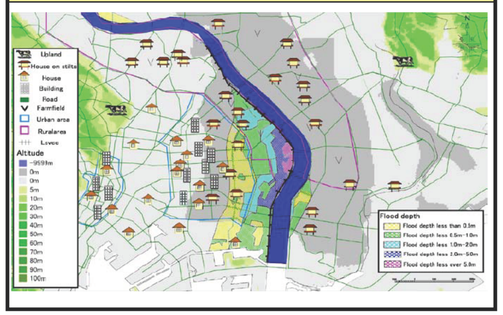
Map predictable inundation area

D: Past inundation areas of several large floods with corresponding rainfall

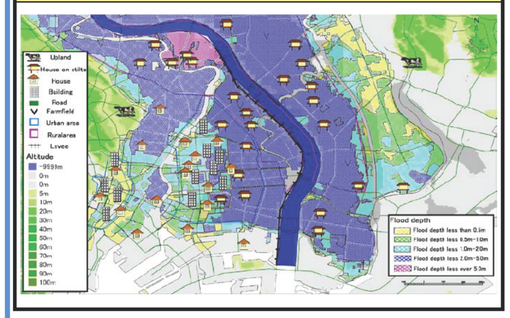


Map based on inundation analysis

E: Past inundation area based on simulation (ex; design flood is the biggest past flood)



F: Inundation area of the design flood bigger than past floods



G: Indication forecast by real time analysis

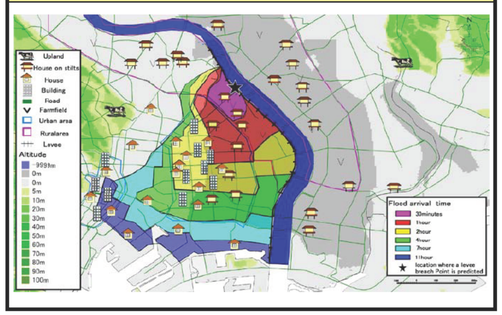


Table 3-3 Types of the current flood hazard maps in the participant country

Country	Type of FHMs	Area/City	Return Period		Reasons	Residents are Involved in the Development of FHMs
			Design Structures	FHM		
Bangladesh	G (Inundation map, large scale)	1. Entire country 2. Dhaka city	25 to 50 year	N/A	-Only used for flood forecasting and warning -Not yet plan to produce for residents as FHM	No
	B (large scale)	Entire country	25 to 50 year	N/A	-Not revised recently -No plan yet to be used as FHM	No
	A (medium scale)	Entire country & up to district level	25 to 50 year	N/A	-Not updated -Not used for FHM yet -Only used as administrative map	No
Malaysia	A +B	Entire country	Urban- 100 years	Simulated- 100 years	based on topographical data	Not yet
			Rural (agriculture) - 25 years	If simulated not available -maximum flood will be used		
	C	entire country (up to year 2000)				
		also available 2006 and 2007 floods			for the states of Pahang, Kelantan and Johor, Koa Tinggi on the way for dissemination	
	D	none yet			can be derived as rainfall data can be extracted	
	F	Damansara catchment ready, 5 river basins expected by end of the year				
	G	Target for Klang River and Muda River enof this year or next year				
Indonesia	G	Jakrta (Ciliwung basin)	Canal:100 Rivers:100 Pond:25 Macro drain:10 Micro drain:5	1,2,5,10,25,50,100	Due to land constraint, it would be still have inundated area	It is start with 2 sub district (Kewrahan) involving community participation, will be used a same method for the whole Jakrta.
	C	Java, Kalimantan, Sumatra Island				
China (Cities)	C	Wenzhou,Guangzhou	50～200	(requested by FHM guideline) 5,10,20,50,100 for flood or heavy rain	Needs Regulations of the FHM Guidelines Local Condition for FHM (Data,Budget,Technical)	Local people are involved at field survey stage.
	D	Shanghai, Baoding,Wuzhou				
	E	Shanghai,Chengdu,Guangzhou,Foshan,Yiyang				
	F	Shanghai,Chengdu,Wenzhou,Baoding,Guangzhou, Foshan,Wuzhou,Yiyang,Lianyungang				
China (Reservoirs)	F	Danjiangkou, Feilaixia, Yuecheng,Guanshan	/	Inundation map, Dam failure flood risk map, Maximum discharge flow for downstream areas		
China (Flood Detention	F	Jinjiang,Pajiang,Pangtoupao, Huangdunhu,Linanyuan,Wenanwa	/	Designed flood division discharge quantity		

Country	Type of FHMs	Area/City	Return Period		Reasons	Residents are Involved in the Development of FHMs
			Design Structures	FHM		
Areas)						
China (Embankment Protective areas)	F	Beijing Embankment Protective areas, Left bank Protective areas of Yihe River,etc.	50～100	Inundation map of designed flood flooding at different dike broken locations		
Philippines	B	Entire country	25			
	C	Manila, Bataang Taguig, Ilo				
	D-	Damau, Butuwan, Ilo, Walangapo, Ligan,Palangbaan, Cavite, Armock, Anhelas				
	E	Tarlac, Abno, Cavite, Ormo, Camaguin, Loaog				
Thailand	B	Entire country	500,100,50,25	10,20,50	a lot of formal information available	No
	C	Past flood event area			Inform and revise with historical data from residential stakeholder.	Verification Procedure
	E	Lampang municipality			Data and budget available, High technology	Verification Procedure
	F	Nan municipality			Data and budget available, High technology	Verification Procedure
	G	Pasak basin			Data and budget available, High technology	Verification Procedure

3.2 Current efforts in flood hazard mapping in each country

The following are excerpts from the participants' reports.

In Bangladesh, where annually 22%, over 60% in worst cases, of the national land is flooded, little effort has been made in flood hazard mapping, and no legal framework has been established concerning flood hazard mapping. But during the flood season, every day the Flood Forecasting and Warning Centre makes 24 hour and 48 hour forecasted inundation maps and produces flood reports based on those maps. The reports provide information on whether the water level has crossed the danger level or not and if it has, how much. They are also posted on the website (http://www.ffwc.gov.bd).

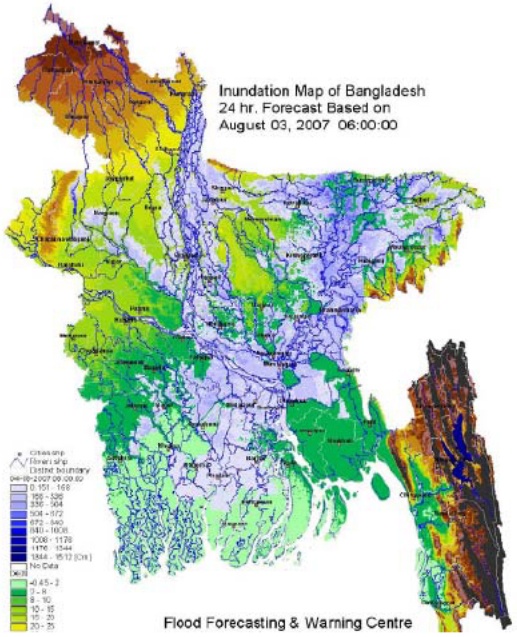


Figure 3-1 Forecasted inundation map in Bangladesh

China has been active in flood hazard mapping. In 2004, the Office of State Flood Control and Drought Relief Headquarters (OSFCH) started FHM as a pilot project. They designated the years 2004-2007 as the first phase and 2008-2010 as the second to produce effective flood hazard maps for various parts of the country. They developed over 300 hazard maps of type E or F in the first phase and also held two flood hazard mapping seminars by themselves. However, no flood hazard maps have been made available for public use.

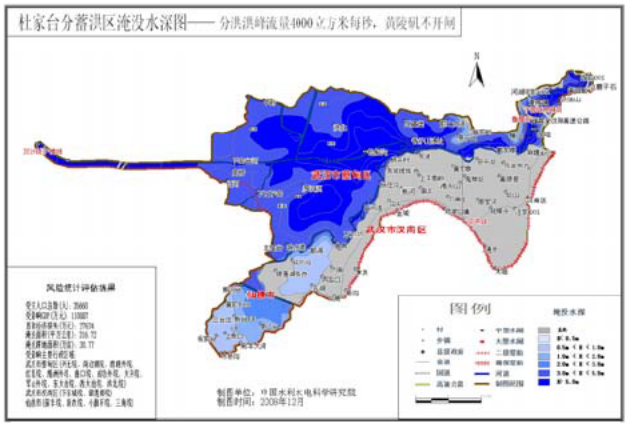


Figure 3-2 Example of FHM in China

Malaysia has produced flood hazard maps to cover the entire national land based on past inundation records, although the maps for Kota Tinggi Province are the only ones with inundation depths. They have also produced flood hazard maps based on hydrological simulation for the Damansara basin and are currently working on the same kind of maps for other six river basins. They are planning to

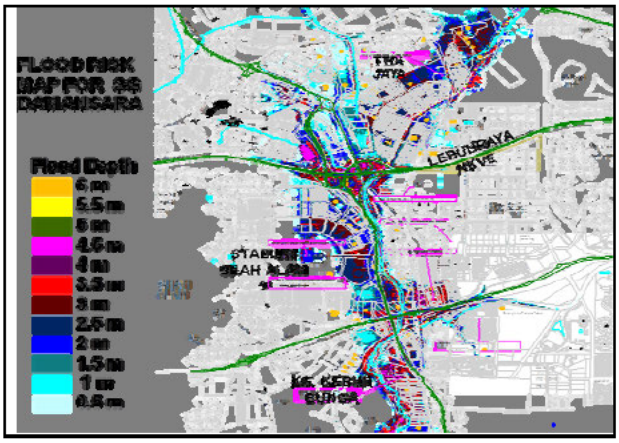


Figure 3-3 Example of FHM in Malaysia

produce 30 flood hazard maps by 2010.

Indonesia has been promoting the production of type-G flood hazard maps, having recognized the importance of this type due to the 2007 flood in Jakarta. They have developed flood hazard maps for design floods of different return periods of 1, 2, 5, 10, 25, 50 and 100 years. Like China, however, Indonesia has not made such maps available for public use.

In Laos, a fewer number of people are killed in flooding because it occurs very slowly. However, they have produced flood risk maps for one of its six river basins and are developing for two others. After the 2007 flood in the Xedone River basin, flood hazard maps were produced for that basin.

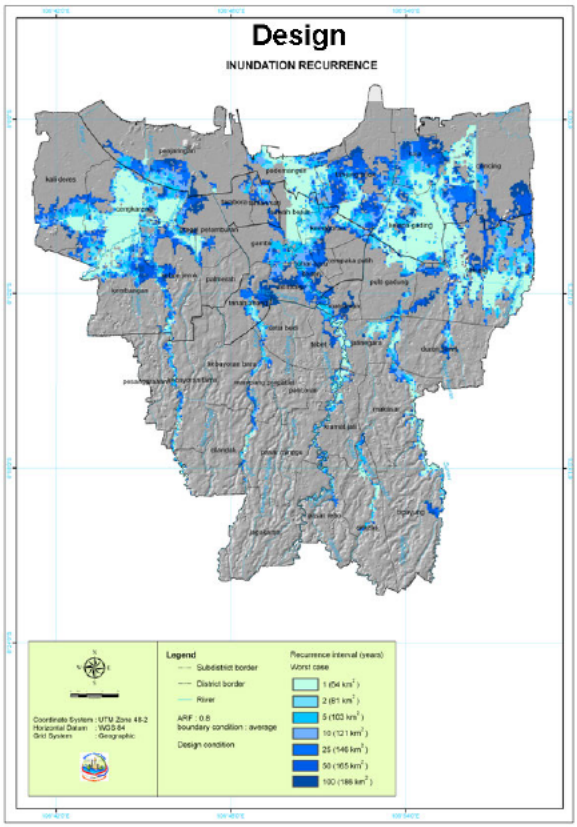


Figure 3-4 Example of FHM in Indonesia

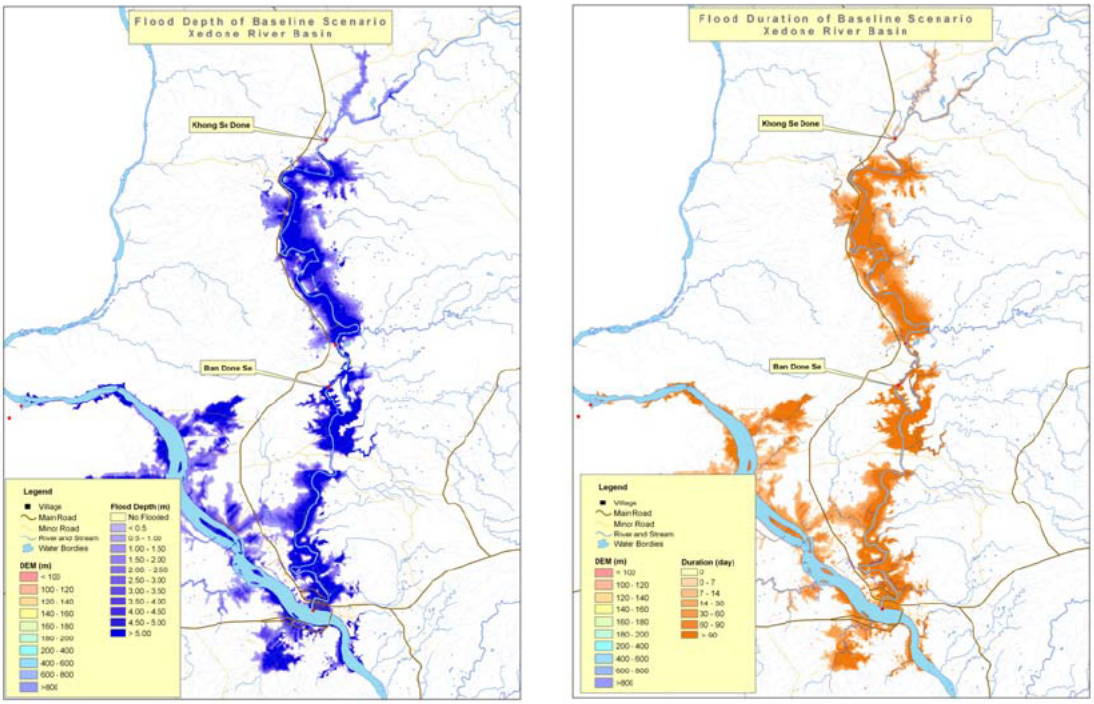


Figure 3-5,6 Example of FHM in the Xedone River basin in Laos

(Left: Flood depth, Right: Flood duration)

In Nepal, JICA-led flood hazard mapping projects started in 1999. Flood hazard maps have so far been produced for nine river basins. Despite this active production of the maps, the country has neither made them available for the public nor highly recognized their effectiveness in disaster management from the outset.

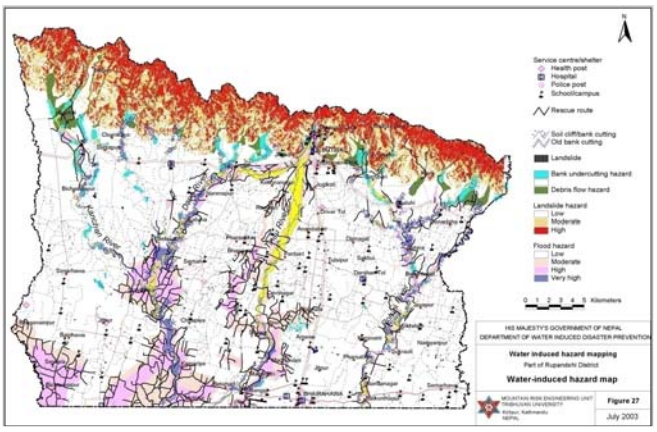


Figure 3-7 Example of JICA-led FHM in Rupandehi district, Nepal

In the Philippines, flood hazard mapping projects are led by PAGASA and the Mines and Geo-sciences Bureau of Department of Environment and Natural Resources (MGB). They have divided the country into 236 zones to produce 1:50,000-scale flood hazard maps and already completed mapping for 165. They have also developed 1:10,000-scale flood hazard maps for more than 10 zones in the PAGASA-UNDP READY PROJECT.

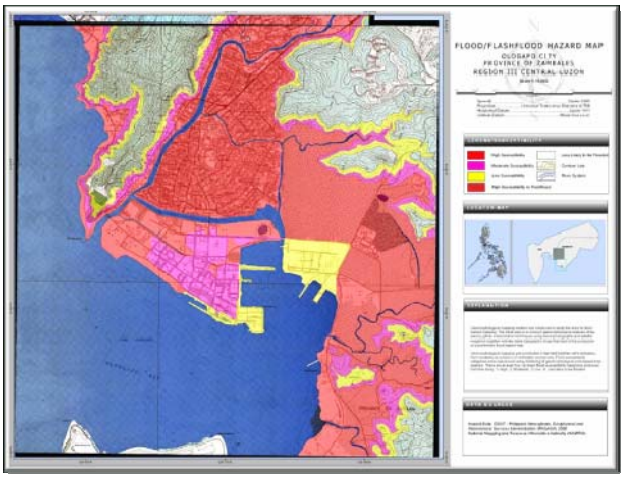


Figure 3-8 Example of FHM in Olongapo City in the Philippines

Thailand has been active in flood hazard mapping and developed all types of flood hazard maps except type D. They think that at least type-F maps are necessary to issue effective flood warnings. All hydrological data necessary for flood hazard mapping are available for all the basins in the country, and DEM data are being prepared for the entire national land. Thailand has already equipped with knowledge and technologies for hazard mapping at a substantial level, and what it needs now is policies for the activity. There are no legal framework and government agencies to promote it.

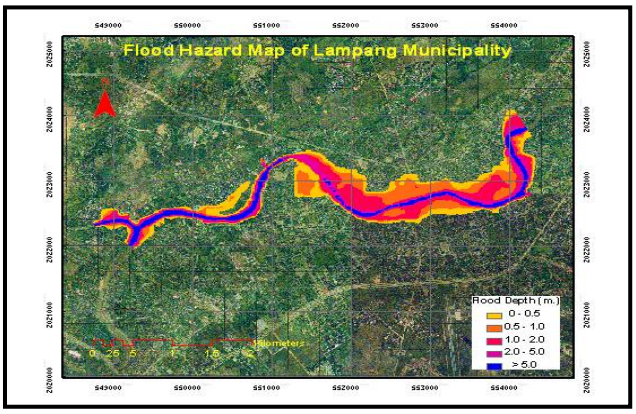


Figure 3-9 Example of FHM in Olongapo City in the Philippines

3.3 Needs for FHMs

To understand the needs for FHMs, the participants were engaged in discussions on the below five themes on the seminar's final day. The following are brief summaries of the discussions.

Theme 1: What kind of "Flood Hazard Map" do you need?

- We should aim to produce **simple flood hazard maps** so that they will be easy to read and understand. (Philippines)
- We need flood hazard maps that show inundation areas simulated based on floods with **different return periods and inundation depths** based on past flood records. (Philippines)
- Different types of flood hazard maps should be produced depending on purposes and organizations responsible for mapping. Hazard map easy to make like Type A or C (China)
- Prefectural and municipal offices uses flood hazard maps produced based on both past records and simulation results. However, **simpler versions are more effective at the local level**. (Indonesia)
- Flood hazard maps should be produced based on **needs of local residents**. Two maps or more may be produced even within a single area to meet different needs. (Thailand)
- GIS analysis is effective even at the community level.
- In some cases, multiple flood hazard maps are produced for a single area. They should be integrated into one.
- Types B and C are good enough for less populated local areas. More scientific maps, types G and F, are needed for urban areas. (Laos)
- **Type C is simple and satisfactory**. Type G is necessary for early forecasting and warning.

Theme 2: Why do you need such FHM?

- In many cases, to reduce the impacts of floods. Flood hazard maps are also useful to some degree in **development planning and land use planning**. (Philippines)
- Flood hazard maps should be closely linked with **structural measures.** With the design flood set at a return period of only 25 years, structural measures can give a wrong sense of safety to those concerned and local communities. (Philippines)
- Because flood hazard maps are inexpensive and largely available. We need them for **policy development**, and donor organizations also need information provided by them to carry out projects. (Nepal)
- Our flood control structures are old. We need **supplementary tools**. (Indonesia)
- To provide people with **flood forecasts and warnings** that are simple, easy to understand

and trustworthy. (Thailand)

- Flood hazard maps are necessary for people to know anticipated inundation areas in all river basins and communities in flood-prone areas, as well as for the government to make **development plans**. (Vietnam)

Theme 3: How do you use FHM? How do you improve the use of FHM?

- To **identify locations and types of buildings** in flood-prone areas. (Philippines)
- To **plan land use**. (Laos)
- Flood hazard maps should be **linked with flood fighting**. They can be used to identify areas that require monitoring during the typhoon season.
- To identify who will be most affected in which area.
- To use in **land use planning** – to properly locate housing areas and farmland.
- To **assess vulnerability** in relation to use of existing infrastructure. Many levees have been built in Bangladesh, but they are easily erodible.
- The government and communities should be informed of possible consequences of development on the environment. Flood hazard maps should be used to keep a balance **between development and environmental conservation**.
- Flood hazard maps are necessary for community leaders to manage **flood evacuation drills**.

Theme 4: What kind of information should be included in a training material?

- Basic information about rivers. Instructions about how to conduct a field investigation and how to read maps with contours. Basic information about technologies such as HEC-HMS.
- Training should be separately prepared depending on needs and conditions of target countries or regions; for example, training for local communities, training for developing countries, training for areas with adequate or inadequate data.
- Information on how to prepare, improve or modify data.
- Information on how to effectively distribute flood hazard maps to residents in addition to how to produce them.
- Multiple training modules should be available for users to choose depending on their level.
- Users should be informed in advance of disadvantages brought by flood hazard maps.

Theme 5: About "Community-based activities"

- The community-based approach is effective when little hydrological data are available. However, technological advice from experts is necessary.
- Since we are fundamentally serving for residents, we need to keep this approach in mind as a valid option.
- It takes a lot of time to produce technologically sound flood hazard maps. We should be

always aware that community-based flood hazard maps can be a quick solution that also costs a lot less.

- Community-based hazard maps are hard to produce for areas where houses are scattered around.
- Younger residents are usually not willing to participate in such activities. The elderly and retired are sole participants in many cases.
- In China, local residents participate in field investigations for flood hazard mapping. In particular, elderly people who have experienced floods can give advice to engineers. Public involvement is crucial. There are volunteers who issue warnings at emergencies in every community. For example, if a typhoon warning is issued, fishermen will volunteer to let other people know about the warning.
- A best way to get cooperation from people is to interview them and collect information right after a disaster. If they are well aware of hazards and flood risk, they are often willing to participate in and support such activities.

3.4 Conclusion *–For Community based flood hazard map activities-*

One of the results revealed in the third seminar was that each participating country had reached quite a high level of flood hazard mapping with support from JICA or other organizations. However, participants voiced the needs for FHMs which are easy for residents to understand. In other words, they were thinking that FHMs which require advanced hydrological or topographical data are not always necessary.

Considering the increased level of flood hazard mapping, what those countries needed next was to find out how they could effectively use flood hazard maps to reduce flood damage. In reality, no participating country had any legal system for distributing FHMs from governments to residents. This means that even though maps had been produced, they had not been available for people. However, in some cases, residents realized that they could make their own maps by themselves with their knowledge. In this context, Dr. Susan's special lecture about community-based disaster management and the subsequent field trip were effective. They emphasized the importance of community-based evacuation planning combining flood hazard maps and a flood forecasting and warning system. They were good concrete examples and gave the seminar participants a clear image of what should be done. We hope that more countries will start to implement such projects.

Community-based flood hazard mapping has great advantages compared with regular mapping. Generally, flood hazard maps are produced in the following procedure:

Step 1) Collection of hydrological and topographical data,

Step 2) Inundation simulation,

Step 3) Production of anticipated inundation area maps,

Step 4) Distribution and explaining about flood hazard maps to residents.

However, with community participation, these four steps can be conducted almost

simultaneously, and residents may be able to increase disaster awareness several times (Figure 3-10). In the third seminar, in which the program and field trips were organized from a viewpoint of community involvement, the seminar participants looked closely at community-based flood hazard mapping activities. This experience must have had them reflect on use of flood hazard maps in developing countries.

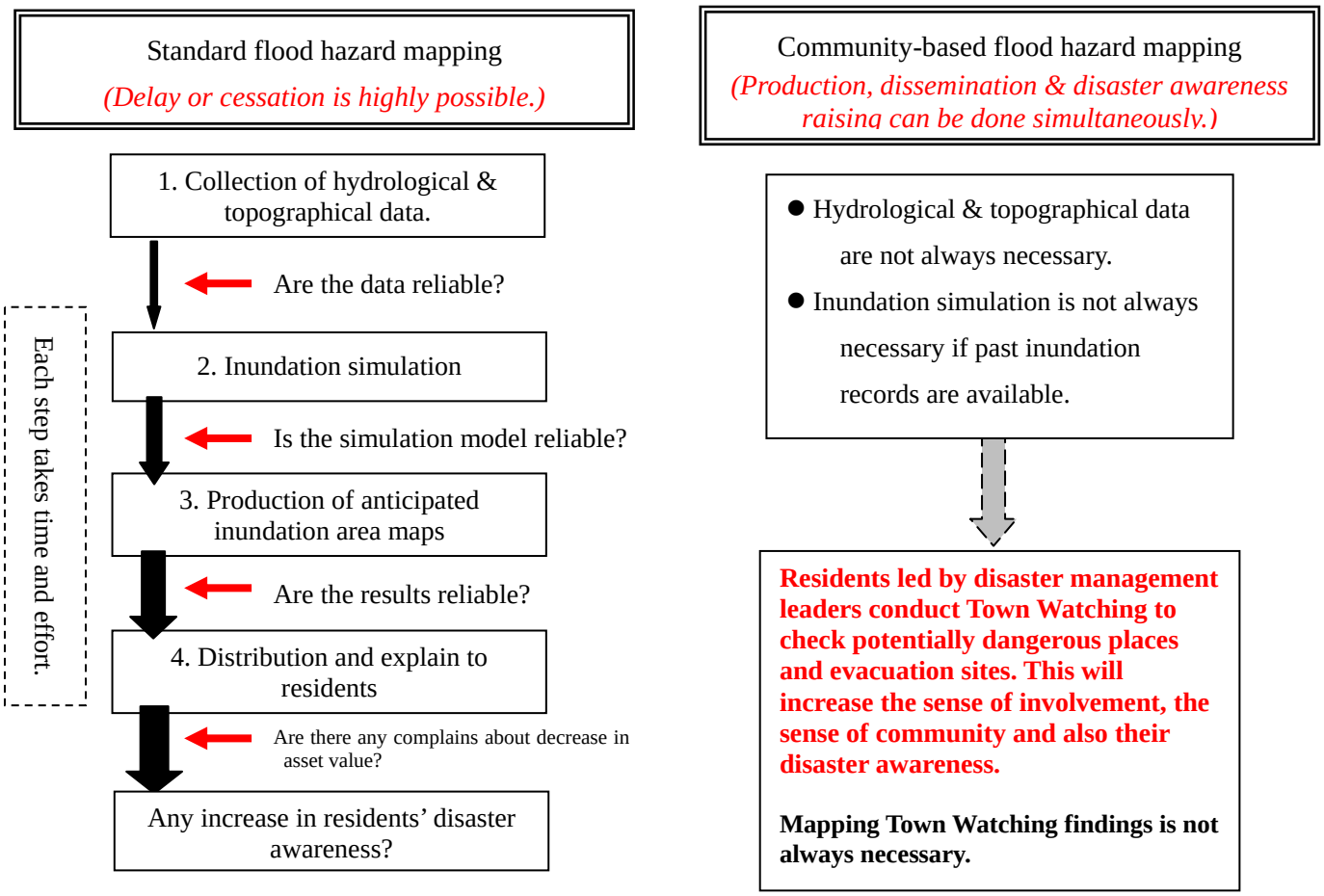


Figure 3-10 Comparison between standard and community-based flood hazard mapping

Chapter 4 Conclusion

The third seminar was held as the concluding meeting of the five-year training program on flood hazard mapping. Enthusiastic discussions among the participants led the meeting to produce significant results.

"Flood hazard maps" is the general term for maps conveying information on flood hazards. In fact, they vary widely among countries depending on flood characteristics and historical and social backgrounds. We, the seminar organizers, are aware that each country has different needs and conditions because of that and did not intend to hold the seminar to show a universal way of producing and using flood hazard maps. We only hoped that the seminar can provide hints to improve flood hazard mapping projects in the participating countries by discussing differences in how they are working on such projects.

The first three of the five-year flood hazard mapping training program emphasized its technical aspects, and little was introduced in terms of its use. That was also the case with the first two follow-up seminars. However, we came to understand the importance of communities' role in disaster management when conducting other training courses such as the "UN/ISDR Comprehensive Tsunami Disaster Prevention Training Course." We realized that community-based flood hazard mapping can be much more effective and efficient in disaster management than acquiring only flood hazard mapping skills.

At emergencies such as disasters, people often cannot count on national and local governments for protection. They will have only themselves to protect themselves from disasters. However, what each individual can do is limited. That is why the role of community is emphasized in disaster management. We at ICHARM will continue research on community-based flood hazard mapping and apply research findings to the new training course, "Local Emergency Operation Plan with Flood Hazard Map," and development of a "Flood Hazard Mapping Guidelines," which should be useful even in developing countries.

- Acknowledgements -

ICHARM is greatly indebted to many people and organizations for the successful operation of these follow-up seminars. Participants arranged their busy schedules to spare considerable time for making reports and joining seminars.

We would like to give special thanks to each co-organizer, the Department of Irrigation and Drainage (DID) of Malaysia, the Office of State Control and Drought Relief Headquarter of China (OSFDH), and the Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA) for their tremendous efforts and cooperation dedicated to the seminars. We could never thank them enough for all they did.

Appendix 2-1 Program of the first seminar

EAST & SOUTHEAST ASIA REGIONAL SEMINAR ON FLOOD HAZARD MAPPING, KUALA LUMPUR 7 - 9 FEBRUARY 2007

In Function Room 9-10, Renaissance Kuala Lumpur Hotel, Kuala Lumpur

In Opening Ceremony, Presentation, Dinner party and Excursion, facilitated by DID
In Discussion and Cocktail Reception, facilitated by ICHARM

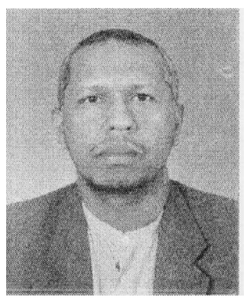
Time	Day 1: Wednesday, 7 February 2007	Participants
08:00 - 09:30	**Registration**	
	Opening Ceremony	
9:30 - 9:45	***Welcoming Address***	VIP Malaysia
	Y.Bhg. Datuk Ir. Hj Keizrul Bin Abdullah, Director General of DID	ICHARM
9:45 - 9:55	***Opening Address 1 by***	DID
	Hiroshi Umezaki, Resident Representative, JICA Malaysia Office	JICA
9:55 - 10:15	***Opening Address 2 by***	Ex-trainees
	Y.B. Datok S. Sothinathan, Deputy Minister of Natural Resources and Environment Malaysia	HTC
10:15 - 10:30	***Coffee Break (Press Conference)***	
10:30 - 11:30	Invited Lecturers: Capacity Building in Applications of Geoinformatics in Flood Hazard mapping	ICHARM, Local &
	Manzul Kumar Hazarika from AIT Thailand	Int. Ex-trainees,
11:30 - 13:00	***Lunch***	14 DID Selectees
13:00 - 13:15	Flood Early Warning System in the Philippine Eastern Seaboard: Province of Surigao del Sur	including HTC, and
	Hilario De Guzman Esperanza from Philippines	Lecturer/s
13:15 - 13:30	Flood Hazard Mapping in Cambodia	
	Tong Seng from Cambodia	
13:30 - 13:45	Presentation by ex-trainees of Flood Hazard Mapping training course	
	Pheng Seangmeng from Cambodia	
13:45 - 14:00	Presentation by ex-trainees of Flood Hazard Mapping training course	
	Chan hachith Amphaychith from Lao PDR	
14:00 - 14:15	Presentation by ex-trainees of Flood Hazard Mapping training course	
	Papon Ruksee from Thailand	
14:15 - 14:30	Flood hazard map of Lampang municipality, Thailand	
	Somchit Amnatsan from Thailand	
14:30 - 15:15	Discussion	
15:15 - 15:45	***Coffee Break***	
15:45 - 16:00	Progress and Pilot Practice of Flood Hazard Mapping in China	
	Luo Xiaoqing from China	
16:00 - 16:15	Flood Hazard Mapping in China	
	Deng Yu Mei from China	
16:15 - 16:30	Presentation by ex-trainees of Flood Hazard Mapping training course	
	Pham Hong Nga from Vietnam	
16:30 - 16:45	Flood Hazard Mapping in the Philippine Eastern Seaboard: Province of Surigao del Norte	
	Socrates Ferido Paat, Jr from Philippines	
16:45 - 17:00	Community Based Flood Warning in Camiguin Island, Philippines	
	Grecile Christopher R.Damo from Philippines	
17:00 - 18:00	Discussion	
19 00 - 20:30	***Cocktail Reception by ICHARM, PWRI, Japan***	

Time	Day 2: Thursday, 8 February 2007	
9 00 - 9:30	Presentation by ICHARM	ICHARM, Local &
	Shigenobu Tanaka, Team Leader of International Technical Exchange Team, ICHARM	Int. Ex-trainees,
9:30 - 10:00	Presentation by Director, HTC Kuala Lumpur	14 DID Selectees
10 00 -10:15	***Coffee Break***	including HTC, and
10:15 - 10:30	Presentation by ex-trainees of Flood Hazard Mapping training course	Lecturer/s
	Subejo from Indonesia	
10:30 - 10:45	Presentation by ex-trainees of Flood Hazard Mapping training course	
	Hj. Jalil bin Hassan from Malaysia	
10:45 - 11:00	Presentation by ex-trainees of Flood Hazard Mapping training course	
	Pn. Paridah Anun and Md. Anuar from Malaysia	
11 00 - 11:15	Presentation by ex-trainees of Flood Hazard Mapping training course	
	Hj. Ariffin bin Mahamud and Cik Hazalizah binti Hamzah from Malaysia	
11:15 - 12:00	Discussion	
12 00 - 13:30	***Lunch***	
13:30 - 18:00	Excursion to the nearest FHM applied area (Taman Tun Dr. Ismail Jaya)	
20 00 - 22:00	***Dinner party by Government of Malaysia***	Depend on DID

Time	Day 3: Friday, 9 February 2007	
9:00 - 10:00	Invited Lecturers: Flash floods in the Himalayas and vulnerability analysis	ICHARM, DID
	Arun B. Shrestha from ICIMOD Nepal	Ex-trainees, HTC
10 00 - 10:30	***Coffee Break***	
10:30 - 11:40	Round Table Discussion & Seminar conclusion and recommendation	
11:40 - 12:00	Closing Address by ICHARM	

Appendix 2-2 Participant list of the first seminar

List of Attendance for the Follow-up Seminar in Malaysia

No.		Country	Sex	FAMILY / First name	No.		Country	Sex	FAMILY / First name
1		Cambodia 2004	Mr.	TONG Seng	10		Malaysia 2005	Ms.	HAZALIZA Binti Hamzah
2		Cambodia 2005	Mr.	PHENG Seangmeng	11		Malaysia 2006	Mr.	ARIFFIN Mahamud
3		China 2004	Ms.	DENG Yumei	12		Malaysia 2006	Mr.	ANUAR Md Ali
4		China 2005	Mr.	LUO Xiaoqing	13		Philippines 2004	Mr.	DAMO Grecile Christopher RIGODON
5		Indonesia 2005	Mr.	SUBEJO	14		Philippines 2004	Mr.	PAAT Socrates, Jr. FERIDO
6		Laos 2005	Mr.	Chanthachth AMPHAYCHITH	15		Philippines 2005	Mr.	ESPERANZA Hilario de Guzuman
7		Malaysia 2004	Mr.	ABD JALIL Bin Hassan	16		Thialand	Mr.	Mr. AMNATSAN Somchit
8		Malaysia 2004	Ms.	PARIDAH ANUN Bt. Tahir	17		Thialand	Mr.	Papon Ruksee
9		Malaysia 2005	Mr.	Miklin Bin ATIONG	18		Vietnam 2004	Ms.	PHAM Hong Nga

Appendix 2-3 Article of local newspapers

RM3.6b flood mitigation plan

Johor to be divided into six areas for better implementation of measures

KUALA LUMPUR: Better flood mitigation costing at least RM3.6bil is in the works for flood-hit Johor.

Drainage and Irrigation Department (DID) director-general Datuk Keizrul Abdullah said they were dividing the state into six areas to better implement structural and non-structural measures to regulate flood flow, reduce the scale of floods and regulate activities at a river basin.

Keizrul said it would cost between RM600mil and RM1.5bil to carry out these and other measures in each zone and initial plans had been submitted to the Government.

"The six areas are Muar, Batu Pahat, Mersing, Kluang, Iskandar Region and Sungai Johor.

"We are looking at various options including providing new storage dams, widening and deepening rivers and having more flood bypass outlets," he said yesterday after speaking at the three-day East and South-East Asia regional seminar on flood hazard mapping jointly organised with the International Centre for Water Hazard and Risk Management, Japan.

Keizrul said they were still working out a detailed flood protection plan and the cost was not part of the Ninth Malaysia Plan.

"The amount may look big but if we don't do something, the next flood might cause more and more damage resulting in billions of ringgit in losses," he said.

Flood hazard maps, used in many developed countries, show areas frequently inundated by floods as well as additional information such as water depth, relief centres and alternative evacuation routes as means to reduce loss of lives and property.

Deputy Natural Resources and Environment Minister Datuk S. Sothinathan, who opened the seminar, said that although there were some flood hazard maps for some rivers and dams, there was still a need to develop one on a national scale.

"The maps, which show the extent of flooding based on some probabilities, can also assist flood relief machinery in rescue operations and is useful for environmental disaster management," he added.

> »The amount may look big but if we don't do something, the next flood might cause more damage«
>
> DATUK KEIZRUL ABDULLAH

RM3.6b to tackle Johor floods

■ By M.K. Megan
megan@nst.com.my

KUALA LUMPUR: The government is expected to spend at least RM3.6 billion to prevent floods in Johor.

A report on the projects was submitted to the government last week and it is expected to give the go-ahead soon.

Deputy Natural Resources and Environment Minister Datuk S. Sothinathan said Johor had been divided into six zones, and projects for each zone is expected to cost between RM600 million and RM1.5 billion.

The zones are classified under Muar, Batu Pahat, Mersing, Kluang, Iskandar and Sungai Johor.

"We acknowledge it is a huge amount but these measures are long term. In the recent floods, we spent about RM1.5 billion to bring life back to normal in the affected areas. This does not include the personal loss of residents and damage to goods and property.

"Instead of spending about RM1.5 billion every year, it is better to spend a big amount one time to save on future expenses."

Sothinathan said the projects would complement the non-structural approaches, such as mapping and demarcation of flood-prone areas, that were currently being planned by the government.

Sothinathan was speaking after the East and Southeast Asia Regional Seminar on Flood Hazard Mapping here yesterday.

> "Instead of spending RM1.5 billion every year, it is better to spend a big amount one time to save on future expenses."
>
> *Datuk S. Sothinathan, Deputy Natural Resources and Environment Minister*

Also present was director-general of the Drainage and Irrigation Department Datuk Paduka Keizrul Abdullah. More than 40 participants from eight countries are taking part in the three-day seminar.

Keizrul said the flood mitigation projects in Johor would be an extension of existing drainage projects, costing some RM250 million, financed by the World Bank several years ago.

He said the work would include deepening and widening of rivers, constructing flood bypass and building dams.

Keizrul said usually such projects would take between eight and 18 months to get approval from the government.

"But due to the urgency of the matter, we are hoping to start work within the next three months," he added.

Appendix 2-4 Program of the second seminar

SEMINAR AGENDA

Tuesday, January 29, 2008

Arrival and registration

Day One- Wednesday, January 30, 2008

Morning

08:00-08:45 - Registration

08:45-09:30 - Inaugural ceremony (Chaired by Mr. YAO, Wenguang):

Salutatory by Mr. WANG, Jiancheng, vice director of the Guangdong Bureau of Water Resource (GBWR);

Opening speech by Mr. TIAN, Yitang, vice director of the Office of the State Flood Control and Drought Relief Headquarters (SFDH);

Salutatory by Mr. YOSHIDA Masaharu, consul general of the Japanese Consulate General in Guangzhou;

Salutatory by Mr. OKADA Minoru, Deputy Director of the Office of the Japan International Cooperation Agency in China

09:30-09:45 - Tea Break: Group photo

09:45-10:00 - Seminar objectives

10:00-12:00 - Presentations on flood disaster statistic and current situation (1 presentation from each country)

10:00-10:15 Malaysia

10:15-10:30 Cambodia

10:30-10:45 Indonesia

10:45-11:00 Lao

11:00-11:15 Philippines

11:15-11:30 Thailand

11:30-11:45 China

11:45-12:00 Discussion

12:00 -13:00 Lunch Break (* Lunch of foreign participants is included in hotel accommodation fee)

Afternoon

13:00-18:00 - Presentation on FHM practices

(Note: Introduction of trainees' current works, progress on their plan, revised plan - if applies, usefulness of training's knowledge, expected additional skill etc).

13:00-13:25 Thailand (Mr. Amnatsan Somchit)

13:25-13:50 Malaysia (Mr. Anuar Md. Ali)

13:50-14:15 Indonesia (Mr. Dudi Gardesi Asikin)

14:15-14:40 Philippines (Mr. Grecile Christopher R. Damo)

14:40-15:05 Philippines (Mr. Hilario De Guzman Esperanza)

15:05-15:25 Tea Break

15:25-15:50 Philippines (Ms. Jimenez Elda Gerada)

15:50-16:15 Malaysia (Ms. Paridah Anun Binti Tahir)

16:15-16:40 Cambodia (Mr. Preap Sameng)

16:40-17:05 Lao PDR (Mr. Thiangthammavong Sangkhane)

17:05-17:30 Cambodia (Mr. Tong Seng)

17:30-17:55 China (Ms Xu Jing)

18:00-20:00 Reception

Day Two - Thursday, January 31, 2008

Morning

09:00-10:00 - Invited Lecture (Dr. Manzul Kumar Hazarika, AIT)

10:00-10:15 - Discussion

10:15-10:30 - Tea Break

10:30-11:30 - Introduction on field survey: Flood control system of

		the North Pearl River by the Research Center on Flood and Drought Disaster Reduction (RCDR)
11:30-12:30		Lunch Break
12:30-12:45	-	Gathering at designated departure place
Afternoon		
12:45-17:00	-	Field survey to Flood control system of the North Pearl River
18:00-20:00	-	Dinner in town of Shanshui Return to hotel

Day Three - Friday, February 1, 2008

Morning		
09:00-10:00	-	Invited Lecture (Dr. Li Na, IWHR)
10:00-10:15	-	Discussion
10:15-10:30	-	Tea Break
10:30-12:00	-	Round Table Discussion: All participants
12:00-13:00		Lunch Break
Afternoon		
13:00-14:00		Two pilot studies on FHM in China 13:00-13:30: Mr. SHEN Zheng 13:30-14:00: Dr. LI Changzhi (IWHR).
14:00-15:00		Q&A: Technical questions from participants on any issue of FHM in their home countries (ICHARM staff will answer their questions)
15:00-15:15		Tea Break
15:15-17:15		Q&A: Technical questions from participants on any issue of FHM in their home countries.
17:15-17:30		Closing Ceremony (including distribution of certificates) Summing-up by the chair of the session; closing speech by Dr. CHENG Xiaotao

Appendix 2-5 Participant list of the second seminar

List of Attendance for the Follow-up Seminar in China

No.	Name of participant	Country	Position	Address/Organization	year
1	Mr. Tong Seng	Cambodia	Vice Chief	Department of Hydrology and River Works, Ministry of Water Resources and Meteorology	2004
2	Mr. Preap Sameng	Cambodia	Official	Department of Hydrology and River Works, Ministry of Water Resources and Meteorology	2005
3	Mr. Dudi Gardesi Asikin	Indonesia		Department of Public Works, Government of Special Capitol Territory of Jakarta Province	2007
4	Mr. Thiangthammavong Sangkhane	Lao PDR	Director of Secretariat	Lao National Mekong Committee Secretariat (LNMCS), Prime Minister's Office	2006
5	Ms. Paridah Anun Bin. Tahir	Malaysia	Senior Assistant Director	Department of Irrigation and Drainage, Ministry of Natural Resources and Environment	2004
6	Mr. Anuar Md. Ali	Malaysia	Civil Engineer	Department of Irrigation and Drainage, Ministry of Natural Resources and Environment	2006
7	Mr. Grecile Christopher R. Damo	Philippines		Department of Public Works and Highways	2004
8	Mr. Hirario De Guzman Esperanza	Philippines	Engineer III	Department of Science & Technology, Philippine Atmospheric Geophysical and Astronominal Services Administration (PAGASA)	2004
9	Ms. Jimenez Elda Gerada	Philippines	Municipal Engneer	Local Government of the Municipality of Pateros	2005
10	Mr. Amnatsan Somchit	Thailand	Chief	The Royal Irrigation Department	2005
11	Dr. MANZUL KUMAR HAZARIKA	Thailand		Asian Institute of Technology	-
12	Ms. Pham Hong Nga	Vietnam	Lecturer	Hanoi Water Resources University, Ministry of Agriculture and Rural Development	2004
13	Mr. Lai Tuan Anh	Vietnam	Lecturer	Hanoi Water Resources University, Ministry of Agriculture and Rural Development	2006
14	Dr. LI Na	China		China Institute of Water Resource and Hydropower Research	-
15	Ms. Yumei Deng	China	Deputy Director	Office of State Flood Control and Drought Relief Headquater, Ministry of Water Resources	2004
16	Mr. Chunpeng Sun	China	Technical Staff	Department of Water Resources,Ministry of Public Works	2004
17	Mr. Luo Xiaoqing	China	Civil Servant	Office of State Flood Control and Drought Relief Headquater, Ministry of Water Resources	2005
18	Mr. Wang Jinxing	China		Bureau of Hydrology, Ministry of Water Resources	2005
19	Ms. Xu Jing	China	Engineer	Office of State Flood Control and Drought Relief Headquater, Ministry of Water Resources	2006
20	Ms. Du Xiaohe	China	Engineer	Department of Water Hazard Research, China Institute of Water Resource and Hydropower Research (IWHR)	2006
21	Mr. Huang Xianlong	China	Engineer	Office of State Flood Control and Drought Relief Headquater, Ministry of Water Resources	2007
22	Mr. Xu Xianbiao	China	Senior Engineer	Office of State Flood Control and Drought Relief Headquarter, Ministry of Water Resources	2007
23	Mr. Akira TERAKAWA	Japan	Deputy Director	ICHARM, Public Works Research Institute	-
24	Mr. Shigenobu TANAKA	Japan	Team Leader	ICHARM, Public Works Research Institute	-
25	Mr. Toshikazu TOKIOKA	Japan	Researcher	ICHARM, Public Works Research Institute	-
26	Dr. Rabindra OSTI	Japan	Researcher	ICHARM, Public Works Research Institute	-
27	Mr. Ken Yoneyama	Japan	Engineer	CTI Engineering	-
28	Mr. Toshinori MORITA	Japan	Engineer	CTI Engineering	-

Appendix 2-6 Program of the third seminar

Schedule of "East & Southeast Asia Regional Seminar on Flood Hazard Mapping, 2009"

Veneu: Kamia 1 & 2 of GARDEN WING FUNCTION ROOM, Edsa Shangri-la Hotel

ICHARM

2/17/2008 (Tue) 1st day			2/18/2008 (Wed) 2nd day		2/19/2008 (Thu) 3rd day	
7:30-7:50	**Registration**					
8:00-8:40	**Opening Ceremony: (MC: Ms. Venus Valdemoro, PAGASA)**					
	Philippine National Anthem: PAGASA					
	Welcome Remarks: Dr Prisco D Nilo, Administrator, PAGASA, DOST		**8:30-9:00**	Mr. Kuribayashi, ICHARM	**8:30-9:10 Lecture**	Mr. Tanaka, ICHARM
	Welcome Remarks: Dr Jayawardena Amithirigala, Research & Training Advisor, ICHARM		**Explanation of Project Cycle Management (PCM)**			
	Message: Mr Norio Matsuda, Chief Representative, JICA		**9:00-10:30**	Participants	**9:10-10:00 Problem analysis**	Participants
	Message: Mr Hirosato Yoshino, Second Secretary, Embassy of Japan		**Problem analysis using PCM**	(4 groups)		(4 groups)
	Keynote Address: Honorable Estrella F Alabastro, Secretary, DOST					
	Group Photo				**10:00-10:20 Break**	
8:40-9:10	**Break**				**10:20-11:50**	
9:10-9:35	**Orientation of the Seminar**	Mr. Tanaka, ICHARM			**Explanationon "Guideline of FHM"**	
9:35-10:15	**Invited Lecture**					
	Community-based Early Warning System	Dr. Susan R. Espinueva				
10:15-11:25	**Advanced Example of FHM**					
10:15-10:35	China	Dr. Li Na, IWHR	**10:30-11:00 Break**			
10:35-10:55	Malaysia	Ms. Paridah Anun Bin. Tahir	**11:00 Departure to the Cavite Province**			
10:55-11:25	Discussion				**11:50-13:30 Lunch & Break**	
11:25-13:00	**Lunch** (in the Hotel with local participants) **& Break**		**Excursion in the Cavite Province**	PAGASA	**13:30-15:45 Discussion**	All participants
13:00-17:10	**Presentation on FHM related activities**					Moderator:
13:00-13:15	Bangladesh	Mr. ISLAM MD. AMINUL				Dr Li Na
13:15-13:30	China	Ms. XU JING				Ms Paridah Anun Bin Tahir
13:00-13:45	Indonesia	Mr. Dudi Gardesi Asikin				
13:45-14:00	Lao	Mr. Oudomsack PHILAVONG				
14:00-14:20	Discussion					
14:20-14:40	**Break**					
14:40-14:55	Malaysia	Mr. Anuar B. Md. Ali (absent)				
14:55-15:10	Napal	Mr.Mitra Baral				
15:10-15:25	Philippines	Mr. Oscar D. Cruz				
15:25-15:45	Discussion					
15:45-16:05	**Break**				**15:45-16:00 Break**	
16:05-16:20	Thailand (1)	Mr. Paitoon Naktae			**16:00-16:30**	
16:20-16:35	Thailand (2)	Mr. Somchit Amnatsan			**Closing Ceremony**	Dr. Jayawardena
16:35-16:50	Viet Num	Mr. Nguyen Hiep			Certification	Dr. Prisco D. Nilo
16:50-17:10	Discussion					
17:10-17:25	Introduction of Excursion	PAGASA	**19:00- Reception Party hosted by PAGASA**	PAGASA Science Garden		

Appendix 2-7 Participant list of the third seminar

List of Participant

No.	Name of participant	Country	Position	Address/Organization	
1	Ms. XU JING	China	Vice director of the division	Office of the state flood control headquarters the second flood defending division, Ministry of water resources	Trainee of 2006 FHM course
2	Dr. Li Na	China	Director of Flood management and Disaster Mitigation Policy Research Section	China Institute of Water Resources and Hydropower Research (IWHR), Department of Water Hazard Research	Invited lecturer
3	Mr. Dudi Gardesi Asikin	Indonesia	Head Section of Water Pollution Control	Sub Department of Environmental Engineering and Utility Management Department of Public Works Provincial Government of Special Territory Area of Jakarta	Trainee of 2007 FHM course
4	Mr. Mitra Baral	Nepal	Engineer	Water Induced Disaster Prevention Division Office No 3, Department of Water Induced Disaster Prevention	Trainee of 2007 Master course
5	Mr. Paitoon Naktae	Thailand	Senior Engineering, Chief of Safety standard sub-bureau	Safety standard sub-bureau, Disaster Prevention Measure bureau Department of Disaster prevention and mitigation, Ministry of Interior	Trainee of 2007 FHM course
6	Mr. Somchit Amnatsan	Thailand	Chief of water management branch	Chief of Water Planning and Solution Branch, Regional Irrigation Office 2, Royal Irrigation Department, Ministry of Agriculture and Cooperatives	Trainee of 2005 FHM course
7	Ms. Paridah Anun BT. Tahir	Malaysia	Senior Assistant Director	Department of Irrigation and Drainage, Ministry of Natural Resources and Environment	Trainee of 2004 FHM course
8	Mr. Anuar B. Md. Ali	Malaysia	Assistant Director	Flood Mitigation Division Department of Irrigation and Drainage	Trainee of 2006 FHM course
9	Mr. Oudomsack PHILAVONG	Lao	Acting Chief, Date&information Division	Lao National Mekong Committee Water Resources & Environment Administration	Trainee of 2007 FHM course
10	Mr. ISLAM MD. AMINUL	Bangladesh	Assistant Engineer	Design Circle-2, Bangladesh Water Development Board	Trainee of 2007 Master course
11	Mr. Nguyen Hiep	Viet Nam	Director of Dike Management, Flood and Storm Control	Ministry of Agriculture and Rural Development	Trainee of 2006 FHM course
12	Mr. Vu Duc Long	Viet Nam	Typhoon Committee	Department and Ministry: National Center for Hydro-Meteorological, Forecasting	Invited Participant from IDI
13	Ms. Do Quynh Hoa	Viet Nam	Typhoon Committee		
14	Mr. Socrates F.Paat, Jr.	Philippines	PAGASA		Trainee of 2004 FHM course
15	Mr. Hilario G. Esperanza	Philippines	PAGASA		Trainee of 2005 FHM course
16	Mr. Oscar D. Cruz	Philippines	PAGASA, Task Leader for Flood Hazard Mapping Component under the UNDP Ready Project		
17	Ms. Ma. Cecilia Monteverde	Philippines	PAGASA, involved in flood hazard mapping activities		
18	Mr. Grecile Christopher Damo	Philippines	Department of Public Works and Highways		Trainee of 2004 FHM course
19	Mr. Richelieu Felipe Irisari Lim	Philippines	Department of Public Works and Highways		Trainee of 2006 FHM course
20	Ms. Elda Gerada Jimenez	Philippines	LGU Pateros		Trainee of 2005 FHM course
21	Mr. Salvio Lasema	Philippines	Supervising Science Research Specialist		
22	Ms. Annabel L.Cayabyab	Philippines	Provincial Environment and Natural Research Officer - Cavite Province		
23	Mr. Rodelio Cruz	Philippines	LGU, Province of Cavite		
24	Dr. Jayawardena Amithirigala	Japan	Research & Training Advisor	ICHARM	
25	Mr. Shigenobu Tanaka	Japan	Team Leader	ICHARM	
26	Mr. Katsuhito Miyake	Japan	Single	ICHARM	from 17th Feb
27	Mr. Daisuke Kuribayashi	Japan	Senior Researcher	ICHARM	
28	Mr. Hideo Yamashita	Japan	Researcher	ICHARM	
29	Dr. Rabindra Osti	Nepal	Specialist Researcher	ICHARM	
30	Mr. Ken Yoneyama	Japan	Senior Researcher	CTI Engineering Co., Ltd	
31	Mr. Toshinori Morita	Japan	Researcher	CTI Engineering Co., Ltd	

Appendix 3-1 Contents of “Progress Report”

Contents of "Progress Report"

1. Objectives of this report :

- This "Progress Report" will be prepared by each participant as materials for discussion during the seminar and the research of Flood Hazard Map (FHM) by ICHARM.
- The content of this report consists of two items as follows; please write each item based on not only your own ideas/opinions but also the official standpoint/data at present **(Official Web site is best!)**.

2. Note:

(1) Volume: maximum 12 page A4 size page using font size 12 including photos/graphs.

(2) Presentation: 15-minute ppt presentation for only "**Item A: FHM-related situation in your country**" by each participant is scheduled on **17th February**.

3. Content:

Item A: FHM-related situation in your country

A-(1) Current/target situation of FHM in your country

(by using official information/data and your opinions)

(1)-1 Please select **current stage of FHM** in your country/region/city from the 7 types (Map-A,B,..G) of map shown in Table 1.

(Please refer Table 2 as a selection flow.)

(1)-2 Please describe **the outline of current situation of FHM** in your country.

(How many FHMs or related projects do you have in your country? Etc.)

(1)-3 (If you have FHMs,) Please write **maximum 3 good practices**.

(Please make sure Where? Why? When? By Who? To Whom? How?)

(1)-4 Please select **target/necessary stage of FHM** in your country/ region/city from the 7 types (Map-A,B,..G) of map shown in Table 1, and **describe the reason**.

(Please refer Table 2 as a selection flow. Which type of FHM do you think is necessary in your country? Which type of FHM is desirable? And why?)

A-(2) For making of FHM

(2)-1 Institutional situation for making FHM

(Is there any FHM-related law? Or governmental system? If yes, which organizations

do take responsibilities for making FHM?)

(2)-2 Hydrological/topographical data situation for making FHM

(If the situation is different by a basin and a river, please clarify the data source.)

(2)-3 Problems for making FHM in your country

A-(3) For disseminating/use of FHM

(3)-1 Institutional situation for disseminating/use FHM

(Is there any FHM-related law? Or governmental system? If yes, which organizations do take responsibilities for disseminating FHM?)

(3)-2 Problems for disseminating/use of FHM in your country

(3)-3 Other how to use FHM in your country

(If you have any idea for use of FHM except for types of Table 1, please describe your ideas.)

Item B: For improvement of FHM research by ICHARM

(This item is not included in the presentation)

B-(1) For efficient/effective disaster preventions

(1)-1 Saturation level of TV, Radio, Internet and Newspaper in your country

(by using official information/data)

(1)-2 The flow of information related to evacuation in flood

(Who issues the flood alert and evacuation order in your country? For example in Japan, in flood time the Japan Meteorological Agency (governmental agency) issues forecast of heavy rain and municipalities (city/town) issue evacuation recommendation / order.)

(1)-3 Please describe how high the “awareness level for disaster prevention by residents” in your country is.

(For example in Japan, some communities organize “Voluntary Disaster Prevention Organization” and act for awareness for disaster such as evacuation drills.)

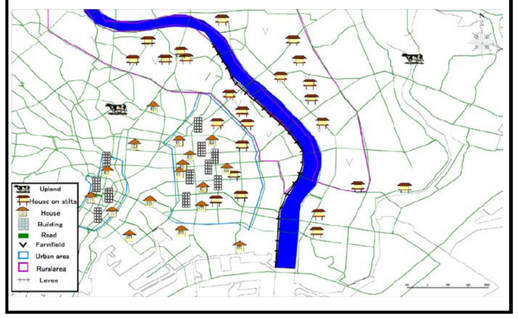
B-(2) “Flood Hazard Map Manual" made by ICHARM

Please suggest improving the “Flood Hazard Map Manual" made by ICHARM to become useful in your country. Is the manual applicable in your country or not?

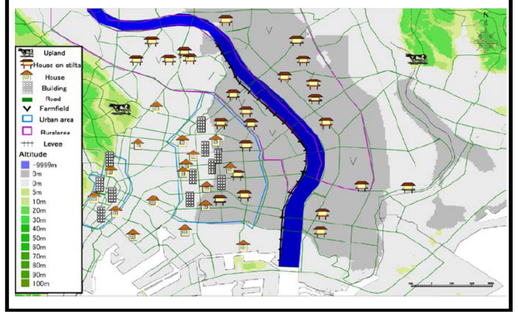
Table 1 List of Maps according to the level

Map without inundation area

A: Location map not including elevation data



B: Location map including elevation data

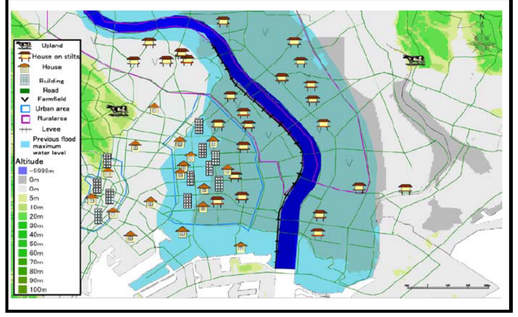


Map showing past inundation areas

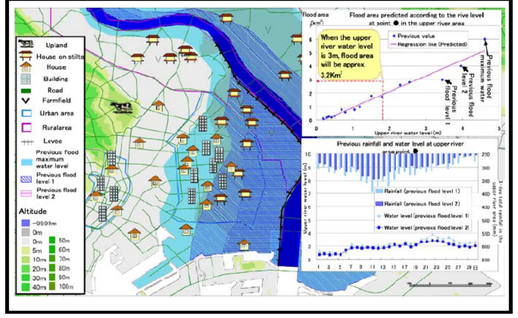
Map predictable inundation area

Map without inundation analysis but including past inundation area

C: Past inundation area of a single past flood (ex: maxinum flood)

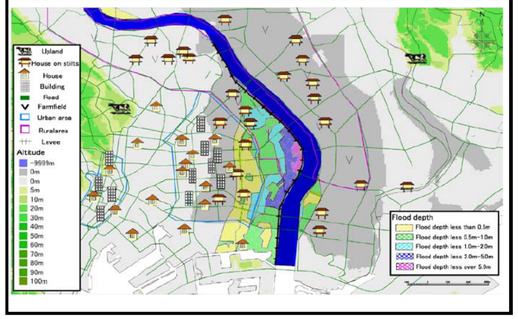


D: Past inundation areas of several large floods with corresponding rainfall

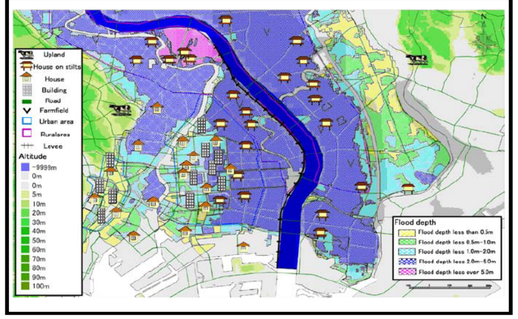


Map based on inundation analysis

E: Past inundation area based on simulation (ex; design flood is the biggest past flood)



F: Inundation area of the design flood bigger than past floods



G: Indication forecast by real time analysis

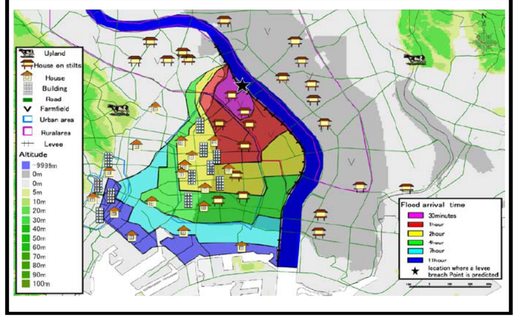
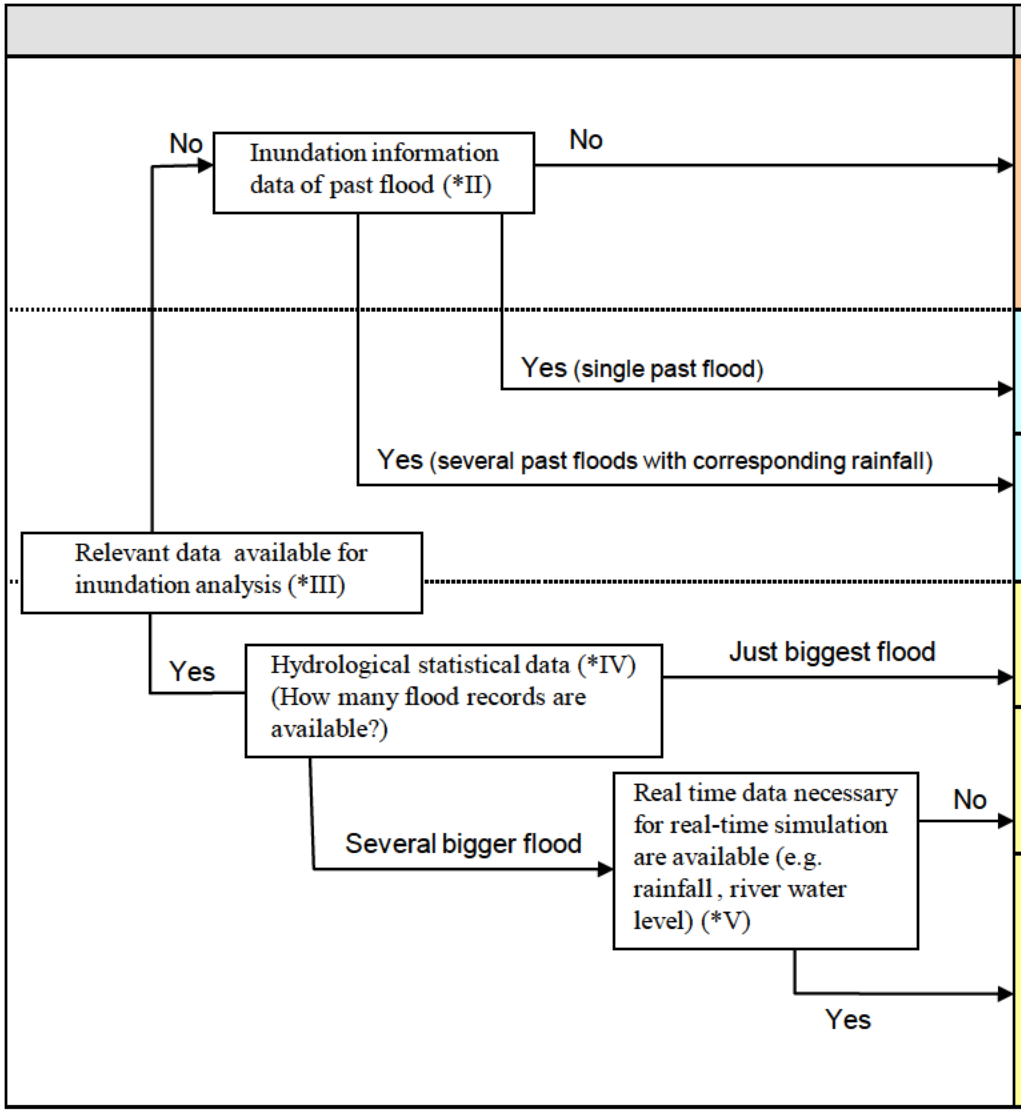


Table 2 Flow of selecting maps



Kinds of maps	Remarks column
[MAP - A] Location map not including elevation data **[MAP - B]** Location map including elevation data	–
[MAP - C] Past inundation area of a single past flood	–
[MAP - D] Past inundation areas of several large floods with corresponding rainfall	–
[MAP - E] Past inundation area based on simulation	【Flood Analysis method】 Simple Flood Analysis •Divide the floodplain using 250m grid cells and analyze flood depth and flow velocity using continuity and motion equations. •Behavior of flood flow is affected by the roughness coefficient set according to the land usage conditions. •Set consecutive banking structures and channels that affect flood flows as floodplain conditions. Advanced Flood Analysis •Divide the flood analysis target area into flood blocks divided by tributaries and consecutive banking structures. •Thinking of one flood block as a pond, create the relation (H-V) of water level and volume. Flood depth is estimated using this H-V relation, based on the flood volume from the river.
[MAP - F] Inundation area of the design flood bigger than past floods	
[MAP - G] Indication forecast by real time analysis	