CONCLUDING REPORT

ROADMAP
TOWARD EFFECTIVE FLOOD HAZARD MAPPING
IN INDONESIA

JICA Regional Training Course on Flood Hazard Mapping
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I THE ROLE OF FHM TO MITIGATE FLOOD DAMAGE

I.1 Present Flood

The most severe climate-related natural disaster in Indonesia are monsoon flood, flash flood and debris flood. These flood are common hydrological phenomena in Indonesia. Flash flood from intense thunderstorms are becoming very common phenomena, especially in urban area like Jakarta province. Figure 1 shows the location of annual inundation, limited only on flood location occur without inundation area.

Table 1. Flood type in Indonesia

Flood Type	Location	River	Time	Cause of flood	Damage
Flash flood "banjir bandang"	Nias island	Masio	Feb, 2001	● Radial river basin type ● Small tributary outlet	●325 house felt down ●121 death
	Medan	Bahorok	2003	● (Leuser mountain) Deforestation ● Hard rainfall on upstream	●67 death (3 foreign)
	East Java, Pacet, Mjokerto	Brantas tributary	Dec, 2002	● Deforestation	●26 death ●Leisure area broken
Monsoon flood "Banjir musiman"	Jakarta	Ciliwung, etc	annual	● Inland area ● Tide + water from upstream ● Land use change (retard flood area) ● Poor drainage system ● Garbage	●170 location ●Jump traffic ●Stop school activity
	Semarang		annual	● Inland area ● Tide (rob) + water from upstream ● Land use change (retard flood area) ● Poor drainage system ● Garbage	
Tsunami flood	Aceh & Nias		2005	● Earth quake in deep Indonesian ocean	●200 000 death
	Flores				●2 100 death
Debris flood "Banjir lahar dingin"	Yogyakarta	Progo, Opak, Oyo		● Merapi mountain ● Debris volcano	
	West Java	Citanduy		● Galunggung mountain ● Debris volcano	●Aggradations river mouth

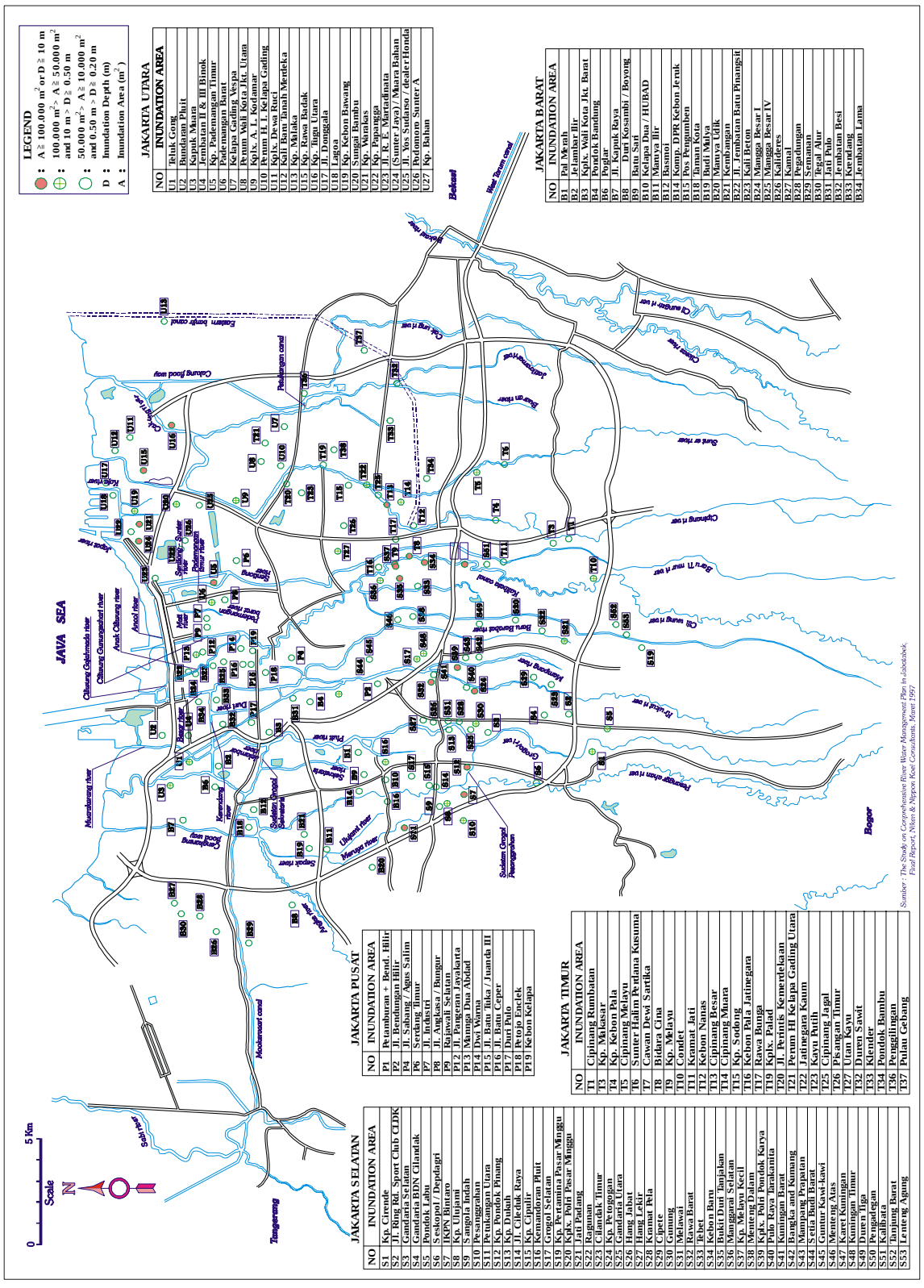

Figure 1. Location of inundations area in Jakarta urban City

I.2 Mitigation Flood

Since flood management and flood fighting should be provided on the comprehensive and holistic work, it should be achieve technical and non technical measures.

a. Technical Measures

- Multi purpose Reservoir
- River embankments ("dyke" as not a long the river, part of branch that flood occur).
- River Normalization (improvement/restoration).
- Short Cut.
- Sabo Dam.
- Drainage system, Flap gate & pump (garbage problem)
- Retention Reservoir (kolam penahan air sementara)

b. Non Technical Measures

- Triangulations Point that sound return period of flood (Peil Banjir).
- Garbage management (periodically).
- Clean side ditch ("kerja bakti')
- Making PRE-Flood Hazard Maps
- Elevate house (Living harmony with flood)

Table 2. Structural and non structural measures activities sharing

Action	Risk Management (Pro-active Response)		Crisis Management (Re-active Response)	
Damage Mitigation	Damage Reduction	• Flood insurance • Flood proofing	Emergency Response	• Collection of flood information • Rising household goods • Self initiated evacuation
		• Pre Flood hazard mapping (case) • Organization flood fighting corps • Assign higher elevation for evacuation (not building) • Cooperation with rescue volunteers		• Dissemination of flood information/enquire on safety condition • Flood fighting • Assign provide emergency applicants (boat)
		• Observation and data collection • Flood forecasting and warning system • Organization of rescue teams • Emergency drainage pump		• Supply real time flood information and warning (case) • Evacuation order and evacuation directives (event) • Rescue activities • Emergency flood control works
Damage Deterrence	Risk Reduction	• Resettlement to safe area-social problem • Elevate housing land-harmony flood	Rehabilitation Restoration	• Removal of mud garbage • Reconstruction and restoration of house
		• Zoning flood prone area • Drainage pump • Ring levee (seldom) • Understanding among stakeholders of flood control project (sometime)		• Collecting and distributing relief fund • Draw and report lessons from the disaster
		• Planning & flood control project • River improvement works (dredging and widening channel, diversion channel) • Levee construction and rising levee • Flood control dams and reservoir		• Inspection and study of the cause of damage • Epidemic prevention • Restoration of attacked facilities • Rank up of flood control plan

I.3 Useful of Flood Hazard Map (FHM)

Table 3. Use of Flood Hazard Maps

Category	Local Resident	Local Municipalities/Government
Everyday life	• Consider proper land use patterns and water resistant buildings suited to the flood vulnerability of the area	• Review urban planning and land use patterns that are resistant to flood
	• Prepare emergency kits, emergency food, etc • Prepare boats and other appropriate means of evacuation	• Updated disaster prevention and flood fighting plans of the area • Review refuges and evacuation routes • Updated specific assistance plan to evacuate or rescue the vulnerable (elderly, handicapped, sick, injured, etc)
	• Identify proper communication channels and systems for information on evacuation • Organize voluntary disaster prevention units	• Updated communication channels and systems for information on evacuation • Develop voluntary disaster prevention units
	• Learn about past inundation history and risk of inundation of the local area • Organize educational sessions on potential flood damage, preparedness and evacuation	• Promote education on disaster prevention and conduct evacuation practice drills • Publicize importance of disaster prevention and preparedness
Emergency situations	• Confirm proper refuges, evacuation routes, emergency kits, etc	• Identify flooded areas, inundation depth, location of refuges, and evacuation routes
	• Evacuate independently, following weather forecast, flood related information, emergency warnings, etc	• Provide information on weather forecast and flood forecast
	• Assist in evacuation of those vulnerable to floods	• Support and rescue those vulnerable to floods
	• Evacuate to proper refuges through safe routes, following advisory and imperative evacuation warnings	• Provide continuous flood related information on evacuation • Set up refuges • Issue advisory and imperative evacuation warnings • Direct evacuation

The information incorporated in flood hazard maps shall be those items that are practical and useful in the event of flooding, ensuring the safety and proper evacuation of local residents. Items such as predicted inundation areas and location of refuges, are terms “Evacuation use Information”, and items that will be helpful in everyday life, by notifying the residents of potential flood damage and enhancing their awareness of the importance of flood disaster preparedness, are termed “Educational use Information”.

To make efficient use of flood hazard maps, local residents must be thoroughly convinced of the real danger of flooding. The indispensable information on evacuation and, accordingly, the evacuation use information, shall be incorporated in the hazard maps. Educational-use information shall be appropriately incorporated or

not, depending on the purpose of preparing the flood hazard maps in the respective municipalities.

Table 4. Key items to be corporated in Flood Hazard Map

Evacuation use Information	Educational use Information
• Predicted inundation area, inundation depth, flood concentration time • Historical inundation records • Areas to be evacuated (where inundated and high land) • Location of evacuation refuges (high area) • Evacuation routes (nearest high area to evacuate) • Dangerous spot on evacuation routes • Rules to follow in the event of evacuation • Communication channels and systems for information on evacuation • Issuance criteria for evacuation warnings • Map preparing body, date of preparation	• Flooding mechanism • Topographic features, flood types • Real danger of flood, predicted extent of damage • Meteorological information • Past flood records (rainfall, inundation and damage) • Rules to follow in the event of flood • Explanation and directions to use-up flood hazard maps • Preparedness against flood

II THE ALLOCATION OF ROLES IN MAKING FLOOD HAZARD MAPS IN INDONESIA

II.1 Organization for Making Fundamental FHM

The responsibility for making FHM are lay on the people who fell warn of the flood, Flood not became a problem if it is occur on land where there is not a human life.

Since flood "disturb" human life, so that we try to avoid flood, include level of inundation just 10 cm. But sometime or many time we disturb swam pond or flood retention area for resident/household.

There are some stakeholder who have link to government policy :

a. Central = National = Pusat
b. Prefecture = Province/Governor = Propinsi/Gubernur
c. Local Government = Municipality = Kabupaten/Bupati

Role sharing

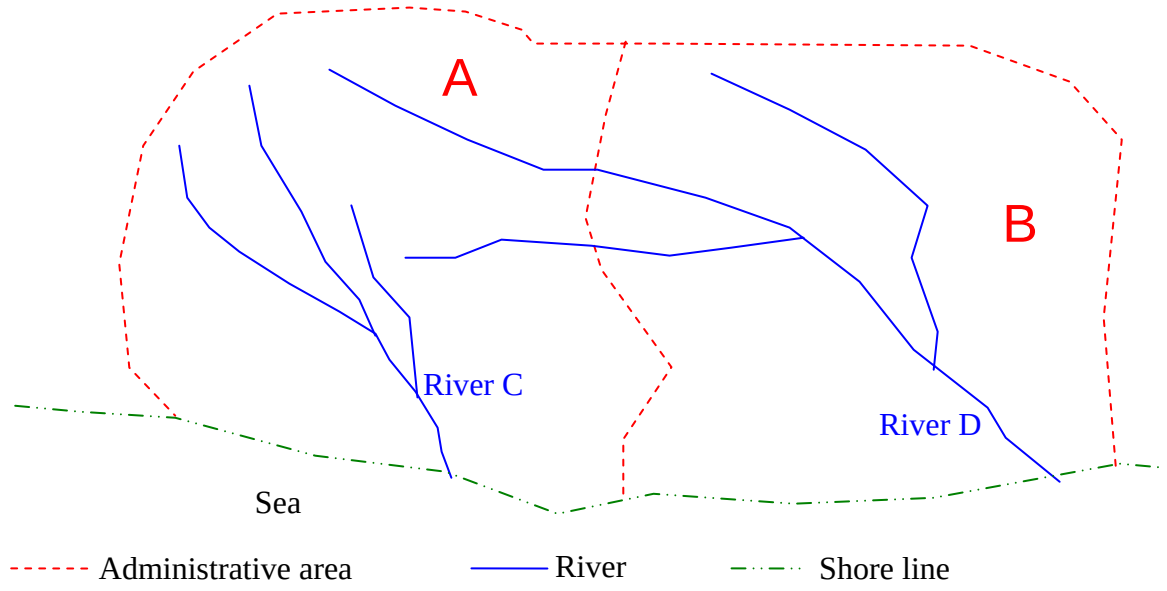

Figure 1. Illustrated river management

The cases in Indonesia about role sharing to manage some river that it cross over the administrative boundary area, the river managed by one level above of government, , if it is cross two or more the border line administrative area. If it cross province boundary area the river managed by central government and If it cross local government boundary area the river managed by province government.

Central Government

Central government has ministry who responsible to flood damage. Since flood damage influence many aspect, there are several ministry involve in flood management activities.

Such as Ministry of Public Works, Where I have been work, has several division. Who concern to flood such as Directorate of Water Resources.

The river which it is manage under central government would be handled case by case as project work such as Ciliwung-Cisadane River Basin Project, Citanduy-Ciwulan River Basin Project and Bengawan Solo River Basin Project, etc.

Making Flood hazard maps in Indonesia depending on Table 4 should be provided by project work, such as :

Table 5. Stakeholder should be work together for making FHM

Data type / items	Analysis work	Ministry (national)	Dinas (local)	Individual/ private
Rainfall (meteorological information)		BMG	BMG daerah	
Land use cover		Bakosurtanal	Pemetaan & survai	
Relief contour				
Soil type		Soil research agency		
	Predicted flood	PU-DGWRD	Balai-Local Gov.	
	Flood mechanism	PU-DGWRD	Balai-Local Gov.	
	Flood type	PU-DGWRD	Balai-Local Gov.	
	Inundated simulation & predicted	PU-DGWRD	Balai-Local Gov.	
Historical inundated records		Inner Gov. & PU	Dinas inner Gov.	Yes
Area to be evacuated		Inner Gov. & PU	Local inner & PU-balai	Yes
Location of refuge	• legal law aspect of the location • Location capability	Inner minister PU	Local inner Gov. Local	Yes
	• Evacuation routes • Traffic routes supplies	Inner Gov. & PU	Local Gov.	Yes
	Explanation & direction to use-up FHM	Social, Transportation (BMG), Inner Gov., PU (DGWRD)		
Dangerous spot on evacuation route		Inner Gov.	Local Gov.	Yes
	Flood warning system	PU-DGWRD	Balai-Local Gov.	
Order to evacuated	• Flood warning sign • Evacuation	• PU-DGWRD • Rescue fire, Soldier, Volunteers	• Balai-Local Gov. • Inner local Gov.	Yes

Local Government

Local government (prefecture or municipalities) has division who they work as long arms of central government. It is called “Dinas”, since reform political situation, it change in many name, such as “Dinas pengairan” always work together on river basin project work (see Table 5).

II.2 Disseminating of Flood Hazard Maps

My office has been made leaflet that it is inform how to escape from flood and earthquake. Disseminating and distribution the information needs more works. Information on the leaflet is limited since many data should be provided.

Disseminating should be provided by everyone who has warned to the flood. Firstly it is provided by central government. Method of disseminating by using radio or TV as educational information.

III ACTION PLAN OF MAKING FLOOD HAZARD MAPS (FHM)

III.1 Target Basin area

Jakarta province is my target for making FHM, but I am employer of government and no promise to JICA, since there are many considerations for selected river basin, such as political condition, etc. My selected area depend on available data, such as rainfall data (1916 – 2004 publish), discharge, relief contour (Digital Terrain Module), climatologically data, land use cover.

Fulfill the request action plan FHM, supported only for Jati Pinggir (Central Jakarta) area, since on that area I have data on my hand for making pre-FHM.

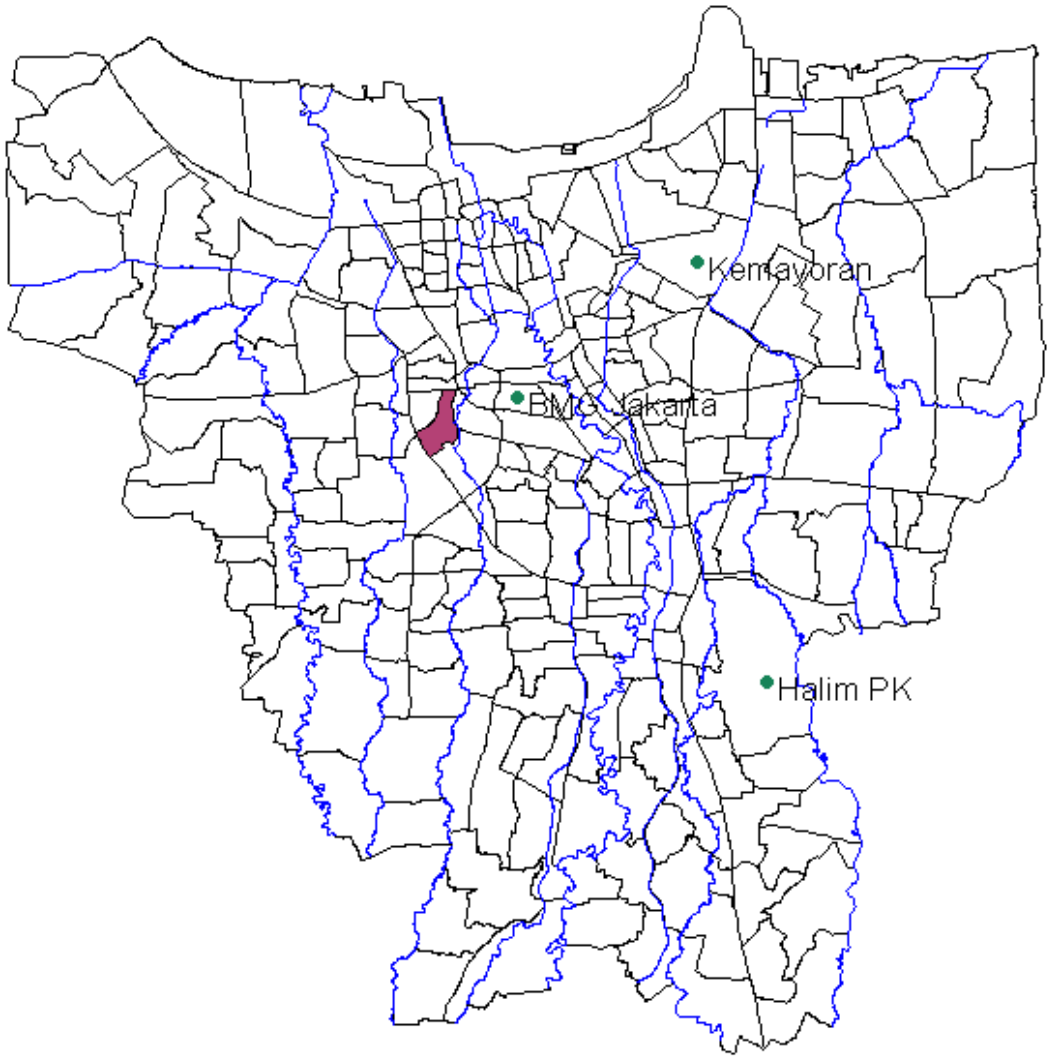

Figure 2. Target area for action plan Flood Hazard Map

Figure 3. Relief contour line, on Jati Pinggir area

III.2 Propose next five years

Proposed on making flood hazard maps for next five year ahead is Jakarta Province, since there are 13 river basin enter to Jakarta province boundary and much effort to define loss of flood damage.

III.3 Problem in propose FHM

The problem for making FHM such as updated topographic map/relief contour include in detail scale map, may be on budget, as this project just in my head plan.

IV SUGGESTIONS FOR TRAINING COURSE MORE MEANINGFUL

All lecturer designed for this course were useful, some of them have provided in term of materials, process, concept, theory, and practical, especially on exercise in the group field survey for making the hazard maps ISE City with group presentation on the Town Watching.

The field survey is more importance, because of the real situation found could be comparing to lecture.

Flood management in Japan is very importance for expertise. The significance of hydrological statistics, flood inundation analysis, calculation of residents evacuation, runoff flood analysis and anticipation of inundation area are key functional of flood hazard map drawing and establishment.

Tryout when making pre-FHM after town watching more useful if we work together with resident people by using PARTICIPATORY RURAL APPRAISSAL). We can get information directly about inundation area, vest life and traffic refuge routes need.