

CHAPTER 3 STUDY ACTIVITIES AND FINDINGS AT REGIONAL LEVEL

3.1 Disaster Management System at Regional Level

For disaster management, local governments including Kabupaten and Kota have the mandate to protect citizen's life against possible disasters. In this sense, local government such as Kabupaten and Kota bear most of the responsibility on related activities that are the closest to citizens. For effective disaster management, the disaster management cycle must be considered, a good balance of pre-disaster, emergency response and post-disaster measures considered carefully, and necessary efforts planned. Especially in recent years, the importance of pre-disaster efforts has gained recognition since efforts made before the occurrence of disaster greatly helps to reduce risks of possible disasters. In this study, pilot area for local level disaster management, Kabupaten Jember at East Java Province and, Kabupaten Padang Pariaman and Kota Pariaman at West Sumatra Province are selected.

In this section, findings and current situation of Disaster Management System in pilot regions, and evaluation of the current system are described to explain general characteristics of disaster management at Kabupaten and Kota levels.

3.1.1 Evaluation of Existing Disaster Management System

As a result of findings from the existing disaster management system in Kabupaten Jember, Kabupaten Padang Pariaman, and Kota Pariaman, things have to improve in a more comprehensive way, not only focused on emergency response. Evaluation of existing disaster management system has been made and applied for formulation of Regional Disaster Management Plans in the pilot Kabupatens and Kota. Evaluation criteria are based on Japanese disaster management system.

Table 3.1.1 Evaluation of Existing Disaster Management System

No.	Necessary Items	Availability	Comments
1	Preparation of Disaster Management Plan	△	PROTAP PBP is a plan for disaster management. Indication is in very limited and detail is not very clear; however, basic concept is mentioned clearly. Need for improvement.
2	Preparation of Disaster Management Plan by types of disaster	×	PROTAP PBP is for all types of disasters. Need to consider levels and types of disasters.
3	Understanding risks from disaster	△	Prepared general hazard Map; however not very detailed. Need for improvement.
4	Establishment of Disaster Management Organization	○	SATLAK PB is disaster management body. Establishment is very similar to disaster

No.	Necessary Items	Availability	Comments
			management council in each municipality in Japan.
5	Formulation of Relevant Pre-disaster Plans and actual implementation	△	Several items for mitigation and preparedness measures are started (No physical measures yet); however, detailed plan should be prepared.
6	Establishment of Emergency Response Headquarters	○	Rupusdalops PBP is function as Emergency Commanding Center in case of occurrence of disaster. However, clear indication of procedure is not formulated in document format. Also, no physical area designated for this Rupusdalops PBP
6	Procedure of Establishment of Emergency Response Headquarters (Rupusdalops PB)	×	As mentioned above, written procedure is not prepared, in regional disaster management plan; the item should be indicated.
7	Establishment of Communication System	△	Land telephone and cellular phone are the main communication means. Need to consider alternative means.
8	Information sharing with SATKORLAK PB	△	In case of large-scale disaster, coordination with SATKORLAK PB is necessary. In the past, since the size of disaster was limited, there was no problem. However, systematic information sharing system should be considered in advance, such as information items, means, and period.
9	Information dissemination for evacuation to citizens	△	Information dissemination for evacuation is carried out mostly orally. In case of large scale disaster, systematic means of dissemination of evacuation order should be formulated.
10	Designation of Evacuation Sites	△	SATLAK PB started to plan evacuation sites for Tsunami Disaster; however, for other types of disasters, they have not been designated yet.
11	Preparation of Evacuation Plan and operation manual for evacuation facilities	×	There is no systematic evacuation plan or relevant manuals.
12	Stockpile of Daily Commodities, rescue and medical equipments	×	Stockpiles of equipment are not yet sufficient due to lack of budget.

○:Yes, △:Moderate × : No

The evaluation items are limited to important ones, and in the course of study, all items were discussed with relevant officials. These items should be included in the regional disaster

management plan systematically, and all the staff should be aware of all their contents, especially items directly related to disaster management.

Regional Disaster Management Plans were formulated together with relevant officials including all the items mentioned above to improve existing disaster management system.

3.1.2 Recommendations on Regional Disaster Management Strategy

In the course of the study, the Study Team held a series of workshops and discussions with relevant officials from Kabupaten and Kota, and identified the current disaster management system in their regions. Based on the findings, evaluation of existing disaster management system has been proposed as mentioned in the previous section. In this section, recommendations on Regional Disaster Management Strategy are made, as obtained through the activities in pilot regions, and they will be applied in other regions in Indonesia.

1) Recommendations

Recommendations on Regional Disaster Management Strategy are as follows:

(1) Recommendation on establishment of BPBD (the new SATLAK PB)

Due to enacting of Law No. 24 regarding Disaster Management, SATLAK PB will be newly established as BPBD. Main members of BPBD will not change much; however, there should be permanent secretariat to support operation of BPBD for sufficient and continuous efforts for disaster management. Also, functions for pre-disaster phases should be given and relevant tasks distributed among the members of BPBD.

(2) Establishment of Disaster Management Agency as secretariat of BPBD

In existing SATLAK PB, there is no permanent agency which can focus on disaster management. It is strongly recommended together with establishment of BPBD, to establish Disaster Management Agency with officials from each agency. This agency will be responsible for all activities for disaster management including formulation and revision of regional disaster management plan, holding drills for government officials, and citizens, working as secretariat of BPBD, and also working as secretariat for the establishment and operation of Rupusdalops PBP.

(3) Establishment of Disaster Management Center

Location of Rupusdalops PBP changes from time to time. Hence, for effective and appropriate emergency response, a certain area should be designated in advance as Disaster Management Center, and certain level of equipment together with communication system should be established in the designated area. However, the level and size of disaster management center will differ from the budget availability. The important point is

to designate a certain area and prepare minimum equipment to support smooth and efficient disaster management activities.

(4) Establishment and Operation Procedure of Rupusdalops PBP

Establishment and operation of Rupusdalops PBP is not clearly defined and no document is available to mention establishment and operation procedure of Rupusdalops PBP. In order to prepare for large-scale disaster, documents showing such procedure is necessary to establish it promptly and to avoid unnecessary panic after occurrence of large scale disaster.

(5) Preparation of Comprehensive Regional Disaster Management Plan

Disaster Management Activities cover a wide varieties of fields; therefore, it is very difficult to grasp everything and many documents are prepared separately. In Japan, Regional Disaster Management Plan is the document covering every phase of disaster management including the institutional setup of disaster management body, and its responsibilities. Therefore, with this document, all elements of disaster management are indicated clearly. The difficulty of disaster management is coordination among relevant organizations. The plan helps to mitigate unnecessary conflict and misunderstanding by being the road map to show the way to mitigate from damages and from possible disasters.

(6) Preparation of Short, Mid, Long term measures for Strategic Disaster Management

Pre-disaster measures need time and budget, and there are priorities among the strategies and measures. Well planned and realistic short, mid, long term measures for strategic disaster management should be formulated, together with annual budget allocation. Also, these strategies should be well balanced with hard and soft component measures.

(7) Participation and Increase Awareness on Disaster Management in Community

In the field of disaster management, the importance of community participation is now strongly recognized. In case of occurrence of large-scale disaster, government officials are also victims of disaster, and they need time to get to a disaster affected area. However in reality, in case of earthquake, people are killed in less than one hour after being trapped in the collapsed building. Therefore, community empowerment is very important. In this project, as a pilot study, selected community empowerment activities were held through a series of workshops; such knowledge will be disseminated to other areas for sustainable community disaster management activities in the future.

3.2 Hazards, Risks and Countermeasures against Natural Disasters in Pilot Regions

This section discusses methodologies for the creation of hazard maps and risk maps for the pilot regions (Kabupaten Jember, Kabupaten Padang Pariaman and Kota Pariaman) for 1) Flood disaster, 2) Sediment disaster, 3) Earthquake and 4) Tsunami disaster. Then, hazard maps and risk maps of each disaster and possible countermeasures against the disasters are shown and listed in each pilot region.

3.2.1 General

1) Objectives of Creations of Hazard Map and Risk Map

The objectives of creation of hazard maps and risk maps are:

- 1) to identify the areas which are considered to be high-hazard and risk to natural disasters, and
- 2) to identify problems facing the area for consideration in the preparation of regional disaster management plan.

For creations of hazard map and risk map for the targeted disasters, simplified methodologies were applied for facilitating smooth technology transfer to the counterpart members of the pilot regions. It is expected that all the local governments in Indonesia (*e.g.* BPBD as disaster management agency, *etc.*) will prepare hazard maps and risk maps in terms of natural disasters based on these methods.

2) Definition of Risk, Hazard and Vulnerability

According to “Living with Risk” published by Inter-Agency Secretariat of the International Strategy for Disaster Reduction (UN/ISDR) in 2004, Risk is defined as “The probability of harmful consequences, or expected losses (deaths, injuries, property, livelihoods, economic activity disrupted or environment damaged) resulting from interactions between natural or human-induced hazards and vulnerable conditions” and can be indicated by the formula below.

$$\text{Risk} = \text{Hazard} \times \text{Vulnerability} \quad (\text{Eq. 3.1})$$

Hazard: A potentially damaging physical event, phenomenon or human activity, which may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation.

Vulnerability: The conditions determined by physical, social, economic, and environmental factors or processes, which increase the susceptibility of a community to the impact of hazards.

3) Flow Chart for Creations of Hazard Map and Risk Map

The conceptual flow chart for the creation of hazard map and risk map is shown in Figure 3.2.2 below. There are three (3) steps to producing a hazard map: namely 1) Data collection, 2) Calculation & Selection of indices and 3) Creation of Hazard map. Further, a risk map is derived based on the formula of “Risk = Hazard x Vulnerability” with the hazard map and the vulnerability indices (or possibly a map representing “Vulnerability”). At “Data collection” stage, the basic data in terms of hazard and vulnerability will be collected (e.g. affected disaster area, number of killed or injured, damage amount, rainfall, tidal level, surface ground condition, population, poverty rate, literacy rate, land use, etc.). Then, the indices for hazard and vulnerability will be calculated during the “Calculation & Selection of Indices” stage; they will be referred to as the candidate indices. The most appropriate indices for hazard and vulnerability can be selected amongst the candidate indices after the trial derivations of hazard map and risk map. It should be noted that some of the indices were selected based on the discussions with the counterpart organizations/members of the pilot regions (Kabupaten Jember, Kabupaten Padang Pariaman and Kota Pariaman) during the workshops. After the selection of indices, the hazard map is created as the summation of the indices at the stage of “Creation of Hazard Map”. The vulnerability map, consisting of the relevant selected indices, can be also created if necessary. Finally, the risk map will be created with the use of the formula of “Risk = Hazard x Vulnerability” as the result of the “Creation of Risk Map” stage.

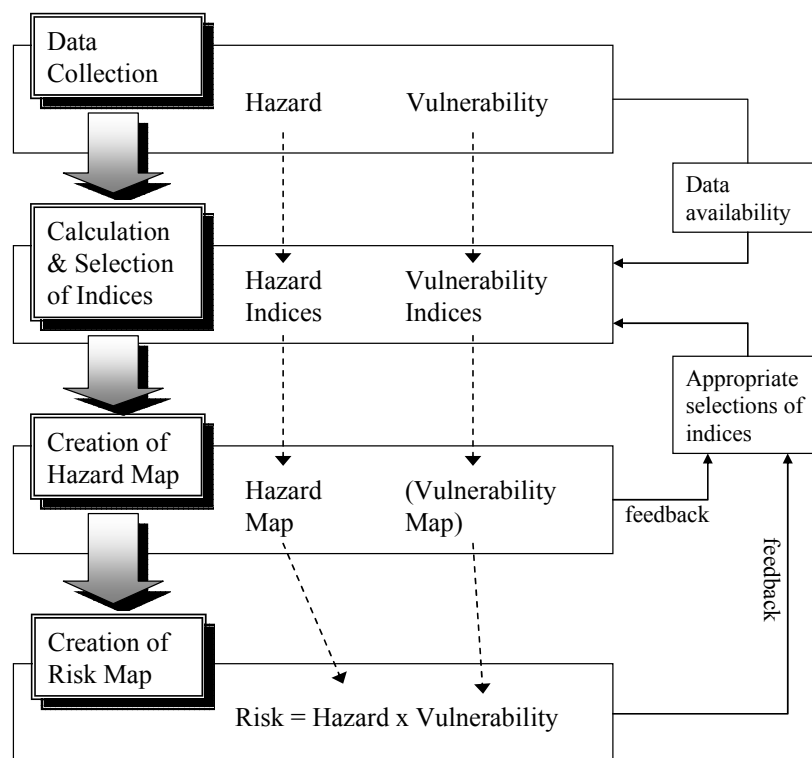


Figure 3.2.1 Conceptual Flow Chart for Creations of Hazard Maps and Risk Maps

Figure 3.2.2 shows the relations among risk, hazard, vulnerability, indices and basic data. “Risk” is composed of “Hazard” and “Vulnerability”. “Hazard” and “Vulnerability” consist of their indices, respectively. “Hazard” is simply the summation of the hazard indices. “Vulnerability” can also be estimated in the same manner. Each index is derived or calculated based on the collected basic data (*e.g.* related documents, electric data, maps, *etc.*) from various information sources. The hazards and vulnerabilities are overlaid for analyzing the risk with the use of GIS (Geographical Information System) software. To overlay the maps, the maps are indicated in grid data, and then the maps are overlaid to calculate the risks. The applied size of the grid for Kabupaten Jember and Kabupaten Padang Pariaman were 1 x 1 km for the analyses. The grid size for Kota Pariaman was 500 x 500 m. Basically, the values of each layer were divided into five (5) classes indicating relative hazard/risk classifications. “Red” means the highest hazard/risk and “Orange” indicates higher hazard/risk. Moderate hazard/risk is shown in “Yellow” while “Green” means lower hazard/risk. Further, “Blue” shows the lowest hazard/risk.

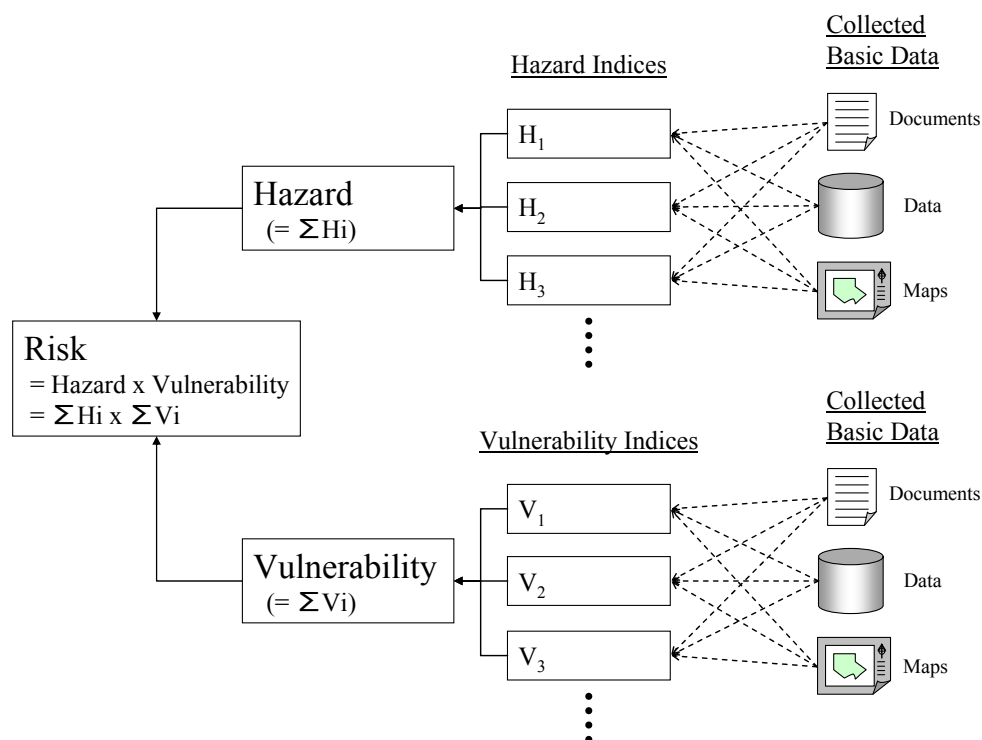


Figure 3.2.2 Relations among Risk, Hazard, Vulnerability, Indices and Basic Data

The indices used for creations of hazard maps and risk maps are shown in the table below. Symbol in parentheses in the table indicates symbol of each index.

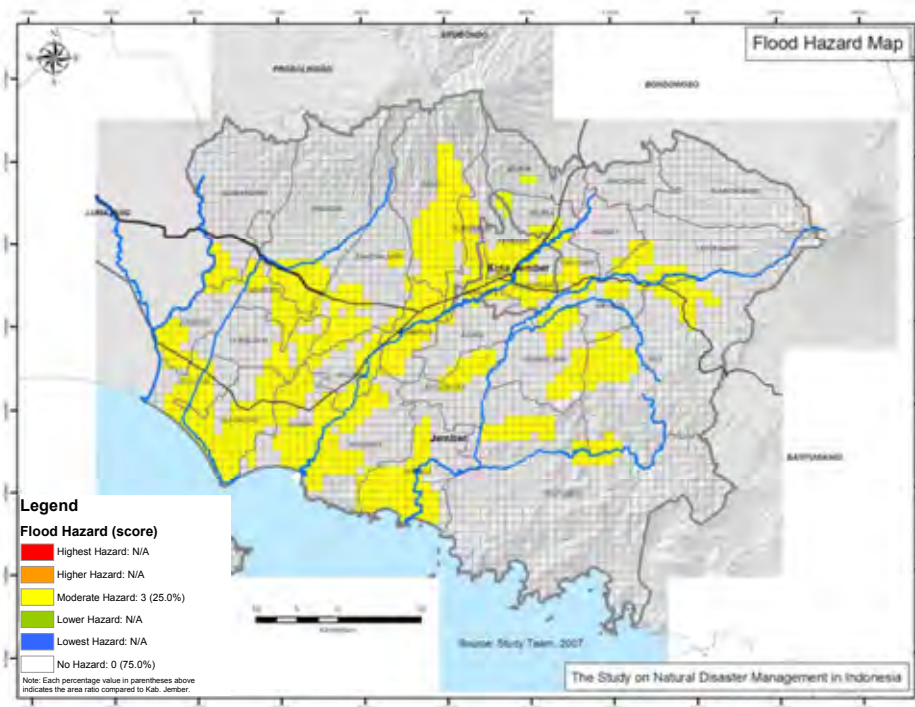
Disaster Type	Kabupaten Jember		Kabupaten Padang Pariaman and Kota Pariaman	
	Hazard Indices	Vulnerability Indices	Hazard Indices	Vulnerability Indices
Flood disaster	<ul style="list-style-type: none"> • Past flood area and flood potential area (H₇₇) 	<ul style="list-style-type: none"> • Population Density (V₁₁) • Built-up Area (V₁₂) • Vegetation/Cultivated Area (V₁₅) 	<ul style="list-style-type: none"> • Flatness (Slope) (H₇₇) • Alluvium (Geology) (H₉₈) • Flood Depth (H₉₉) • Flood Duration (H₁₀₀) 	<ul style="list-style-type: none"> • Population Density (V₁₁) • Built-up Area (V₁₂) • Plantation and Rice-field Area (Land Cover) (V₁₅)
Sediment disaster	<ul style="list-style-type: none"> • Slope (H₁₄) • Geology (H₁₅) • Annual Rainfall (H₁₆) 	<ul style="list-style-type: none"> • Population Density (V₁₁) • Built-up Area (V₁₂) • Land Cover (V₁₄) 	<ul style="list-style-type: none"> • Slope (H₁₄) • Geology (H₁₅) • Annual Rainfall (H₁₆) 	<ul style="list-style-type: none"> • Population Density (V₁₁) • Built-up Area (V₁₂) • Road/Rail in Steep Area (V₁₄)
Earthquake *	(Ground surface acceleration intensity)	(Number of Building by Type for each Kecamatan) (Damage rate)	(Ground surface acceleration intensity)	(Number of Building by Type for each Kecamatan) (Damage rate)
Tsunami disaster	<ul style="list-style-type: none"> • Inundation area and depth estimated based on ground elevation (H₁₃) 	<ul style="list-style-type: none"> • Population Density (V₁₁) • Built-up Area (V₁₂) • Damage Rate (V₁₃) 	<ul style="list-style-type: none"> • Inundation area and depth estimated based on ground elevation (H₁₃) 	<ul style="list-style-type: none"> • Population Density (V₁₁) • Built-up Area (V₁₂) • Damage Rate (V₁₃)

*: Any types of hazard index and risk index for Earthquake were not estimated. "Ground surface acceleration intensity" was used as seismic hazard map. For assessment of seismic risk, ratio of damaged buildings was made as earthquake risk map based on "Number of buildings by type for each Kecamatan" and "Damage rate".

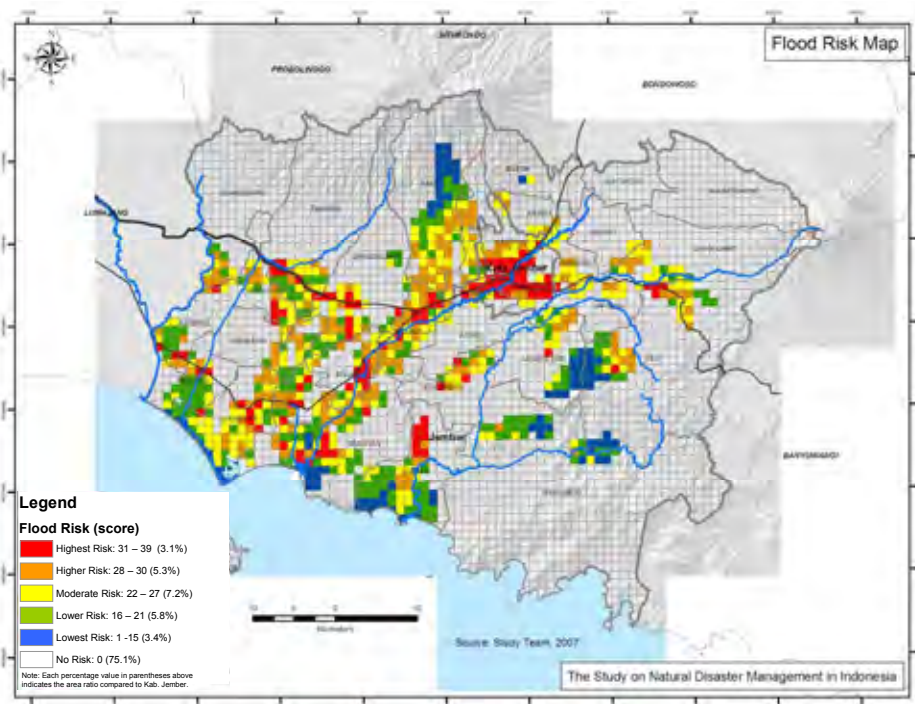
3.2.2 Flood disaster

1) Kabupaten Jember

A. Hazard Map for Flood Disaster



B. Risk Map for Flood Disaster



C. Possible Countermeasures against Flood Disaster

On the basis of the hazard map and risk map, two areas were selected which have suffered from flood disasters in the past. The one is located in the eastern mountainous region, covering Kec. Silo and Kec. Mayang. (to be referred as “F1 Area” hereinafter). The other is located in F2 Area in the map, covering Kec. Jenggawah, Kec. Ambulu, Kec. Wuluhan, Kec. Balung, Kec. Puger, Kec. Gumukmas and Kec. Kencong. Based on the flood disaster profiles mentioned above, the possible countermeasures for F1 Area and F2 Area are indicated in Table 3.2.1.

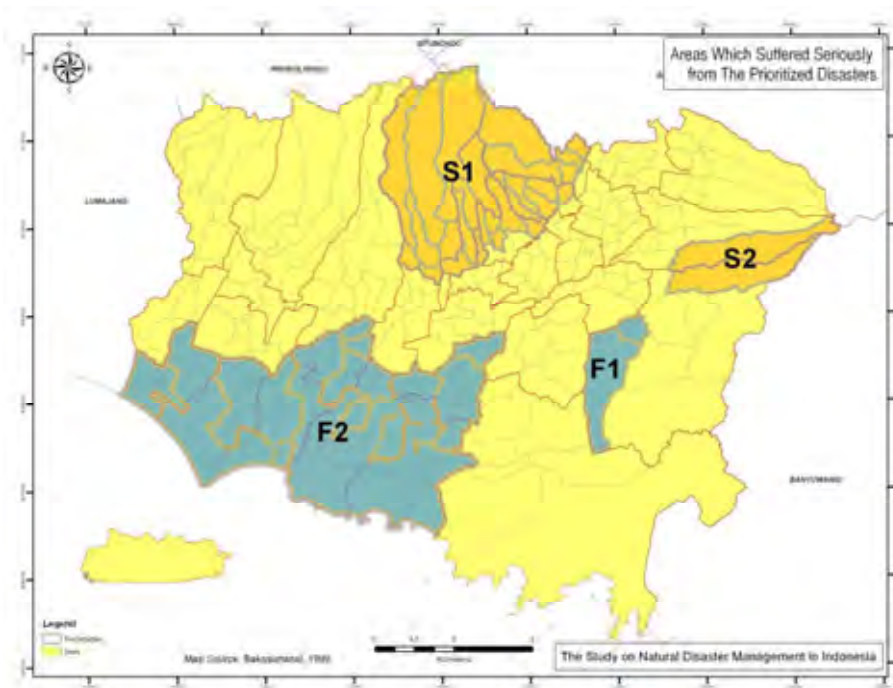


Figure 3.2.3 Areas which Suffered Seriously from Flood and Sediment Disasters

Table 3.2.1 Possible Countermeasures for F1 Area and F2 Area

	Non-structural Countermeasure	Structural Countermeasure
F1 Area	<ul style="list-style-type: none"> • Reforestation • Land use limitation • Early warning system for fast and appropriate evacuation • Community activities • Evacuation shelter and route 	<ul style="list-style-type: none"> • Dike • Revetment works • Reinforcement of dike and revetment works • Channel excavation and widening • Bridge improvement (Raising, removal of bridge columns, etc.)
F2 Area	<ul style="list-style-type: none"> • Land use limitation • Early warning system for fast and appropriate evacuation • Community activities • Evacuation shelter and route 	<ul style="list-style-type: none"> • Normalization of river course • Dike • Revetment works • Reinforcement of dike and revetment works • Excavation and widening of river course • Flood Control Facilities

All of the countermeasures indicated in the table above are expected to be implemented in order to minimize the damages due to flood disasters. In general, it requires much more resources (*e.g.* budget, man-months, technology, *etc.*) for the implementation of structural countermeasures than for non-structural countermeasures. Therefore, the implementation for the non-structural countermeasures with smaller budget should be prioritized for the time being. The above general policy should not impede the structural countermeasures with minimum budget which gives the significant beneficial effects from a viewpoint of disaster reduction. In the long run, cost effective strategic planning is indispensable in view of the implementation period, construction schedule, budgeting, capacity development, project management related to structural countermeasures and non-structural countermeasures. Prior to appropriate implementation of the countermeasures, formulation of master plan (M/P) or feasibility study (F/S) for disaster reduction in terms of flood disaster including sediment disaster as a part of Integrated River Basin Management (IRBM) are recommended to be carried out. Figure 3.2.4 shows the conceptual procedure for step 1, step 2 and step 3 for realization of “Safe Kabupaten Jember against Water-Related Disasters”.

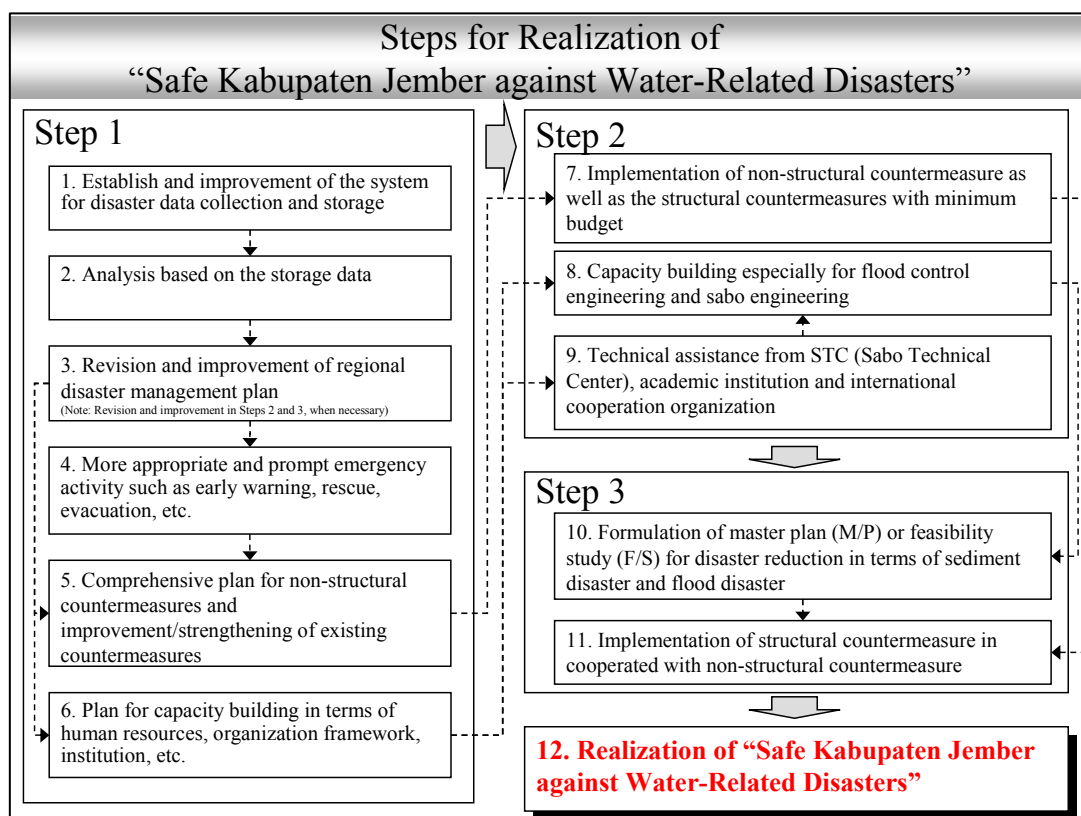
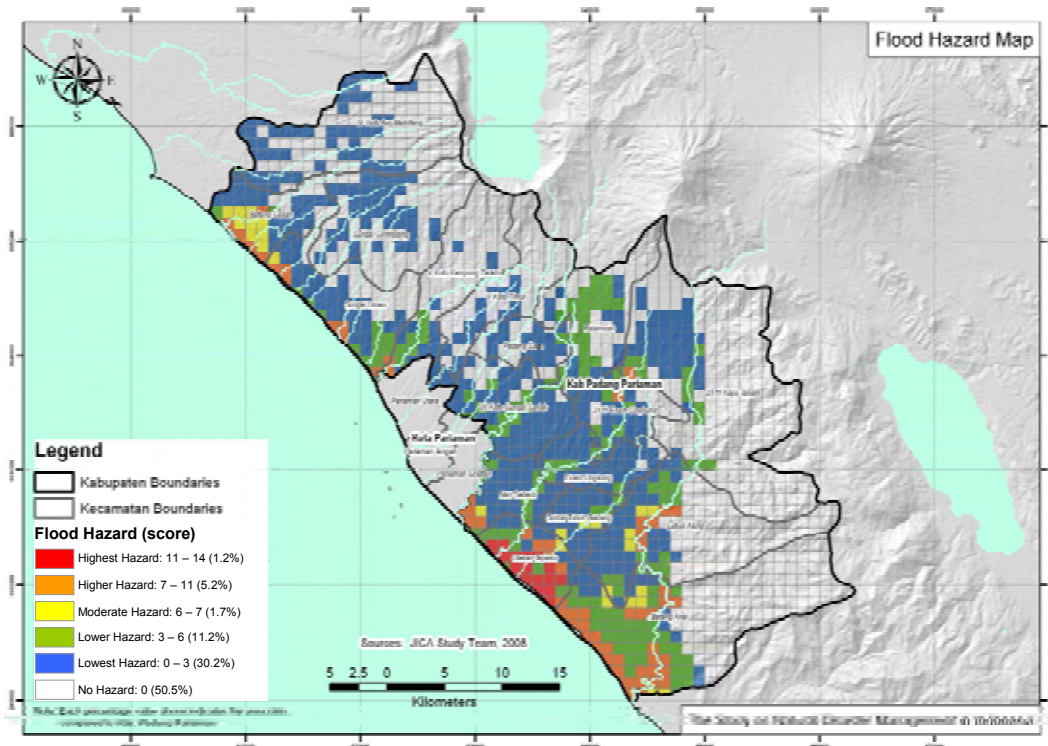


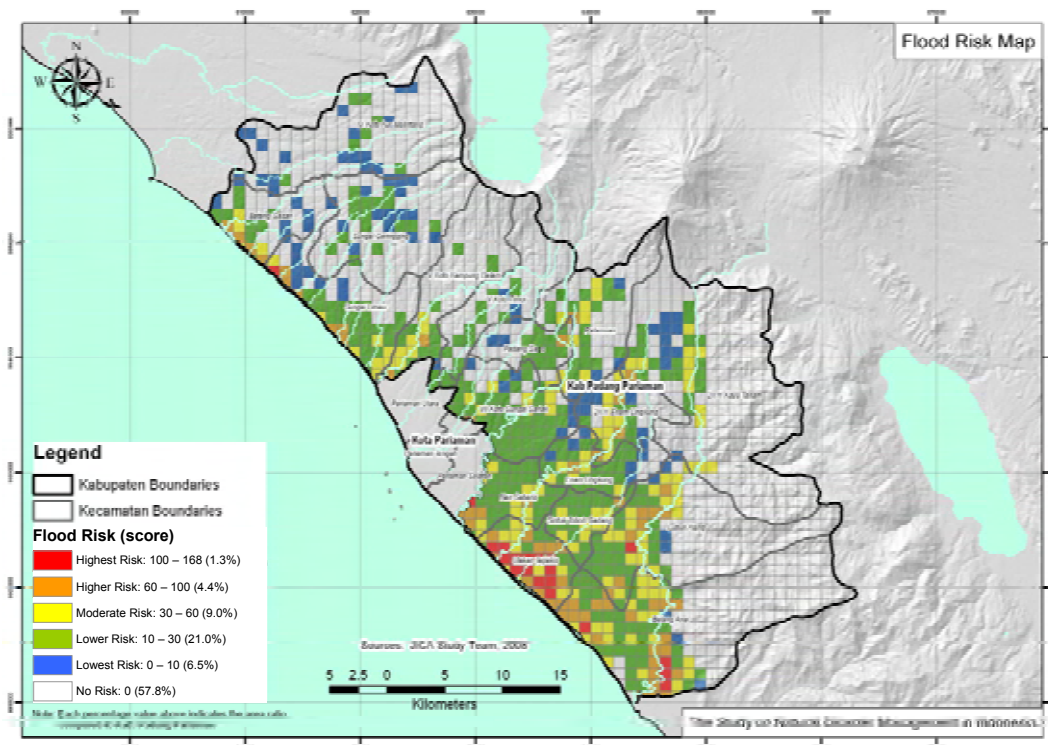
Figure 3.2.4 Steps for Realization of “Safe Kabupaten Jember against Water-Related Disasters”

2) Kabupaten Padang Pariaman

A. Hazard Map for Flood Disaster



B. Risk Map for Flood Disaster

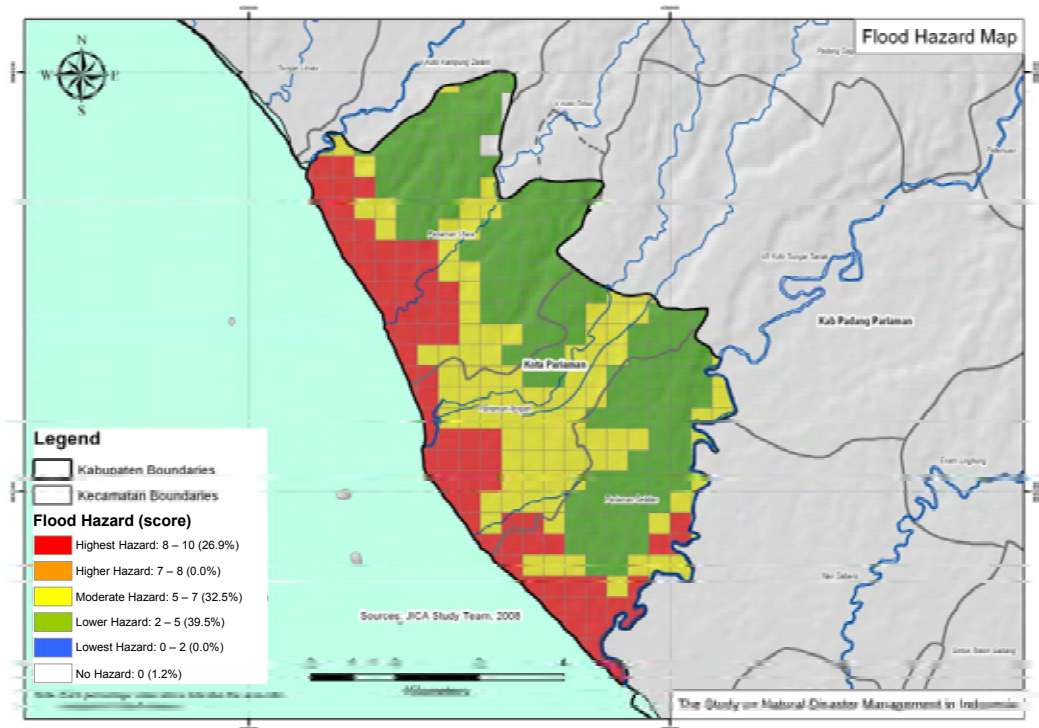


C. Possible Countermeasures against Flood Disaster

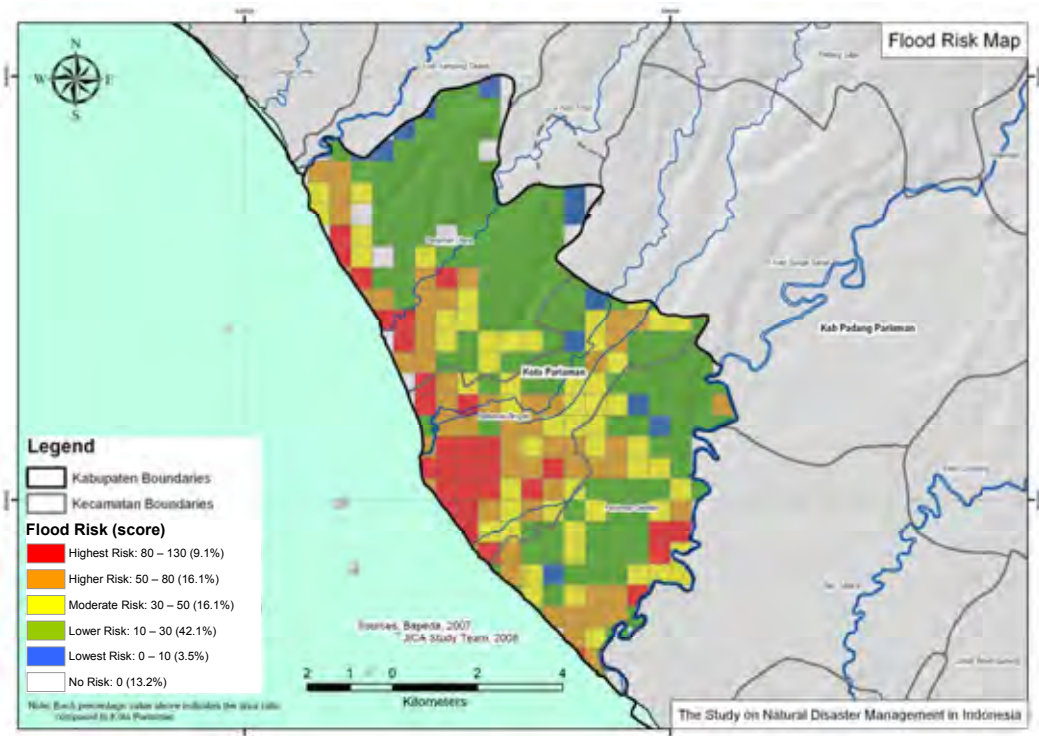
Kecamatan		Possible Countermeasures	
		Structural Countermeasures	Non-Structural Countermeasures
1	Batang Anai	Levee Channel excavation and widening Normalization of river course Improvement of drainage system	Early warning system Land use limitation Evacuation shelter and route Flood-proof house
2	Lubuk Alung	Levee Channel excavation and widening Normalization of river course Improvement of drainage system	Early warning system Land use limitation Evacuation shelter and route Flood-proof house
3	Sintuk Toboh Gadang	Improvement of drainage system	Early warning system Land use limitation Evacuation shelter and route Flood-proof house
4	Ulakan Tapakis	Levee Channel excavation and widening Normalization of river course Improvement of drainage system	Early warning system Land use limitation Evacuation shelter and route Flood-proof house
5	Nan Sebaris	Levee Channel excavation and widening Normalization of river course Improvement of drainage system	Early warning system Land use limitation Evacuation shelter and route Flood-proof house
6	2 x 11 Enam Lingkung	Levee Channel excavation and widening Normalization of river course Improvement of drainage system	Early warning system Land use limitation Evacuation shelter and route
7	Enam Lingkung	Levee Channel excavation and widening Normalization of river course Improvement of drainage system	Early warning system Land use limitation Evacuation shelter and route
8	2 x 11 Kayu Tanam	Revetment works Channel excavation and widening Normalization of river course Improvement of drainage system	Early warning system Land use limitation Evacuation shelter and route
9	VII Koto Sungai Sarik	Levee Channel excavation and widening Normalization of river course Improvement of drainage system	Early warning system Land use limitation Evacuation shelter and route
10	Patamuan	Revetment works Improvement of drainage system	Early warning system Evacuation shelter and route
11	Padang Sago	Revetment works Improvement of drainage system	Early warning system Evacuation shelter and route
12	V Koto Kampung Dalam	Levee Revetment works Channel excavation and widening Normalization of river course Improvement of drainage system	Early warning system Land use limitation Evacuation shelter and route Flood-proof house
13	V Koto Timur	Revetment works Improvement of drainage system	Early warning system Evacuation shelter and route
14	Sungai Limau	Levee Channel excavation and widening Normalization of river course Improvement of drainage system	Early warning system Land use limitation Evacuation shelter and route Flood-proof house
15	Batang Gasan	Levee Channel excavation and widening Normalization of river course Improvement of drainage system	Early warning system Land use limitation Evacuation shelter and route Flood-proof house
16	Sungai Geringging	Revetment works Improvement of drainage system	Early warning system Evacuation shelter and route
17	IV Koto Aur Malintang	Revetment works Improvement of drainage system	Early warning system Evacuation shelter and route

3) Kota Pariaman

A. Hazard Map for Flood Disaster



B. Risk Map for Flood Disaster



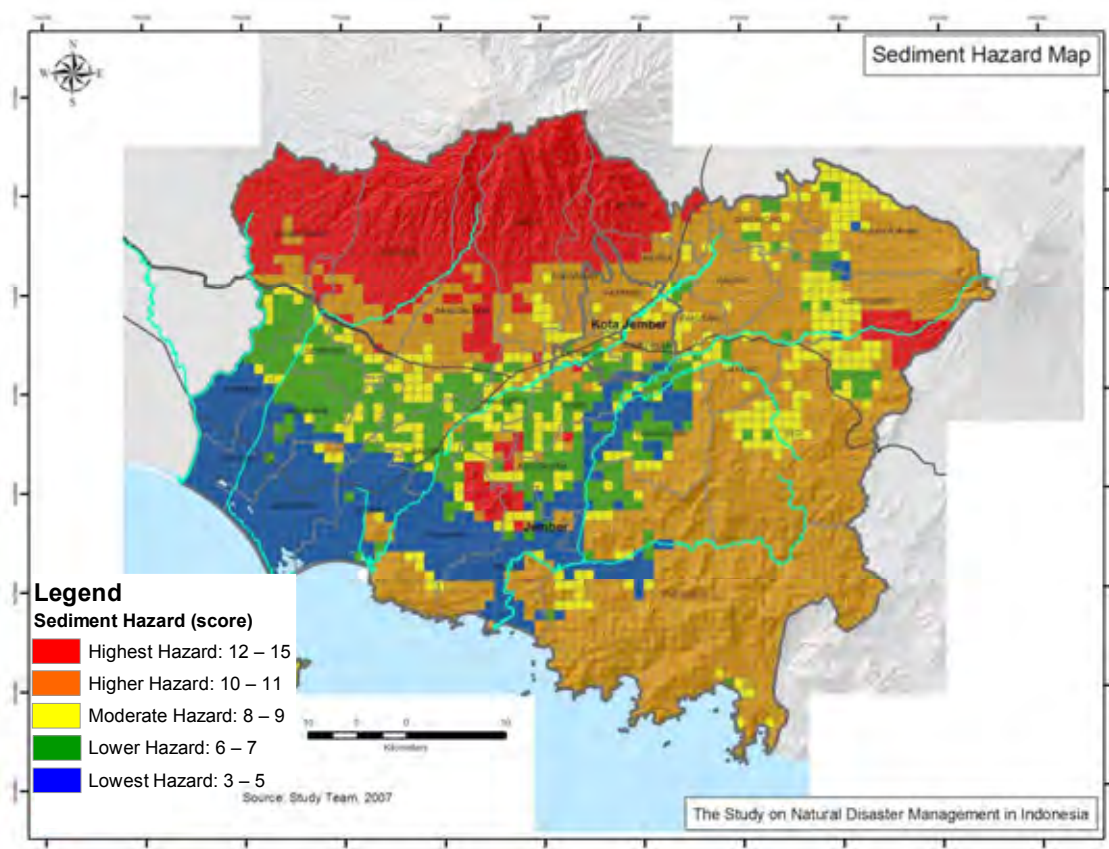
C. Possible Countermeasures against Flood Disaster

Kecamatan		Possible Countermeasures	
		Structural Countermeasures	Non-Structural Countermeasures
1	Pariaman Utara	Levee Channel excavation and widening Normalization of river course Improvement of drainage system	Early warning system Land use limitation Evacuation shelter and route Flood-proof house
2	Pariaman Tengah	Levee Channel excavation and widening Normalization of river course Improvement of drainage system	Early warning system Land use limitation Evacuation shelter and route Flood-proof house
3	Pariaman Selatan	Improvement of drainage system	Early warning system Land use limitation Evacuation shelter and route Flood-proof house

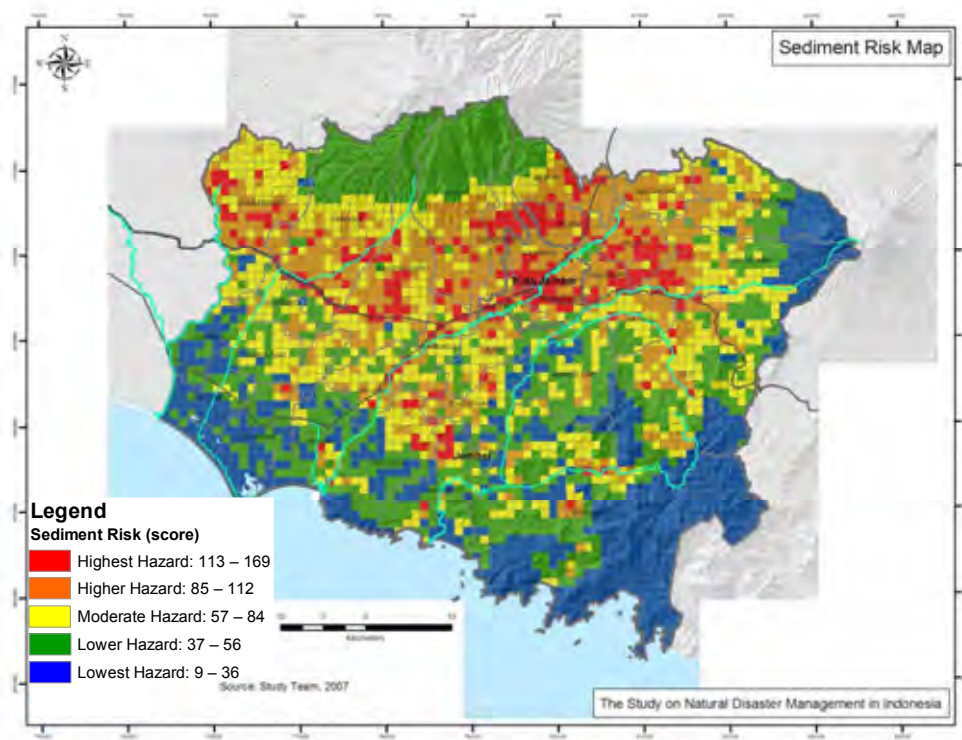
3.2.3 Sediment disaster

1) Kabupaten Jember

A. Hazard Map for Sediment Disaster



B. Risk Map for Sediment Disaster



C. Possible Countermeasures against Sediment Disaster

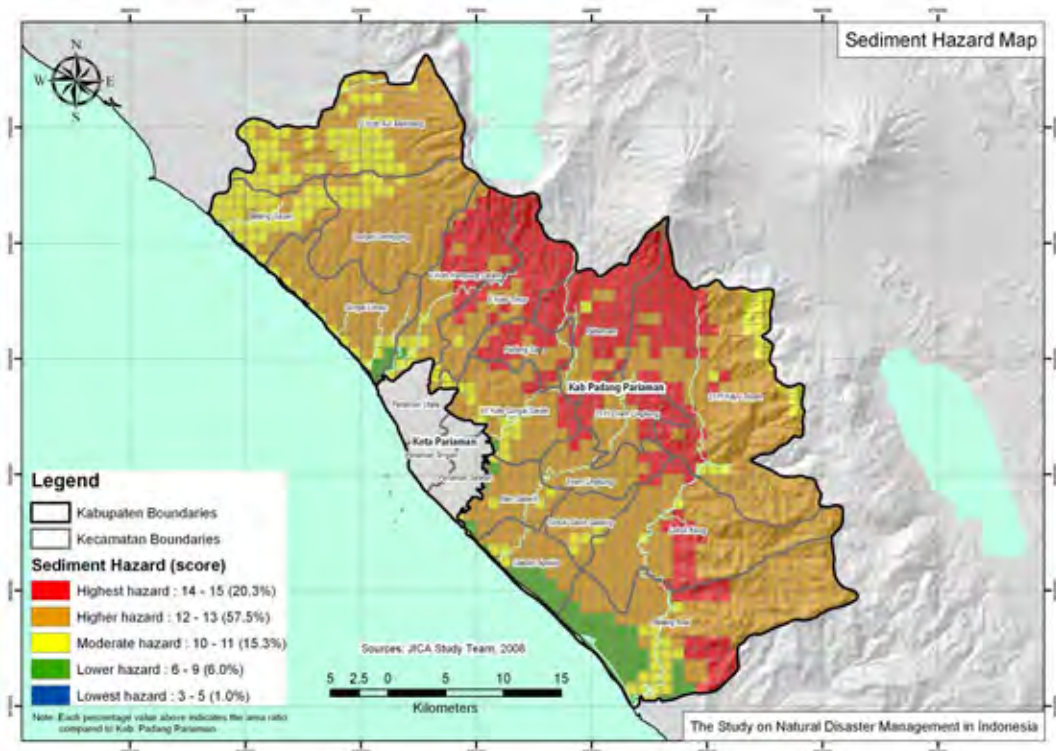
Refer to the corresponding section of Kabupaten Jember for flood disaster. There are two areas selected which suffered seriously from sediment disaster (Refer to Figure 3.2.6). The one is located in the north, covering Kec. Panti, Kec. Sukorambi, Kec. Arjasa, Kec. Jelbuk, Kec. Patrang and Kec. Kaliwates (to be referred as “S1 Area”). The other is located in eastern mountainous region in Kec. Ledokombo and Kec. Silo (to be referred as “S2 Area”).

Table 3.2.2 Possible Countermeasures for S1 Area and S2 Area

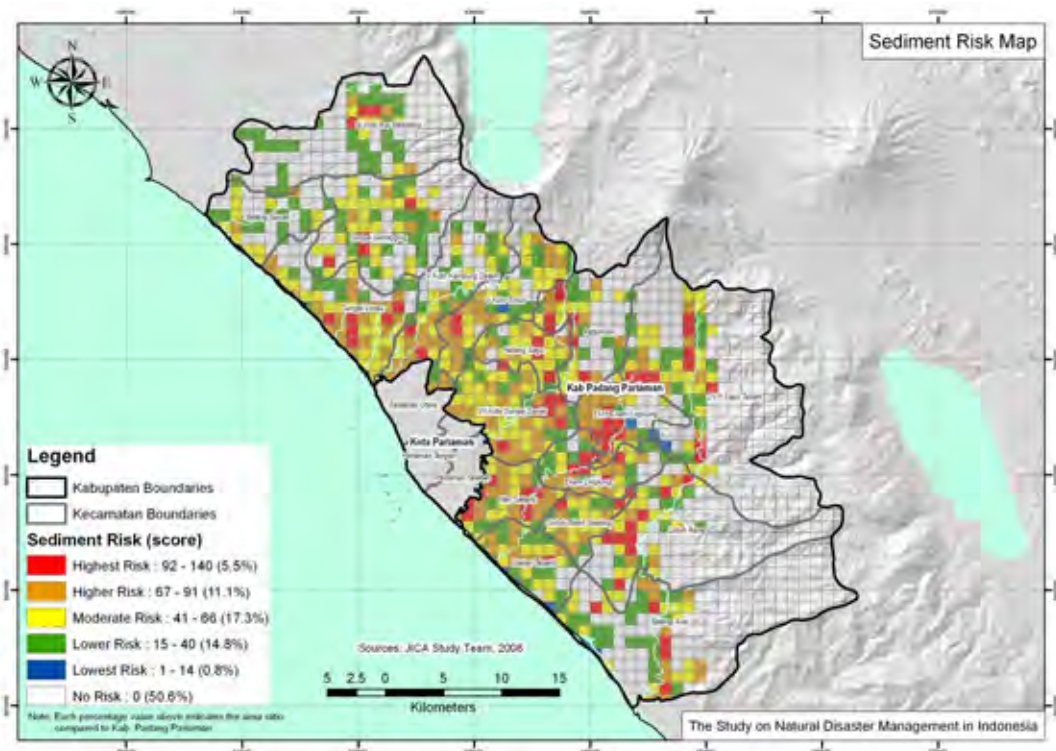
	Non-structural Countermeasure	Structural Countermeasure
S1 Area	<ul style="list-style-type: none"> • Reforestation • Land use limitation • Early warning system for fast and appropriate evacuation • Community activities • Evacuation shelter and route 	<ul style="list-style-type: none"> • Guide bank (Spur dike) • Retaining wall • Slope protection works (Grating crib works)
S2 Area	<ul style="list-style-type: none"> • Reforestation • Land use limitation • Early warning system for fast and appropriate evacuation • Community activities • Evacuation shelter and route 	<ul style="list-style-type: none"> • Groundsel works • Embankment • Revetment works • Hillside works (Forestation)

2) Kabupaten Padang Pariaman

A. Hazard Map for Sediment Disaster



B. Risk Map for Sediment Disaster

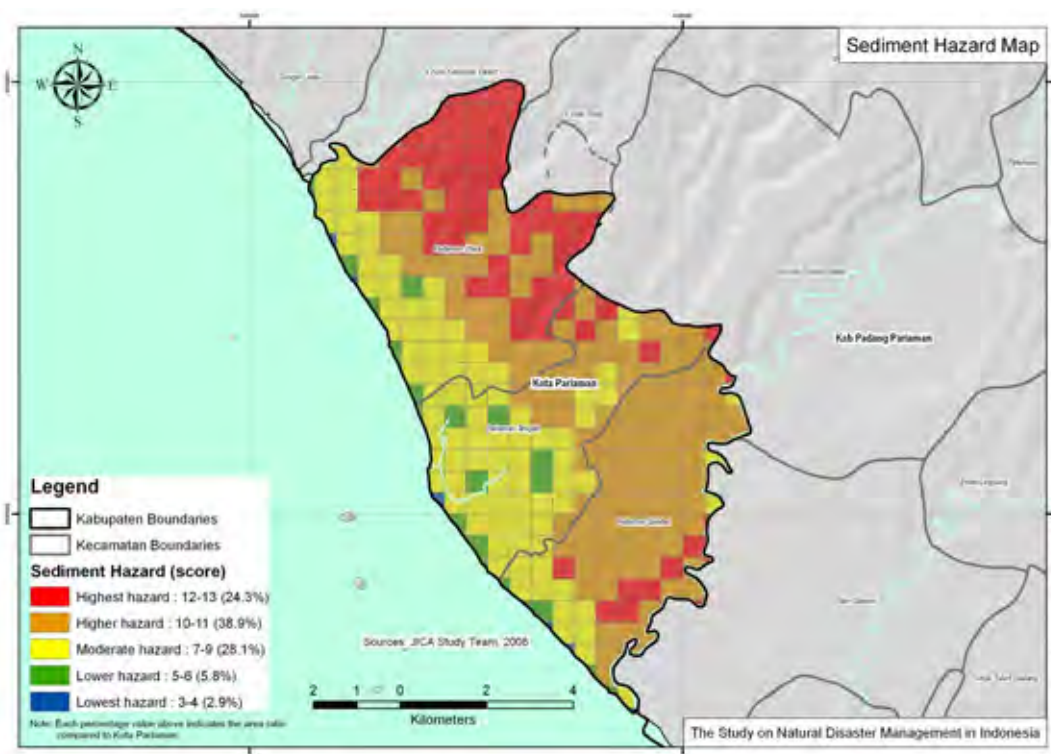


C. Possible Countermeasures against Sediment Disaster

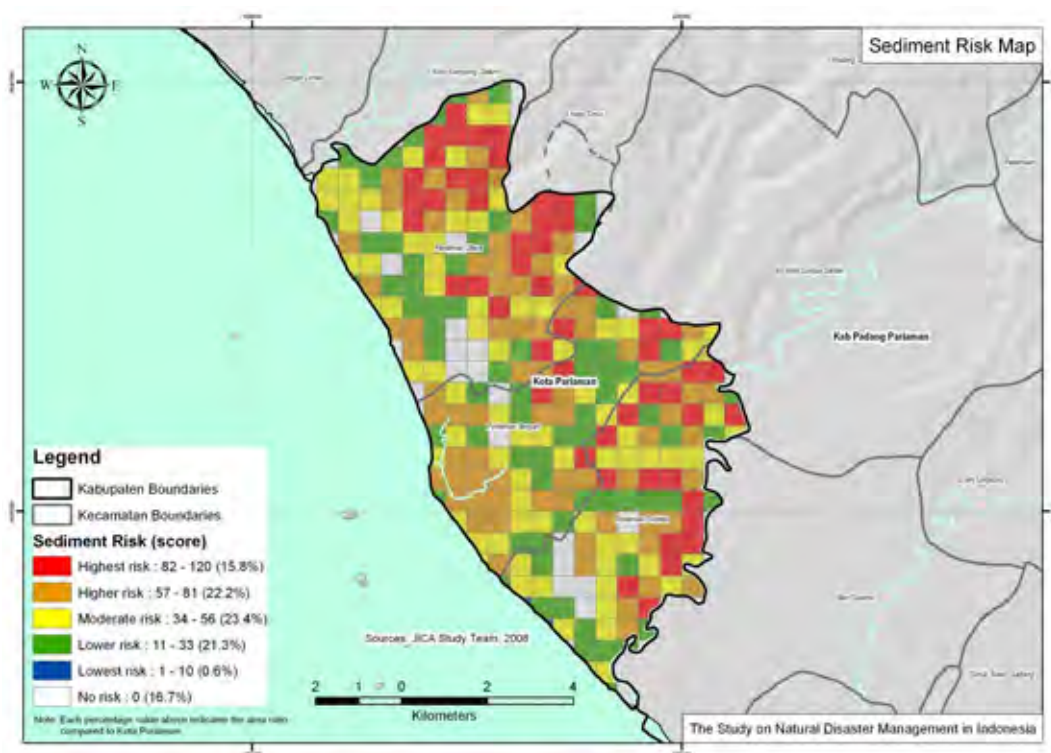
Kecamatan		Disaster Characteristics	Possible Countermeasures	
			Structural Countermeasures	Non-Structural Countermeasures
1	Batang Anai	Sediment disaster is hardly occurred.	No necessity at present	No necessity at present
2	Lubuk Ahung	There is collapse by the erosion of a river.	<ul style="list-style-type: none"> • Retaining Wall • Grating Crib Works • Rockfall Prevention Works 	<ul style="list-style-type: none"> • Land Use Limitation • Prohibition of Cutting • Early Warning(predictive information and rainfall gauging)
3	Sintuk Toboh Gadang	Sediment disaster is hardly occurred.	No necessity at present	No necessity at present
4	Ulakan Tapakis	Sediment disaster is hardly occurred.	No necessity at present	No necessity at present
5	Nan Sebaris	Sediment disaster is hardly occurred.	No necessity at present	No necessity at present
6	2 x 11 Enam Lingkung	Sediment disaster is hardly occurred.	No necessity at present	No necessity at present
7	Enam Lingkung	There is collapse by the erosion of a river.	<ul style="list-style-type: none"> • Retaining Wall • Grating Crib Works • Rockfall Prevention Works 	<ul style="list-style-type: none"> • Land Use Limitation • Prohibition of Cutting • Early Warning(predictive information and rainfall gauging)
8	2 x 11 Kayu Tanam	There is collapse by the erosion of a river.	<ul style="list-style-type: none"> • Retaining Wall • Grating Crib Works • Rockfall Prevention Works • Concrete Spraying 	<ul style="list-style-type: none"> • Land Use Limitation • Prohibition of Cutting • Early Warning(predictive information and rainfall gauging)
9	VII Koto Sungai Sarik	Sediment disaster is hardly occurred.	No necessity at present	No necessity at present
10	Patamuan	Many collapse places are seen at a road and river side.	<ul style="list-style-type: none"> • Retaining Wall • Grating Crib Works • Rockfall Prevention Works 	<ul style="list-style-type: none"> • Land Use Limitation • Prohibition of Cutting • Early Warning(predictive information and rainfall gauging)
11	Padang Sago	Many large collapse places are located along a river.	<ul style="list-style-type: none"> • Retaining Wall • Grating Crib Works • Rockfall Prevention Works 	<ul style="list-style-type: none"> • Land Use Limitation • Prohibition of Cutting • Early Warning(predictive information and rainfall gauging)
12	V Koto Kampung Dalam	A collapse place is located along a river.	<ul style="list-style-type: none"> • Retaining Wall • Grating Crib Works • Rockfall Prevention Works 	<ul style="list-style-type: none"> • Land Use Limitation • Prohibition of Cutting • Early Warning(predictive information and rainfall gauging)
13	V Koto Timur	Many collapse places are seen at a road side.	<ul style="list-style-type: none"> • Retaining Wall • Grating Crib Works • Rockfall Prevention Works 	<ul style="list-style-type: none"> • Land Use Limitation • Prohibition of Cutting • Early Warning(predictive information and rainfall gauging)
14	Sungai Limau	Collapse is seen in a marine terrace.	<ul style="list-style-type: none"> • Retaining Wall • Grating Crib Works • Rockfall Prevention Works 	<ul style="list-style-type: none"> • Land Use Limitation • Prohibition of Cutting • Early Warning(predictive information and rainfall gauging)
15	Batang Gasan	There is collapse by the erosion of a river.	<ul style="list-style-type: none"> • Retaining Wall • Grating Crib Works • Rockfall Prevention Works 	<ul style="list-style-type: none"> • Land Use Limitation • Prohibition of Cutting • Early Warning(predictive information and rainfall gauging)
16	Sungai Geringging	There is collapse with a comparatively large scale by the erosion of a river. Much collapse places are located also along a road.	<ul style="list-style-type: none"> • Retaining Wall • Grating Crib Works • Rockfall Prevention Works 	<ul style="list-style-type: none"> • Land Use Limitation • Prohibition of Cutting • Early Warning(predictive information and rainfall gauging)
17	IV Koto Aur Malintang	There is collapse with a comparatively large scale by the erosion of a river. Much collapse places are located also along a road.	<ul style="list-style-type: none"> • Retaining Wall • Grating Crib Works • Rockfall Prevention Works 	<ul style="list-style-type: none"> • Land Use Limitation • Prohibition of Cutting • Early Warning(predictive information and rainfall gauging)

3) Kota Pariaman

A. Hazard Map for Sediment Disaster



B. Risk Map for Sediment Disaster



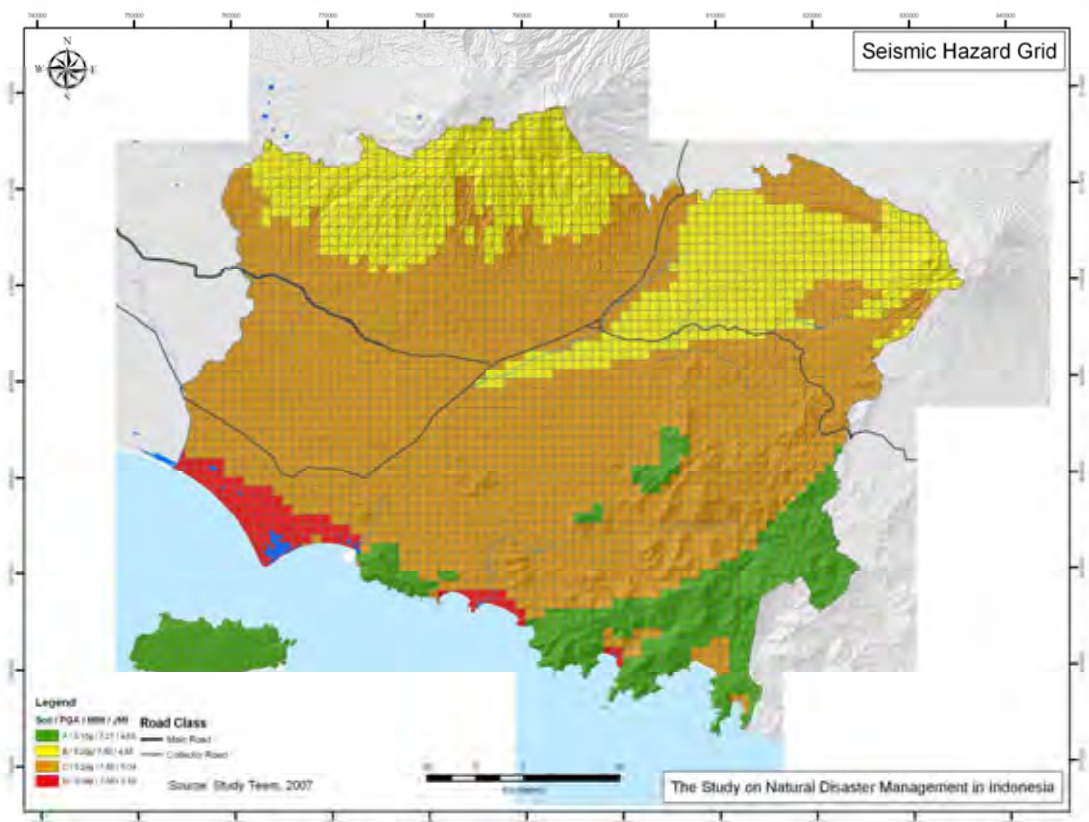
C. Possible Countermeasures against Sediment Disaster

Kecamatan	Disaster Characteristics	Possible Countermeasures	
		Structural Countermeasures	Non-Structural Countermeasures
1 North Pariaman Central Pariaman South Pariaman	There are few collapse places and there is little generating of sediment disaster. Although a collapse place is seen for a while on the north side of a city, there is no necessity for large-scale countermeasure	• Retaining Wall	• Land Use Limitation • Early Warning (predictive information and rainfall gauging)

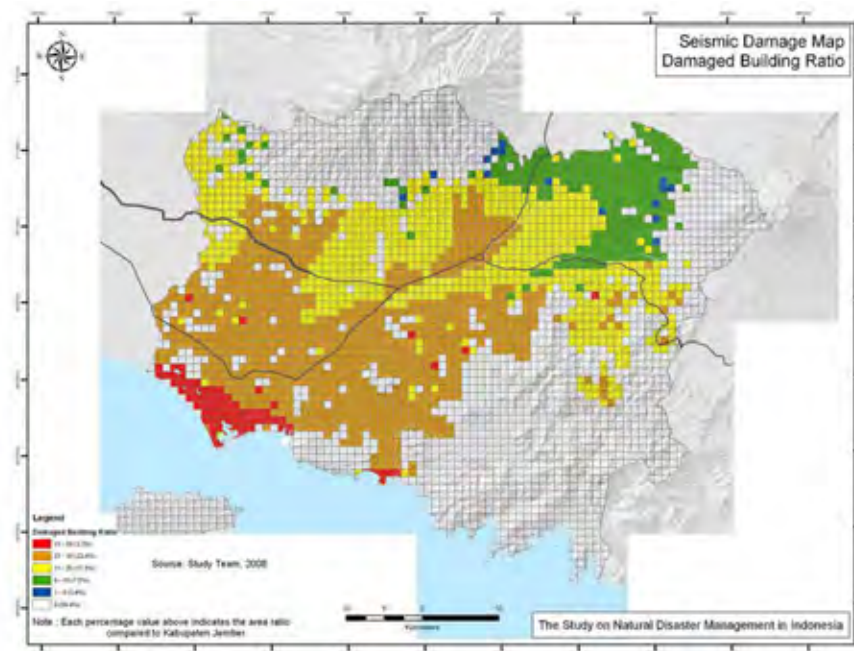
3.2.4 Earthquake

1) Kabupaten Jember

A. Seismic Hazard Map (Distribution of ground surface acceleration intensity)



B. Earthquake Risk Map (Ratio of Damaged Buildings)



C. Possible Countermeasures against Earthquake

In order to reduce the potential number of people killed due to earthquake, the most effective measure is strengthening of building structure as structural measure. It is extremely difficult to prepare effective warning system prior to earthquake disaster. Any effort done after earthquake can not be effective to reduce the potential number of lives lost. Rescue activity and supporting activity have to be done after earthquake occurrence but those efforts hardly save human life effectively. Possible structural measures are listed as follows:

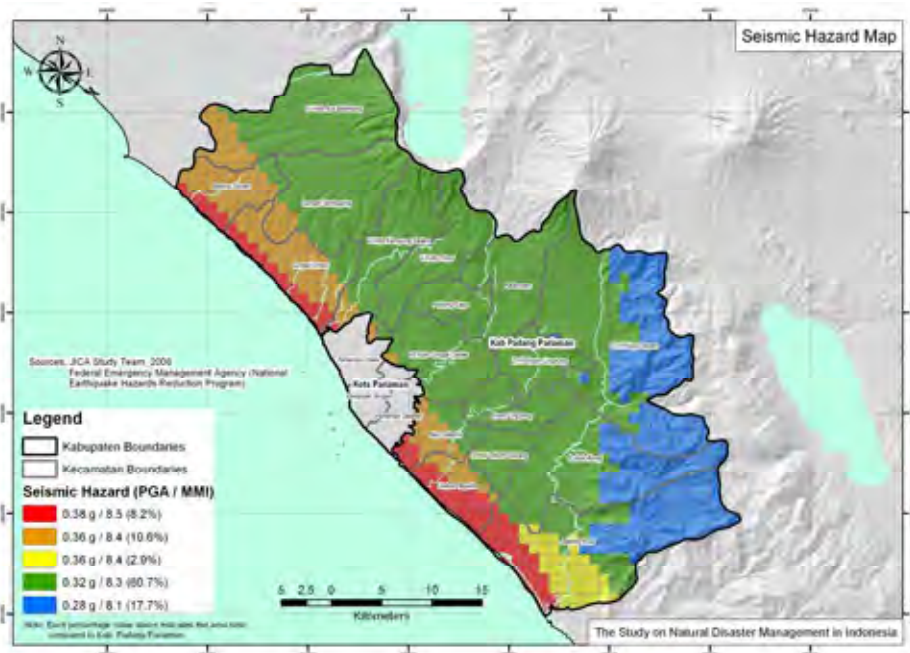
- Consolidation of building permission and supervising system
- Establishment or improvement of diagnosis system for existing buildings
- Promotion for strengthening of existing buildings into earthquake resistant buildings
- Encouragement for rebuilding into earthquake resistant buildings
- Education in terms of earthquake resistant buildings

It is not possible to reduce potential number killed or injured by implementing non-structural measures, but it is still necessary to make some preparations for emergency rescue, life support and relief. The non-structural preparation activities are listed as follows:

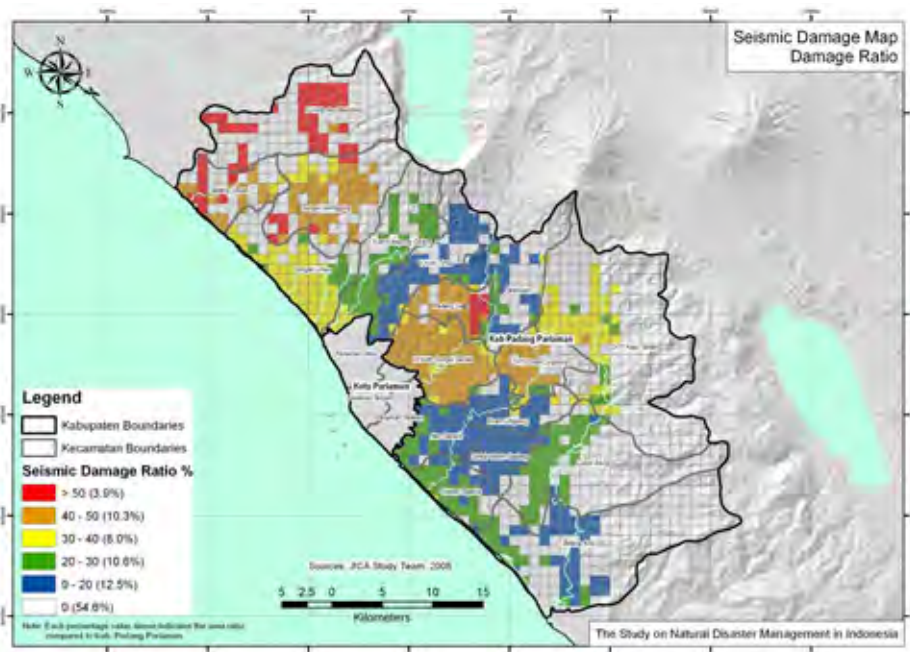
- Securement of temporary shelters for evacuation
- Preparation and Stock necessary materials in case of emergency
- Mutual support agreement with the vicinity administrative organizations
- Cooperation with organizations of central government for disaster reduction
- Establishment of damage evaluation system in post-disaster phase
- Education and emergency drills for local community and residents at community level

2) Kabupaten Padang Pariaman

A. Seismic Hazard Map (Distribution of ground surface acceleration intensity)



B. Earthquake Risk Map (Ratio of Damaged Buildings)

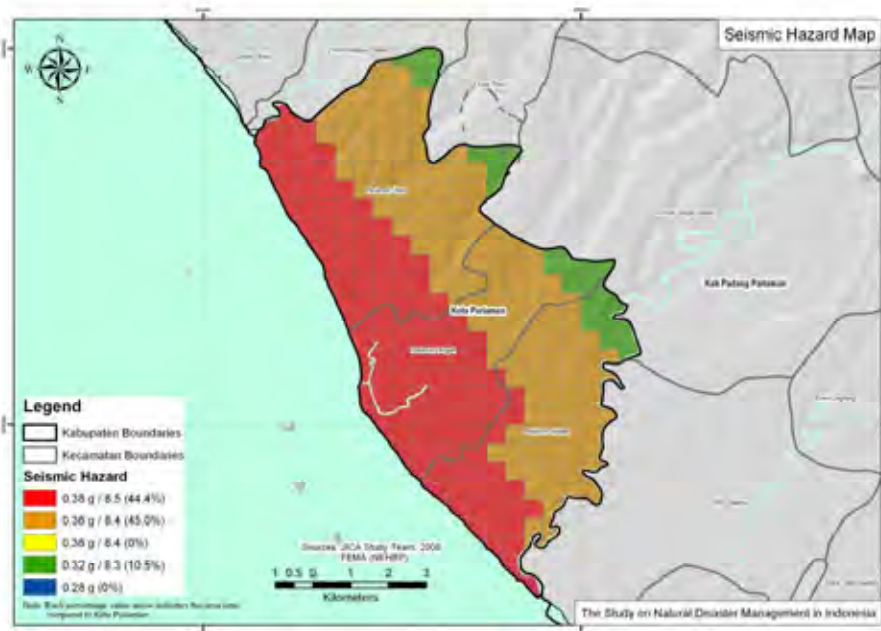


C. Possible Countermeasures against Earthquake

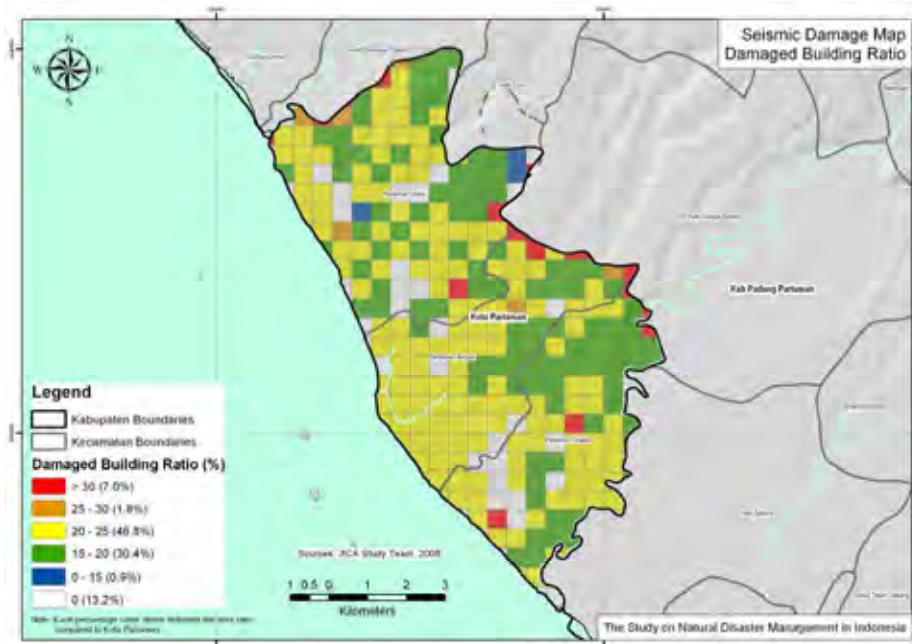
Refer to the corresponding section of Kabupaten Jember, since all the possible countermeasures are the same for all of the pilot regions (Kabupaten Jember, Kabupaten Padang Pariaman and Kota Pariaman).

3) Kota Pariaman

A. Seismic Hazard Map (Distribution of ground surface acceleration intensity)



B. Earthquake Risk Map (Ratio of Damaged Buildings)



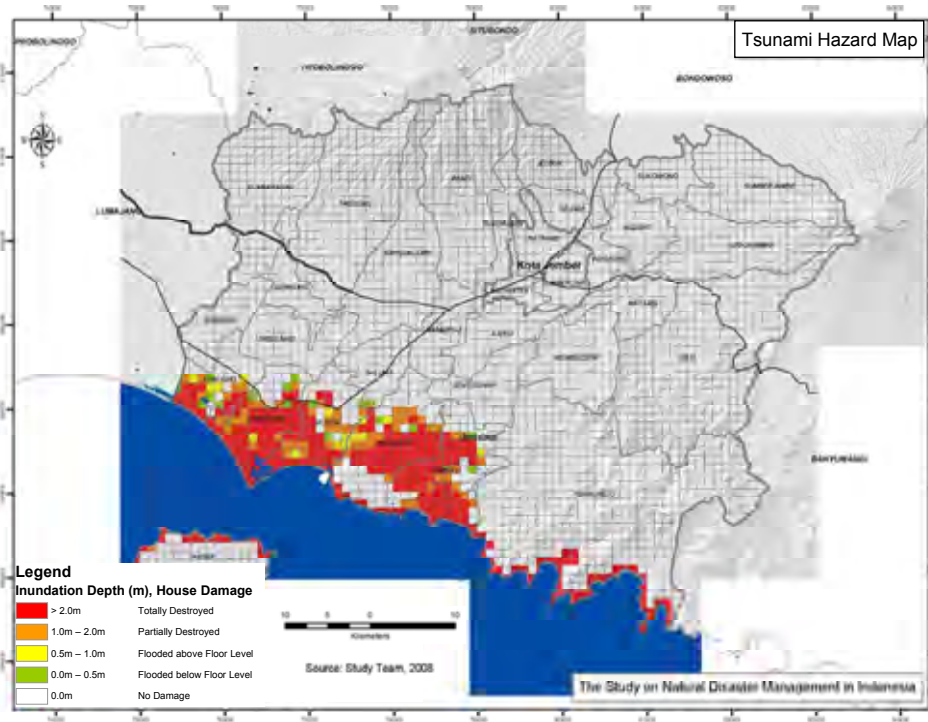
C. Possible Countermeasures against Earthquake

Refer to the corresponding section of Kabupaten Jember, since all the possible countermeasures are the same for all of the pilot regions (Kabupaten Jember, Kabupaten Padang Pariaman and Kota Pariaman).

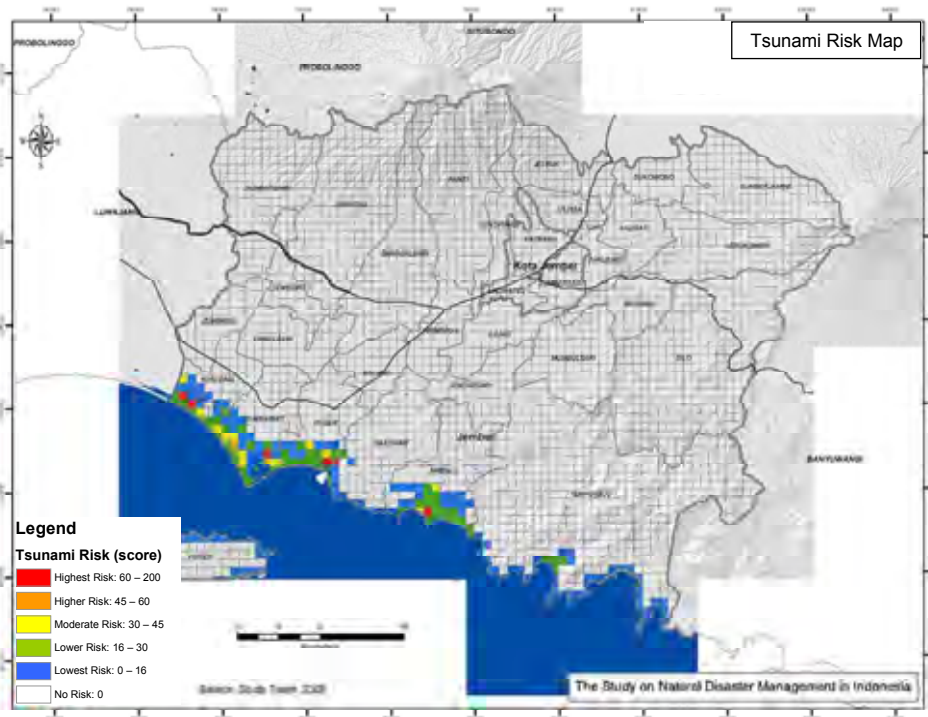
3.2.5 Tsunami disaster

1) Kabupaten Jember

A. Tsunami Hazard Map



B. Tsunami Risk Map

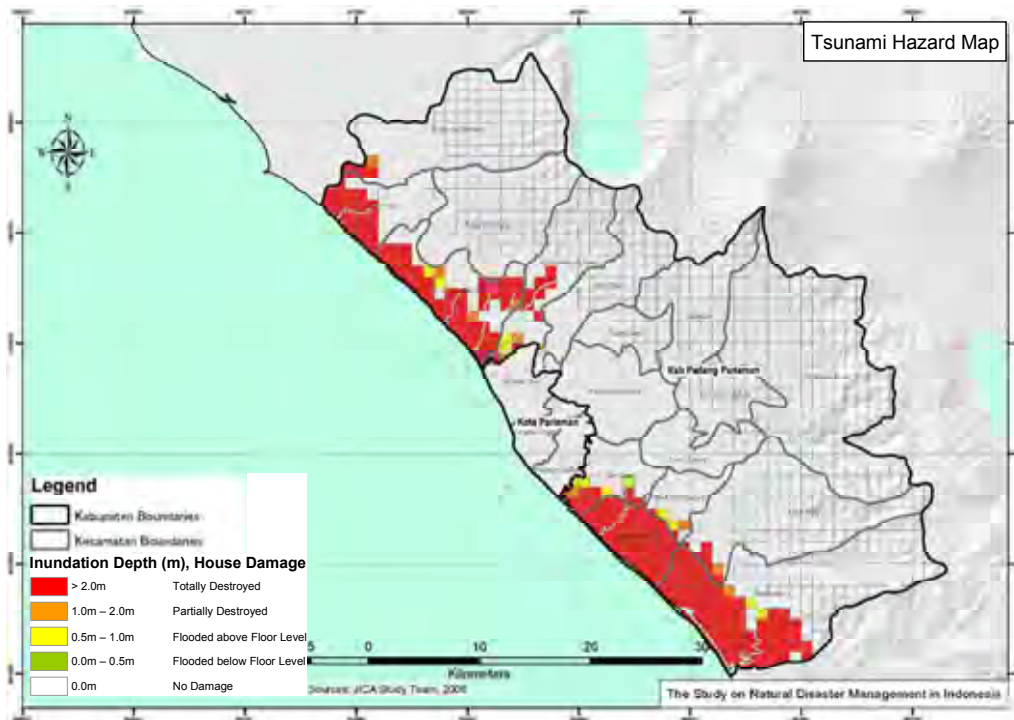


C. Possible Countermeasures against Tsunami Disaster

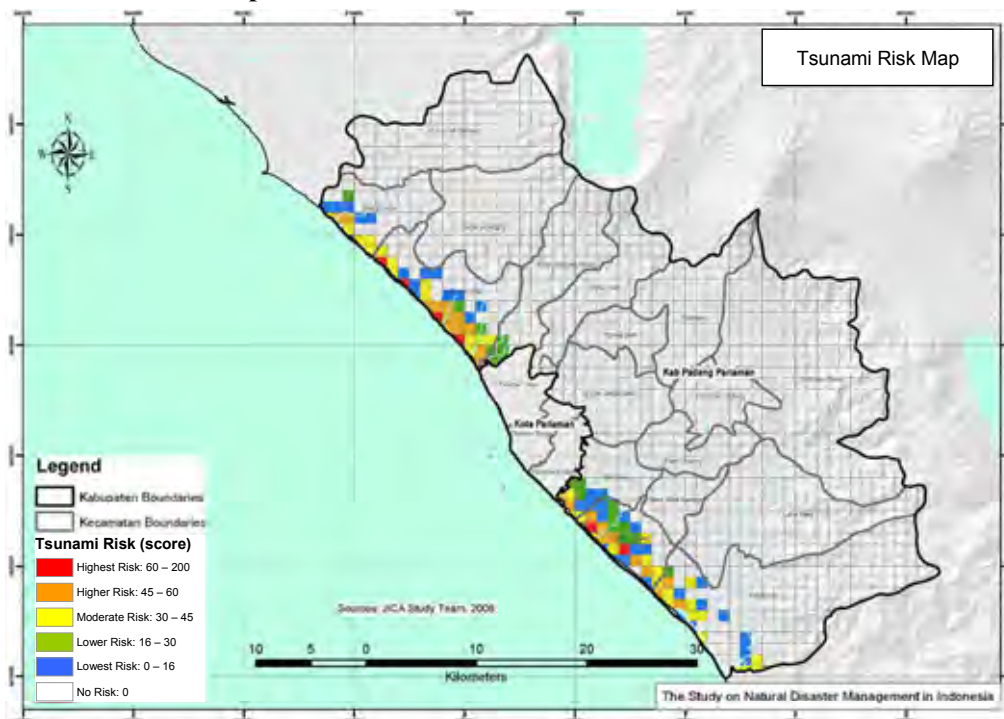
- Structural Countermeasures
 - Tide embankment, Tsunami breakwater, Tsunami floodgate, and River embankment
 - Coastal forest
 - Wave-proof building
- City planning for tsunami disaster prevention
 - Relocation
 - Land Use Regulation
- Tsunami hazard mapping
- Maintenance of evacuation site and route
- Tsunami drills
- Education

2) Kabupaten Padang Pariaman

A. Tsunami Hazard Map



B. Tsunami Risk Map

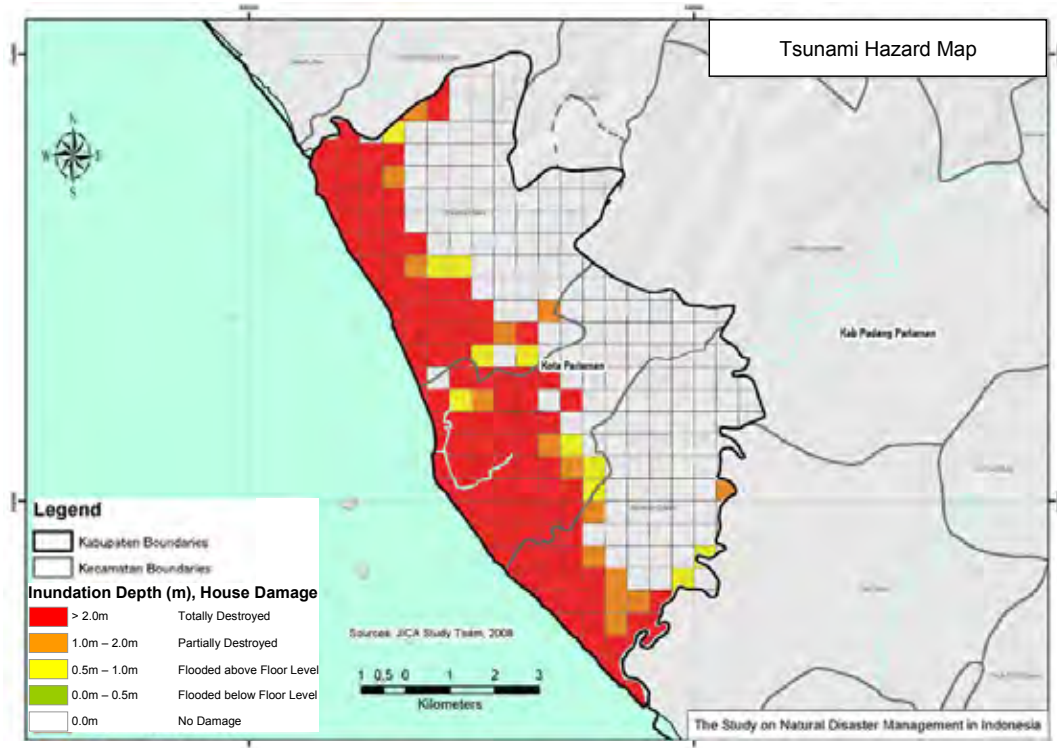


C. Possible Countermeasures against Tsunami Disaster

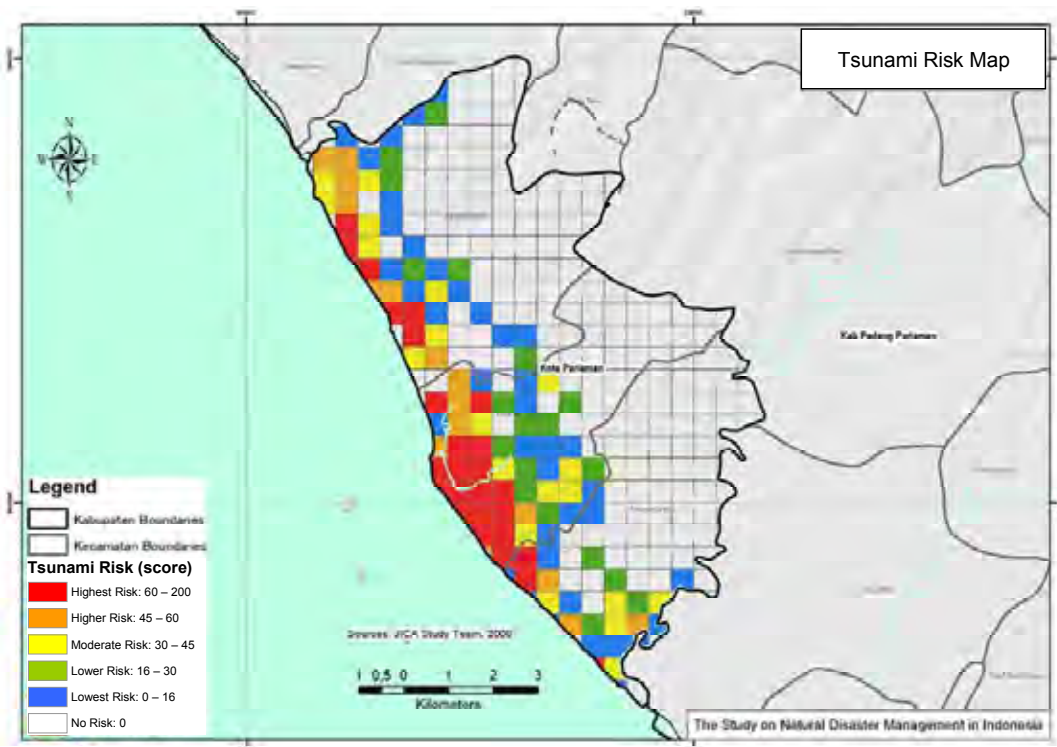
Kecamatan: (Oceanfront Kecamatan)	Existing Condition					Possible Countermeasures	
	Past Coastal Disaster (rising tide)	Evacuation places or high places in 2km from the coast	Coastal Forest in front of settlement	Possibility of relocation	Population Density in the coastal area	Structural Countermeasures	Non-Structural Countermeasures
1. Bading Arah	No	No	Yes, but thin (Northern Area) No (Southern Area)	Low Adequate relocation site is very far	Comparatively Low	Short-term Countermeasure - Wave-proof building - Maintenance of Evacuation site and Route - Construction and Designation of adequate building as Tsunami shelter - Installation of Evacuation sign board Long-term Countermeasure -	1) Coastal Forest 2) Regulation of land-use 3) Tsunami hazard map 5) Tsunami Drill 6) Education 7) Early Warning System
4. Mukah Tapak	Yes Serious	No	Yes but thin	Low Adequate relocation site is very far	Comparatively Low Partly High (Ulu-an)	Short-term Countermeasure - Wave-proof building - Maintenance of Evacuation site and Route - Construction and Designation of adequate building as Tsunami shelter - Installation of Evacuation sign board Long-term Countermeasure - Tide embankment, River embankment (partly)	1) Coastal Forest 2) Regulation of land-use 3) Tsunami hazard map 5) Tsunami Drill 6) Education 7) Early Warning System
5. Man-Sabaris	No	No	Yes but thin	Low Adequate relocation site is very far	Comparatively Low	Short-term Countermeasure - Wave-proof building - Maintenance of Evacuation site and Route - Construction and Designation of adequate building as Tsunami shelter - Installation of Evacuation sign board Long-term Countermeasure - Tide embankment, River embankment (partly)	1) Coastal Forest 2) Regulation of land-use 3) Tsunami hazard map 5) Tsunami Drill 6) Education 7) Early Warning System
14. Sungai Limau	Yes Serious	Yes (Northern Area) No (Pasar Baru, Puhang)	Yes but thin	High (Except Southern Area)	Comparatively Low Partly High (Pasar Sungai Limau, Pasar Baru, Puhang)	Short term Countermeasure - Wave-proof building - Maintenance of Evacuation site, Route - Construction and Designation of adequate building as Tsunami shelter (Pasar Baru, Puhang) - Installation of Evacuation sign board Long term Countermeasure - Tide embankment, River embankment (partly)	1) Coastal Forest 2) Regulation of land-use 3) Tsunami hazard map 5) Tsunami Drill 6) Education 7) Early Warning System It was already installed partly in southside of Bating Naras.
15. Bading Gasan	Yes Serious	Yes	Yes but thin	High	Comparatively Low	Short term Countermeasure - Wave-proof building - Maintenance of Evacuation site and Route - Installation of Evacuation sign board Long term Countermeasure - Tide embankment, River embankment (partly)	1) Coastal Forest 2) Regulation of land-use 3) Tsunami hazard map 5) Tsunami Drill 6) Education 7) Early Warning System

3) Kota Pariaman

A. Tsunami Hazard Map



B. Tsunami Risk Map



C. Possible Countermeasures against Tsunami Disaster

Kecamatan (Oceanfront Kecamatan)	Existing Condition					Possible Countermeasures	
	Past Coastal Disaster (rising tide)	Evacuation places or high places in 2km from the coast	Coastal Forest in front of settlement	Possibility of relocation	Population Density in the coastal area	Structural Countermeasures	Non-Structural Countermeasures
1 North Pariaman	Yes slightly	Yes	Yes but thin	Low Adequate relocation site is very far.	Comparatively High	<p>Short-term Countermeasure</p> <ul style="list-style-type: none"> - Wave-proof building - Some houses are already constructed. - Maintenance of Evacuation site and Route - Installation of Evacuation sign board <p>Long-term Countermeasure</p> <ul style="list-style-type: none"> - Tide embankment 	<p>(1) Coastal Forest</p> <p>(2) Regulation of land-use</p> <p>(3) Tsunami hazard map</p> <p>(5) Tsunami Drill</p> <p>(6) Education</p> <p>(7) Early Warning System</p>
2 Central Pariaman	Yes slightly	No	Yes but thin	Low Adequate relocation site is very far.	High	<p>Short term Countermeasure</p> <ul style="list-style-type: none"> - Wave-proof building - Some houses are already constructed. - Maintenance of Evacuation site, Route - Construction and Designation of adequate building as Tsunami shelter - Installation of Evacuation sign board <p>Long term Countermeasure</p> <ul style="list-style-type: none"> - Tide embankment, Tide barrier - Tsunami floodgate 	<p>(1) Coastal Forest</p> <p>(2) Regulation of land-use</p> <p>(3) Tsunami hazard map</p> <p>(5) Tsunami Drill</p> <p>(6) Education</p> <p>(7) Early Warning System</p> <p>It was already installed partly.</p>
3 South Pariaman	Yes slightly	No	Yes but thin	Low Adequate relocation site is very far.	Comparatively High	<p>Short term Countermeasure</p> <ul style="list-style-type: none"> - Wave-proof building - Some houses are already constructed. - Maintenance of Evacuation site, Route - Construction and Designation of adequate building as Tsunami shelter - Installation of Evacuation sign board <p>Long term Countermeasure</p> <ul style="list-style-type: none"> - Tide embankment 	<p>(1) Coastal Forest</p> <p>(2) Regulation of land-use</p> <p>(3) Tsunami hazard map</p> <p>(5) Tsunami Drill</p> <p>(6) Education</p> <p>(7) Early Warning System</p> <p>It was already installed partly.</p>

3.2.6 Early Warning System

1) Plan for Early Warning and Evacuation in Pilot Regions

The plan for early warning and evacuation in pilot regions was prepared as follows.

a) Objective

The objectives of the plan are:

- Saving people's lives
- Reduction of property damage

b) Actions/Items to be Conducted

The actions and items to be conducted for effective early warning system are cited below.

(Common)

- Establishment of information transmission route, and determination of transmission methods
As for the transmission methods, stable and reliable methods such as utilization of traditional and indigenous method of drum, siren, mobile phone, loudspeaker car, etc. will be considered
- Concretization, documentation and popularization of role allocation of each organization/agency and leader/individual related to information transmission and evacuation
- Capacity enhancement to organizations concerned
- Development of leaders, and training for the leader
- Education, public awareness and drills to the people through the community based disaster management activities, such as education about disaster mechanism, drills for secure evacuation and concrete and continuous activities of rainfall measurement by people themselves with the aim of grasping the relationship between disaster and rainfall
- Setting/selection of evacuation place and evacuation route and their popularization
- Accumulation and analysis of disaster data and natural condition data like rainfall data
In cooperation with organizations concerned such as BMG, data about relationship between disaster and natural phenomena shall be accumulated in order to set accurate warning criteria

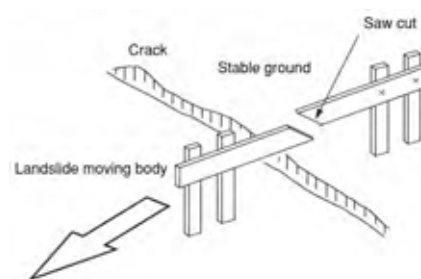
(Flood)

- Establishment of systematic and integrated hydrological observation system of rainfall and water level and its data transmission system by utilizing existing activities of organizations concerned, in order to develop early warning system
- Accumulation of basic meteorological and hydrological data in order to set warning criteria

- Determination of measuring point of water level and accumulation of data, for setting of warning criteria in high-frequency inundation areas
- Recommendation of location of hydrological stations to be newly installed, and selection of hydrological stations to upgrade observation equipment to a self-recording type or with telemetering function
- Education and increasing public awareness to the people living in high-frequency flood area and flood potential area by using hazard and risk maps

(Sediment Disasters)

- Accumulation of basic meteorological and hydrological data in order to set the warning criteria (same as for floods)
- Education and increasing public awareness to the people living in high-frequency hazard area and hazard potential area by using hazard and risk maps
- Education to the people about relationship between rainfall and sediment disasters
- Simple measurement by people and/or officials in the locations where the predictive phenomena is observed, and education to them about the mechanism of landslide



(Earthquake)

Early warning is extremely difficult.

(Tsunami)

- Establishment of early warning system by BMG
- Development of transmission and dissemination system of BMG's warning to the people (installing siren towers)
- Education about mechanism and risk of tsunami to the people living in coastal areas

3.3 Initial Environmental Examination (IEE)

3.3.1 Basis of IEE

EIA process in Indonesia is project-based and the requirement for the conduct of such EIA study is basically determined based on the scale of such a project. The Indonesian EIA process is initiated once the project location and its scale is concretely determined, preferably early during the feasibility study/basic engineering design of the project concerned.

This disaster mitigation plan is not intended to be either a master plan or a feasibility study of such mitigation projects planned on a realistic sense, since only possible structural measures, in

addition to non-structural measures, are identified, and even the locations and scales of the required project facilities of structural measures are not be specifically determined. Accordingly, an initial environmental examination (IEE) [principally focused on the possible project facilities of structural measures considered for the priority areas in Kabupaten Jember (of East Jawa Province) and also for the possible project facilities of structural measures considered in the relevant areas as appropriate in the whole administrative areas of Kabupaten Padang Pariaman and Kota Pariaman (of West Sumatra Province), where the major focus of the disaster mitigation plan is on earthquake and tsunami disaster mitigation measures] was conducted on a preliminary basis based on the JICA Guidelines for Environmental and Social Considerations.

Possible structural measures of disaster mitigation in the priority areas of Kabupaten Jember will be limited to cope with sediment and flood disasters where the priority areas are also divided either as sediment disaster (mitigation) areas or flood disaster areas.

On the other hand, possible structural measures for disaster mitigation in Kabupaten Padang Pariaman and Kota Pariaman (both of these areas are geographically contiguous since Kota Pariaman is entirely surrounded by Kabupaten Padang Pariaman) are principally for tsunami as well as flood and sediment disasters. There is no possible structural disaster mitigation measure for earthquake other than designing of buildings and structures to be resistant to earthquake and strict enforcement of earthquake design codes and standards in the design of structures, which are essentially regarded as nonstructural disaster mitigation measures from the environmental viewpoint.

3.3.2 Conclusions and Recommendations

The overall possible sediment and flood disaster mitigation plan for all 4 priority areas of Jember District (Kabupaten Jember) and the overall disaster mitigation plans for both Kabupaten Padang Pariaman and Kota Pariaman are considered as Category B (requiring no detailed environmental and social impact assessment studies) since the action plans are mainly focused on the implementation of non-structural measures, including ecologically beneficial reforestation, supplemented with small-scale structural measures. It is recommended that the implementation of non-structural measures shall take precedence over that of structural measures.

The possible areas targeted for structural measures of disaster mitigation in both pilot regions (Kabupaten Jember and Kabupaten Padang Pariaman cum Kota Pariaman) do not cover any protected/nature reserve forest areas. Disaster mitigation measure for such a protected area is recommended to be confined principally to reforestation of any deforested lands with a variety of native flora species of non-monolithic nature to restore/replicate the original forest ecosystem to the maximum extent possible. In this respect control of illegal logging is the highest priority, in particular in the protected and nature reserve forest areas of Kabupaen Padang Pariaman, which

are in fact located in critically sloping mountainous terrains. Measures to control illegal logging of protected and nature reserve forests will include educational measures to enhance the awareness of local communities on the importance and benefit of forestry protection against natural disasters.

The implementation of structural measures of disaster mitigation would inevitably cause some adverse social effects. Such adverse social effects might include acquisition of privately owned lands and properties resulting in even involuntary resettlement of some of such property owners who are required to forgo their houses. Public consultation with those people potentially adversely affected by the project (PAPs/project affected persons) right from very beginning of the project planning (as also mandated by Decision No.8/2000 on EIA Process of Indonesia) is very important and recommended as the very basic social impact mitigation measure to be duly followed. In this respect, the long-term benefits of disaster mitigation project to the community also need to be explained in very simple and easily understood terms. Moreover, it is strongly recommended that the compensation made for lost lands and properties shall be based on market price as guaranteed by the recent Decision No. 3/2007 by the National Land Administration Agency (*Badan Pertanahan Nasional/BPN*). These social impact mitigation measures are very essential and when properly implemented will facilitate effective co-operation of the project-affected community, including the most affected PAPs requiring involuntary resettlement, for the execution of the project.

3.4 Community Based Disaster Risk Management

Disaster reduction measures are most successful when they involve direct and active participation of the people most likely to be exposed to hazards. Communities must be aware of the importance of disaster reduction for their own well-being. In addition, local leaders, including both men and women drawn from political, social and economic sectors need to assume a primary responsibility for the protection of their own communities. Based on these basic policies, community based disaster risk management activities were conducted as one of the programs in the Study for enhancing regional disaster risk management capacities.

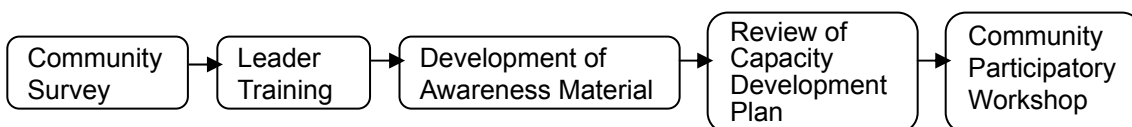
3.4.1 Community Capacities to be Strengthened for Effective Disaster Risk Management, and Activity Flow

Capacities to be strengthened for effective disaster risk management are divided into the following three categories.

- a) Comprehension of natural disasters and awareness of importance of disaster risk management

- b) Capacity to take necessary actions for disaster reduction in coordinated manner
- c) System to support and improve community’s actions and awareness for disaster risk management

Community activities were conducted to enhance the above capacities in Kabupaten Jember, Kabupaten Padang Pariaman, and Kota Pariaman. The basic flow of activities was as follows:



3.4.2 Conclusions and Recommendations

Through the CBDRM activities in Kabupaten Jember, Kabupaten Padang Pariaman, and Kota Pariaman, it was recognized that the system to support or foster the CBDRM activities in communities is still weak. After the Sumatra Earthquake and Tsunami disaster in December 2004, many activities related to disaster risk management in communities were implemented. However, it was found that the activities are still at the first stage for repeating or were ended as ad hoc events.

More efforts for promoting CBDRM activities are required for the organizations related to disaster risk management. To support those efforts, the “Guidelines for CBDRM activities” were compiled based on the experiences and results of CBDRM activities in Kabupaten Jember, Kabupaten Padang Pariaman, and Kota Pariaman. The guideline provides the basic strategy and framework to conduct CBDRM activities. It is expected that CBDRM activities will be propelled by effective use of the Guideline. Further it is requested to modify the Guideline based on their experience in the CBDRM activities by the initiatives of BNPB.

In addition, to ensure continuous CBDRM activities, a support system to sustain their efforts is required. They desired the establishment of a system to provide regular opportunity to learn disaster and disaster risk management for community leaders in disaster vulnerable areas, and to support kick-off activities in the communities. However, even when it is difficult to allocate budget for the activities, award for good practices of the CBDRM activities, or public awareness program for disaster risk management in Kecamatan or Kabupaten level can create an opportunity to consider their own efforts for disaster risk management. As a first step to promote sustainable CBDRM activities, at least a small support system should be included in the local government system.

In addition, an early warning system to deliver the information to the community level for mitigating damages caused by disaster is still weak or is yet to be established. It is necessary to improve current conditions in order to assure or make effective the community actions to be designated by CBDRM activities.

3.5 Strategy for Formulation of Regional Disaster Management Plan and Guideline for Formulation of Regional Disaster Management Plan for Selected Natural Disasters, and Activities for Formulation of the Plan

3.5.1 Strategy for Formulation of Regional Disaster Management Plan

Regional Disaster Management Plans were prepared based on the discussions with relevant officers, and to fulfill the recommendations mentioned in this section. The plan should be continuously modified and improved by the officials of Kabupaten Jember.

Based on the aforementioned findings in the Study, Regional Disaster Management Plans in Kabupaten Jember, Kabupaten Padang Pariaman, and Kota Pariaman were formulated. Before starting concrete activities for formulation of the plan, relevant officers from pilot Kabupatens, Kota, and JICA Study Team discussed and confirmed the following basic policy for formulation of the plan:

- 1) Although regional disaster management plan needs to cover both natural disasters and also accident disasters, only four (4) kinds of natural disaster (earthquake, tsunami, flood and sediment disaster) were selected as target disasters in this Study. Therefore, in the future, Kabupaten and Kota need to formulate and add parts for other disasters utilizing knowledge and experiences acquired through activities for formulation of the plan in this Study.
- 2) In the same way as the structure of regional disaster management plans in Japan, the plan has several “Parts” for each type of disaster, and each “Part” basically consists of four (4) sections, “General”, “Pre-Disaster Measures”, “Emergency Response Measures” and “Post Disaster Measures” along with phase of disaster response. The reasons for applying this kind of structure are: 1) a proper and concrete plan can be described based on the characteristics of each disaster as well as in each phase of disaster response, 2) Indonesian side can easily add “parts” for other disasters not covered in this Study to be able to formulate plans in the future. In addition, while this Study targets four (4) kinds of natural disasters, separated into two documents considering similarity of some disasters: “Earthquake Disaster Measures” deals with earthquake and tsunami, and “Rain and Storm Disaster Measures” deals with flood and sediment disaster. In case of Kabupaten Jember, since main disaster in the area is sediment disasters, therefore, “Rain and Storm Disaster Measures” are set as Part 1 and “Earthquake Disaster Measures” as Part 2, while Kabupaten Padang Pariaman, and Kota Pariaman are opposite from Kabupaten Jember.
- 3) Contents of the plan are prepared based on the Japanese plan, but modified the contents to be suitable for the current conditions of Indonesia.
- 4) Finalization of the plan toward authorization and promulgation will be conducted by Indonesian side based on the plans formulated as outputs of this Study.

The plan has been prepared mainly by Kabupaten and Kota Planning Team formulated for the Study and JICA Study Team through a series of workshops with Planning Team intensively and actively. Regional disaster management plans formulated in this Study are shown in Volume 2-3 to 2-5 of this report.

In addition, all levels of disaster management plan must be in the same structure to be able to coordinate among all levels of government. And in the study, national level and local level for Kabupaten and Kota were formulated. Therefore, provincial level, also needs to follow the same structure to be able to coordinate well among all level of government. There are several provinces that have already formulated regional disaster management plan; however, they still need to modify them by formulated by types of disasters. The contents are recommended to reflect the disaster management cycle, since the formulated plans emphasize on “General” part, and details measures are limited. It is very much expected to improve them in the future.

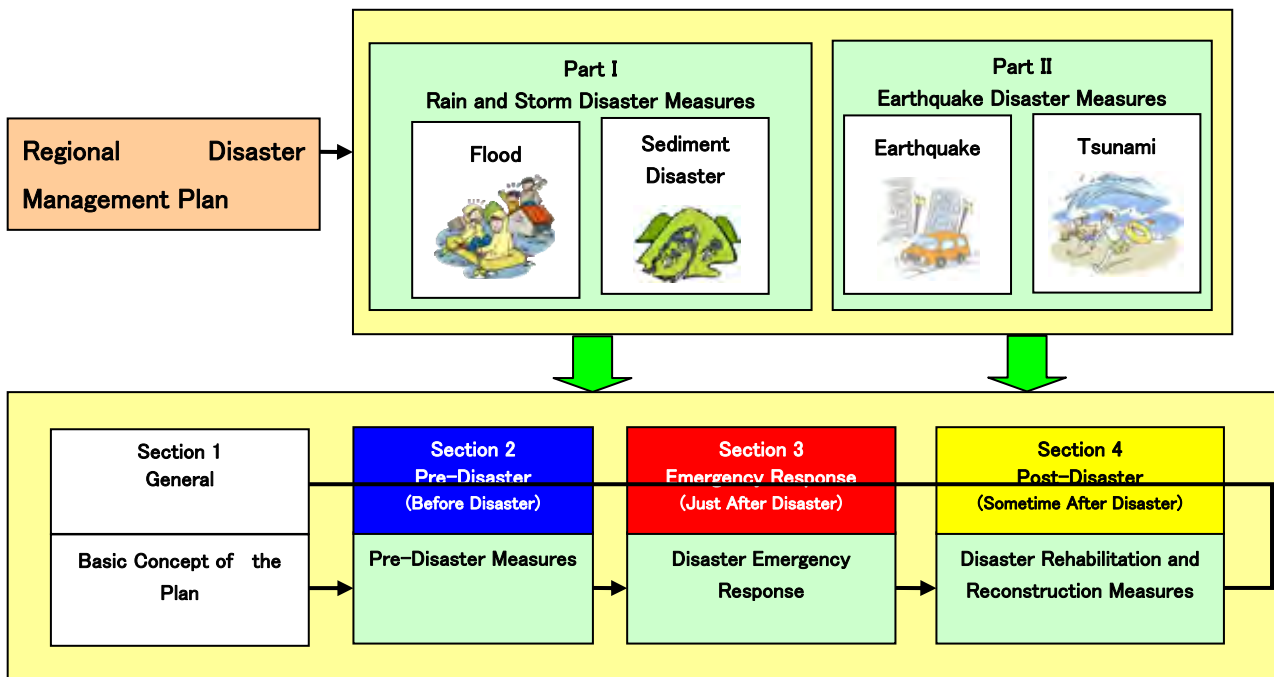


Figure 3.5.1 Categorization and Structure of the Plan

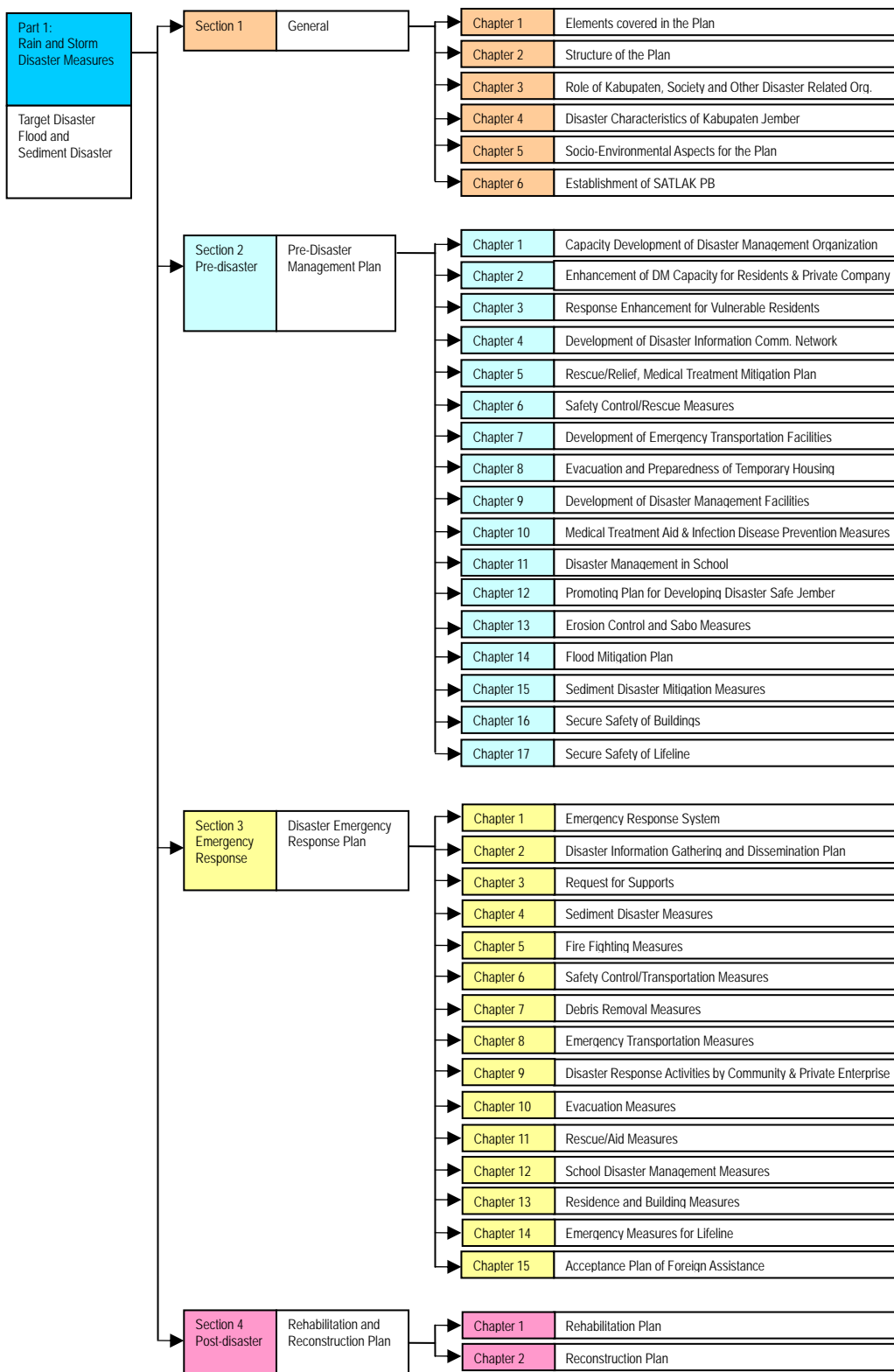


Figure 3.5.2 Contents of “Rain and Storm Disaster Measures” Part of Regional Disaster Management Plan (Kabupaten Jember)

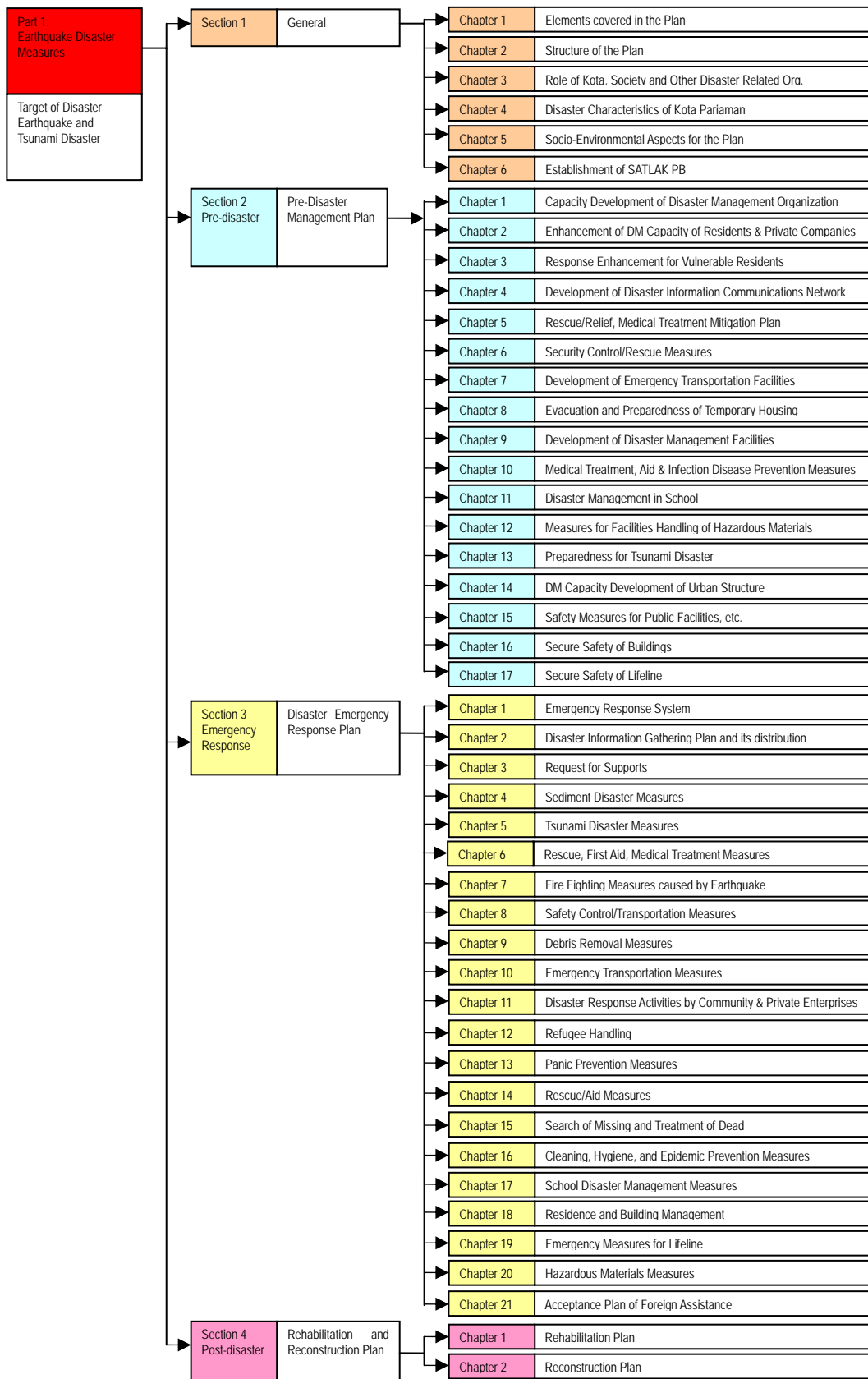


Figure 3.5.3 Contents of “Earthquake Disaster Measures” Part of Regional Disaster Management Plan (Kota Pariaman)

3.5.2 Strategy for Formulation of Guideline for Formulation of Regional Disaster Management Plan for all Kabupatens and Kotas in Indonesia

In the study, Regional Disaster Management Plans were formulated in 3 pilot areas. The plans include all necessary measures to be carried out to mitigate possible damages from 4 target disasters. Therefore, it is expected to disseminate information on these plans and to formulate Regional Disaster Management Plan in all other Kabupatens and Kotas in Indonesia by utilizing information prepared in this project.

To fulfill the objective, Guideline for Formulation of Regional Disaster Management Plan is formulated in the Study to be able to help formulate a plan by each Kabupatens and Kotas.

Utilizing the regional disaster management plan as a sample, it is basically not difficult to formulate the plan by each Kabupatens and Kotas. In the plan, there are several sections which need to be modified based on the characteristics of areas, however, there are also many sections, which can mostly be copied, since the basic measures to be taken are the same even when the characteristics of regions differ. Therefore, the main contents of the guideline are short and emphasize on describing the whole concept of the plan; a sample Regional Disaster Management Plan is attached to be able to smoothly understand the whole contents of the plan.

The contents of Guideline for formulation of Regional Disaster Management Plan are as follows:

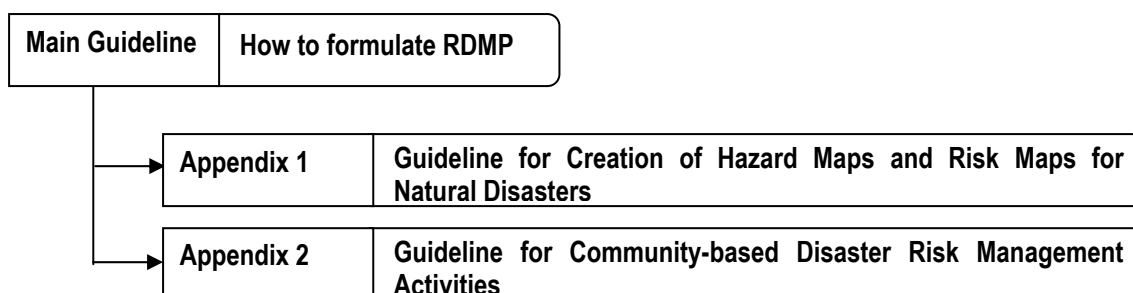


Figure 3.5.4 Categorization and Structure of the Plan

By utilizing the guideline, BNPB should distribute to Provincial governments in Indonesia, and Provincial government (BPBD) should distribute to each Kabupatens and Kotas in the province by holding workshops to explain how to formulate the plan. Also, provincial government plays an important role to inspect the contents of regional disaster management plan from each Kabupatens and Kotas to unify and coordinate with the province regional disaster management plan.

BNPB needs to keep regional disaster management plans from all Provinces in Indonesia, and Provincial BPBD needs to keep plans from all Kabupatens and Kotas in the province.

CHAPTER 4 CAPACITY DEVELOPMENT AND TECHNICAL TRANSFER, AND PUBLIC RELATIONS ACTIVITIES

4.1 Implementation of Activities for Capacity Development and Technical Transfer

One of the main objectives of the Study is to develop capacity of national and regional organizations concerned and communities for disaster management in order that various activities for capacity development and technical transfer could be done through the Study according to the plan of capacity development and technical transfer.

4.1.1 Capacity Development and Technical Transfer to National and Regional Organizations Concerned

Capacity development of disaster management related organizations is crucial for effective implementation of national and regional comprehensive disaster management plans formulated in this Study as well as review and revision of future plans.

In this Study, the following capacities were targeted for capacity development of the national and regional organizations concerned.

- Capacity of formulation and updating of plan:
Capacity of formulation and updating of the disaster management plan at national and regional levels so that Indonesian organizations can formulate regional disaster management plans in regions other than model areas by themselves.
- Capacity of implementation of measures:
Capacity of implementation of measures for mitigation, preparedness, emergency response and rehabilitation according to the disaster management plan.
- Capacity of coordination among organizations:
In Indonesia, there are many organizations related to disaster management depending on the type of disaster and actions appropriate to each disaster. The coordination among these organizations and strengthening of coordination capacity are crucial for formulation and implementation of disaster management plan.

Capacity development was conducted by on the job training, workshops and seminars, and training program in Japan. The followings are objectives, contents and general outputs of workshops and seminars, and training program in Japan, which were held or conducted through the Study.

1) Joint Seminar

The joint seminars were held in Jakarta targeting to BAKORNAS PB (BNPB), SATKORLAK, SATLAK and concerned organizations.

Objectives of joint seminar were as follows:

- Strengthening of coordination capacity between national and regional disaster management organizations
- Mutual understanding of each plan of disaster management and strengthening of consistency of each plan

In the joint seminars, information and opinions were exchanged especially among BAKORNAS PB (BNPB), SATKORLAK and SATLAK, which are the main counterparts of this Study, regarding the current status of disaster management activities at each level as well as the progress of formulation of disaster management plan at regional level. Participants could recognize the current status and issue of disaster management of each level, and the necessity of consistency of each plan through the joint seminars.

2) Workshop at National Level

The workshops at national level were held targeting to BAKORNAS PB (BNPB) and organizations concerned at national level.

Basically, main objectives of capacity development activities including the workshops at national level through activities for formulation of national disaster management plan are as follows:

- Strengthening capacity for formulation and updating of plan
- Strengthening capacity for implementation of measures
- Strengthening capacity for coordination among organizations

(1) Workshop in 2007

Since BAKORNAS PB has been engaged in the process of institutional reform based on The Disaster Management Law No. 24, 2007 and has had to focus the development of government and presidential regulations including establishment of new disaster management organization of BNPB, the main topic in the workshops in 2007 were these regulations; therefore, discussion about national disaster management plan, as a main target of the Study, couldn't be conducted well with BAKORNAS PB as well as organizations concerned.

(2) Workshop in 2008

Organization of new disaster management agency (BNPB) that has almost been established, and concrete activities and discussion for formulating national disaster management plan were started. As a first step, BNPB organized a task force team for formulating national disaster management plan. In addition, BNPB and the Study Team agreed on a basic policy for formulation of national disaster management plan as follows: 1) structure of the national disaster management plan in Indonesia would be similar to the structure of disaster management basic plan in Japan, 2)

contents of the plan would be prepared based on the Japanese plan correcting it to be suitable for the current state of Indonesia, and 3) the plan would be finalized by the Indonesian side.

One week's workshops including internal workshop between BNPB and the Study Team. Workshop to invite organizations concerned were planned to be held once a month to discuss a specified theme.

In the workshops, contents of important items and determination of responsible organizations of each item of the plan were mainly discussed based on the draft plan prepared by the Study Team. Through the discussions, it is concluded that BNPB has comprehended the content, necessity, background and meaning of each item of the plan, and BNPB has increased understanding of disaster management planning by comparing activities with their own regulations and guidelines, and consequently their capacity for future modification and updating of the plan has been enhanced. In addition, each workshop with organizations concerned was held by BNPB as a main actor from selection and inviting of organizations concerned along the theme of the workshop to chairing and conducting of the workshop. BNPB summarized the discussion about determination of responsible organizations of each item in the plan. These activities contributed to enhancing BNPB's capacity of coordination of organizations concerned. When BNPB will carry out the activities for coordinating and monitoring the state of implementing disaster management activities by responsible organizations based on the national disaster management plan in future, their capacity of coordination will be enhanced and status of BNPB will also be improved.

3) Workshop at Regional Level

A lot of workshops have been conducted in model areas of both Kabupaten Jember and Kabupaten Padang Pariaman and Kota Pariaman as well as East Java and West Sumatra provinces.

Basically, main objectives of capacity development activities including the workshops at regional level were as follows:

- Strengthening capacity for formulation and update of plan
- Strengthening capacity for implementation of measures
- Strengthening capacity for coordination among organizations

Activities including workshops for formulation of regional disaster management plan were mainly conducted in Kabupaten Jember in the phase from April 2007 to March 2008, and conducted in Kabupaten Padang Pariaman and Kota Pariaman from May to September 2008. Details are described below.

(1) Kabupaten Jember and East Java Province

The workshops held in Kabupaten Jember and East Java Province were divided roughly into two topics by the objective of the workshops.

- A. Workshop for organizations and institution
- B. Technical workshop for prior disasters

Objectives, target, and outputs of each workshop are described below.

A. Workshop for organizations and institution

The workshop for organizations and institution was held targeting to SATLAK of Kabupaten Jember, especially National Unity and Public Protection Board, Social Agency and Public Welfare Agency as well as SATKORLAK.

Main objectives of the workshops were as follows:

- Strengthening capacity for formulation and update of plan
- Strengthening capacity for coordination among organizations

Through a series of workshops and individual meeting & discussions with organizations concerned, it is generally judged that counterparts has grown in understanding of disaster management plan in areas such as contents, necessity of continuous revise, importance of clarification of roles and responsibilities, etc. However, it is a present issue that level of understanding of the plan is uneven by person. This is because discussion of some workshops were conducted by several participants from particular agencies as well as the time for publicity of entire plan was very limited due to taking time to prepare the entire plan.

Continuous discussion should be conducted by SATLAK and organizations concerned for updating and revision of the plan and implementation of concrete actions according to the plan. It is considered that the above-mentioned issue will be gradually eliminated through continuous discussion, which will also surely contribute to development of the above capacities.

B. Technical workshop for prior disasters

The Technical workshop for prior disasters was held targeting at key persons from the related counterpart agencies in SATLAK of Kabupaten Jember, such as National Unity and Public Protection Board, Public Works Agency, Transportation Agency, Irrigation Agency, Agriculture Agency, Forestry and Plantation Agency as well as BMG Malang and Irrigation Board of Lumajang.

Main objectives of the workshops are as follows:

- Strengthening capacity for formulation and updating of plan, especially for hazard and countermeasures
- Strengthening capacity for implementation of measures

- Strengthening capacity for coordination among organizations

In a series of workshop, many topics regarding prior disasters of flood and sediment disaster were discussed with participants, for example, a basic concept of hazard, risk and countermeasures, importance of management for disaster data/information, characteristics of recent disasters, selection of prioritized disaster prone area, concrete countermeasures, etc.

Owing to these continuous workshops, the awareness of the key persons was considerably raised for reduction of prior disasters. It could be clearly confirmed from the results of questionnaires by participants about the workshop. On the other hand, it was obvious through the discussion of the workshop that inter-organizational coordination is crucial for implementation of effective countermeasures or construction of infrastructure with the consideration of disasters. In order to plan and implement the effective countermeasures against disasters, it is necessary that more close coordination and cooperation among the organizations concerned will be enhanced through further positive discussion.

(2) Kabupaten Padang Pariaman, Kota Pariaman and West Sumatra Province

A. Workshop in 2007

Activities for formulation of regional disaster management plan in the above model area were determined to start from May 2008. Thus, the main objectives of the workshops in 2007 in these areas were to share the information on the activities in Kabupaten Jember and to make them understand the process and necessary actions for formulation of the plan.

In addition to the workshops with the above objectives, key persons including Bupati of Kabupaten Padang Pariaman and Mayor of Kota Pariaman attended actively in joint seminars in Jakarta and also workshops in Kabupaten Jember; therefore, the base for the coming activities in 2008 was well-prepared at the time of 2007 in these area.

B. Workshop in 2008

For commencement of actual activities in Kabupaten Padang Pariaman and Kota Pariaman, both SATLAKs of Kabupaten and Kota organized counterpart teams and assigned members of the teams, to work closely together with the Study Team, in response to the request from the Study Team. Two kinds of teams, planning team and disaster team, were organized in each Kabupaten and Kota, and each team consisted of about five (5) members. Workshops were basically held separately targeting either the planning team or the disaster team.

Activities of each team and objective of workshop were as follows:

- Planning Team: Based on regional disaster management plan in Kabupaten Jember, the planning team modified and corrected it to be suitable for Kabupaten and Kota taking account of existing plans and current condition of Kabupaten and Kota.

Modification and correcting work were conducted in each specified chapter by planning team according to the schedule, and the prepared chapters were confirmed and discussed between the planning team and the Study Team in regular workshops.

- Disaster Team: Together with the Study Team, the disaster team carried out information collection, field survey, discussion and investigation work regarding creation of hazard & risk maps and countermeasures. Activities in the workshops included the above-mentioned discussion and investigation as well as technology transfer such as introduction of Japanese disaster countermeasures and methodology for creation of the maps.

Contents, target and outputs of each workshop are described below.

a) Workshop with Planning Team

Workshops with the planning team were held targeting at strengthening the following capacities:

- Capacity for formulation and updating of plan
- Capacity for coordination among organizations

The regional disaster management plan was prepared by counterparts themselves, while the Study Team gave advice, technical inputs, and explanation of background and meaning of each item of the plan, as required, in the workshop. Through the process of the work such as reviewing the plan of Kabupaten Jember, modifying the plan, and adding new contents by themselves, it is clearly judged that counterparts developed a better understanding of structure, contents, meaning, important items, and revising methodology of the plan, as well as importance of clarification of roles and responsibilities of organizations concerned and coordination among them, or activities to be implemented based on the plan in the future.

However, it is considered as a present issue that only the counterparts engaged in the work have enough understanding of the plan, whereas other SATLAK members and officials lack sufficient awareness of the plan. The plan should be publicized and explained to the people by counterparts in future.

b) Workshop with Disaster Team

Workshops with the disaster team were held targeting at strengthening the following capacities:

- Capacity for formulation and updating of plan, especially for hazard and countermeasures
- Capacity for implementation of measures

In workshops, technical topics regarding target disasters of earthquake, tsunami, flood and sediment disaster were discussed with counterparts, for example, a basic concept of hazard, risk and countermeasures learning from Japanese disaster management measures, importance of

management for disaster data/information, methodology of creation of hazard & risk maps, concrete countermeasures, etc.

Owing to these workshops, the awareness of the counterparts was considerably raised especially for importance of collection and management of disaster related information, and methodology of disaster analysis. This could be clearly confirmed from the results of a counterpart interview. Continuous disaster management activities led by the counterparts are expected to be done utilizing the knowledge and experiences acquired through the Study.

c) Common Workshop

In addition to the above workshops with planning team and disaster team, two large workshops were held. One is a kick-off workshop targeting to SATKORLAK in West Sumatra, and SATLAK members in Kabupaten Padang Pariaman and Kota Pariaman, and the other is a wrap-up workshop targeting to SATLAKs of other districts in West Sumatra Province as well as SATKORLAK in West Sumatra, and SATLAK members in Kabupaten Padang Pariaman and Kota Pariaman.

In particular, the wrap-up workshop was held: 1) to publicize and explain regional disaster management plans as outputs of the activities of the Study, to SATLAK members of Kabupaten Padang Pariaman and Kota Pariaman, 2) to publicize and explain the plans to other districts in West Sumatra Province in order to promote formulation of similar plans in those districts, and 3) to discuss a role of SATKORLAK in West Sumatra for promoting formulation of the plans as well as coordination among Province and districts. BNPB was also invited to the workshop to understand activities for formulation of the plan in regional area and to expand these activities to all the districts in Indonesia.

In the wrap-up workshop, regional disaster management plans of Kabupaten Padang Pariaman and Kota Pariaman were distributed to all the participants totaling 120 persons, and counterparts presented and explained disaster characteristics and the plan of each Kabupaten and Kota. In a free discussion in the last session of the workshop, there was active discussion toward future concrete activities. For example, the participants discussed a process of formulating and authorizing regional disaster management plan and the role and responsibility of the Province for the process; also SATLAK members participating from other Kabupatens and Kotas strongly requested support for the activities from the Province. It can be said that this workshop contributed to enhance opportunities for formulation of regional disaster management plan in other districts in West Sumatra Province.

4) Counterpart Training in Japan

Overseas training is one of the most effective capacity development activities. JICA training programs for the counterpart members of this Study were conducted from 27th of August to 7th of

September 2007. Main objectives of the counterpart training were: 1) to comprehend the concrete plan and actual examples of disaster management in Japan, and 2) to utilize the acquired knowledge and experience for formulation of disaster management plan.

In order to achieve the main objectives, the program was planned for the counterparts to be able to understand and acquire the following knowledge.

- Disaster Risk Management system in Japan by visiting selected concerned organizations
- One of the ways for disaster education is by visiting the memorial, educational and training facilities on Disaster Risk Management
- Importance of drills and exercises for Disaster Risk Management by inspecting actual role playing exercise and onsite comprehensive disaster management drill.
- Effectiveness of structural measures for natural disasters evaluated during field trip.

The participants for this training were as follows:

- | | | |
|-------------------------|----------------------------------|-----------------------------|
| - Dr. Syamsul Ma'arif | Chief Executive | BAKORNAS PB |
| - Mr. Sugeng Triutomo | Director for Disaster Mitigation | BAKORNAS PB |
| - Ms. Dewina Nasution | Director for Building Capacity | BAKORNAS PB |
| - Mr. Abdul Hamid | Head of Protection Community | SATKORLAK East Jawa |
| - Dr. Marlis Rahman | Vice Governor | SATKORLAK West Sumatra |
| - Mr. Muhamad Fadhallah | 2nd Assistant of Bupati | SATLAK Kab. Jember |
| - Dr. Muslim Kasim | Bupati Kab. Padang Pariaman | SATLAK Kab. Padang Pariaman |
| - Mr. Mahyuddin | Mayer | SATLAK Kota Pariaman |

According to interviews of some of the participants, the participants seem to be satisfied about the training program and learned a lot of things from the training.

For smooth and prompt implementation of activities for disaster management as well as formulation of disaster management plan, it is considered key that the head of the organization or local government confirms or comprehends the necessity and effect of the plan. In this training, all the participants are key persons for disaster management in each organization or local government. In fact, in Kabupaten Jember, 34 loudspeakers for early warning were installed in mosques inside of the hazardous area after the training; this was a lesson learned from the early warning system in coastal area of Kobe city.

Moreover, from Kabupaten Padang Pariaman and Kota Pariaman, the head of each local government participated in the training. They enhanced awareness of disaster management in the training, and also took part in the joint seminar in Jakarta subsequent to the training; Bupati of Kabupaten Padang Pariaman also participated in the workshop for regional disaster management plan on 29th January, 2008 in Kabupaten Jember. In addition, in Kabupaten Padang Pariaman, the budget related to disaster management has been increased to three to four times from last year's

one according to decision by Bupati after he participated in the training. Also, according to the instruction of Bupati, tsunami education materials were prepared based on “Inamura no Hi” (Japanese famous true story for tsunami education), and were distributed to residents in Kabupaten Padang Pariaman.

It is concluded that the training was successful and effective not only for capacity development of participants but also for activation of disaster management activities through enhancement of disaster management awareness of participants.

4.1.2 Capacity Development of Communities

Leader training and workshops in selected pilot communities were conducted with the aim of capacity development of community leaders and community members in model areas of Kabupaten Jember, Kabupaten Padang Pariaman and Kota Pariaman. Their outcomes are considered to be sufficient because the activities in this Study not only enhanced the capacity of community leaders and members but also expanded disaster management activities by governmental organization including SATLAK. For example, SATLAK of Kabupaten Padang Pariaman plans to hold community workshops by its own budget referring to the program in this Study.

4.2 Public Relations and Public Awareness Activities

Public relations and public awareness activities has been carried out in order to widely announce contents and proposals of the Study, to improve the sense of participation of parties concerned including residents, and to enhance public awareness of disaster management. These activities have employed various media such as radios, newspapers, flyers, newsletters, calendars, posters, websites, etc., so as that information reaches to people at all levels of society.

The following public relations and public awareness activities have been done through the Study:

- 1) Preparing and distributing newsletters
- 2) Constructing and publishing a website
- 3) Public Relations through Newspapers
- 4) Developing and Distributing the Leaflets for Disaster Awareness
- 5) Developing and Distributing the Calendars for Disaster Awareness
- 6) Contest of Mascot for Disaster Awareness

Aiming at enhancement of public awareness for disaster management, contests for mascot for disaster awareness were conducted in three pilot regions for formulation of regional disaster management plan. The mascots as shown below were selected for awards.

SATLAKs of pilot regions plan to utilize the mascots in various activities related to disaster management in the future. It can be concluded that this kind of activity is highly effective for enhancement of disaster awareness not only for people, but also for disaster management organizations such as SATLAK.



Kab. Jember



Kab. Padang Pariaman



Kota Pariaman

Selected Mascots

CHAPTER 5 CONCLUSIONS AND RECOMMENDATIONS

As a result of the Study on Natural Disaster Management in Indonesia by JICA, the Study Team has several recommendations to support their disaster management planning and activities for BNPB (former BAKORNAS PB), SATKORLAK and SATLAK in pilot regions, the counterpart agencies of Indonesia.

- 1) For the first time in Indonesia, the National disaster management plan and Regional disaster management plan for pilot regions were compiled to cover earthquake including Tsunami and Rain and Storm disaster. The responsible agencies of disaster management in Indonesia at all levels (National, Provincial, Kabupaten and Kota levels) should thoroughly read this disaster management plan, so that necessary disaster mitigation measures for future possible disaster can be taken before disaster occurrence. Preparedness is the very essence to reduce disaster damage.

The disaster management plan should be updated regularly once every 5 or 10 years according to change of urban/regional land use and socio-economic conditions, and reviewed when necessary; especially if a big disaster occurs. In the case of Japan, the national disaster management basic plan has been revised seven times including overall revision twice.

- 2) The disaster management plans, which Study Team helped BNPB, SATLAK and other relevant government agencies to formulate, covers only four (4) types of natural disaster (*i.e.* Flood disaster, Sediment disaster, Earthquake disaster and Tsunami disaster). It is recommended that BNPB and SATLAK formulate a comprehensive plan based on the lessons learned and experiences of the Japanese plan because in terms of the climate, geographical condition and hazard type, Indonesia and Japan have a lot in common and the Japanese plan is easy to apply to other disaster types that are not referred to in the Plans formulated in this Study.

Especially for national disaster management plan, BNPB should take the lead and incorporate all disaster types and formulate a comprehensive national disaster management plan.

- 3) In a plan for other disasters, which will be added to these disaster management plans, the activity areas for each disaster phase including emergency response, recovery, rehabilitation, preparedness and mitigation have to be clearly described, and for each activity area, the plan needs to identify the stakeholders that are responsible for each area.

- 4) National disaster management plan should be referred to in the preparation of local disaster management plans. Once BNPB formulates the National Plan, BNPB will take the lead to coordinate the local disaster management plan to maintain consistency between the national and the regional plans.
- 5) A disaster management operations plan/manual needs to be formulated for use when people are actually implementing the actions that are stipulated in the national and regional disaster management plans. Operational plans need to be formulated by each government ministry, agency, local government and entities where national and/or regional disaster management plans identify some actions. The plan/manual should be distributed to all responsible agencies. Based on it, disaster management drills such as emergency response should be practiced regularly at the national, provincial, and local levels.
- 6) Concerning the local disaster management plan, Kabupaten Jember, Kabupaten Padoan Pariaman and Kota Pariaman were selected as pilot project areas for this Study. The final results of regional disaster management plan including planning know-how should be disseminated to Provinces in East Java and West Sumatra and related municipalities so they can establish the necessary coordination among disaster management agencies regarding responsibilities of relevant agencies, versatile applications of the plans at related municipalities in the provinces, *etc.*
- 7) Collection and preparation of detailed scientific data to support practical planning work is necessary. In this study, the maximum level of detailed topographic map data that the study team could obtain was 1:25,000 and 1:50,000 scale maps which were compiled many years ago by BAKOSURTANAL and the military map agency. For example, in west Sumatra, contour data is not available for interval and detailed elevation data of lowland area below 20m. This is a problem because if the tsunami invasion height is set at 5 meters, there is no data to define the limits of tsunami inundation area. What should be prepared is a large scale topographic map at 1:2,000 or 1:5,000 which is showing detail elevation such as 1 or 2 meters at least in coastal lowland area including settlement/urbanized area. Such large scale topographic map is necessary basic material not only for future tsunami disaster management planning but also for flood disaster management, urban land use planning and infrastructure development. In addition to compilation of large-scale topographic map, geological data compilation is also necessary for damage analysis for earthquake, land collapse and landslide.

For socio-economic data, CENSUS data is key information for regional planning. In case of detailed regional planning, the data collection unit must cover at least the village level; however, village (*desa*) boundary data is sometimes unclear on the map. This fact affects

on data analysis on existing socio-economic condition of study area. This type of data discrepancy in administrative unit should be solved soon by both national and local government agencies.

- 8) For flood disaster management, collection of at least rainfall data by main watershed is necessary. Rainfall observation points should be increased and observed rainfall data should be collected through a network system for analysis as the basis for early warning against flooding. Water level observation of rivers is also necessary for flood disaster management as basic information. Data integration and database development of rainfall and hydrological conditions should be promoted to provide a scientific base for disaster management plans at both national and regional level.
- 9) Furthermore, accumulation of historical disaster data such as earthquake, tsunami disaster, flood area, land collapse/landslide area, is very important. At present situation, the most of past disaster data are scattered and lost in a poor arranged manner at any relevant agencies. In short, there are problems in terms of data collection, accumulation and management. For instance, the data of the disaster event (*e.g.* flood area, flood duration, *etc.*) are insufficient or incomplete and there are no sufficient accumulation of past disaster data. In addition, there is no unified format of disaster data and reliable data management system. Thus, it is quite difficult to consider how to utilize the disaster data for disaster reduction activities. It is difficult to delineate the highly disaster prone areas and to clarify the relations with socio-economic condition and natural condition. Disaster data accumulation should be promoted at national and local levels using specific format and obtaining accuracy. Disaster data accumulation will significantly give support to the preparation of necessary disaster mitigation measures.
- 10) In this project, JICA study team developed GIS database for hazard mapping and disaster risk analysis. The whole GIS system including computer, software and data will be totally transferred to Kabupaten Jember , Kabupaten Padoan Pariaman and Kota Pariaman. Basic methodology for hazard mapping and risk analysis including data collection, field survey, data digitization, geographic database development, analysis and output mapping are explained in the Supporting Report. Geographic database system for disaster management should be effectively used for planning work in each agency. In the future, an application system should also be developed by each agency such as land use zoning, spatial planning, environmental zoning and natural resource management.
- 11) Promotion of community based disaster management is one of the key issues in local disaster management. Disaster prevention drills including evacuation, rescue operation, fire fighting, stock of water, food and medicine, and so on should be conducted for the

community unit. Public awareness on disaster management should be raised through school education and community disaster management activities lead by national and local government.

- 12) In order to support disaster damage reduction activities by government and community, existing capacity of firefighting including improvement of equipment, rescue operation system and human resource development should be promoted.
- 13) Emergency medical service system should also be improved. Human resource development for doctors, nurses, and related experts is necessary for emergency response to a large disaster such as a big earthquake. Based on the tertiary hospitals in each province, improvement program preparation and training for disaster medical services should be promoted. Import of the latest international knowledge and information for disaster medical services is recommended.
- 14) Preparation of earthquake disaster management plan for large cities such as Jakarta Metropolitan Area, Bandung, Medan and local capital cities located earthquake prone area should be promoted. Damage estimation based on micro-zoning methodology for a big city should be conducted to grasp the necessary input for both physical and non-physical mitigation measures.
- 15) Disaster management in big cities located at coastal area should be discussed from the global warming point of view. In Jakarta Metropolitan Area, land subsidence has been progressing especially in coastal areas. Flood and inundation disasters will occur in wider areas and water stagnation will continue longer due to such land subsidence. These phenomena will be exacerbated by sea level raising by effects of global warming over the medium to long term. Necessary mitigation measures should be discussed as a part of natural disaster management.