ABSTRACT

IMPROVING NATURAL DISASTER MANAGEMENT FOR INDONESIA COASTAL AREA (THE CASE OF ACEH TSUNAMI)

by

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A natural hazard cannot be avoided and can happen in every part of the world. Combining with the vulnerability of the area, this hazard can turn into a disaster which causes great losses and damages. To reducing these impacts, a disaster management is needed. This process can be very complicated due to the complexity of the cases. One of the most complex cases in disaster management is Indonesia, which experienced one of the most recent catastrophic natural disasters in world: the Aceh tsunami.

To reach the objective of the research, which is to define what natural disaster management strategy can be applied for Indonesia coastal area - specifically in the case of Aceh tsunami - based on theory and practice, a literature review is conducted. The literature review functions to picture the shifts in disaster management, both in theoretical perspective and also in the Aceh provincial spatial plan (practical perspective). Moreover, it will explore basic strategies in disaster management which with another results of the literature review are used to gather experts' opinion on disaster management strategy for Aceh by using Delphi Method.

For the disaster management strategy, this research is adopting Oosterberg et al. disaster management strategy and adjusting it to tsunami disaster management. The strategies becomes keep tsunami away from urban area (for tsunami hazard reduction), prepare urban areas for tsunami (for tsunami vulnerability reduction), and keep urban areas away from tsunami (for tsunami exposure reduction).

Theoretically, the disaster management shifts from response management towards risk management which emphasis on vulnerability reduction. This management asked for more pro-active measures by implementing multidisciplinary approach and involving partnerships in the institutional framework. It also requires community participation on the planning process and continuous communication with communities. Connecting this shift with the disaster management strategy, 'prepare urban area for tsunami' is the most ideal strategy in the disaster management. This strategy even promoted through Hyogo Framework which focusing on reducing vulnerability and increasing resilience.

Practically, after the tsunami on December 24, 2004 there is a major change in the disaster management in Indonesia which also influences the Aceh spatial plan draft: the disaster management becomes one of the focuses in the spatial plan. Before, the disaster management was ignored and did not mentioned at all in the spatial plan. 'Prepare urban area for tsunami' strategy is adopted to reduce the vulnerability of the area. The implementation of this strategy also combines with 'keep tsunami away from urban area' strategy. Sea walls are built and coastal vegetations (mangrove, coral reef, and sea grass) are planted or rehabilitated so that they can function as coastal green belt.

Based on the strategies identified in the literature review (theoretical and practical), a Delphi questionnaire is sent to some experts related to the disaster management in Aceh. The Delphi survey finds that most of the respondents choose 'prepare urban area for tsunami' strategy as the most suitable strategy to be applied in Aceh. This result is in line with the findings on theoretical and empirical review as explained before. Moreover, this strategy is also already applied in Aceh now even though the result is still not satisfying most of the experts.

As conclusion, the natural disaster management strategy that can be applied for Indonesia coastal area - specifically in the case of Aceh tsunami - based on theory and practice is 'prepare urban area for tsunami'. However, the 'prepare urban area for tsunami' strategy cannot be implemented alone without the help of the other two strategies. These three strategies must be combined to reach maximum goals, both for short and long term.

This research also recommends four things to be considered in implementing the disaster management in Aceh and guidelines for the future research. First, using the big influence of Islamic value in Aceh for the information spreading and planning process. Second, increasing public involvement in the arrangement of disaster management. Third, reminding the Acehnese to their local value and wisdom. The last, for future research, a broader scope of research by involving some lesson-learned from other countries in the literature review is suggested.

Keywords: Aceh, tsunami, disaster management, hazard, vulnerability, resilience, pro-active, re-active

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PREFACE

Natural disaster can happens anywhere and anytime. Until know, human still cannot stop it from happening. Human can only try to minimize its impacts by conducted disaster management.

My interest to disaster management, especially tsunami, triggers by two factors: my job as natural disaster mitigation staff in the Ministry of Marine Affairs and my personal experience with the Aceh tsunami. Being sent to follow the International Seminar/Workshop on Tsunami: 150 Years of Krakatau Eruption on August 2003 opened my eyes to the vulnerability condition of Indonesia. Ironically, I never think that this disaster can happen in Aceh, my home province. I wrote this thesis with hope that Aceh experience can be a lesson-learned for other disaster-prone area.

I would like to express my gratitude to my thesis supervisors: Dr. Johan Woltjer from RuG and Drs. Arief Rosyidie, M.SP.,M.Arch.,Ph.D from ITB for their critics, suggestions, and feedbacks. I also would like to show my appreciation for Ir. Haryo Winarso, M.Eng, Ph.D., my academic supervisor in ITB.

Special thanks for my family for all the supports in my study. My husband and son for their patience, my parents and family in Banda Aceh for the help on Delphi survey, and my parents-in-law and family in Jakarta for taking care of my little family while I am gone.

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Fegi Nurhabni

Groningen, 22 August 2008

For my husband and son who love me endlessly….

CONTENTS

LIST OF TABLES, FIGURES, AND CHARTS

List of Tables

List of Figures

List of Charts

Chapter 1
Introduction

I.1 Background

Natural hazard can take place in every part of the world. Combining with the vulnerability of the area this hazard can turn into a disaster which has great impact to the human civilization. Losses of life, disturbance of development process, and damages of the property and environment are some examples of the impacts. The impact is even greater when the disaster occur in developing countries which have higher level of vulnerability rather than developed countries (El-Masri and Tipple, 1997).

In the last decade, more focus is given on how to manage the disaster risk so that the number of losses and damages can be reduced into minimum. UN/ISDR (United Nations/International Strategy in Disaster Reduction) has established the United Nations International Decade for Natural Disaster Reduction (1990-2000) and through the World Conference on Disaster Reduction in 2005 has called for disaster risk reduction by developing nations and communities resilience towards disasters. This approach is popularly known as Hyogo Framework.

Theoretically, there are two disaster management approaches that can be used: pro-active and re-active approach. Both approaches complete each other and form a never ending cycle of disaster management (DKP, 2004; Lewis, 1997). Pro-active approach, which taking place before the disaster happened includes prevention[1], mitigation[2], and preparedness[3] measures. On the contrary, the re-

[1] Prevention is efforts to hamper or reduce dangerous impacts that destroy the community's live and livelihood if a disaster occurs (DKP, 2004)
[2] Mitigation is efforts to reduce or minimize the impact of a disaster to the community (DKP, 2004)
[3] Preparedness is all efforts dealing with, or anticipating, a disaster that can be happened in the national, regional, and local scale (DKP, 2004)

active approach taking place after the disaster and including emergency response[4] and rehabilitation and reconstruction[5].

In the reality, the pro-active approach is often neglected. People mostly respond after the disaster happens (re-active). As a consequence, the loss and damage is huge. In order to avoid these impacts, it is important to emphasis more on pro-active approach rather than only re-active approach (Moe and Pathranarakul, 2006; Ganderton, 2005; DKP, 2004).

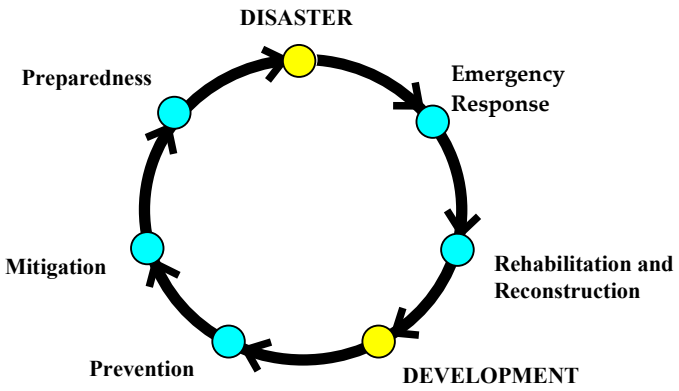


Figure I.1. Disaster Management Cycle

(Source: modify from DKP, 2004)

One of the most complex cases in disaster management is Indonesia. There are two reasons why Indonesia is chosen as the case study for this research. First, it geographically located on world's active earthquake line, which is physically very vulnerable to have one or combination of the natural disasters. Tsunami, earthquake, storm, flood, volcano eruption, and landslide are some of them. Second, like other developing countries, it also has vulnerable social condition. This condition is triggered by some urban problems such as rapid urbanization and increased level of poverty (El-Masri and Tipple, 1997).

[4] Emergency response is set of efforts of giving aid to the disaster victims in form of food, medicine and temporary shelter, and trying to handle the damages so that it can functioning again (DKP, 2004)

[5] Rehabilitation and reconstruction is re-development after disaster to increase the community's resilience by re-develop better infrastructure than before (DKP, 2004)

The most recent catastrophic natural disaster in Indonesia is the Aceh tsunami. Aceh, or officially Nanggroe Aceh Darussalam (NAD) Province, coastal area was hit a big tsunami wave on 26 December 2006. The tsunami causes great losses and damages. It killed 110,229 people while 12,132 are still missing and 703,518 were misplaced. The cross-sectoral damages and losses – including regional governance and the environment – is about 5,1 trillion rupiah (BAPPENAS and the International Donor Community, 2005).

Linking Aceh tsunami with the disaster management approach, the case is also lack of pro-active approach. There are no prevention, mitigation, and preparedness efforts done by the government in order to minimize the losses and damages if the natural hazards happen. These efforts are still not mentioned in the Spatial Plan of Aceh Province 1993-2008 (BAPPEDA Prov. NAD, 2008). So, when the tsunami took place the impacts are huge and affect the condition of Aceh coastal area, not only the community and infrastructure but also the environment.

Learning from the experience, now both re-active and pro-active approaches are implemented in Aceh. For the re-active approach, BRR Aceh dan Nias (Rehabilitation and Reconstruction Agency for Aceh and Nias) as the responsible agency for rehabilitation and reconstruction post-tsunami in Aceh provides a master plan including the zoning based on the tsunami risk assessment. The risk is assessed based on two aspects: hazard and vulnerability, whereas hazard is defined as the probability of occurrence of natural event and vulnerability as the un-preparedness for disaster and its consequences (Merz et al., 2006; Oosterberg et al., 2005). This zoning functions as the new development guidance. At the same time, the pro-active effort is also given a lot of emphasize. It becomes one of main considerations in the new Draft of Spatial Plan for Nanggroe Aceh Darussalam Province 2009-2023. In the draft plan it is said that Aceh will be planned and re-developed based on the existing values, norms, and natural disaster mitigation – including early warning system – to minimize the risk on the future. The community will be given chance to participate in the planning process directly (BAPPEDA Prov. NAD, 2008).

What is disaster?

The word disaster can be explained in various ways because of the complexity of the events (El-Masri and Tipple, 1997). Different professions can define disaster differently. According to Mc Entire 2000[a] (in McEntire 2001), disaster can be seen as the negative effects of interaction between triggering agents – natural environment, human activity, or the combination of both – and vulnerability. It is also can be explain as the full predicament situations happen to the individual or communal (Kumar 2000 in Moe and Pathranarakul 2006). UNCHS (United Nations Centre for Human Settlements) (UNHCS, 1994 in El-Masri and Tipple, 1997), proposes a holistic definition of natural disaster. It is said that a natural disaster is an interaction between natural hazards with the vulnerable condition which can cause harm and loss to man and the environment. These impacts can cause suffering and chaos that will create socio-economic, cultural and political disruption. In this perspective, disaster is not only a technical matter but also environmental, social, and developmental concern (El-Masri and Tipple, 1997).

According to the UN International Strategy for Disaster Reduction (UN/ISDR, 2004), there are two main sources of disaster, which are natural and technological disasters. Natural disasters include hydro-meteorological disasters, geophysical disasters, and biological disasters. The technological disasters encompass three groups, which are industrial accidents, transport accidents, and miscellaneous accidents. This conventional distinction, between natural (Acts of God) and man-made (Acts of Man), is sometime blurred because not all natural disasters are exclusively natural (El-Masri and Tipple, 1997). According to them, natural disasters are usually as the result of human action, both direct and indirectly. However, this conventional classification is the most common distinction used in the disaster management.

From the impact point of view, disaster can be differentiated into two types: exogenous and endogenous (Moe and Pathranarakul, 2006). Exogenous refers to an event in which one part of the community suffers biological, economic and

psychosocial distress, while the other accumulates the material gains and social satisfactions. The endogenous disaster refers to a process in which the whole part of a community encounters and shares the problems of the social structure and function.

I.2 Problem Statement and Research Question

Since this research intends to give a better understanding on (tsunami) disaster management, both on theoretical and practical side, Indonesia - specifically the Aceh tsunami – is chosen as the case study. Experiencing one of the biggest tsunami in the world, the disaster management applied in Aceh and Indonesia hopefully can be used as lesson-learned that can be implemented in other tsunami-prone area.

In Indonesia, disaster management is conducted through the guidance of Disaster Management Act (UU No. 24/2007) and Spatial Planning Act (UU No. 24/1992 and UU No. 26/2007). Focusing on tsunami and other coastal disasters, Coastal Area and Small Islands Management Act (UU No. 27/2007) also should be considered. These acts play important role on the arrangement of provincial, municipal, and regency spatial plan.

After Aceh tsunami on 2006, there is a shift in Indonesia's disaster management policy. Before Aceh tsunami, disaster management only gets a little attention and it focus more on the re-active approach. The pro-active approach is only gets a little attention and even often neglected by the government. The old Act on Spatial Planning (UU No. 24/1992) mentions almost anything about disaster management as a part of planning process. After the Aceh tsunami, Act on Disaster Management, new Act on Spatial Planning (UU No. 26/2007), and Act on Coastal Area and Small Islands Management are legalized with more emphasize on disaster management. As a consequence, the content of disaster management in the provincial, municipal, and regency spatial plan is also change.

Regards to the statement, this research is developed with the guidance of two questions:

1. *How according to the literature the risk of losses and damages can be reduced when big natural disaster like tsunami takes place in coastal area?*

   The first question pictures tsunami disaster management: approaches, strategies, and also their implementation discussed on the scientific literatures in managing tsunami risk. It will provide the research with theoretical perspective of the management that will be the basic to answer the second research question.

2. *How these can be adopted to the case of Aceh coastal area?*

   The question will link the theoretical management to the specific case, which is the Aceh coastal area. The coasts already experienced one of the biggest tsunami in the world and now on the rehabilitation and recovery phase. It is important to know whether the management implemented in this area is on the right track or not, in the sense whether it is the same with the disaster management theory elaborated from the first question. The assessment will be conducted by using Delphi method.

I.3 Research Objective and Scope

The aim of the research is to define what natural disaster management strategy can be applied for Indonesia coastal area - specifically in the case of Aceh tsunami - based on theory and practice. The decision to choose the management will base on the experts' opinion in Delphi method using some three criteria: the Aceh physical condition, the social life and culture of the community, and the existing government policies, in this case the provincial spatial plan.

For the scope, the research is limited to tsunami management with the empirical case of Aceh tsunami on 26 December 2004. The main focus of the research will

be on the provincial spatial plan before and after tsunami: whether the spatial plan already adopts the theory which suitable with the situation and condition of Aceh coastal community and environment or not.

I.4 Research Methodology

The research will be conducted through some stages. It will start with exploration of theories and management strategies in the literatures, classification of the strategies, and determination of strategy to be applied in Aceh based on the experts' opinion, and the comparison with the present tsunami management applied in Aceh attached in the spatial plan. The results are analyzed to get the recommendations, which is the tsunami management strategy to be applied in Aceh. Conclusions are also given at the end of the report.

The stages can be explained as follows:

- *Literature review*

  The literature review will be done on the theoretical and the practical case. In this stage, the theory and definition of disaster management, approaches in disaster management, and strategies dealing with tsunami management discussed in the literatures (theoretical) and the present Spatial Plan for NAD Province (practical), will be reviewed. The literature review also will connect the disaster management with the planning process since it is a part of planning itself.

  The theoretical and practical strategies reviewed in the previous stage will be summarized and classified into groups. The classification will be used as the basis for the questionnaire needed in the assessment of Delphi Method.

- *Gathering Experts' Opinion*

  The classified strategies and some other questions and statements will be presented to experts related to the research topic, both academicians and

practitioners by using Delphi Method. The experts come from various government agencies (DKP, BRR Aceh dan Nias, BAPPEDA Prov. NAD, Satkorlak PBP NAD, BAPPEDAL Prov. NAD, Dinas Bina Marga dan Cipta Karya Prov. NAD, BAPPEDA Kota Banda Aceh, Dinas Tata Kota dan Permukiman Kota Banda Aceh), international organizations (UNDP, GTZ-SLGSR), and university (UNSYIAH).

The iteration or round of the method is stopped at the second round. The expert opinions about the strategies and whether the strategies are applicable to Aceh coastal area will be the basis to define the management strategy which is suitable for Aceh.

- *Conclusion and recommendation*

  As the last step, the research results are concluded by comparing the theoretical, practical, and experts' opinion strategies. The comparison result will be presented in the form of table to make more structured and easier to be understood. Analysis then conducted to see the reasons behind the comparison result. Whether the result said that the theory and the present policy is the same or different, a deeper study must be conducted to see the rational behind it. Some recommendations are also given to complete the tsunami management strategy in Aceh. By doing it, it hoped that the research not only useful for academic purposes but also for practical application in the future.

To simplify, these stages can be drawn as a diagram as can be seen in Figure I.2 below:

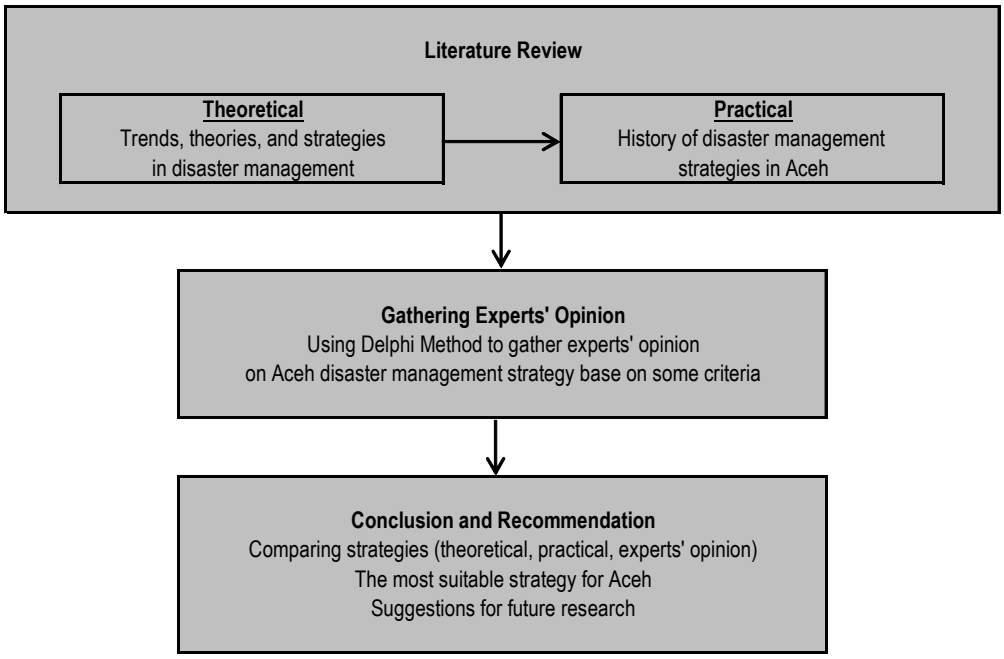


Figure I.2. Research Methodology Diagram

I.5 Structure of the Report

Based on methodology, the thesis report can be divided into five chapters: Introduction, Current Insights of Natural Disaster Management, Aceh Disaster Management in the Provincial Spatial Plan: Pre and Post Tsunami, Experts' Opinion on Aceh Disaster Management, and Conclusion and Recommendation. Brief explanation of each chapter can be explained as follows:

Chapter 1: Introduction

The first chapter consists of five sub chapters: background, problem statement and research question, research objective and scope, methodology, and structure of the thesis. This is the basic of the research because it guides the whole research.

Chapter 2: Current Insights of Natural Disaster Management

The second chapter is the theoretical chapter. In this chapter, the natural disaster management is elaborated and reviewed critically. It talks not only the theories, but also management approaches and strategies dealing with tsunami disaster. The strategies in handling the problem will be used as lesson-learned that can be applied for Indonesia case.

Chapter 3: Aceh Disaster Management in the Spatial Plan: Pre and Post Tsunami

Chapter 3 is the overview of empirical case of the research, which is the Aceh tsunami. NAD Province disaster management policy before and after tsunami are explained base on the information on the provincial spatial plan. The explanation will be focused on the disaster management implementation and its relation to the theoretical strategies explained in the previous chapter.

Chapter 4: Experts' Opinion on Aceh Disaster Management

By using the theoretical and empirical data in Chapter 2 and Chapter 3, the experts' opinion is gathered and assessed by using Delphi Method. Based on this assessment, the opinion of the experts' toward the theoretical and practical tsunami management can be known. The findings of the Delphi survey also will be elaborated here.

Chapter 5: Conclusion and Recommendation

The last chapter consists of conclusion of the research. It is including the comparison of the strategies and the analysis. The recommendations or suggestions for future research and improvement on disaster management also will be elaborated here.

The connection between chapters is presented in Figure I.3 below:

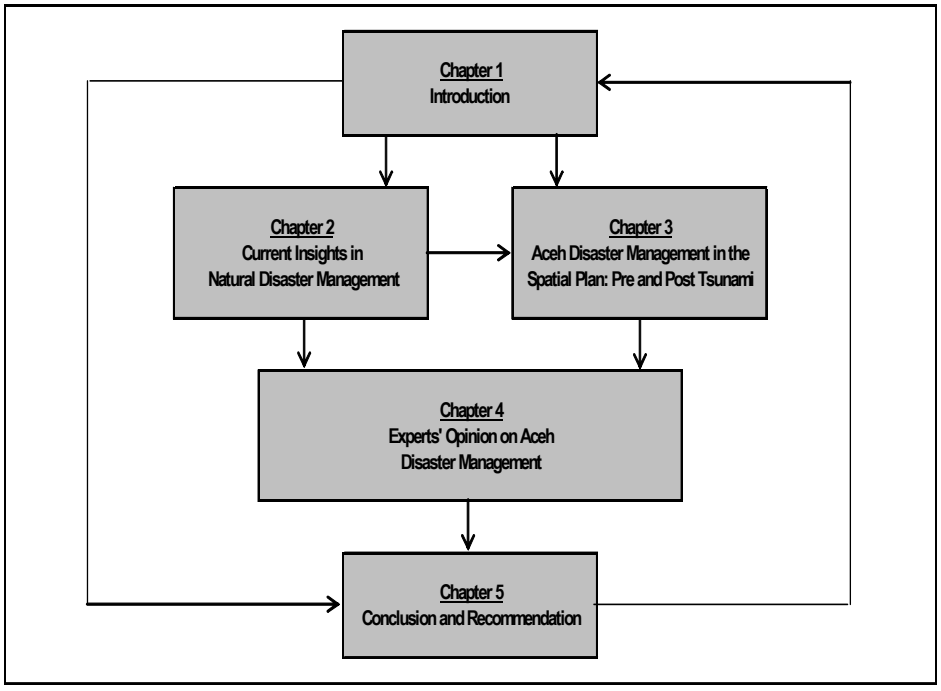


Figure I.3. Chapter Flow Diagram

Chapter 2
Current Insights of Natural Disaster Management

II.1 Disaster Management

There are many definitions of disaster management. However, the basic thing in all disaster management definitions is that it always relates to efforts of dealing with and avoiding disaster risks. It involves preparing for the disaster before it happens (pro-active) and disaster response as well as supporting and rebuilding society after disaster has occurred (re-active). This definition is adopted as the basis of the research.

There are an agreement that these approaches, pro-active and re-active, must be implemented integratedly and holistically in order to reduce the negative impacts create by the disaster (DEPHUKHAM[a], 2007; Mileti and Gailus, 2005; DKP, 2004; Trim 2004; McEntire, 2001). Pro-active approach is conducted before the disaster happened (pre-disaster). It includes prevention, mitigation, and preparedness measures. The aim of this approach is to prepare the disaster-prone area to have a very minimum impact if it experiences a disaster. Re-active approach, on the other hand, is conducted after the disaster took place (post-disaster). Including to this approach are emergency response, which taking place very early after the disaster happens, and rehabilitation measure. This approach will have to make sure that the area can reach it previous level of development after the disaster.

In the last decade, there is a shift on disaster management approach, from re-active only into the combination of pro-active and re-active. In the past, the pro-active approach is often neglected due to the assumption that natural disaster was acts of God in punishing human; therefore it was associated with huge and catastrophic impacts that must be accepted by human (McEntire 2001, Weichselgartner 2001). Human just have to accept the impacts and lived with it.

As an effect, when the disaster occur the re-active efforts can be very expensive because the recovery and rehabilitation stage can take years before it can reach the prior condition. That is why now pro-active approach gets more attention than before. Some articles state that it is important to emphasis more on pro-active approach rather than only re-active approach (Moe and Pathranarakul, 2006; Bernard, 2005; Ganderton, 2005; Mileti and Gailus, 2005; DKP, 2004). By combining both approaches, a holistic and integrative ways are conducted in managing the disaster and its impacts (McEntire, 2001; Trim, 2004) and hopefully the impact can be reduced into minimum. This integration is an ideal solution in disaster management due to the dynamics of the bio-physical and social condition.

It is also important to remember that disaster management is not a linear approach but a never ending cycling process as described in Figure I.1. It is the same like planning process that never stop at one point only. By reducing the risk through pro-active approach, the damages and losses will least than it should be and it will make the implementation of re-active approach easier.

This shift cannot be avoided since basically disaster management is a part of planning process. Since now the planning paradigm shift from technical rationality planning approach towards the collaborative planning approach, the disaster management also has to adjust to the same process. According to Healey (2006), planning is socially constructed so it must adopt local context of the planning area. In other word, there is no blue print in planning. It also applies to disaster management. There is no standard procedure on disaster management strategies. It involves probability of risks, assessment of vulnerability, the mitigation effort, and the balance between time, effort, and cash (Evans, 1997). Every area can have different strategy based on its own physical and social characteristics. If not, the implementation of the strategy will be ineffective.

In her work, Pearce (2003) sums shift in disaster management as described in Figure II.1 below:

From		To
Hazards	→	Vulnerability
Re-active	→	Pro-active
Single agency	→	Partnerships
Science driven	→	Multidisciplinary approach
Response management	→	Risk management
Planning for communities	→	Planning with communities
Communicating to communities	→	Communicating with communities

Figure II.1. The Shift in Disaster Management Strategies

(Source: Pearce, 2003)

The key in combining the dynamics and cycling process of disaster management with effective goal achievement is sustainability. Sustainability concept here a little bit different with the sustainable development concept introduced by the Bruntland Comission (1987) in Steg and Gifford (2005), Pope et al. (2004), and El-Masri and Tipple (2002) which describes sustainable development as how to balance social, economic, and environmental qualities to accomplish the present generation needs without sacrificing the ability of the future generations to meet theirs. The sustainability definition that is used in this research is the one that states by Mileti and Gailus (2005):

> In the context of hazards and disaster studies, sustainability means that a locality can tolerate – and overcome – damage, diminished productivity, and reduced quality of life[6] inflicted by an extreme event without significant outside assistance.

[6] Refers to Steg and Gifford (2005) research, quality of life can be defined as multi-dimensional construct that can be extend to which important values and needs of people are fulfilled. It refers to human well-being either as the individual's objective living conditions, as individual's cognitive (experience of life), or both.

In order to achieve this sustainability, the community must become more active and involved in the disaster management process (Mileti and Gailus, 2005; Pearce, 2003). Public participation must become un-separated part in every stages of disaster management. This involvement also will increase the capacity or resilience of the society and automatically reducing the vulnerability. The discussion on capacity, resilience, and vulnerability will be explained more on the next sub chapter.

II.2 Strategies in Disaster Management

As described before, the disaster management strategy shifts towards reducing vulnerability rather than reducing hazard. In other word, human try to live with the natural hazard but at the same time try to reduce the vulnerability if the hazard turns into disaster. It guides to the next discussion on vulnerability.

According to Weichselgartner (2001), the vulnerability concept itself is still fuzzy. It is happened because even though in the framework of disaster management vulnerability can be seen from different point of view (Merz, et.al., 2006; Oosterberg et.al., 2005; Weichselgartner, 2001). First, vulnerability is defined as the potential exposure, or damage potential, of the hazards. This is a technical measure of vulnerability. Second, vulnerability is seeing as the societal coping ability, or resistance, to the given hazard. It means that the vulnerability is measured from the society loss susceptibility point of view. The last one is combining both vulnerability concepts, so vulnerability is not only a technical issue but also a social issue.

In this research, vulnerability is considered as both technical and social matters (the third point) because both issues cannot be separated. It is also supported by the definition of vulnerability in Hyogo Framework (ISDR, 2005) which states that vulnerability can be defined as conditions determined by physical, social, economic, and environmental factor, or process that can increase the community's

sensitivity towards disaster impacts. Together with hazard, the probability of disaster occurrence, vulnerability can be used to measure the risk of disaster. It is also called the Pressure and Release (Crunch) Model. The key concept in this model is how to decrease the vulnerability by increasing the capability or, in the terms of UN/ISDR, increasing the resilience. Hyogo Framework (UN/ISDR, 2005) states that the resilience can be increased through the implementation of five priority actions: ensuring disaster reduction as a national and local priority with strong institutional basic for the implementation, identifying and monitoring disaster risks and increases the early warning system, using knowledge, innovation, and education to develop a safety and resilience culture in all levels, reducing the risk basic factors, and strengthening disaster awareness for effective response in all level.

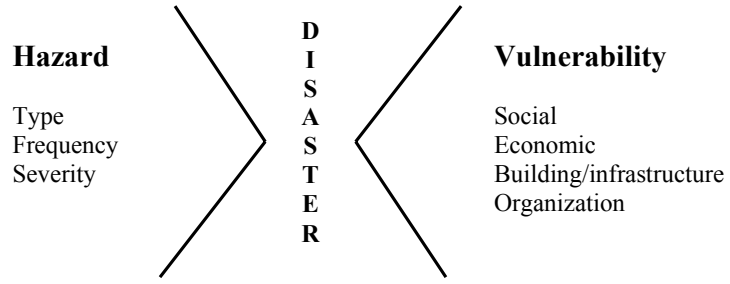


Figure II.2. The Pressure and Release (Crunch) Model

(Source: Sanderson, 1997)

Oosterberg et al. (2005) in their article also use this Pressure and Release (Crunch) Model in the (flood) risk assessment. They define risk as the interaction between hazard (disaster probability), exposure (capital and population in the disaster risk area) and vulnerability (un-preparedness for a disaster and its consequences).

Risk = Hazard * Exposure * Vulnerability

(Source: Oosterberg et al., 2005)

Exposure here can be seen as the first type of vulnerability that already mentioned above while the Vulnerability is the second type of vulnerability. So, basically the formula that used by Oosterberg et al. is also a Pressure and Release (Crunch) Model. Oosterberg et al. originally used the formula for flood risk reduction but in it also can be used for other disasters, including tsunami disaster risk reduction.

Refer to the formula above, according to Oosterberg et al. disaster risk reduction can be reached through the implementation of three strategies: hazard reduction, exposure reduction, and vulnerability reduction. Oosternerg et al. rename the strategies into: keep disaster away from urban areas, keep urban areas away from disaster, and prepare urban areas for disaster. Since this research is about tsunami disaster, these strategies are adopted into tsunami risk reduction by renaming the strategies into: keep tsunami away from urban areas (tsunami hazard reduction), keep urban areas away from tsunami (tsunami exposure reduction), and prepare urban areas for tsunami (tsunami vulnerability reduction).

These strategies seem very simple but they are the basic strategies in disaster management. Most countries or organizations adopt and implement one or the combination of these strategies in their disaster management plan. The U.S. government is one of the examples. In implementing the disaster reduction program, named the National Tsunami Hazard Mitigation Program, the U.S. government use the concept of vulnerability reduction, which is preparing urban area for tsunami. With this program, the U.S. government tries to develop a 'tsunami resilience' community (Bernard, 2005; McEntire, 2005)

The three strategies - keep tsunami away from urban areas, keep urban areas away from tsunami, and prepare urban areas for tsunami - are used for Delphi assessment discussed in Chapter 4. Together with some other questions and statement, the strategies will be used to picture the experts' opinion on disaster management in the case study area.

II.3 Concluding Remarks for Current Insights of Natural Disaster Management

There are shift in disaster management point of view as explained by Pearce (2003) through Figure II.1. The old paradigm which focuses on response management by implementing hazards reduction and re-active measures now change into risk management by conducting vulnerability reduction and pro-active measures. The trend also asked for partnerships and multidisciplinary approach in disaster management rather than single agency and science driven approach. From planning point of view, it calls for more collaborative planning rather than rational planning.

For disaster management strategy, there are three basic strategies as presented by Oosterberg et al. (2005). They are: keep disaster away from urban areas (hazard reduction), prepare urban areas for disaster (vulnerability reduction), and keep urban areas away from disaster (exposure reduction). This strategies are adopted for tsunami disaster by renaming them into: keep tsunami away from urban areas (tsunami hazard reduction), prepare urban areas for tsunami (tsunami vulnerability reduction), and keep urban areas away from tsunami (tsunami exposure reduction). Connecting these strategies with the disaster management paradigm change, prepare urban area for tsunami is the most recent trends in the disaster management.

Chapter 3
Aceh Disaster Management in the Provincial Spatial Plan: Pre and Post Tsunami

III.1 Nanggroe Aceh Darussalam: a Lesson-Learned for Tsunami Disaster

Nanggroe Aceh Darussalam Province, or Aceh in short, draws world attention due to its experience on giant tsunami on 26 December 2004. The impacts of the tsunami are catastrophic and affecting not only Aceh but also another parts of Indonesia and also some neighbouring countries. The President of Indonesia himself announces this event as a national disaster.

Physically, the province locates in north tip of Sumatera Island. As the consequence, it mainly borders directly with open waters (Andaman Sea in the north, Malacca Strait in the east, and Indian Ocean in the west). The only inland border is in the south with North Sumatera Province. It covers an area of 57,365.57 km^2 or 2.89% of Indonesia in total.

Administratively, NAD Province consists of four municipalities and 17 regencies (Pemprov NAD, 2008). Most of these municipalities/regencies are located in the coastal area, including Banda Aceh, the capital city of NAD Province. Only three regencies – Bener Meriah, Aceh Tengah, and Gayo Lues – are not part of the coastal area. Consequently, most of main infrastructures for land transportation are also built along the coastline. This infrastructure includes *Jalan Lintas Sumatera* (Sumatera Highway), the main connector between provinces in Sumatera Island. That is why when the tsunami attacked on December 26, 2004, it paralyzed almost all part of NAD Province. Many areas, including Banda Aceh, only can be reached by using airplanes or helicopters. Some regencies along the west coast were almost totally destroyed.

Figure III.1. Map of Nanggroe Aceh Darussalam Province

(Source: Pemprov NAD, 2008)

As one of the first areas states as part of Republic of Indonesia, Aceh is given some privilege status. The first President of Indonesia, Soekarno himself called Aceh as *daerah modal* (capital region) due to Acehnese support for Indonesia at that moment. Thus, together with Yogyakarta Province, Aceh got the title of *Daerah Istimewa* (Special Teritory) because of its specialties. One of the specialties is religion. Aceh is very famous for its strict Islamic values implementation. Unfortunately, Aceh also has a long story of civil war between Aceh Freedom Movement (GAM) and the Government of Indonesia (GOI). This conflict gives big impact on Aceh development because some big companies ended their investment in Aceh.

Based on *Undang-Undang No.11/2006* (Act No.11/2006) on Government of Aceh, NAD Province these privileges are legalized. These privileges are including

the implementation of Islamic law (*Qanun*) as an addition to the Indonesia law. *Qanun* is an ordinance, like (provincial/municipality/regency) regulation, that rules the Aceh government and society (DEPHUKHAM, 2006). Another privilege relates to the right to have and choose a local party in the local election. It is also part of the peace agreement between Government of Indonesia (GOI) with Aceh Freedom Movement (GAM). As consequences of those privileges, NAD Province has a unique institutional system. For example, it has *Mahkamah Syar'iyah* (Islamic Law Court of Law), *Majelis Permusyawaratan Ulama* (Theologian Discussion Council), and *Lembaga Wali Nanggroe* (Elder Institution) that cannot be found in other provinces. In essence, almost all daily life activities in Aceh are based on the Islamic values and the religious leaders still have a big role in the community.

III.2 The Lack of Disaster Management in the Pre Tsunami Spatial Plan (1993-2008)

The Spatial Plan for Nanggroe Aceh Darussalam Province 1993-2008 were made based on *Undang-Undang No.24/1992* (Act No.24/1992) about Spatial Planning. It was legalized as *Peraturan Daerah No.5/1994* (Local Regulation No. 5/1994) in 1994. Referred to the Spatial Planning Act and some internal and external changes in the national and provincial policy, this provincial spatial plan was revised again in 1995, 1997, 2000, and 2004 (DPPW, 2003). The last revision spatial plan (2004) has not been finished and legalized due to the tsunami event.

In general, the provincial spatial plan before tsunami focuses on four points. The first is the economic development, both regionally (Indonesia-Malaysia-Thailand Growth Triangle/IMT-GT) and locally (Sabang Free Port). The government tried to stimulate the economic growth by cooperating with some neighbouring countries – Malaysia and Thailand – in the region and also re-opening Sabang as the free port of west Indonesia. Second, it discusses the splitting of some

regencies into smaller regencies due to the decentralization process. It is hoped that the decentralization will faster the development process, especially in the remote areas. Next, about the Ladia Galaska (Lautan Hindia-Gayo Lues-Selat Malaka) Project. Ladia Galaska is a new highway that will connect the west coast, the central Aceh, and east coast. Last, the environmental protection issue related to Leuser Ecosystem Area (*Kawasan Ekosistem Leuser/KEL*).

The spatial plan does not give adequate emphasis on the disaster management, especially the tsunami hazard. It is indeed explain about the need to protect several areas to reduce the risk of some hazards - earthquake, flood, and landslide - from the urban areas (DPU Prop. DI Aceh, 1993), but only in general. No risk map or specific policy that describes the disaster management approaches, both pro-actively and re-actively.

One of the reasons why the issue of disaster risk, hazard, and vulnerability are not mention in the DI Aceh Province Spatial Plan is because the disaster management is still not one of the considerations in Indonesia development. The development trend at that time focused more on the economic growth and physical development. It can be seen from the content of Act No.24/1992 on Spatial Planning. The act gives a detail spatial guideline for the government levels but only from the spatial utilization side. According to the act, the Provincial Spatial Plan is the manifestation of strategy and policy from National Spatial Plan (SEKNEG, 1992). It focuses on the spatial utilization (the structure, pattern and monitoring).

It seems that the policy makers assume Indonesia as a safe country that does not face natural disaster threat. So, disaster management efforts are not given big portion in the act. They lack of knowledge that disaster management should be consider in the development process. On the other hand, the policy makers perceptions are created because of Indonesia never had a catastrophic natural disaster for over a century. All the disasters, including tsunami, happen in the local scale. The impact of the disaster is also very little to the national development. So, the efforts that been done at that time more on re-active

approach after disaster. The institution that responsible for this duty is BAKORNAS PB (National Coordination Agency for Disaster Management). This agency is responsible directly to the President and coordinate by the Minister of Social Welfare.

The effort to change this view already been tried but in the smaller scale. In the middle of 2004 (before the Aceh tsunami), DKP published Guidelines for Natural Disaster Mitigation in Coastal Area and Small Islands. The scope of this guideline is very limited because it just discusses the natural disaster mitigation in coastal area and it does not have juridical power. According to this guideline, disaster management in the coastal area can be conducted through three strategies (DKP, 2004). The first one is the protection strategy. Including in this strategy is the built of protection structure along the coastline (structural mitigation). The second strategy is the adaptive strategy which tries to adjust the coastal development with the natural environment change. The last one is retreat or do-nothing strategy where human should 'give in' to nature dynamics.

These strategies share the same 'spirit' with Oosterberg et al.'s strategies explained in Chapter 2. The protection strategy is the same with 'keep tsunami away from the urban area' strategy since they both focus on how to protect the area behind the coastline. The strategy can be applied by implementing the structural mitigation, both hard structure (e.g. seawall) or soft structure (e.g. mangrove as coastline green belt). The second strategy, adaptive strategy is 'prepare urban area for tsunami'. It means the human and its development that should adjust to the disaster risk. And the last one, the do nothing strategy is the same with 'keep urban area away from tsunami'. Here, human retreat and move the urban area to some place else that is safer.

III.3 The Aceh Tsunami and its Impacts on Indonesia Disaster Management Policy

On December 26, 2004, an earthquake occurred in the Indian Ocean, the western part of Sumatera Island. The earthquake was huge (8.9 Richter Scale) and triggered tsunami to the coastal area of NAD Province and the west coast of North Sumatera Province as well as to some neighbouring countries. The tsunami, known as Aceh tsunami, causes a great losses and damages. According to BAPPENAS and the International Donor Community (2005), the cross-sectoral damages and losses, including regional governance and the environment, is about 5,1 trillion rupiah. The tsunami also killed 110,229 people while 12,132 are still missing and 703,518 were misplaced.

Recognizing the extent of the devastation after tsunami, the Government of Indonesian (GOI) declared the tsunami in Aceh as a national disaster. The local government (provincial and municipalities/regencies along the north and west coast) was collapse and the central government took control over the province. The President appointed BAKORNAS PB to implement the emergency response with the Minister for Social Welfare as the coordinator of the emergency response phase. The Indonesian President declared the end of the emergency response phase on 26 March 2005.

Following the end of emergency response phase the government then assigned the National Development Planning Agency (BAPPENAS) to coordinate the establishment of a rehabilitation and reconstruction plan for Aceh and Nias. Several institutions in cooperation with international bodies participated in the process of developing the *Rencana Induk* (Master Plan). Apart from reviewing the needs for the redevelopment of the areas affected by the disaster, the Master Plan also outlined the need to establish an agency responsible for the coordination and implementation of the rehabilitation and reconstruction plan for Aceh and Nias.

Figure III.2. One of Settlement Aids

(Source: private documentation)

On April 15, 2005, the Master Plan for the rehabilitation and reconstruction of Aceh and Nias was legalized through Presidential Regulation No. 30/2005 and on the following day, the President declared the establishment of the Agency of the Rehabilitation and Reconstruction for the Region and Community of Aceh and Nias (BRR Aceh dan Nias) in Government Regulation No. 2/2005. Later, after being approved by the Indonesian Parliament, this emergency regulation became Law No. 10/2005.

In general, the Master Plan aims at re-develop the impacted area so that the community can conduct their activities in a better and safer condition. Therefore its spatial plan focuses more on zoning regulation (see Figure III.3). The municipalities and regencies are not moved to safer area but prepare the areas to (future) tsunami disaster by carrying out strict zoning, preparing escape routes and shelters, and implementing early warning system. This effort also supported by building the coastal protection (e.g. sea wall and green belt). So, not only preparing the areas to tsunami, the master plan also suggests combining it with keep away tsunami from the urban areas. In addition, public participation also gains a lot of attention in the master plan. The community are invited to actively participate in the re-development process.

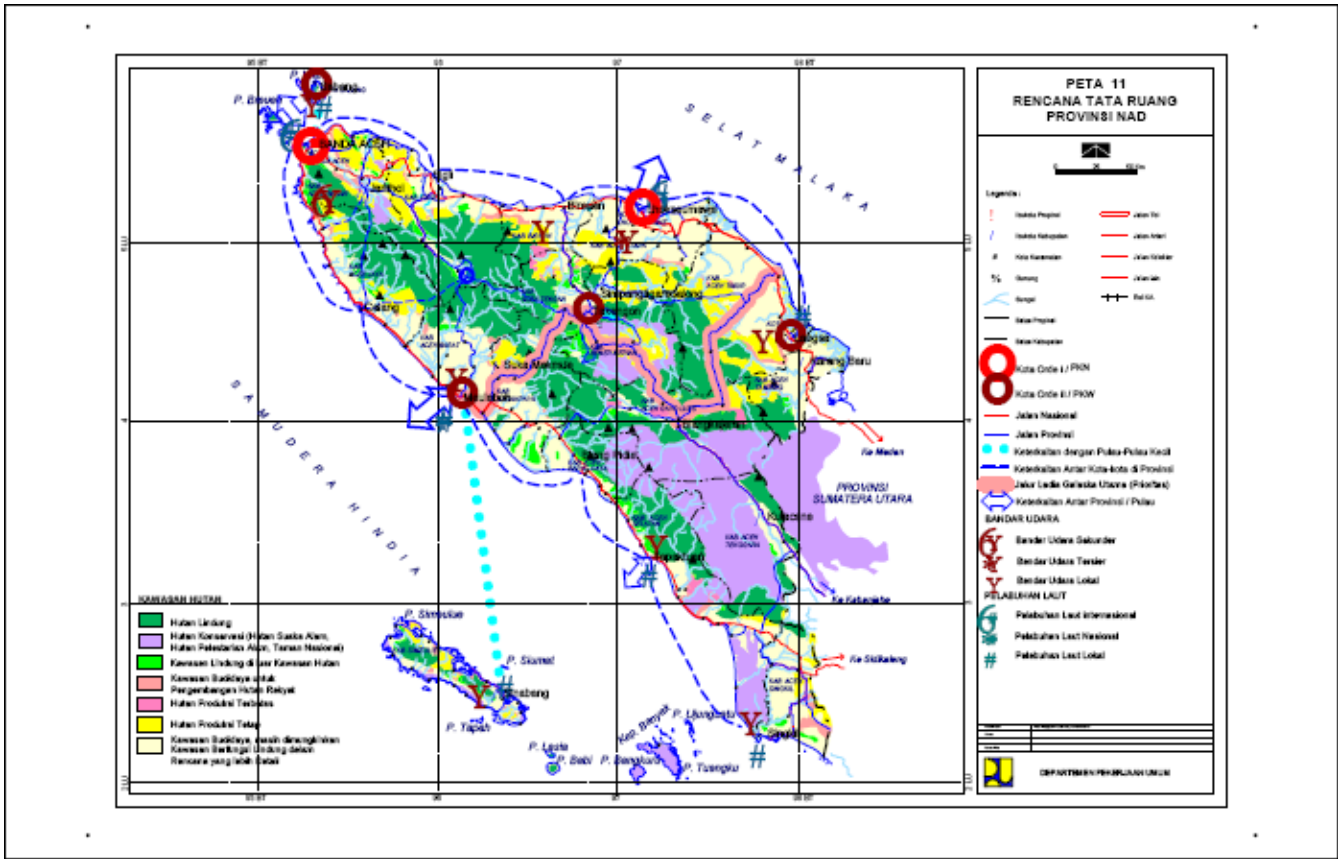


Figure III.3. Land Use Plan of NAD Province based on the Master Plan

(Source: BAPPENAS, 2005)

In 2007, the GOI make a major breakthrough on the (tsunami) disaster management in Indonesia by legalizing three acts: Act No. 24/2007 on Disaster Management, Act No. 26/2007 on Spatial Planning (substituting Act No. 24/1992 on Spatial Planning), and Act No. 27/2007 on Coastal Zone and Small Islands Management. These acts are connected to each other and function as national guidelines in disaster management.

The main act, Act on Disaster Management, focuses on all aspect of disaster management in Indonesia. It explains the authority and responsibility of each government level in the disaster management as members of BAKORNAS PB, the disaster management institution. It also mentions the rights and obligations of the society in the management. The role of business and international institution, disaster financial and aid management, monitoring and evaluation, and legal action solution are also described in detail but the most important part of the act is the process in implementing disaster management concept. It is said that disaster management can be differentiate into three phases: pre-disaster, emergency response, and post-disaster (DEPHUKHAM[a], 2007).

Figure III.4. Seawalls for Coastal Protection

(Source: private documentation)

The other two acts support this concept in the framework of spatial planning and coastal management. One of articles on the new Act on Spatial Planning describes the relationship between spatial planning with disaster management. It is said that

the spatial planning must be conducted with the consideration on the Indonesia physical condition that vulnerable to disaster (DEPHUKHAM[b], 2007). In addition, Act on Coastal Zone and Small Islands Management completes the first two acts by focusing more on the coastal area. It elaborates both pro-active (mitigation) and re-active (rehabilitation) approaches in the coastal management concept. Thus the mitigation process is given bigger emphasize here. It demands all government level to include disaster mitigation in the making of integrated coastal and small islands management and recall for the participation of all stakeholders in the coastal area to always put attention to the mitigation effort (DEPHUKHAM[c], 2007).

III.4 Aceh Disaster Management Policy Post Tsunami (2008-2023)

Based on the Master Plan for Rehabilitation and Reconstruction for Aceh and Nias and the national three acts that already mentioned in Sub Chapter III.1, BRR assisted BAPPEDA NAD to make a new spatial plan for NAD Province. This spatial plan is still in the draft form because it has not legalized by the Provincial Council yet.

Learning from the experience from Aceh tsunami, the draft of spatial plan gives a strong emphasis on the disaster management approaches and strategies. For example is by including Disaster Risk Spatial Planning Program as one of the programs in the spatial plan.

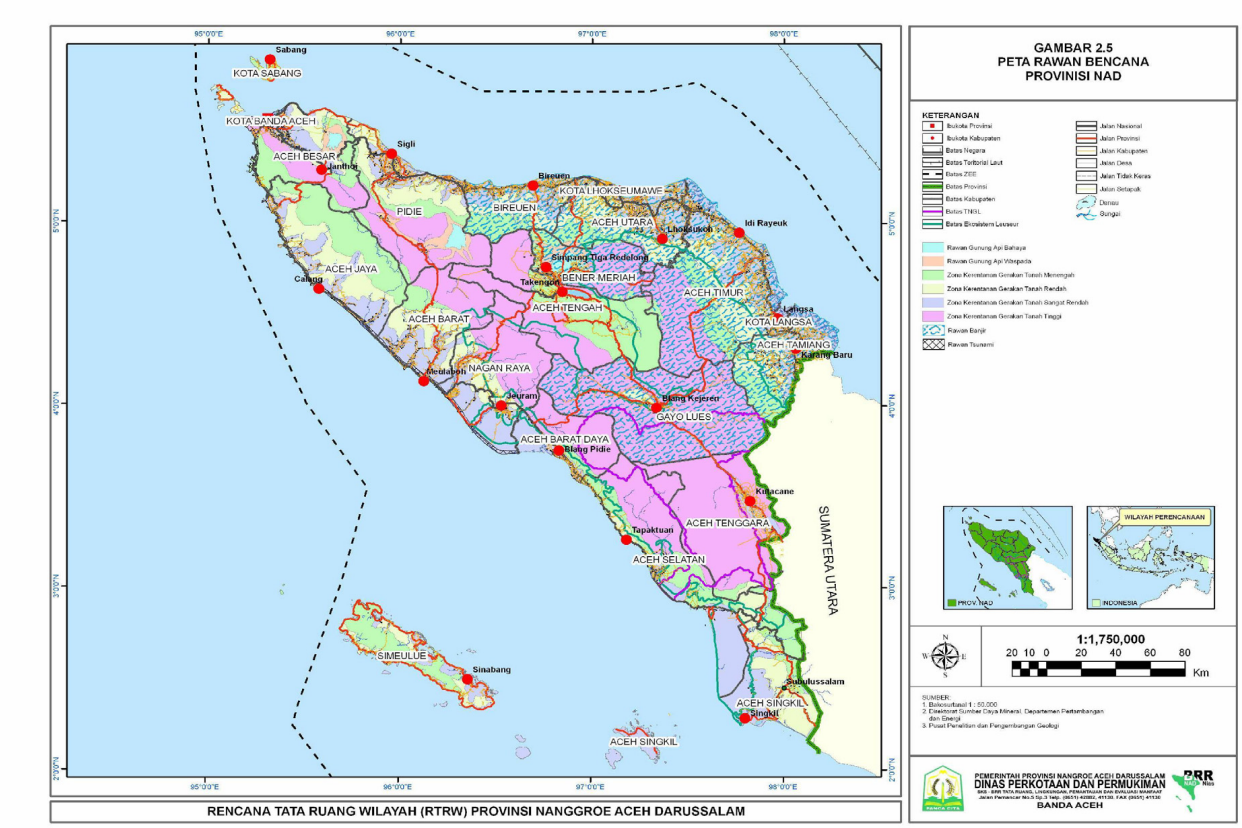
Referring to the spatial plan draft, Disaster Risk Spatial Planning Program has three sub-programs: the arrangement of spatial plan for disaster risk area, the legalization of spatial plan for disaster risk area in the local regulation, and disaster mitigation-based development planning. The arrangement of spatial plan for disaster risk area becomes important since not all part of the areas can be used for development. Some areas must be left as buffer zone and cannot be occupied. To make this spatial plan legally binding, the draft should be legalized as local

regulation (*Peraturan Daerah/Perda*) by the Provincial Council. Without the legalization, the spatial plan will have no legal power at all. The development planning that is conducted also has to be based on mitigation as part of pro-active approach. It includes the increasing the public resilience through information spreading. The spreading can be applied by using mass media (television, radio), pamphlet, education, and training.

It can be said that basically, this program and its sub-programs is a further implementation of zoning regulation mentioned in the master plan. Figure III.5 below shows one of the planning map themes in the NAD spatial plan draft. This map and other planning map themes are also the breakdown of the land use plan described in master plan (Figure III.4) but more detail and specific in its zoning.

Another program reciprocal to the Disaster Risk Spatial Planning Program is Community Control Enhancement Program. This program is not specifically about community participation in disaster management process but more general, it is about community participation in the spatial plan implementation. Since disaster management is part of planning process as argued in Chapter 2, this program is also argued can be classify as disaster management program. Refer to provincial spatial plan draft; the Community Control Enhancement Program aims to involve the community as the development controller. With this program, the community is expected to have an active role in every stage of the development, from the planning stage until the implementation stage. They have a right to object or report if they see misconduct.

Since based on the master plan, the spatial plan draft also shares the same spirit with the master plan. Just like the master plan, the spatial plan draft also suggests to prepare urban areas for tsunami with the combination with keeping away tsunami from the urban areas. However, the last strategy – keep the tsunami away from the urban areas – only implemented in the main cities such as Banda Aceh (the capital city of NAD Province) due to the budget limitation. Building sea walls or rehabilitating the coastal ecosystems (mangrove, coral reef, and sea grass) as green belt needs more budget than only preparing the area for tsunami.



Note: The crossed area along the north and west coast is tsunami risk area.

Figure III.5. Disaster Risk Map of Nanggroe Aceh Province

(Source: BAPPEDA Prov. NAD, 2008)

The other strategy, keep urban area away from tsunami, is not mentioned at all both in the master plan and spatial plan draft. Lack of budget and community rejection is some of the reasons why this strategy is not chosen to be implemented in Aceh. The idea of moving the urban areas to the higher and safer ground seems impossible because it will be very expensive and not suitable with the local value and tradition of Acehnese that always wants to live near to the water. It is always important to remember that traditionally Acehnese is not an agricultural community. Most of the Acehnese lives as fisherman or trader. That is why they prefer to live along the coastal area.

III.5 Concluding Remarks for the History of Aceh Disaster Management in the Provincial Spatial Plan

After tsunami, there is a major change in the disaster management in Indonesia which also influence the Aceh spatial plan draft: the disaster management becomes one of the focuses in the spatial plan. Before, the provincial spatial plan focuses more on economic development as explained in Sub Chapter III.2.

In the spatial plan draft, the government tries to reduce the vulnerability of Aceh by preparing the urban for disaster that can happen. The preparation is not only physically but also by increasing the community resilience. The preparation of the area for disaster is also known as adaptive strategy because it tries to adjust with the physical and social condition of the region.

Beside the preparation strategy, the government also combine it with hazard reduction. Sea walls are built and coastal vegetations (mangrove, coral reef, and sea grass) are planted or rehabilitated so that they can function as coastal green belt.

Chapter 4
Experts' Opinion on Aceh Disaster Management

IV.1 Delphi Method as a Survey Tool

In order to gain the experts' opinion on disaster management in Aceh, Delphi method is used as a tool. According to Linstone and Turoff (1975):

> Delphi may be characterized as a method for structuring a group communication process so that the process is effective in allowing a group of individuals, as a whole, to deal with a complex problem.

In a more simple word, it is a systematic interactive prediction technique to obtain forecasts or opinions from a group of independent experts by asking them to respond to the questionnaires in two or more rounds. The experts chosen for this research come from various government agencies, international organizations, and university with the total of 16 respondents.

These respondents are chosen based on two considerations: their involvement in Aceh disaster management and their knowledge on disaster management in general. The involvement here means the contribution that given in the planning and implementing disaster management in Aceh. The contribution can be directly like that has been done by the local government and some international organizations or indirectly through giving suggestion like what has been done by national government and university research organization. In addition to the involvement, the respondents should have knowledge on disaster management. The knowledge here refers to the experience in planning and implementing disaster management approaches in Aceh or other places.

The list of respondents (in alphabetical order) can be seen in Table IV.1 below.

Table IV.1. List of Respondent

No.	Name	Institution	Position
1.	Ahyoni	UNDP (United Nations Development Program) Indonesia	University Liaison Associate - Disaster Risk Reduction Unit
2.	Asri Wijayanti	UNDP (United Nations Development Program) Indonesia	Liaison Associate – Disaster Risk Reduction Unit
3.	Bahagia	Bappeda Kota Banda Aceh (Planning Board of Banda Aceh Municipality)	Head of Bappeda
4.	Darmawan L. Cahya	GTZ – SLGSR	Spatial Planning Expert
5.	Didik Sugiyanto	Tsunami and Disaster Mitigation Research Centre – Universitas Syiah Kuala (UNSYIAH)	Secretary
6.	Firdaus Agung	Ditjen KP3K – DKP (Directorate General of Marine, Coast, and Small Islands – Ministry of Marine Affairs and Fisheries)	PMO Secretary for Marine and Coastal Resources Management Project (MCRMP)
7.	Firkan Maulana	GTZ-SLGSR	Senior Advisor
8.	Hamdani	Bappeda Prov. NAD (Planning Board of NAD Province)	Head of P2SP
9.	Hanzi	Bappedal Prov. NAD (Environmental Impact Controlling Board of NAD Province)	Head of AMDAL
10.	Iskandar	Satkorlak PBP - NAD (Disaster Management Coordination Unit – NAD	Head of Data Collection Unit
11.	Meyland	GTZ-SLGSR	Environmental Management Specialist
12.	Mohammad Rizal	Dinas Bina Marga dan Cipta Karya Prov. NAD (Bina Marga and Cipta Karya Department of NAD Province)	Head of Spatial Observation and Management Section
13.	Muhammad Dirhamsyah	Tsunami and Disaster Mitigation Research Centre – Universitas Syiah Kuala (UNSYIAH)	Director
14.	R. Pamekas	BRR Aceh dan Nias (Rehabilitation and Reconstruction Agency for Aceh and Nias)	Expert Staff on Infrastructure, Environment, and Maintenance
15.	Soesmarjanto Soesmoko	BRR Aceh dan Nias (Rehabilitation and Reconstruction Agency for Aceh and Nias)	Head of Early Warning System and Disaster Mitigation
16.	T. Buchari Budiman	Dinas Tata Kota dan Permukiman Kota Banda Aceh (Spatial and Sttlement Department of Banda Aceh Municipality)	Head of Dinas Tata Kota dan Permukiman

To structure the communication, just like what Linstone and Turoff state above, there are some stages that should be fulfilled. First, asking or sending a questionnaire to some individuals or experts to gain feedback or answers. The feedback can be directly (e.g. through workshop) or indirectly (e.g. via e-mail).

For this research, the indirect feedback is chosen and it is conducted through e-mail correspondence. Thus, since all the respondents are from Indonesia, the questionnaire is made bilingual (in English and Bahasa Indonesia) to avoid misunderstanding (see Appendix I). Second, anonymous assessment and summary from the previous round is given to the group. The respondents are given opportunity to revise their answer after reading the summary. In this stage, participants are encouraged to revise their earlier answers in light of the replies of other members of the group. The respondents' answers for the first and second round can be seen in Appendix II. And finally, the Delphi process stops based on the pre-defined stop criterion. This pre-defined criterion can be in form of number of rounds, achievement of consensus, or the stability of results. In this research, the process is limited into two rounds due to the time limitation.

Since the scope of research is limited into disaster management policy (Spatial Plan of NAD Province), the Delphi Method that is use here is Policy Delphi. According to Turoff (1975), Policy Delphi is a tool to support decision making but cannot be used as the only source in decision-making. One of the characteristics of this specific method is qualitative analysis, which is used in this research. In this research the experts are asked the level of their agreement-disagreement or satisfaction-dissatisfaction on some statements. Some answers need reasons but some are not. Moreover, they are also asked to give opinion on disaster management approaches which they think is the 'best' with supporting reason.

The results of the survey are presented in Chart IV.1 – IV.8 as follows:

1. From the first question - *Spatial Plan for NAD Province 1993-2008 valid for 25 years and revise every five years. Do you think the revision is needed periodically or only needed when extraordinary event like tsunami disaster happens?* - most of the respondents agree that the spatial plan should be revised regularly rather than only revised if there is an extraordinary event happens. It can be seen from Chart IV.1 below where the number of respondents that strongly agree (level 1) on 'periodically' is more than 'if

extraordinary event happens'. However, they are not totally refusing the idea of changing it in the middle if a disaster took place. Fifty percent of the respondents still strongly agree that to change the spatial plan in special circumstances. So, the changing of spatial plan can be done both regularly and if it is needed.

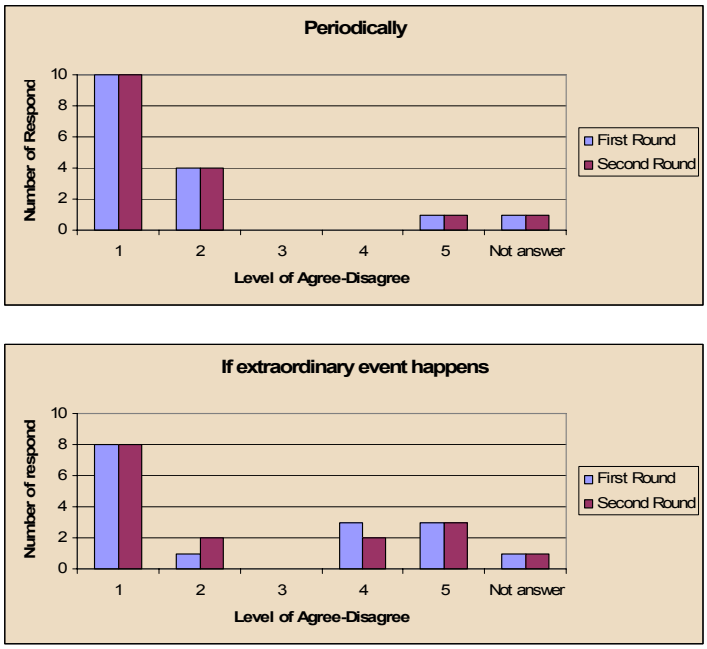


Chart IV.1. The Revision of Spatial Plan is needed periodically or only needed when Extraordinary Event Like Tsunami Disaster Happens?

2. For the second statement - *the previous Spatial Plan for NAD Province (1993-2008) did not give adequate emphasis on disaster management aspect* – more than half of the respondents strongly agree and agree to the statement. The number of respondents that fair and disagree to the statement is only one person for each as can be seen in Chart IV.2. Since the number of strongly agree and agree respondents is more than 75%, it is concluded that the spatial plan pre-tsunami was not accommodate the disaster management.

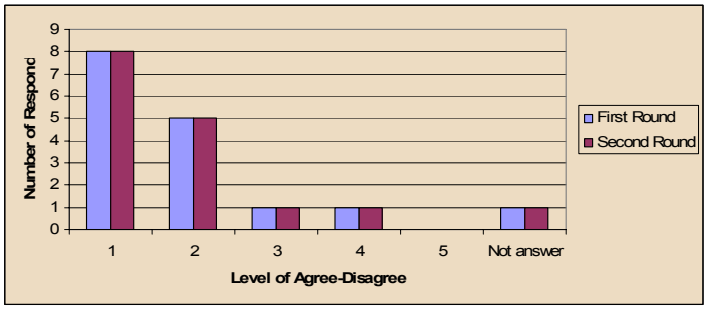


Chart IV.2. The Previous Spatial Plan for NAD Province (1993-2008) did not give Adequate Emphasis on Disaster Management Aspect

3. Almost 90% of the respondents strongly agree that *Draft of Spatial Plan for NAD Province must include disaster management aspect as one of considerations in development planning* (Question 3). The rest, two persons of 16, agree too. So it can be said that all the respondents agree to the statement.

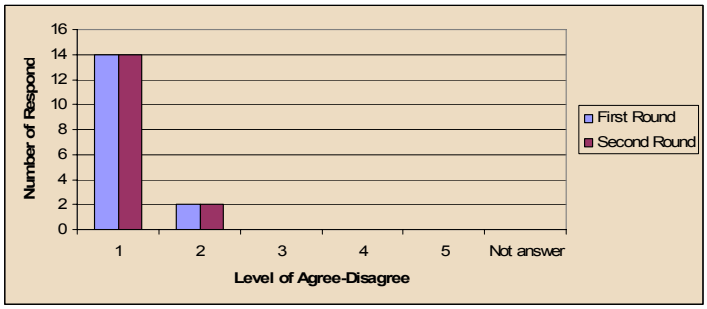


Chart IV.3. Draft of Spatial Plan for NAD Province must include Disaster Management Aspect as one of considerations in Development Planning

4. To the statement that *disaster management applied must be based on local cultural values of the Acehnese as coastal community that prefer to live near to the water*, 11 of 16 respondents are strongly agree. The rest of respondents agree and fair with the statement (see Chart IV.4). Due to the majority answer, it is found that the respondents agree to the statement.

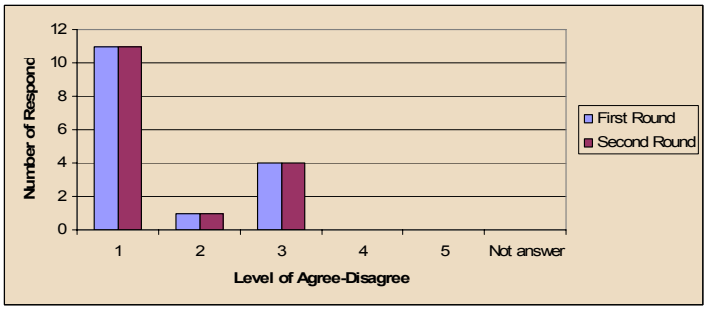


Chart IV.4. Disaster Management Applied must be based on Local Cultural Values of the Acehnese as Coastal Community that prefer to live near to the Water

5. *The present disaster management in Aceh is already combine the pro-active (before disaster: prevention, mitigation, and preparedness) and re-active (after disaster: emergency response and rehabilitation and reconstruction) approaches* is the fifth statement. With this statement, whether there is a shift in disaster management policy after tsunami or not (especially in Aceh) can be known. It turns out that most respondent answers that the re-active approach is more dominant (seven strongly agree plus four agree versus five strongly agree plus five agree). Nevertheless, the answer also shows that the pro-active approach gains less negative[7] respond than the re-active approach. Since the number of positive respond is bigger than the negative or fair, it is concluded that the present disaster management in Aceh is already combine the pro-active and re-active approaches.

[7] In this research it is considered that level 1 (strongly agree/satisfy) and 2 (agree/satisfy) as positive, level 3 as fair, level 4 (disagree/dissatisfy) and 5 as negative (strongly disagree/dissatisfy), and no answer as uncounted.

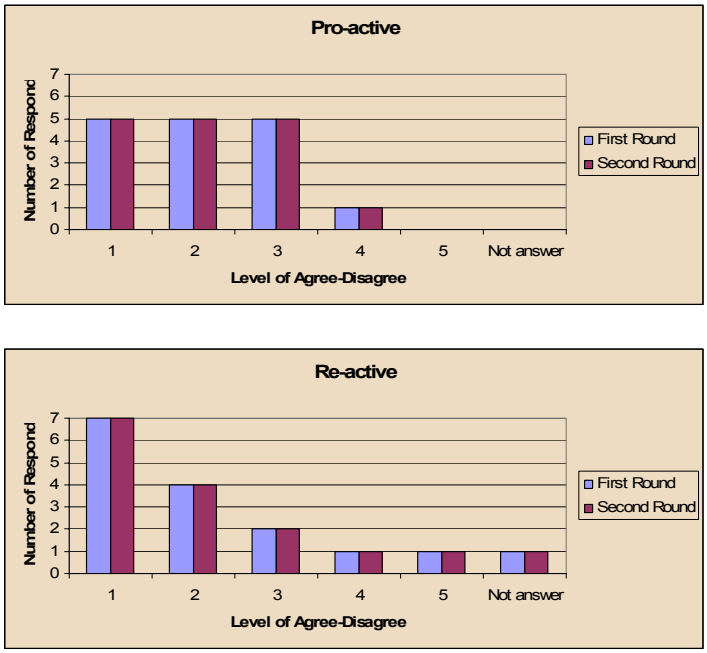


Chart IV.5. The Present Disaster Management in Aceh is already Combine the Pro-Active and Re-Active Approaches

6. The sixth question: *Basically, (tsunami) disaster management approach can be divided into 3 groups: (i) keep tsunami away from urban area, (ii) prepare urban area for tsunami, and (iii) keep urban area away from tsunami. The order of approach that can be applied in Aceh?* For this question, the majority choose ii, iii, i with different reasons (see Appendix 2). In essence, the respondents choose this option because it is the most possible to be implemented in Aceh. The principle is because tsunami cannot be avoided then the urban area that should be prepared to deal with it when it comes. This option is cheaper and reasonable than the other two (keeping the tsunami away from the urban area and keeping the urban area away from the tsunami).

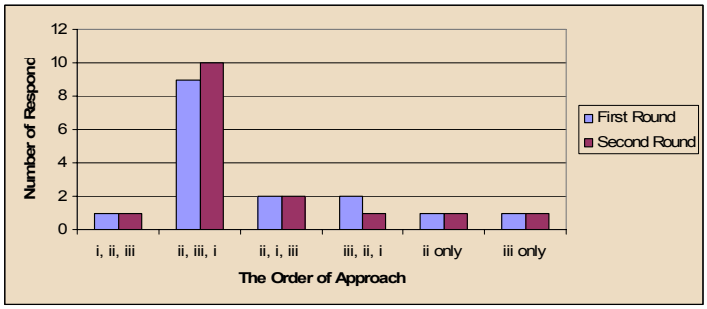


Chart IV.6. Basically, (Tsunami) Disaster Management Strategies can be divided into 3 Groups: (i) Keep Tsunami away from Urban Area, (ii) Prepare Urban Area for Tsunami, and (iii) Keep Urban Area Away from Tsunami; the Order of Approach that can be applied in Aceh?

7. The seventh question - *is the approach that you choose (# 1) being implemented in Aceh?* – is a continuation of the previous question. Five of 16 respondents say NO to the question while the rest say YES. Four respondents that answer NO choose ii, iii, i in the previous question and the other one choose i, ii, iii.

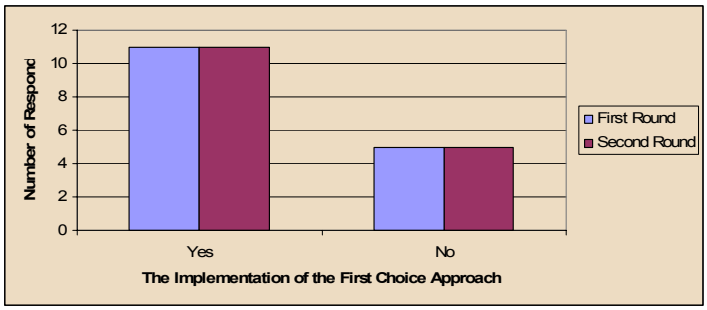


Chart IV.7. Is the Approach you choose (# 1) being Implemented in Aceh?

8. The last question is only for those who answer YES in the previous question. Those who say NO are not counted here and are categorized as NOT ANSWER. So only 11 respondents are counted here. The question is: *If yes, do you satisfied with the result?* The respondents' answer is mostly said satisfied (five people). The rest are strongly agree (one person), fair (three

persons), dissatisfied (one person), and strongly dissatisfied (one person). It is concluded that most of the respondents are satisfied with the implementation of approach that they choose as the 'best' approach for Aceh.

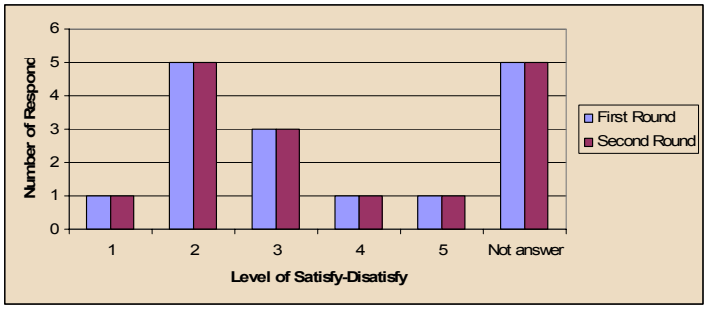


Chart IV.8. If Yes, Do you Satisfied with the Result?

IV.2 Finding and Interpretation of the Dephi Results

By analysing the results of Delphi survey, there are some findings that can be found. Some of these findings are implicitly said in the Delphi questionnaire answer but with the cross check and combination with the data on Chapter 2 and Chapter 3, it will be visible and become clearer. Some others can be seen directly from the questionnaire answers.

To structure the answer, the respondents' are classify into four groups based on their institution. The groups are national government, local government, international organization, and university. The structuring aims to see whether the experts' institution has influence on their answer on Delphi survey.

IV.2.1 NAD Spatial Plan should be revised periodically and if a disaster occurs

This is one of the findings that can be seen directly from the experts' answers in Chart IV.1 above. The chart shows that most of the respondents are

agree more on the periodic revision rather than only because of the occurrence of a disaster.

Looking from the group point of view, the number of experts from international organization and university group who is agree to the findings are more than the government groups. The government groups have positive answer to the periodically revision but half of them refuse to revise the spatial plan in special occasion.

IV.2.2 Previous NAD Spatial Plan did not give adequate emphasis on disaster management aspect

Refer to Chart IV.2, it is clear that most of the respondents agree the previous spatial plan did not give enough emphasis on disaster management. These respondents come from all groups, not only from one specific group.

This statement is also supported by the finding in literature review explained in sub chapter III.2. Exploration in the previous spatial plan only shows that the policy trend at that time focuses more on economic and infrastructure development but without considering the disaster management factor.

IV.2.3 NAD Spatial Plan Draft must include disaster management which based on Acehnese local cultural values as one of the considerations

The basis for this finding is Chart IV.3 and IV.4. From these charts, it can be seen that almost all the respondents answer positively. It seems that the experts from university and national government are strongly agreed to the both statement. On the other hand, the other two groups give four fairly answer on the statement 4. One person from local government and the rest is from international organizations that working in Aceh.

This finding is also supported by the spatial plan draft itself. The spatial plan said that Aceh will be planned and re-developed based on the existing values, norms,

and natural disaster mitigation – including early warning system – to minimize the risk on the future (BAPPEDA Prov. NAD, 2008).

IV.2.4 The present Aceh disaster management already combines the pro-active and re-active approach

For this finding, the respondents' answers are more random than other findings. The separation between government (national and local government) experts and the non-government experts (international organisations and university academicians) does not give a clear distinction of the answer. If the standard that is used only positive, fair, and negative, the government group gives more positive answer towards pro-active approach. On the contrary, the non government group react positively more on re-active approach.

IV.2.5 'Prepare urban areas for tsunami' is the most suitable strategy for Aceh

This is the most critical finding of all because it answers the second research question. Refer to Chart IV.6, most respondents answer the second option as their first choice. This answer is in line with the remarks in Chapter 2 and Chapter 3. So it can be stated that according to theoretical, empirical, and Delphi result, the most suitable strategy for Aceh is by preparing the urban areas for tsunami.

Looking deeper to the respondents' institution, the experts' that choose this option comes from government institutions, both national and local. The rest of respondents give various alternatives even though some of them also choose the same option with the government employers.

IV.3 Concluding Remarks for Experts' Opinion on Aceh Disaster Management

The use of Delphi Method as a tool for gathering the experts' opinion is proven to be useful. By structuring the Delphi result it can be seen that institution where the experts' work can play important role in shaping their opinion towards Aceh disaster management. Experts who are working for the government, both national government and local government, more 'strict' rather than the non-government experts. This opinion may be shaped because as government employers their hands are tight to the government policies and programs. The experts from international organizations and university seem to have more freedom and room to explore and experiment with alternatives. They give more various answers, which is can be caused of different education background and different organization's mission.

The most important remark in this chapter is the experts' opinion on the most suitable strategy for Aceh. Majority chooses the second strategy option; prepare urban area for tsunami, which is in line with the theoretical and empirical review in the previous chapters.

Chapter 5
Conclusion and Recommendation

V.1 Conclusion

From Chapter 2 and Chapter 3, the disaster management strategy – both theoretically and practically in Aceh – can be known. The strategies identify in these chapters are used as the basis to gather experts' opinion on disaster management strategy that is suitable for Aceh by using Delphi Method (Chapter 4).

The theoretical strategies in Chapter 2 are adapted from Oosterberg et al. (2005) classifications on flood management. The strategies rename into:

- keep tsunami away from urban area (tsunami hazard reduction),
- prepare urban areas for tsunami (tsunami vulnerability reduction), and
- keep urban areas away from tsunami (tsunami exposure reduction).

Connecting these strategies with the current trend in the disaster management, 'prepare urban areas for tsunami' is the most popular strategy in the present due to its adaptable characteristics. It can be adjusted to the local condition and very flexible.

For the implementation strategy (Chapter 3), the master plan and the spatial plan draft also adopting the strategy of 'prepare urban areas for tsunami' by increasing the community resilience, building some supporting infrastructure, zoning, and implementing building code. The community resilience is increased through information spreading (e.g. through mass media, education, training, pamphlet, book, etc). The built of escape route, shelter, and early warning system are some of the examples supporting infrastructure. Zoning is conducted through the implementation of master plan that is adopted by the provincial spatial plan. After

being legalized, this provincial plan must be adopted to the lower level of governance, the municipalities and regencies spatial plan, as well as to the more micro plans. According to the Act 24/2007, the more micro plan after spatial plan (RTRW) is detail spatial plan (RDTR) and then building and environment plan (RTBL). If RTRW only speaks zoning in global (provincial/municipal/regency scope), RDTR will give a more detail information on the zoning per district. This information will be detailed more in RTBL which also determine the building code for each zone.

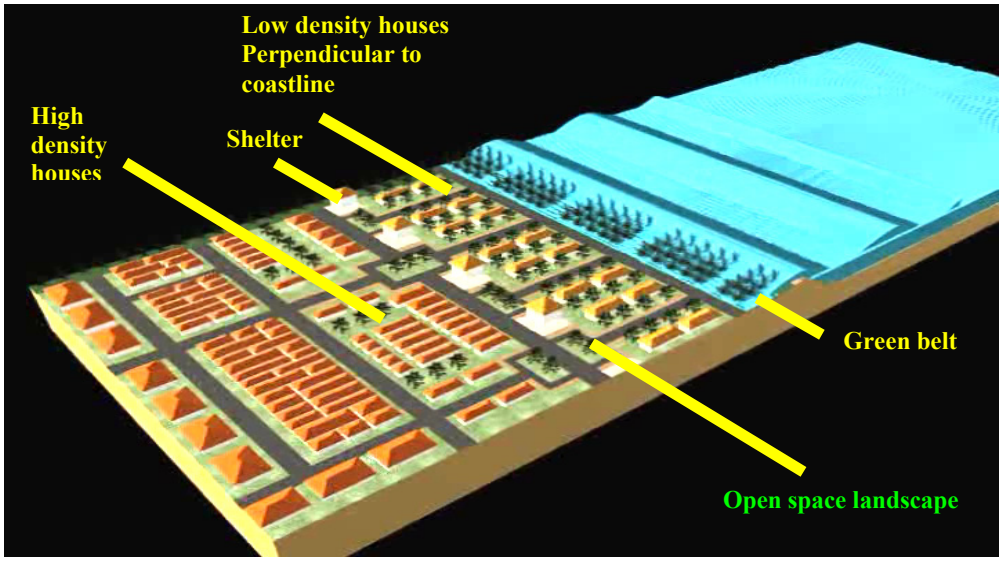


Figure V.1. Zoning Examples for Tsunami-Prone Area

(Source: DKP, 2005 in Pratikto, 2005)

Based on Chapter 2 and Chapter 3, a questionnaire for Delphi assessment is made. With Delphi Method, the experts' opinion about the disaster management in Aceh is explored. Their opinion can be called as and 'ideal' strategy because not only based on theoretical point of view but also based on the implementation in Aceh.

Giving these strategies, respondents of the Delphi survey choose the second strategy as their first choice with the reason (in general) that it is the most possible and reasonable strategy that can be implemented in Aceh. Two of the respondents argue:

> Tsunami cannot be avoided because it is given from natural phenomena. We are the one who should adjust ourselves (avoid, prepare, etc) (translation)

> Geographically the area is on disaster zone that difficult to avoid this. So disaster preparedness planning is important than keep tsunami away

Other strategies seem a little bit hard to be implemented due to some reasons. Government budget and Acehnese culture are some of the reasons. According to one of the respondent:

> It is very expensive to move or fortify the city. It is make sense if some parts of the city are seriously prepared to deal with tsunami disaster (translation)

The budget for rehabilitation and reconstruction of Aceh and Nias now mostly comes from the aids of other countries and also from loan of international donor agency (World Bank, Asia Development Bank, International Monetary Fund). The national budget itself cannot afford the rehabilitation and reconstruction process.

From the cultural side, Aceh is a tribe that lives from trade and fishing. They have a close relationship with water. Moving them to the higher ground is like cutting their legs. That is why the third option even though theoretically very 'ideal' cannot be implemented in the Aceh tsunami case. According to one of the respondents, the third option is:

> …. the safest and the cheapest pro-active effort for long term investment (translation)

For the first strategy, policymaker choose it as a possible option to be implemented in Aceh but the experts in the Delphi survey are not agree with that. In general, they say that this is only temporary solution that not solving the problem at all. Plus, it is also more expensive than the second option even though cheaper than the third option.

> For developed urban area in the coastal area such as Banda Aceh minicipality, the approach that most likely to be done is anticipating if tsunami happens again by building dykes, escape hill, escape road, escape building, alarm, etc……(translation)

Some experts in the Delphi survey also utter their un-satisfaction about disaster management conducted in Aceh now. These complaints emerge because the local government does not implement the zoning regulation strictly. The respondents say that the implementation is not suitable with master plan:

> …the tsunami spatial blue print (PERPRES no. 30/2005) is not implemented fully, many coastal urban areas built too close to the beach (translation)

> …tsunami anticipation efforts are not implemented well, for example un-robust dykes development, un-continue escape road etc. Moreover, more and more people build their houses along the coastline which is un-secure area

Other says that the implementation is not conducted continually:

> It has not conducted continually (translation)

While some others give budget and time as the reason:

> …it needs process/time to achieve 'awareness' in the society (translation)

> The implemented approach is already good, but because of the limitation of time and budget there are still some activities that have not been conducted yet (translation)

To simplify the comparison between theoretical, practical, and experts' opinion on disaster management, a summary is presented in Table V.1 below:

Table V.1. Compared Strategy

	(i)	**(ii)**	**(iii)**
Theoretical Strategy - *Reduction* - *Human vs nature*	Keep tsunami away from urban area *Hazard reduction* *Human over nature*	Prepare urban area for tsunami *Vulnerability reduction* *Balance between human and nature*	Keep urban area away from tsunami *Exposure reduction* *Nature over human*
Implementation Strategy - **Pre tsunami** - **Post tsunami**	 No Yes	 No Yes	 No No
Experts' Opinion	Yes (third choice)	Yes (first choice)	Yes (second choice)

Based on the compared strategy above, it can be concluded that the most suitable strategy to be implemented in Aceh is the second option: **prepare urban area for tsunami**. This strategy aims at vulnerability reduction by concerning both human

and the nature. “Live together with disaster” is the best way to describe this strategy.

The advantage of this strategy is its flexibility because it can be adjusted to the physical, value and culture of the area. It is very important so that the strategy can be implemented fully and reaches it goals. Since this strategy is a compromise between man and his nature, the development planning can be directed to the safer zone through spatial zoning. By doing this, even though the disaster takes place, the losses and damages can be reduced into minimal. For Aceh, this strategy must consider Aceh physical constraint, which is located in a lowland area. Almost all of its urban area located along the coastline. A strict zoning and building code implementation must be applied. This strategy also must be adjusted to the local culture of the Acehnese. For example, since the majority of Acehnese cannot live far away from the water (sea, river) than the strategy must include this aspect as one of the considerations in making the zoning. The houses built near to the water must be adjusted to the area constraints too, for example by building them in the shaped of *rumah panggung*. This *rumah panggung* is Aceh traditional house which is built with floor one or two meters above the ground. Its wall usually made from wood. It is already been proved that most of this traditional houses survived from the tsunami due to its ergonomic shape and flexible material rather than modern houses made from concrete. The tsunami waves which come can pass the house with minimal damage.

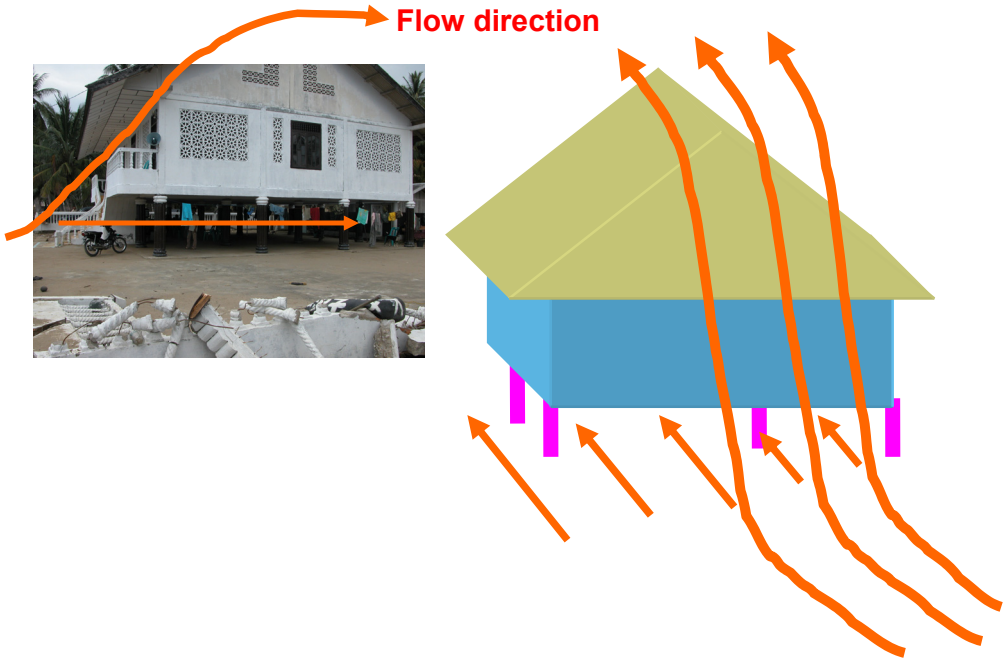


Figure V.2. Lesson-Learned from Rumah Panggung in Muara Batu, North Aceh

(Source: Pratikto, 2005)

Some compromises and adjustments maybe needed in the disaster planning process but as long as it is for the safety reason, surely it can be done. Public participation is also urgently needed in the development and disaster planning process.

However, the 'prepare urban area for tsunami' strategy cannot be implemented alone without the help of the other two. These three strategies must be combined to reach maximum goals, both for short and long term. For example, 'prepare urban area for tsunami' needs to be combine with 'keep tsunami away from the urban area' now because of the limitation of budget. However, for long term disaster management, the best way is by combining it with 'keep urban area from tsunami'. This will take a long time to process and maybe cannot be implemented fully due to some compromises with all related stakeholders.

The disaster management process should not be stop at one point only. It should be continue because the disaster threat itself never stops. For Aceh case, the pro-active and re-active approaches are conducted together now. The re-active

approaches will be stopped in the near time but the pro-active approaches must be continued and never stop just like the cycle in Figure I.1. More implementation of pro-active approach is better than only react after a disaster happens (re-active).

V.2 Recommendation

To complete the conclusion above, there are some points that should be considered in order to implement the disaster management strategy in Aceh. These remarks are also important as guiding information for future research.

Firstly, using the big influence of Islamic value in Aceh. Since the value of Islam has a big influence in the Acehnese daily live, planners can use this as an advantage in implementing the disaster management approach and strategy by giving information to the religious figures. If the religious figures are already understood about the disaster management approach and strategy, they can spread it to the lay people. It will be more effective than if the planners has to share the information themselves because religious figures have a high position in Acehnese society and their words are believed by the community.

Secondly, the arrangement of disaster management must include as much as people to gain more input (collaborative planning approach). Without it, the implementation will not be as smooth as it should be since there will be some parties that feel neglected and will not be cooperated. These conflicts must be minimised.

Thirdly, reminding the Acehnese to their local value and wisdom. Mostly Acehnese now are already forgot these values and wisdom. For example, about *rumah panggung* as explained in the conclusion sub chapter. The Acehnese elders must built the houses in that way due to some reasons that just be realized after tsunami. Another example is about local wisdom. Simeulue Island, a small island in the south of Aceh and located near to the epicentrum of the earthquake, only loss few people on the tsunami. They survived because they still believed on an

old story from their elders. The story said that if there is a big earthquake and then the sea level retreat until they can see the fishes and reefs it means a very high tide will come (tsunami) and they must run to the higher ground. DKP (2005) adopted this local wisdom in one of the Marine Science Series. This series are made in form of comic so it will be easier to understand by the children and illiterate people.

The last, for future research, a broader scope of research by involving some lesson-learned from other countries in the literature review is suggested. It will be interesting since every country has their own uniqueness in their physical and socio-cultural characteristics.

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