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An Example of Methodological Triangulation

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ACRONYMS

AGDC	Aceh Geospatial Data Center
ALOS	Advanced Land Observing Satellite
BAPPEDA	Regional Development Planning Agency
BAPPENAS	National Development Planning Agency
BIG	Geospatial Information Agency
BNPB	National Disaster Management Agency
BMKG	Meteorology, Climatology and Geophysics Agency
BRR NAD-Nias	Nanggroe Aceh Darussalam-Nias Rehabilitation and Reconstruction Agency
BSPR	Home Improvement Social Assistance
CPT	Cone Penetration Test
CSRRP	Community-Based Settlement Rehabilitation and Reconstruction Program
Depkes	Ministry of Health
DRI	Disaster Recovery Institute
ERS	European Remote Sensing
ESRI	Environmental Systems Research Institute, Inc
FAO	Food and Agriculture Organization
GCP	Ground Control Points
GTZ	German Technical Cooperation Agency
ICRAF	International Center to Research in Agroforestry
IFRC	International Federation of Red Cross and Red Crescent Societies
IOM	International Organization for Migration
IRP	International Recovery Platform
IRS	Indian Remote Sensing
ISDR	United Nations International Strategy for Disaster Reduction
ITB	Bandung Institute of Technology
ITS	Sepuluh Nopember Institute of Technology
IUCN	International Union for Conservation of Nature
JICA	Japan International Cooperation Agency
KPKT	Ministry of Urban Wellbeing, Housing and Local Government

LESA	Land Evaluation and Site Assessment
MOSTI	Ministry of Science, Technology and Innovation
MREP	Marine Resource Evaluation and Planning
NGO	Non-Governmental Organizations
NRCS	Natural Resources Conservation Service
NSW	New South Wales Government
Pemko	City Government
PennState	Pennsylvania State University
PP RI	Government Regulation of the Republic of Indonesia
PU	Public Works
Puslitanak	Soil and Agro Research Center
RI	Republic of Indonesia
Ristek	Research and Technology
RMS	Root Mean Square
RTH	Green Open Space
SIM-C	Spatial Information and Mapping Centre
SPNB	National Housing Corporation
SPOT	Satellite Pour l'Observtion de la Terre
SRTM	Shuttle Radar Topography Mission
TDMRC	Tsunami and Disaster Mitigation Research Center
UN	United Nations
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UN-HABITAT	United Nations Human Settlements Programme
UNIFEM	United Nations Development Fund for Women
UNIMS	United Nations Information Management Service
UPLINK	Urban Poor Linkage
URISA	Urban and Regional Information Systems Association
USDA	United States Department of Agriculture
USGS	United States Geological Survey
UU RI	Law of the Republic of Indonesia
WCED	World Commission on Environment and Development
WWF	World Wildlife Fund

FOREWORD

Sociologists use many different research methods when conducting sociological research. This book will describe how to combine quantitative with qualitative methods in a research project. The approach of combining both methods is called ‘Triangulation’. In the social sciences, triangulation is often used in combining several research methods to study one subject. Also known as “cross-examination” or “mixed method” research, triangulation is very useful in capturing more detail, minimizing the effects of bias and ensuring a balanced research study, no matter how big or small that study may be. Triangulation gives a more detailed and balanced picture of the situation. There are overlaps in practice, which are fair, being complementary at times and contrary in others. This has the effect of balancing each method out and giving a richer and hopefully truer justification.

This triangulation approach is detailed through a real research project. For this book, the ‘Triangulation Strategy’ will be demonstrated by using it throughout the whole process and implementation of a project. An evaluation study of the suitability of land for development has been conducted in Banda Aceh, Indonesia. It is based on the physical environment, taking into account the risk of disaster and the social implications for settlement areas. The study aims to identify the basic physical environment for the settlements. It also identifies and confirms the locations of settlement areas that are prone to disaster. Furthermore, it also analyzes the residents’ awareness level, their reasons and perceptions in those high-risk residential areas. Finally, the research results make it possible to recommend a proposed plan to reduce the risks of disaster. The system of land suitability evaluation uses that adopted by the Food and Agriculture Organization (FAO), processing and analyzing spatial data using a Geographic Information System (GIS). Analysis of results on the physical environment showed that the whole area of Banda Aceh is suitable for residential purposes. However, based on the disaster analysis, it is found that 54% of the total area of Banda Aceh is not suitable for settlements (being risky), and 29% of this is a very high-risk area. The unsuitable areas became the basis for the social implications study and for a planning analysis of the integrated land usage. Social sampling analysis was done with a random sample of 414 respondents.

The social implications results showed that the entire society is positively aware of the risks and impacts of living in the disaster-prone areas. The people have strong reasons and justifications for staying in the areas prone to disaster. The reasons include their tightly knit relationships with current neighbours, the difficulty of bearing the extra costs if they decided to move, the religious belief that disaster will happen wherever you are at any time and that therefore the current area poses no problem, and the issue of inheritance. The public perception analysis showed that the people have a high perception of the government's foundation and support. The suitability of residential areas based on the physical environment and the perception of the community becomes the basis for the planning of such areas in order to reduce the impact of disaster. The protection strategies include the building of protective sea walls, preservation of greenbelts, and terracing as suited to local natural conditions. The building of escape buildings and evacuation routes is also recommended in the residential areas. The escape buildings are recommended to be built in mosques and schools, taking into account the religious belief that the mosque is the best place to seek shelter when it was previously not damaged in the 2004 tsunami that hit Aceh. In some areas, the relocation of residential areas to safer places should be made a priority in the long term for the purpose of reducing the risk of disaster in the future.

The study was conducted from the end of 2012 until 2015 at the School of Housing, Building and Planning, Universiti Sains Malaysia and Syiah Kuala University in Banda Aceh, Indonesia. The field research was conducted in Banda Aceh, Indonesia. Soil and water sample processing was carried out in the Soil Laboratory, Faculty of Agriculture, University of Syiah Kuala, Aceh. Analysis of the spatial data generated in the research by GIS and Remote Sensing was done by the University of Syiah Kuala, Banda Aceh and the School of Housing, Building and Planning, Universiti Sains Malaysia.

The research required materials and equipment. The materials used in this study are the base map, thematic maps and satellite images of Banda Aceh, and there was a materials laboratory to analyze soil samples. A special tools laboratory was also used to measure the variables of soil and water (Appendix 1). Additionally, the project used stationery, computers, scanners, printers, GPS (Global Positioning System), cameras, and software such as ArcGIS, Excel, Visio, Auto CAD, Photoshop and SPSS. The tools and materials used were obtained from USM (Universiti Sains Malaysia) and UNSYIAH (University), Banda Aceh.

This book is carefully organized in its methods and presentation of written material to explain the steps made to combine the two popular methods of undertaking a research project. Actual research projects are presented here to give a real sense of combining both methods. Such methods of writing are expected to provide guidance to prospective researchers doing research by the same methods.

CHAPTER ONE

INTRODUCTION

This book consists of seven chapters. Chapter One is the introduction to the book. Chapter Two describes the literature and the overview obtained from reviewing journals, collections of articles, reports, textbooks and other resources related to the research. This chapter starts with Banda Aceh as the study location: its history, physical conditions, climate and population structure.

Chapter Three contains the conceptual framework and methods used to answer the research question, the variables used, the methods and techniques of data analysis, as well as the analyzer used. This chapter details the strategy of using the triangulation approach. The next chapters are the result of interpretation, research and data analysis. The theme is based on the research objectives. Chapter Four describes the conformity assessment of land for settlement based on the physical aspects of the environment. Chapter Five identifies locations for the placement of security measures against a potential disaster such as occurred in Banda Aceh. Chapter Six describes and discusses the social implications of people living in areas that are not suitable as settlements.

Chapter Seven summarizes the findings as described in Chapters Four, Five and Six. This chapter also proposes a settlement plan that is appropriate to reduce the risk of disaster.

The study was an evaluation of land suitability for settlement in Banda Aceh, Indonesia, taking into account physical environment, risk of disaster and social implications. This research revealed the problems, which were mainly in answering questions on the current suitability of land for settlements in Banda Aceh after the tsunami of 2004. The study was felt necessary by the authorities, as it relates to the safety of residents and investment in the short and long term. It considers the physical factors of the environment, taking into account the type of disaster likely to occur. The studies continue to take into account the social implications of people living in areas not suitable for resettlement after a disaster such as a tsunami and an earthquake. The social implications are revealed by the views, perceptions and factors that affect the local community who live in that place. The questions answered were about the dominant factors for the comfort of the people. In addition the project produced a model for future disaster reduction in Banda Aceh.

In terms of history, Banda Aceh is a city in the State of Aceh within the Republic of Indonesia. Aceh is a special and unique country with a situation of unrest, political crisis and conflict. In addition, the earthquake and tsunami in late 2004 make Aceh an interesting field for international researchers to study, especially for research related to tsunami disasters (Pemko-Banda-Aceh, 2013a). Banda Aceh was chosen for this study because the area has suffered a large-scale disaster, with multiple processes and stages of reconstruction. The research work was best done over there because there are many phases of development: the initial process, the semi-finished and the occupied settlement, and some have reached the perfect stage of a mature neighbourhood. Banda Aceh is the largest city and the capital of Aceh. On top of that, the level of destruction as a result of the earthquake and tsunami was more than 50 percent (Takahashi et al., 2007).

In terms of geography, Banda Aceh is located at 4° 41' 42.486" N, 96° 44' 57.836" E, which is about 149 km north-west of Meulaboh, Aceh West (Shofiyati et al., 2005; USGS, 2012). The earthquake was the fourth strongest in the world recorded since 1900 (Atjehpost, 2014; CNN, 2004; Hermansyah, 2012; USGS, 2012). Banda Aceh is an archipelagic state. An archipelagic state is an area that is influenced by an oceanographic environment (New South Wales Government, 1990; Sala, Harrison, and Caldeira, 2015). An oceanographic area is where sea and land ecosystems meet (Farhan & Lim, 2012; Hartadi, 2001). Natural geographical conditions are that the area is surrounded by unbroken ocean, and is deeply influenced by the sea and various environmental events. Overall, Aceh is the most western coastal area in Indonesia, overlooking the Indian Ocean. On December 26 2004 USGS recorded an earthquake of magnitude 9.1 on the Richter scale occurring off the west coast of northern Sumatra, Indonesia. The Global Seismic Network said that the earthquake was at a depth of 30 km below the Indian Ocean (Chlieh et al., 2007; Lay, 2015; USGS, 2012).

The earthquake caused cracks in some of the Indian Ocean sea bed and the tsunami that resulted moved across the Indian Ocean in just a few hours (Shofiyati et al., 2005). The overwhelming effect of the tsunami wave can be seen along the west coast of northern Sumatra, the province of Aceh. As a result of the wave, more than 220,000 people died or were lost to the sea. The Indonesian National Board for Disaster Management recorded a total of 124,068 deaths and 112,343 people missing. The tsunami also caused damage to 120,000 hectares of coastal areas due to the influx of the sea (BNPB, 2005; Matsumaru, Nagami, & Takeya, 2012).

Based on geography also, Banda Aceh is located at 4° 41' 42.486" N, 96° 44' 57.836" E. Banda Aceh's position and orientation are shown in Figure 1.2. Banda Aceh has an area of ± 6136 ha. or 61.36 km^2 and its borders are as follows:

a. The northern part borders the Straits of Malacca;
b. The south side has borders with the subdistricts of Darul Imarah and Ingin Jaya (Aceh Besar);
c. On its west side it has a border with Peukan Bada subdistrict (Aceh Besar);
d. The eastern border is with subdistricts Barona Jaya and Darussalam (Aceh Besar).

The City of Banda Aceh consists of nine subdistricts and 89 villages. Detailed information is as shown in Table 1.1, Figure 1.1 and Figure 1.2.

In general, in terms of their physical condition, lands in Banda Aceh are alluvial, consisting of layers of gravel, sand, and clay. In coastal areas, the ground is regosol and alluvial, resulting from the erosion of soil particles deposited by water or surface flow at a low level. In some coastal areas, such as along the Kreung coast, precipitation and curvature of the river occur. Deposition by local surface run-off produces barrows in certain parts, which eventually form a kind of alluvial soil (Puslitanak, 2000; Pemko-Banda-Aceh, 2012b). The types of soil in Banda Aceh is as shown in detail in Figure 1.3.

In terms of topography, Banda Aceh ranges from 0 to 6 meters above sea level, with an average height of less than 5 meters above sea level. The (physiographic) surface form is relatively flat with a gradient of between 0 and 2 per cent. The surface form is such that it is prone to flooding and impoundment of water, especially during high tides and sea surges.

In terms of its geology, as shown in Figure 1.4 Banda Aceh is located on alluvial sediments (Badan-Geologi, 1981). The deposits have not been compacted since the Holocene and have a loose structure. Banda Aceh is surrounded by Tertiary and Holocene rocks. The southern part of the west of Banda Aceh is dominated by carbonate rocks, while the eastern half is dominated by volcanic rocks. Both types of rock are the bedrock of Banda Aceh. Alluvial deposits which cover the city of Banda Aceh have not resulted in geological structures such as displacement and fracture, but Banda Aceh is affected by activity in the flanking geological structures.

Table 1.1: Subdistricts and Villages in the City of Banda Aceh (Pemko-Banda-Aceh, 2012a)

No.	Subdistrict	Villages
1	Baiturrahman	Ateuk Deah Tanoh, Ateuk Jawo, Ateuk Munjeng, Ateuk Pahlawan, Kampung Baru, Neusu Aceh, Neusu Jaya, Peuniti, Seutui dan Sukaramai
2	Banda Raya	Geuceu Ineum, Geuceu Kayee Jato, Geuceu Komplek, Lam Ara, Lam Peuot, Lamlagang, Lhong Cut, Lhong Raya, Mibo dan Penyeurat
3	Jaya Baru	Punge Blang Cut, Geuceu Meunara, Lamteumen Timur dan Lamteumen Barat, Bitai, Empeerom, Lampoh Daya, Lam Jamee dan Ulee Pata
4	Kuta Alam	Peunayong, Laksana, Keuramat, Kuta Alam, Beurawe, Kota Baru, Bandar Baru, Mulia, Lampulo, Lamdingin dan Lambaro Skep
5	Kuta Raja	Lampaseh Kota, Merduati, Keudah, Peulanggahan, Gampong Jawa dan Gampong Pande
6	Lueng Bata	Lamdom, Cot Mesjid, Batoh, Lueng Bata, Blang Cut, Lam Paloh, Sukadamai, Panteriek dan Lamseupeung
7	Meuraxa	Alue Deah Teungoh, Asoe Nanggroe, Baru, Blang, Blang Oi, Cot Lamkueweuh, Deah Baro, Deah Glumpang, Lambung, Lamjabat, Lampaseh Aceh, Pie, Punge Jurong, Punge Ujong, Surien dan Ulee Lheue
8	Syiah Kuala	Ie Masen Kaye Adang, Pineung, Lamgugob, Kopelma Darussalam, Rukoh, Jeulingke, Tibang, Deah Raya, Alue Naga dan Peurada
9	Ulee Kareng	Pango Raya, Pango Deah, Ilie, Lamteh, Lam Glumpang, Ceurih, Ie Masen Ulee Kareng, Doy dan Lambhuk

Figure 1.1: Map of Study Area Orientation (AGDC, 2013; BIG, 2013; ESRI, 2013)

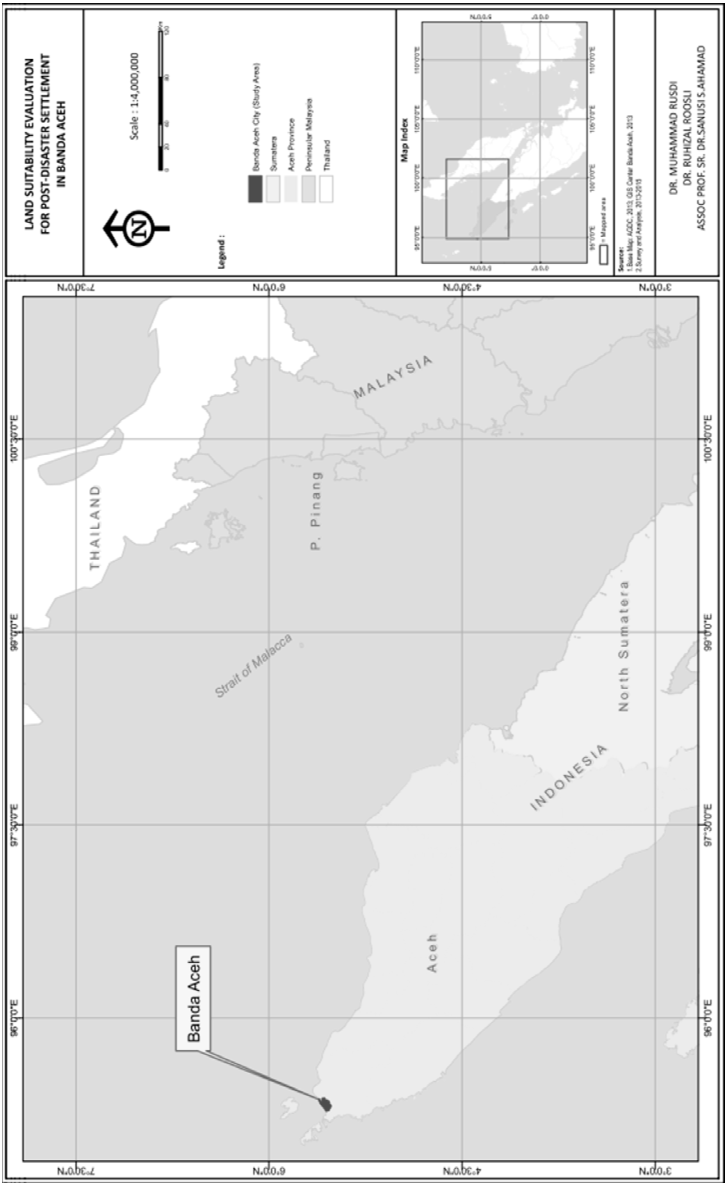


Figure 1.2: Map of Banda Aceh City Administration (AGDC, 2013; GIS-Center-Banda-Aceh, 2013)

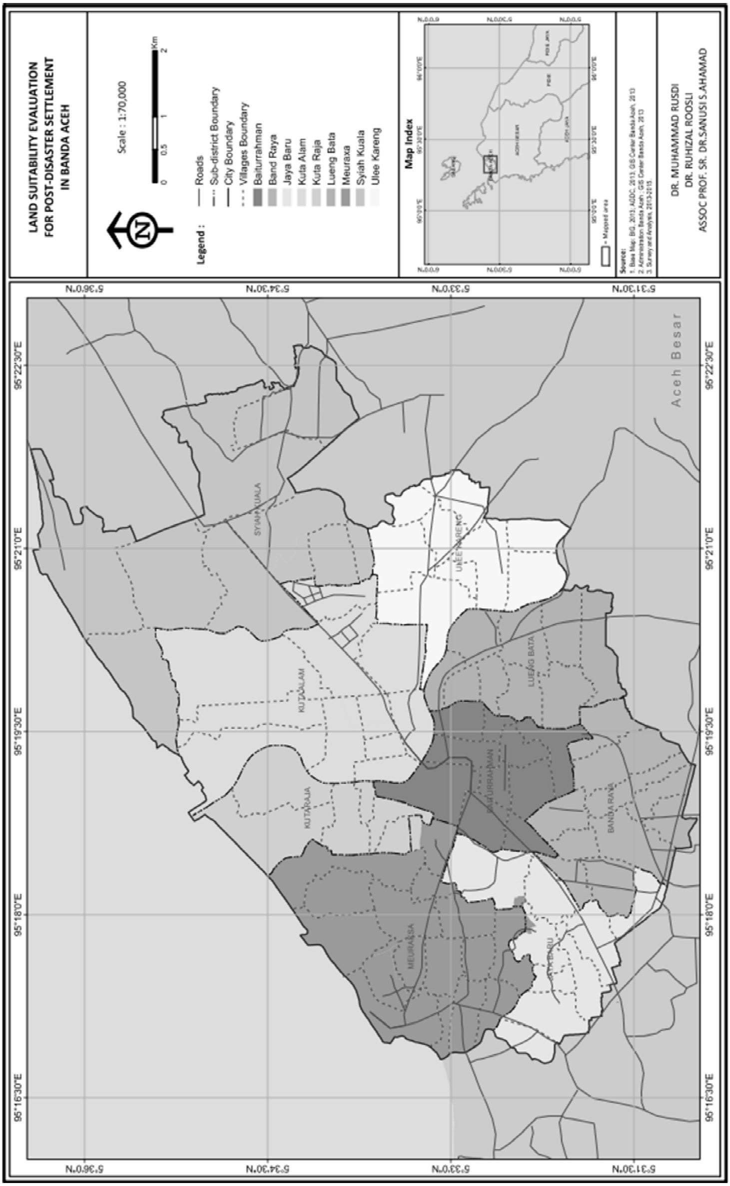


Figure 1.3: Map of Soil Types in Banda Aceh (Puslitanak, 2000; AGDC, 2013; GIS-Center-Banda-Aceh, 2013)

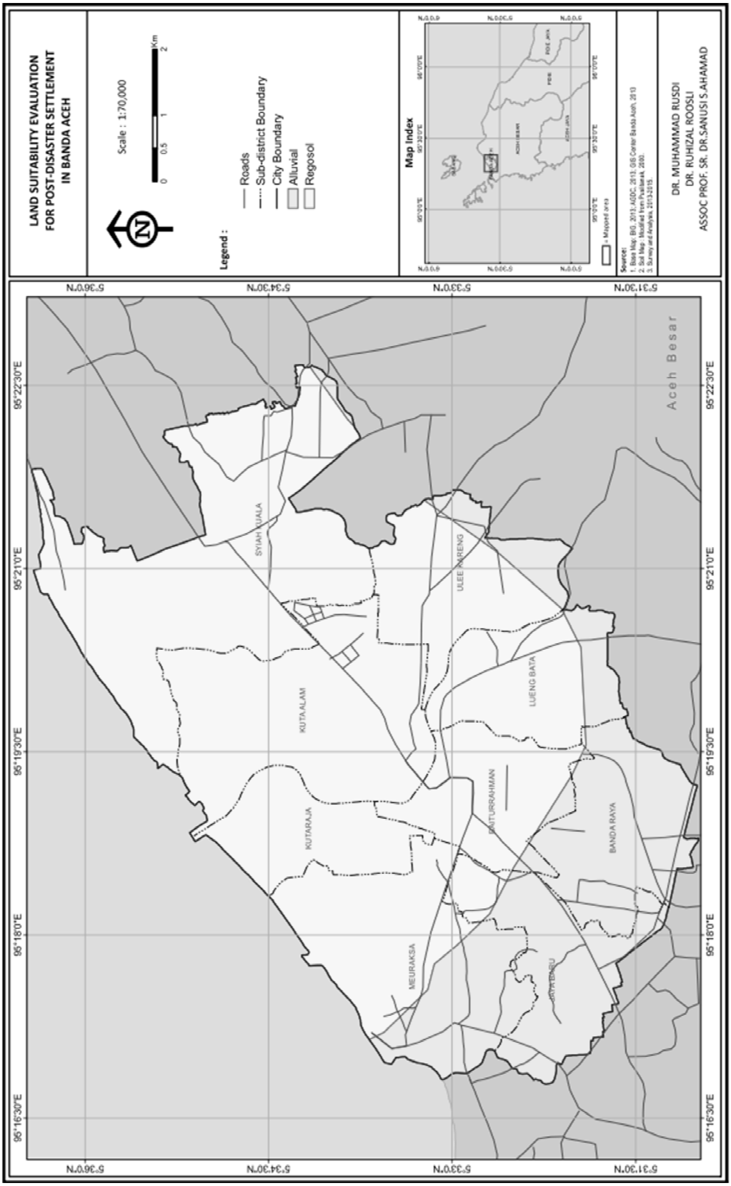
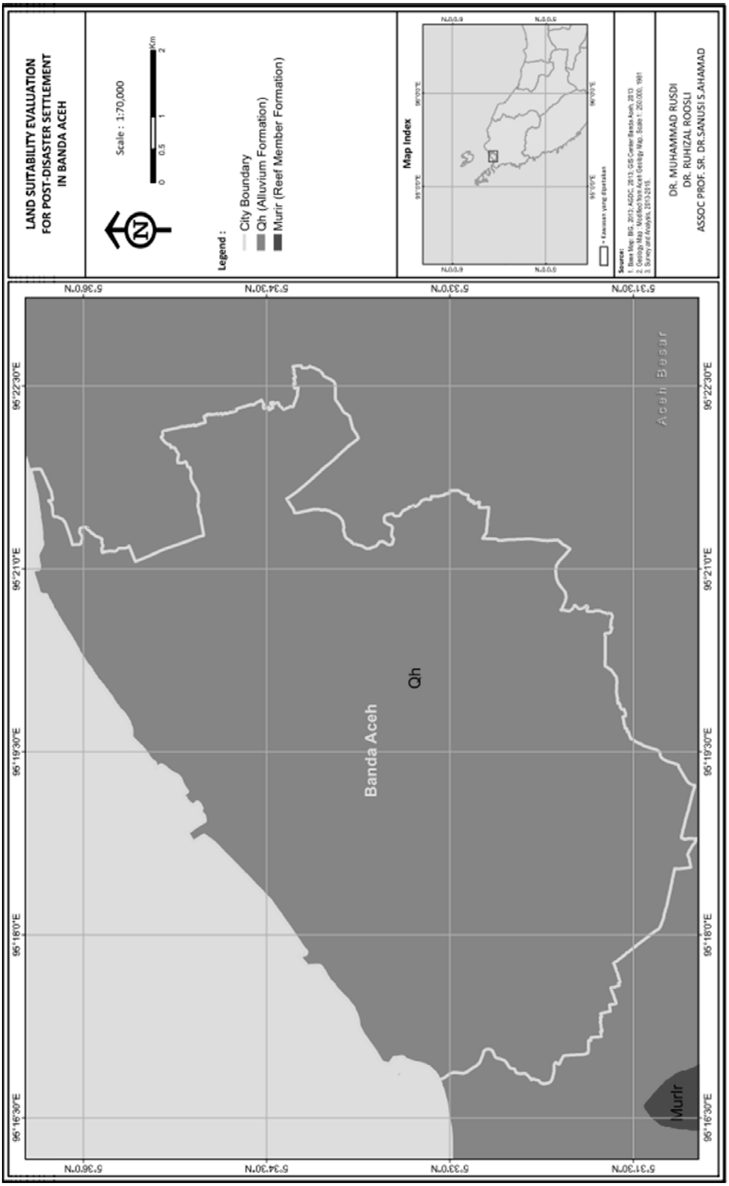


Figure 1.4: Map of Banda Aceh Geological Area (Badan-Geologi, 1981)



The Great Sumatran fault lies along the Sumatra Island from Semangko in Lampung to Pulau Weh, and is connected to the Andaman Islands. Analysis of geological spatial displacement is as shown in Figure 1.5. The western part of Aceh is also within a subduction zone of the Eurasian Plate and the Indo-Australian Plate. The movement of geological structures has affected Banda Aceh but was blocked by the strong lithology of its sediments.

According to data from the meteorological station in Blang Bintang from 1986 to 2003, it was found that the average monthly air temperature in Banda Aceh is 25.5ºC to 31ºC, with atmospheric pressures between 1008 to 1012 millibars. The most frequent rainfall in Banda Aceh occurs in August, totaling 245 mm. The lowest rainfall occurs in June, i.e about 3 mm. Total rainfall during the year is 1065 mm, with a monthly average of 88.75 mm. The average monthly humidity is 74.6 percent over a year (Pemko-Banda-Aceh, 2013c).

In the dry season rainfall is less than 60 mm, while in the rainy or wet season rainfall exceeds 100 mm. According to Schmidt and Ferguson (1951), the type of climate is determined by comparing the average of the month (BK) with the wet (BB) coefficient of 100 percent. The result of this comparison is that the Q value of 100 percent was obtained, which showed that the type of climate in the study area is relatively dry (type E).

Hydrological conditions in Banda Aceh are heavily influenced by the sea and by the mountains. This can be seen in the ground water, which can be salty, brackish or fresh. Areas that have salty ground water are located in the north and east of the city towards the city centre. This area overlooks the Straits of Malacca. Brackish water exists in the central part of the city from east to west, while fresh groundwater is present in the southern part of the city, namely in the area near the Bukit Barisan mountains (Pemko-Banda-Aceh, 2012b). Spatial analysis of hydrological conditions, which include water and river sources, gives results as shown in Figure 1.6.

Areas of construction (built-up areas) cover 4877.2 hectares (ha) or 79.48 per cent of the city, while the area with no construction is 1258.8 ha (20.52%). Areas of construction include residential areas, offices, public service offices, business centers, educational centers, health centers, tourist centers, ports and places of worship. Conversely, areas that are not built-up include parks, city forests, forest reserves, cemeteries, swamps and ponds (Pemko-Banda-Aceh, 2013d). Detailed land use can be seen in Figure 1.7.

Figure 1.5: Map of Semangko Fault in Banda Aceh (AGDC, 2013; BIG, 2013; NGA & NASA, 2013)

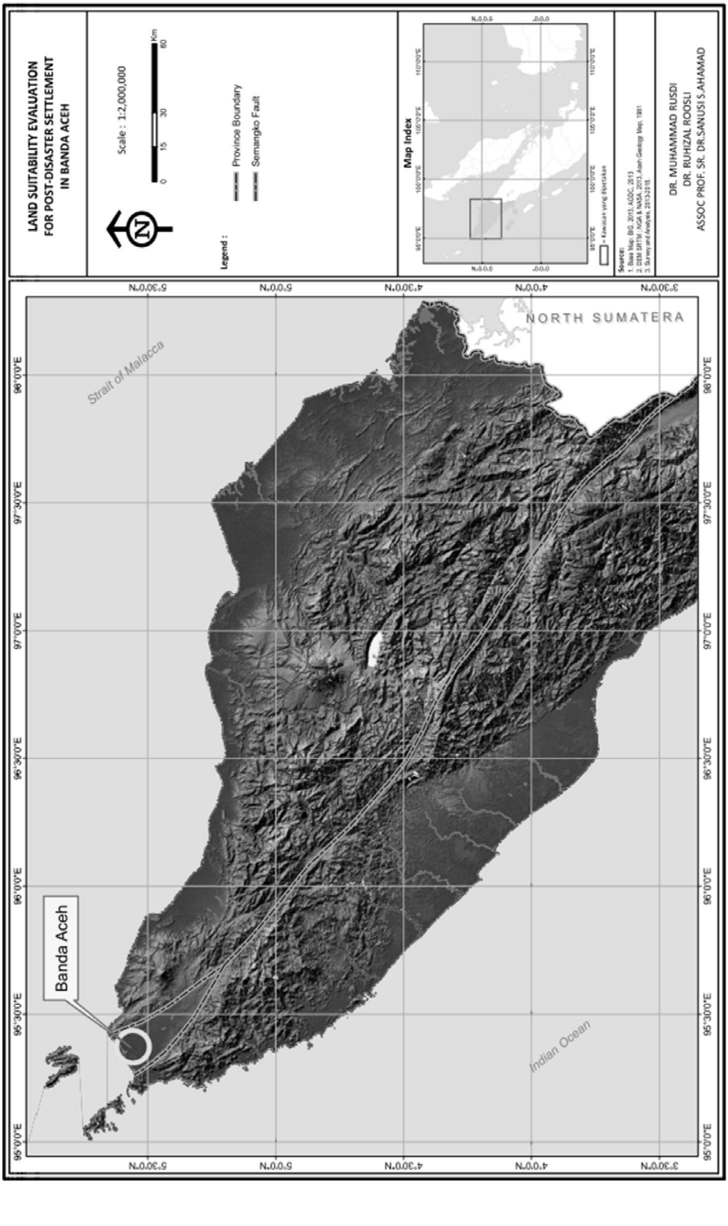


Figure 1.6: Map of Hydrological Conditions in Banda Aceh (AGDC, 2013; GIS-Center-Banda-Aceh, 2013)

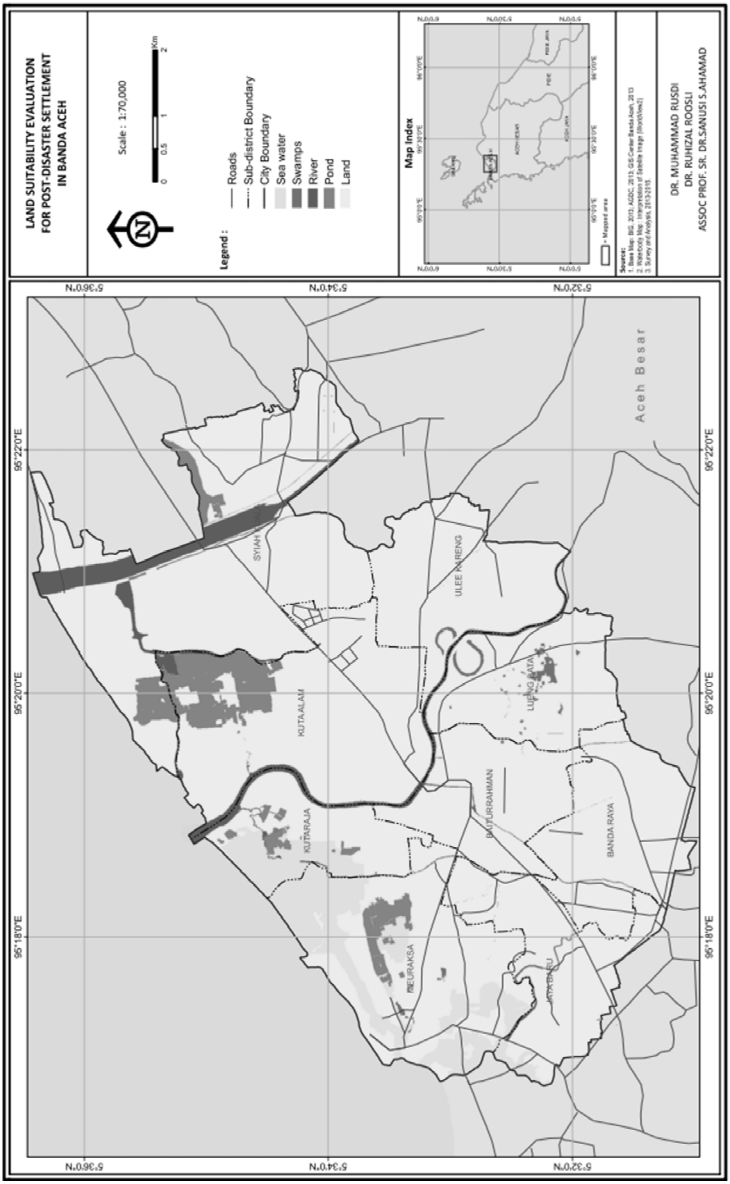
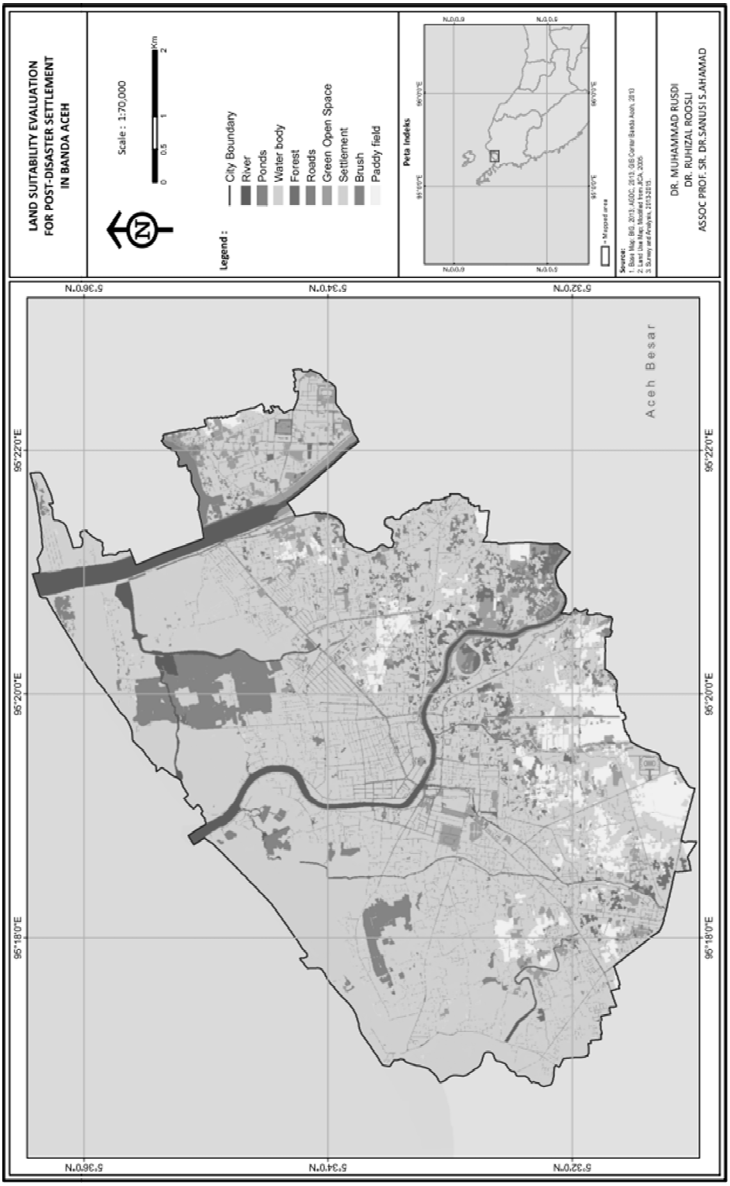


Figure 1.7: Map of Land Use in Banda Aceh (JICA & BAPPENAS, 2005; AGDC, 2013; GIS-Center-Banda-Aceh, 2013)



The majority of the Banda Aceh community is Muslim. The population density is higher than that of other cities in the state of Aceh. In 2004, the population growth rate in the period 2001 to 2003 was recorded as 2.4 per cent per year (Pemko-Banda-Aceh, 2013b). After the tsunami, the Banda Aceh population was reduced by 25.61 per cent. According to census data, the population prior to the tsunami was reduced by a total of 177,881. In 2007, i.e three years after the tsunami (2005-2007), the number of people in Banda Aceh had again increased to 219,857 (11.8%) (Pemko-Banda-Aceh, 2013b).

The earthquake and tsunami aggravated the infrastructure situation in Aceh, especially its houses. Earthquake aftershocks are included in the category of strong earthquakes. Based on the recorded data, the number of homes destroyed is estimated at 120,000 units, and 70,000 homes were damaged throughout Aceh (BRR-NAD-Nias, 2008a). The impact affected most communities near the epicenter (MTU, 2007).

Infrastructure and housing have an important role in supporting efforts to improve the lives of people and the surrounding area. In terms of the development of a society, infrastructure plays an important role in economic growth by supporting consistent and effective increases of production, transport, communications and transactions (KPKT, 2013; Masriadi, 2011). The role of infrastructure is also important for and correlates with supporting the establishment of civil society, to create, among other benefits, a healthy environment in residential areas and to promote culture and provide comfort. BRR-NAD-Nias (2008a) notes that in Aceh up to April 2008 a total of 111,995 units of housing and the basic infrastructure of 809 settlements have been refurbished, involving 5,325,554 hectares of land allocated for the resettlement area with mixed use development. Within this package, a Social Assistance for Home Improvements (BSPR) scheme was provided to 50,081 families. A total of 16,874 housing units were reserved in Banda Aceh. Now, ten years after the tsunami, most of the buildings have been rebuilt and repaired accordingly. Unfortunately, some of the housing has not been occupied by the residents and some has even been abandoned. This problem is closely related to the discomfort and anxiety felt by communities close to disasters, the sense that it might happen again at any time (Nizar, 2014). As Chiara and Koppelman (1997) noted, any site for housing and resettlement must meet the following criteria: a) it should be attractive, convenient and efficient; b) it must offer safety and comfort and function properly; and c) it should maintain nature and be in harmony with the environment.

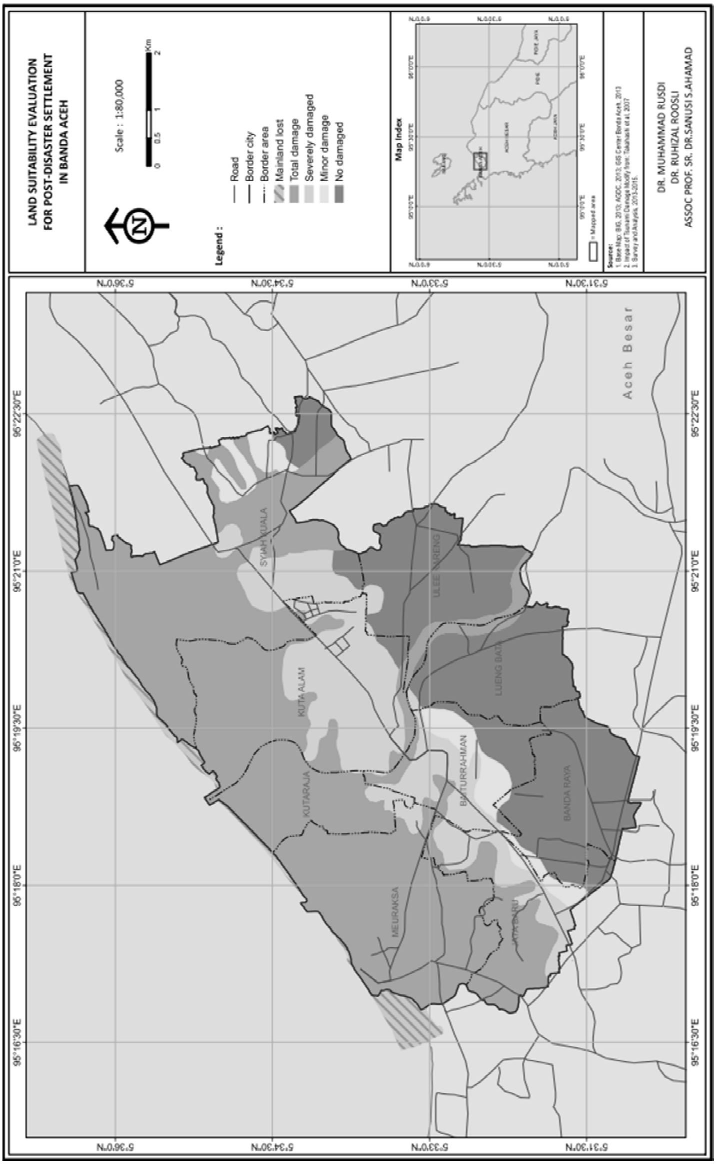
Another effect on the region after a natural disaster is a transfer of some residents to a more comfortable place with better infrastructure. This migration is also followed by economic investors wanting to undertake business activities in areas not affected by the disaster. This will lead to changes in the local community such as rising land prices, stress on the capacity of the infrastructure, and social conflicts to be resolved.

Competition for land use is consistent with the idea of obtaining the highest value and the best use of land. This means that the use of land for activities which have been producing outputs of low value is substituted with activities that have higher production values (Bracken, 2008). The demand for land often increases, and thus the development activities primarily for housing are often affected by the problem of limited land. The land area does not increase, while demand continues to rise until it is higher than the supply. Construction of settlements in territories that do not conform to this will affect the environment and human life as well as the inhabitants of these settlements.

In line with the changing times, the problem of limited land for development becomes increasingly critical, especially for the settlements. Such circumstances will be the basis for the implementation of a more detailed study of the suitability of land for residential development based on the physical characteristics of the environment in Banda Aceh. In addition, natural disasters such as earthquakes, tsunamis and floods were studied to obtain a more detailed picture of the impact of investment activity. This was done in view of Banda Aceh being on an earthquake fault line with sloping topography and a highly probability of a tsunami and flooding. The tsunami in Aceh proves that disaster might befall human beings at any time. Thus, the most important thing is to try to minimize the risk of natural disasters, as it is impossible to completely avoid disaster. Furthermore, Srinivas and Nakagawa (2008) argue that we should take lessons from the disaster as an opportunity to prepare better for disasters in the future.

Banda Aceh as the main town in the province of Aceh is one of the cities hardest hit by the earthquake and tsunami (Guswanto and Nugroho, 2005; Nugroho, 2005; RI, 2005). Damage to buildings and infrastructure is estimated to impact fifty percent of the area of Banda Aceh (Takahashi et al., 2007). This is shown in Figure 1.8. To improve and repair the situation in Aceh after the tsunami, the Indonesian government set up a special institution named *Badan Rehabilitasi dan Rekonstruksi Nanggroe Aceh Darussalam-Nias/Agency for the Rehabilitation and Reconstruction of Aceh and Nias* (BRR NAD-Nias) for the period of 16 April 2005 to 12 February 2009. BRR is an agency which acts as the national ministry established

Figure 1.8: Map of Building Damage Caused by Earthquake and Tsunami in Banda Aceh (Takahashi et al., 2007) (AGDC, 2013; BIG, 2013; GIS-Center-Banda-Aceh, 2013)



for managing and administering the financial resources, rehabilitation and reconstruction of Aceh after the earthquake and tsunami. The financial resources come both from within the country and from outside (RI, 2005).

The type of houses, construction and programme name in the last stages of the recovery area are as shown in Figure 1.10. The first three months after the disaster of 26 December 2004 are referred to as the emergency phase. At this stage, all the energy was deployed to keep the survivors able to live with even the most basic necessities of life. At this time, settlement is still in the form of tents, as shown in Figure 1.10a. After the emergency phase is the recovery phase. Generally, this phase involves the functioning and restoration of public services.

Housing built in this rehabilitation phase of barracks and temporary housing (shelter) is as shown in Figures 1.10b and 1.10c. The recovery phase ended in December 2006. Beginning in 2007 until 2009 was the phase of reconstruction, which aimed to develop the social system, economic system, infrastructure, and administrative functions. At this stage many homes were built for permanent residents, or at least land was provided by the government for this purpose. Based on the classification of houses by Unterman and Small (1994), the most common type of home construction was a single-storey terrace house, and there was a smaller number of semi-detached houses as shown in Figure 1.10g. The forms of single-storey terrace houses built will vary according to the sponsor or funder. This can be seen in Figures 1.10d, 1.10e and 1.10f, which show that the model homes rebuilt by IOM are different when compared to houses built by Muslim Aid and UPLINK.

Detailed information about the executor, the amount, source of funds, contracting, and cost of the project at the time of reconstruction can be seen in the catalog with the title of Housing and NAD-Nias Settlements (BRR-NAD-Nias, 2008b). Based on these reports, the reconstruction of houses in Banda Aceh amounted to 16,874 units, representing 7,766 units reported to the Indonesian government through the BRR, and 9,108 units by non-governmental organizations (NGOs) and international agencies.

Figure 1.9: Timeline of Recovery Stages After the Tsunami in Aceh