CHAPTER I
INTRODUCTION

This chapter describes the background of the research, research questions, research objectives, limitation of the research, and also benefit of the research.

1.1 Background

Indonesia is a huge country. It is also named as the world's largest archipelago since it has more than 17 thousand islands spread from Sabang, an island located on the northern tip of Sumatra, to Merauke, a region located near the border between Indonesia and Papua New Guinea (PNG). The distance between Sabang and Merauke is approximately 5,200 km or 3,200 miles (Bhimadi, 2015) which equals to the distance between San Francisco at the US Pacific coast and Bermuda at the Atlantic (Satya, 2017).

As the largest archipelagic country in the world, Indonesia is endowed with the beauty of its nature. This fortune has attracted people from all over the world to come to visit Indonesia and contributed to the national economic development. Additionally, the geological characteristic of Indonesia regions results in the occurrence of natural resources deposits, such as energy and mineral resources (Suryantoro & Manaf, 2002). However, despite having beautiful nature and abundant natural resources, Indonesia is also renowned as one of the most disaster-prone countries in the world (Priester, 2016).

One of the most frequently occured disasters in Indonesia is earthquake. It ranks the second position of the most frequent disasters after flooding (EM-DAT, 2015). Being located on the collision of several major tectonic plates results in this threat. Earthquakes possess the potential of destruction, loss of life, property damage, and also economic disruption (Adams et al, 2002).

An earthquake can be highly severe and deadly because it occurs suddenly. There are nearly no precursory signs or early warnings, and in seconds, it can devastate everything on the surface. According to the report from EM-DAT (2011),

earthquakes that shake developing countries would result in higher death toll compared to developed countries.

Earthquakes, basically, do not kill people but the collapsed buildings do. In developing countries, due to economic and education matters, people tend to build their dwellings carelessly. This is the beginning of the calamity. Dwellings that are built carelessly possess high vulnerability and would be collapsed when an earthquake strikes. Consequently, the collapsed building cause casualties to the dwellers. Spence (2004) compiled an estimate of the causes of death in earthquakes. The report says, between 1950 – 1999, over 75% of all earthquakes fatalities are caused by the collapse of buildings (see Figure 1.1).

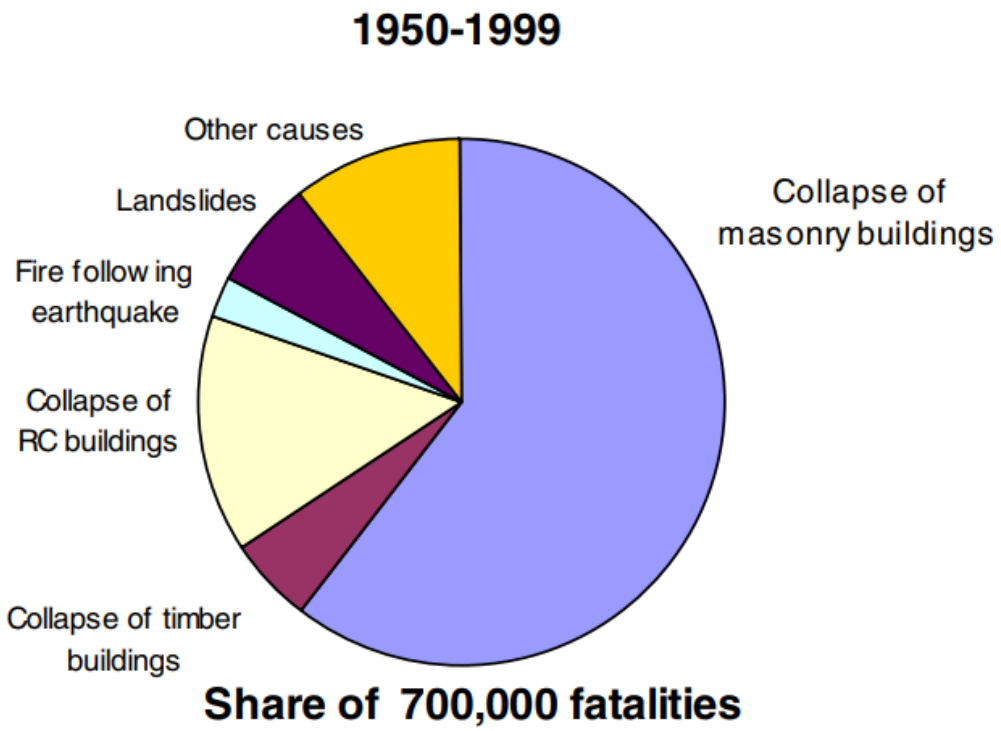

Figure 1.1. Share of Earthquakes Fatalities by Cause between 1950 – 1999 (Spence, 2004)

The collapsed buildings and damaged infrastructures caused by earthquake do not only lead to fatalities but also the economic disruptions and social impacts. In most cases, the economic growth and investment are weakened by the calamity. Especially in developing countries where most of the livelihoods depend on home

industry, should these houses are damaged or collapsed, the economy will be shut down. From the social aspects, people will be left homeless, with no property, no jobs, no education, no money, injured, starving and sick. They will be forced to live in shelters and are vulnerable to infectious diseases.

Predicting the future occurence of an earthquake is notoriously difficult. However, estimating the probable future losses and damages due to an earthquake, or usually also named as seismic risk assessment, is possible. Estimating probable future losses and damages can be conducted through a seismic risk assessment. This assessment can help the urban planners and local authorities to prepare action plans for disaster management.

In some earthquake-prone countries, this activity has been done in order to have a better preparedness and reduce the risk of earthquakes. Nevertheless, estimating the damages and losses caused by earthquakes is not a simple task. It requires a complex process and analysis. One of the standardized tools for estimating the potential losses and damages caused by earthquake is HAZUS. It is a tool developed by Federal Emergency Management Agency (FEMA) and nationally used in the US to do a risk assessment.

HAZUS runs deterministic and probabilistic scenarios to obtain loss estimation result. Deterministic analysis depends on the laws of physics or on correlations developed through experience or testing to predict the outcome of a particular hazard scenario. Meanwhile, probabilistic analysis evaluates the statistical likelihood that a specific hazard scenario will occur and impact the observed areas. However, HAZUS is designed to assess the performance of typical buildings in the US. It requires, therefore, some modifications in the application of HAZUS model should this tool is used in other countries (Aswandono, 2011).

Recently, an earthquake hit one of the districts in Central Java, Indonesia named Banjarnegara. According to the report of Meteorological, Climatological, and Geophysical Agency of Indonesia (BMKG) (2018) the magnitude was M 4,4. However, even though the magnitude is classified as relatively small, the earthquake that occurred on April 18th, 2018 caused major damages on a number of buildings, injured people, and forced hundreds of people to evacuate. Explained by

Prof. Sarwidi, as reported by Universitas Islam Indonesia (UII) (2018), small magnitude may cause significant intensity on the surface if the depth is relatively shallow, 4 KM.

The report of BNPB (2018) says that there were total of 316 damages building due to the earthquake. 217 building were located in Kasinoman Village, 62 buildings were in Kertosari Village, and 37 buildings were in Plorengan Village. The report was made on April 18th 2018, only a couple of hours after the occurrence of the earthquake.

In Indonesia, especially in Banjarnegara, building risk assessments using HAZUS is still very limited. Before the occurence of the earthquake, a building risk assessment has never been conducted. Therefore, more studies regarding building risk assessments are needed. This research attempts to assess the buildings risk due to earthquake using HAZUS and compare it with the actual building damages and losses due to the recently occurred earthquake on April 18th, 2018.

This research focuses on one study ward, Kasinoman Village. The whole residential buildings in Kasinoman Village are assessed. The assessment aims to obtain the type and also the actual damages of the building. The selection of Kasinoman Village as the object of research is encouraged by the fact that this village possess the highest number of damaged buildings compared to the other villages within Kalibening Sub-district subjected to the 2018 Banjarnegara Earthquake.

1.2 Research Questions

Research questions are the highlighted problems stated in the background of the research. In this research, the research questions are as follows:

1. How are the building damages in Kasinoman Village subjected to the 2018 Banjarnegara Earthquake?
2. How to estimate building damages in Kasinoman Village subjected to the 2018 Banjarnegara Earthquake using scenario of HAZUS?
3. How is the result of building damages subjected to HAZUS scenario compared to the actual building damages?

4. How to modify the parameters of earthquake building damage assessment of HAZUS in accordance with buildings characteristic in Kasinoman Village, Banjarnegara?

1.3 Research Objectives

Research objectives are the expected outcomes of the research based on research questions. The research objectives of this research are as follows:

1. To obtain the actual damage information of building in Kasinoman Village subjected to the 2018 Banjarnegara Earthquake
2. To estimate the damages of building in Kasinoman Village subjected to the 2018 Banjarnegara Earthquake hazard scenario
3. To compare the result of HAZUS damage estimation to the actual damages.
4. To modify parameters of earthquake building damage assessment of HAZUS in accordance with buildings characterictic in Kasinoman Village, Banjarnegara.

1.4 Limitations of the Research

Limitations of the research define the border of the research. Therefore, the research is only focused on the specified problems. This research has a limited scope due to the limited time and sources. This research estimated the building damages using HAZUS subjected to The Banjarnegara Earthquake taht occurred on April 18th, 2018 with Mw of 4,4.

The study area is a Village within Kalibening Sub-district, named Kasinoman Village. Among other villages, Kasinoman Village is one of the most damaged areas.

There are many types of building occupancy in the study area. However, only residential buildings are considered as the object of the research while the other types of building occupancy like government buildings, hospital, and commercial buildings are not.

1.5 Benefits of the Research

The benefits of this research are as follows:

1. With particular modifications, HAZUS are able to be adopted and implemented in Banjarnegara, Indonesia
2. Estimation of building damage using HAZUS would help the planners or government to map earthquake building risk of particular areas.
3. It would help the planners or government to prepare the earthquake risk reduction action plans.
4. With further analysis, it would help the planners and government to estimate the replacement cost on building damages due to earthquake hazards.