THESIS

ANALYSIS COMMUNITY'S COPING STRATEGIES AND LOCAL RISK GOVERNANCE FRAMEWORK IN RELATION TO LANDSLIDE: A Case of Tawangmangu Sub-District, Karanganyar Regency, Indonesia

Thesis submitted to the Double Degree M.Sc. Programme, Gadjah Mada University and Faculty of Geo-Information Science and Earth Observation, University of Twente in partial fulfilment of the requirement for the degree of Master of Science in Geo-Information for Spatial Planning and Risk Management

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Signed……

DISCLAIMER

This document describes work undertaken as part of a program of study at the Double Degree International Program of Geo-information for Spatial Planning and Disaster Risk Management, a Joint Education Program of ITC Faculty of UT, the Netherlands and UGM, Indonesia. All views and opinions expressed there in remain the sole responsibility of the author, and do not necessarily represent those of the institute.

ABSTRACT

Landslides were occurred in 2007 at Tawangmangu resulting collapse of dozens houses and killing of dozens people. Analysis of people perception and analysis of the coping strategy to landslides are the two elements that are essential to determine the level of preparedness of communities to landslides occurring in the future. People coping strategy should be implemented in line with the coping strategy conducted by the government and other stakeholders. To know the preparedness of government and other stakeholders in facing landslide, it was required to analysis the risk governance frame work. Analysis of risk governance frame work was done at the district and sub-district level.

Survey method with random sampling was applied to assess the level of people perception and people coping strategy related to landslide. The number of respondents was spread proportionally across five villages; Plalar, Guyon, Sodong, Salere and Ngledoksari. The respondents were interviewed using questionnaires with open and closed questions. To analyze the risk governance framework at the district and sub-district used the survey method with questionnaire and in-depth interviews. The number of respondents in the district is 24 representing 24 agencies and in the sub-district 24 respondents representing six agencies.

People perception related with landslide dominated in high and moderate level. Totally, 46.2% respondents have moderate level of risk perception, 47.3% have high level and only 6.5% respondents that have low level. Age and education are two factors that influence the people's perception to landslide. Local people applied four types coping strategy, which are: economic, structural, social and cultural coping strategy. Totally, 51.6% respondents have high level, 33.3% have moderate level and only 15.1% respondents that have low level of coping strategy. The factors that influence the level of coping strategy are education, income and building type. Analysis of risk governance framework is limited to the three components including stakeholder involvement, risk management and risk communication. Base on the data analysis, the level of stakeholder involvement at the district scope was categorized on the moderate till high and the level of stakeholder involvement at sub-district level was categorized on the high level. Generally, the risk management of Karanganyar was categorized on the moderate level and high level and the risk management in Tawangmangu was categorized on the moderate level. Risk communication at the Karanganyar was categorized on the moderate level and in Tawangmangu was categorized on the moderate level. There are some elements must be improved on the risk governance framework, those are data management, the pattern of relationships among stakeholders, increased participation of NGOs, constructed and updated landslide risk map, enhancement of microfinance role in helping the community when disaster strikes and dissemination of information about the landslide to the local community.

Key Words: Landslide perception, coping strategies, risk governance framework

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Yogyakarta, March 2013

Heru Setiawan

CONTENTS

LIST OF FIGURES

LIST OF TABLE

LIST OF ABBREVIATION

ADPC	Asian Disaster Preparedness Center
BAKOSURTANAL	*Badan Koordinasi Survei dan Pemetaan Nasional* National Coordinating Agency for Surveys and Mapping
BAPPEDA	*Badan Perencanaan dan Pembangunan Daerah* Regional Development and Planning Agency
BNPB	*Badan Nasional Penanggulangan Bencana* National Disaster Management Agency
BPBD	*Badan Penanggulangan Bencana Daerah* Regional Disaster Mitigation Agency
BPN	*Badan Pertanahan Nasional* National Land Agency
BPS	*Badan Pusat Statistik* Centre of Statistic Bureau
EWS	Early Warning System
GIS	Geographic Information System
GO	Government Organization
IRGC	International Risk Governance Council
NGOs	Non Government Organizations
RBI	*Peta Rupa Bumi Indonesia* Topographic Map of Indonesia
Rp	*Rupiah* (Indonesia's currency)
RT	*Rukun Tetangga* Sub area of RW
RW	*Rukun Warga* Sub area of village
SPSS	Statistical Product and Service Solution (software)
UN-ISDR	United Nation secretariat of the International Strategy for Disaster Reduction
USGS	United States Geological Survey
UTM	Universal Transverse Mercator
WHO	World Health Organization

CHAPTER I
INTRODUCTION

Introduction chapter describes the general overview of this research, consisting of research background, research problems, research objectives, research conceptual framework, benefit of the research, scope and limitations and thesis structure.

1.1. Research Background

One of hazard occurred frequently in Indonesia is landslide. Almost every place in Indonesia especially on mountainous area, landslide usually happened. Landslides commonly happen during rainy season between December and February. They bring extensive damages on property and cause losses of lives. According to the data that published by National Disaster Management Agency (2009) 1,362 people died and 315 people injured from 1998 till 2007 caused by landslide. According to BNPB, the total occurrence (%) of natural hazard in Indonesia from 1815 to 2012 is shown in the Figure 1.1. From the figure it can be seen that landslides become the major hazards in Indonesia with 17% of the total disaster occurrences in Indonesia.

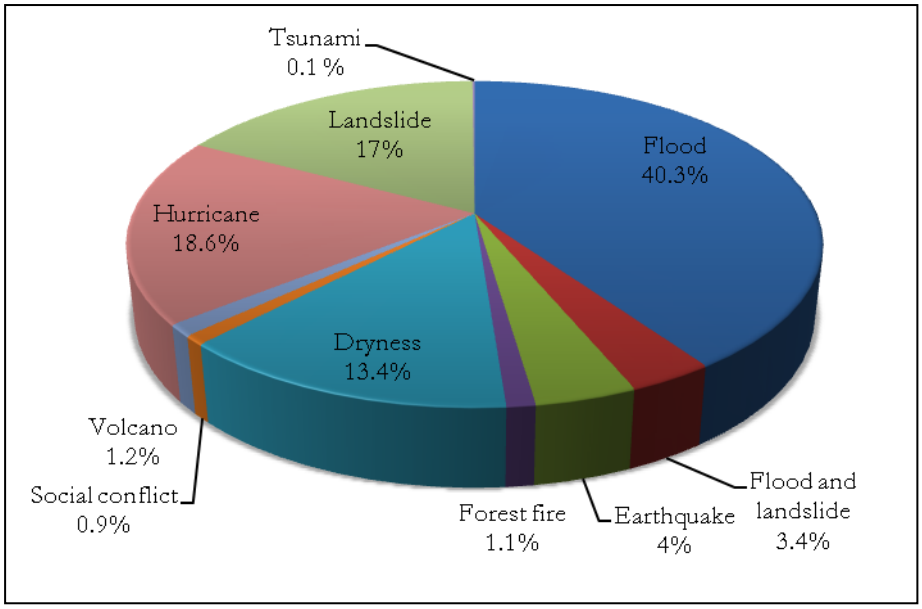

Figure 1.1. Disaster occurrences in Indonesia

Generally, landslides mostly occurred in rural areas with hilly topography and close to volcano. It is commonly found that the soil condition in this area is fertile with significant amount of water resources and the beautiful panorama to stay. Therefore, most of the landslide prone areas have been developed as the villages or

cities with high population density. As the results, thousands of people died several thousands of houses damages and thousand hectares of land buried due to landslide disasters (Karnawati et al, 2013). In order to minimize damages, it is necessary to assess and manage areas that are susceptible to landslide. Local people who live in prone areas have coping strategy dealing with landslides and take actions that should be done to minimize the damages.

Karanganyar is one of the regency in Indonesia that frequently struck by landslide. Some of the Karangayar's districts are located close to Lawu Volcano which makes the areas susceptible to landslide. Landslides occurred in several sub-districts, for instance Karangpandan, Ngargoyoso, Matesih, Tawangmangu, Jatiyoso, Jumapolo, Jenawi, Kerjo and Jumantono. One of the big events of landslide occurred in Tawangmangu Sub-district on December 27th, 2007, caused 34 casualties. The driving factors of the event were high intense rainfall, morphological condition, slope and land use change (Prawiradisastra, 2008)

Figure 1.2. Landslide event in Tawangmangu Sub-district on December 27th, 2007 (Sources: Kristijono et al, 2008).

To reduce landslides negative impact, various local institutions both governmental and non governmental institutions carry out disaster management strategies. Each institution has different interests so coordination and communication between one institution and others in the handling of landslides is necessary for the effectiveness disaster management. Risk governance analysis is one of tools to know the level readiness of government to cope of hazard in their area. This research focused on local scale both district level and sub-district level and emphasizes on analysis of community coping strategies and to analyze risk governance framework related to landslide in study area.

1.2. Research Problem

Landslide that caused by either natural or by human intervention is one of the frequent natural hazards in Karanganyar District. Landslide in Tawangmangu Sub-district was occurred almost every year especially during rainy season. The recent data about landslide in Karanganyar occurred on 22 February 2012 in four districts, namely Karangpandan, Ngargoyoso, Matesih, and Tawangmangu. The landslide caused two people dead and close the access road between Tawangmangu and Magetan District (Metrotvnews, 2012)

Both local government and local community have applied several coping strategies to deal with landslide in Tawangmangu. Local government coping strategies focused on structural coping strategies for example construct retaining wall on steep slope and install early warning system devices. Local people coping strategies were focused on social coping strategies and structural coping strategies. Coping strategy conducted by the government often do not consider the perceptions and knowledge of local people related with landslide itself. As a result, every year there are still casualties due to landslides. Therefore, the research on the analysis of people perceptions and coping strategy is required as input to the government in determining the appropriate coping strategy.

Local governments have the primary responsibility for disaster risk management. Although there are several numbers of stakeholders involved in the disaster management system, social and economic losses because of landslides are still increasing. The study needed to develop and to improve local risk governance framework to minimize further occurrences and impacts, in case landslides occurred. Effective communication between institutions one and others is very important to avoid overlapping roles and programs. It was also essential to study how people in this area perceive landslides and cope with them. This information should be integrated with the mitigation plans developed by the government and non-government organization to minimize the adverse impacts of landslide.

1.3. Research Objectives

General objective of this research is to assess community's coping strategies and disaster risk governance framework in local scale. The more specific objectives are:

1. To analyse the local people's perception in relation to landslide
   a. To identify the local people's perception about landslide.
   b. To analyse the factors that influence local community's perception of landslides.

2. To analyse people's coping strategies related to landslide
   a. To identify what are the types of household coping strategies dealing with the landslides.

b. To analyse what are the types of community's coping strategies dealing with the landslides.
c. To analyse the factors that influences coping strategy by local community.
d. To analyse local community's acceptation for landslide risk reduction programs carried out by the local government and other institutions.

3. To analyse the present risk governance framework at the local level in study area.
   a. To analyse stakeholder involvement on risk governance framework in the study area.
   b. To analyse risk management on risk governance framework in the study area.
   c. To analyse risk communication on risk governance framework in the study area.
   d. To analyse the parameters and elements that need to be improved on risk governance framework in the study area.

1.4. Research Questions

The following research questions are needed to be addressed to achieve the research objectives as mentioned in Table 1.

Table 1.1. Research objectives and research questions

No.	Research Objectives	Research Questions
1.	To analyse local people's perception in relation to landslide	▪ What are the local people perceptions about landslide? ▪ What are the influencing factors of local people perception about landslides?
2.	To analyse people's coping strategies related to landslide	▪ What are the types of household coping strategies dealing with the landslides? ▪ What are the types of community's coping strategies dealing with the landslides? ▪ What are the influencing factors of local people coping strategies? ▪ How is the people acceptation of landslide risk reduction programs?
3.	To analyse the present risk governance framework at the local level in study area.	▪ How is the stakeholder involvement on risk governance framework in the study area? ▪ How is the risk management on risk governance framework in the study area? ▪ How is the risk communication on risk governance framework in the study area? ▪ What are the elements that need be improved on local risk governance framework?

To answer the research questions as mention above, secondary and primary data are required. Secondary data were collected during the field work from government organisation and non government organisation. Primary data were collected using some methods such as in-depth interview and questionnaire.

1.5. Research Conceptual Framework

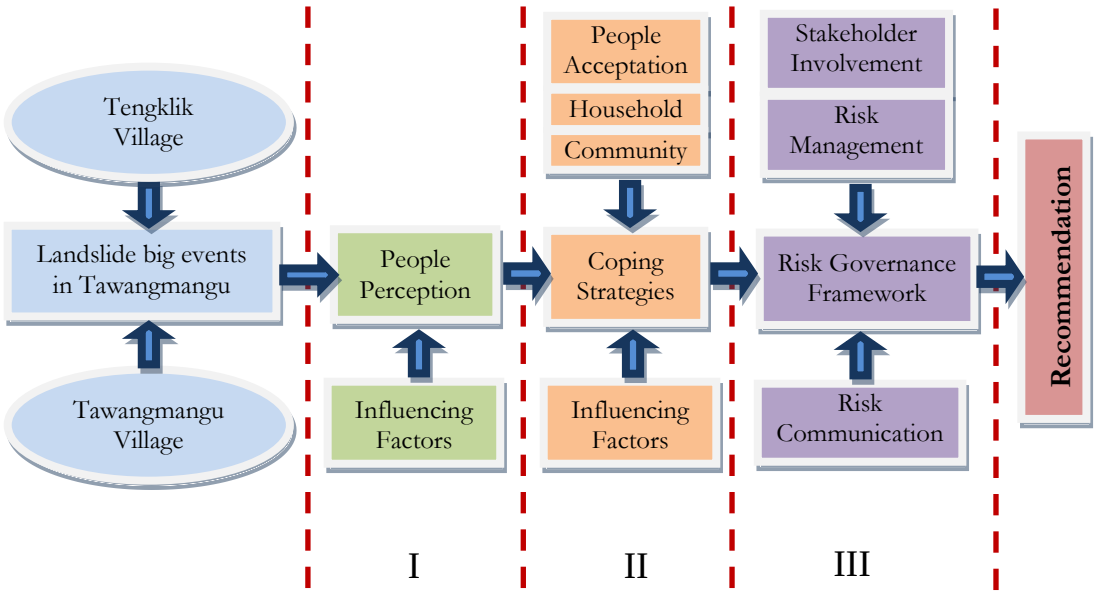

Figure 1.3. Research conceptual framework

The research outline is described in the research conceptual framework; it consists of three elements, namely people perception, people coping strategies and analysis of risk governance framework. The background of research was based on two major landslide events in 2007 in Tengklik Village and Tawangmangu Village. Landslide event in Tengklik Village has resulted in the collapse of 33 houses and landslide event in Tawangmangu village caused 34 people died. Two landslide events are the worst landslide events that occurred in Tawangmangu Sub-district. Based on these landslide events, the research related to people perception on landslide becomes important. By knowing the people perception about disaster, will be know how respond of people to survive and to cope from disaster in the future. The people perception about disaster and its negative impacts because of disaster will affected the ability of people to cope the disaster. Ability of people to deal with a disaster will reduce the negative impact which may be caused by the disaster (Sare, 2009). The implementation of indigenous knowledge in the context of hazards and other threats is referred as "coping mechanism" or "coping strategy" (Twigg, 2004).

Coping strategy conducted by household and the community have goals to prevent the occurrence of landslides and to reduce the negative effects because of landslide. Beside the local people, both local government and non-government organization has been implementing coping strategies to landslides. The types of coping strategy conducted by the government and NGOs sometimes are not match with local people expectations. So, it is necessary to analyze the public acceptation of coping strategy conducted by the government and other stakeholders. To know the preparedness of government and other stakeholders in facing landslide was required analysis of the risk governance frame work. Analysis risk governance frame work was done at the district and sub-district level. Finally, this research would give some recommendations to the government and policy makers in implementing local government disaster management.

1.6. Benefit of The Research

This research generated information about perception, coping strategies and risk governance framework at local level in study area. An analysis of people perceptions and coping strategy is very useful as input for governments to determining disaster risk reduction program in accordance with the wishes of the people. The result of risk governance framework analysis will be useful for government to improve and to develop disaster management at local level. The authority can use the information from this research to build integrated planning in disaster risk management.

1.7. Scope and Limitation

Perception and coping strategies data is obtained from fieldwork data inventory. The data of people perception and coping strategies was derived from questionnaire in two villages, Tengklik Village and Tawangmangu Village. Questionnaire was distributed in five sub-villages consist of Plalar Sub-village, Guyon Sub-village, Sodong Sub-village and Salere Sub-village that are located in Tengklik Village and one more sub-village namely Ngledoksari Sub-village is located in Tawangmangu Village.

Analysis of risk governance framework was conducted in the district scope and sub-district scope. The data of risk governance framework was collected using questionnaire and dept interview with head of institution (government organization and non government organization) that involved on disaster management in Karanganyar Regency. Analysis of risk governance only focused on three parameters, those are stakeholder involvement, risk management and risk communication.

1.8. Thesis Structure

This thesis has a structure as follows:

Chapter 1 – Introduction

Introduction chapter describes the general overview of this research, consisting of research background, research problem, research objectives, research conceptual framework, benefit of the research, scope and limitations and thesis structure.

Chapter 2 – Review of Related Literature

This chapter consists of several theories related to the research topic. Started with the terminology of hazard and disaster, the defining of landslide, concept of perception, terminology of coping strategies and the research concept of risk governance framework closed this chapter.

Chapter 3 – Study Area and Research Method

Chapter three explains characteristic of study area and method of the research. Brief information related of characteristics of study area comprise general information of Karanganyar, general overview of Tawangmangu Sub-district, landslide susceptibility of Tawangmangu Sub-district and characteristic of Tengklik Village and Tawangmangu Village. The research method including data preparation, data processing and data analysis as well as sampling method and questionnaire will discuss in this chapter.

Chapter 4 – Characteristic of Respondents

This chapter describes characteristic of respondents including age, gender, education, household size, occupational types, income, building type and people experience to the landslide. Characteristic of respondents pre-assumed has correlations with the level of landslide risk perception and the coping strategy of local community.

Chapter 5 – Local People Perception of Landslide

This chapter discusses perception of local people perception related to landslide. To know the people perception related to landslide, questionnaire with close and open ended question was used as a tool in this research. This section also describes factors that assumed have correlation to landslide using statistical analysis.

Chapter 6 – Coping Strategy of Local Community

This chapter implicates detailed explanation related to landslide community and household's coping strategies related landslide. The discussion focuses on the type of coping strategies employed by the local people, the factors that influencing the level of coping strategies and the level of public acceptation to landslide risk reduction program conducted by government and non government organisation

Chapter 7 – Analysis of Risk Governance Framework

This chapter explains the analysis of risk governance framework at the district and sub-district level. The discussion started with analysis of stakeholder involvement, risk management and closed by discussion about risk communication

Chapter 8 – Conclusion and Recommendations

This chapter explains conclusion, contribution of this research for the local government and decision maker and recommendations for the future research.

CHAPTER II
LITERATURE REVIEW

This chapter consists of several theories related to the research topic. Started with the terminology of hazard and disaster, the defining of landslide, concept of perception, terminology of coping strategies and the concept of risk governance framework closed this chapter.

2.1. Hazard and Disaster Terminology

There are different definitions of hazards. According to UN-ISDR (2009), hazard defined as a dangerous phenomenon, substance, human activity or condition that may cause loss of life, injury or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage. ADPC (2006) defined hazard as a potentially damaging physical event, phenomenon or human activity that may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation.

UN-ISDR (2004) defined disaster as a serious disruption of the functioning of a community or a society involving widespread human, material, economic or environmental losses and impacts, which exceeds the ability of the affected community or society to cope using its own resources. According to WHO (1999), disaster can be defined as any occurrence that causes damage, ecological disruption, loss of human life or deterioration of health and health services on a scale sufficient to warrant an extraordinary response from outside the affected community or area.

2.2. Landslide in General

According to Varnes (1984), landslide comprises almost all varieties of mass movements on slopes, including some, such as rock-falls, topples, and debris flows, that involve little or no true sliding. Landslide can be triggered by several factors such as intense rainfall, earthquake shaking, water level change, storm waves or rapid stream erosion that cause a rapid increase in shear stress or decrease in shear strength of slope-forming materials (Dai et al, 2002). Based on the type of movement, landslide can be divided on several types: fall, topple, slide, spread, flow, and complex (Highland and Bobrowsky, 2008). The characteristic of each landslide type is described below:

A. Falls are abrupt movements of masses of geologic materials, such as rocks and boulders that become detached from steep slopes or cliffs.
B. Topple is defined as the forward rotation out of a slope of a mass of soil or rock around a point or axis below the centre of gravity of the displaced mass. Topples

can be complex and composite and the material consist of rock, debris (coarse material), or earth materials (fine-grained material).

C. Slide can be described as a down slope movement of a soil or rock mass which occurs on surfaces of rupture or on relatively thin zones of intense shear strain.

D. Spread is an extension of a cohesive soil or rock mass. It is merged with the general subsidence of the fractured mass of cohesive material into softer underlying material.

E. Flow is a spatially continuous movement. The surfaces of shear are short-lived, closely spaced, and usually not preserved.

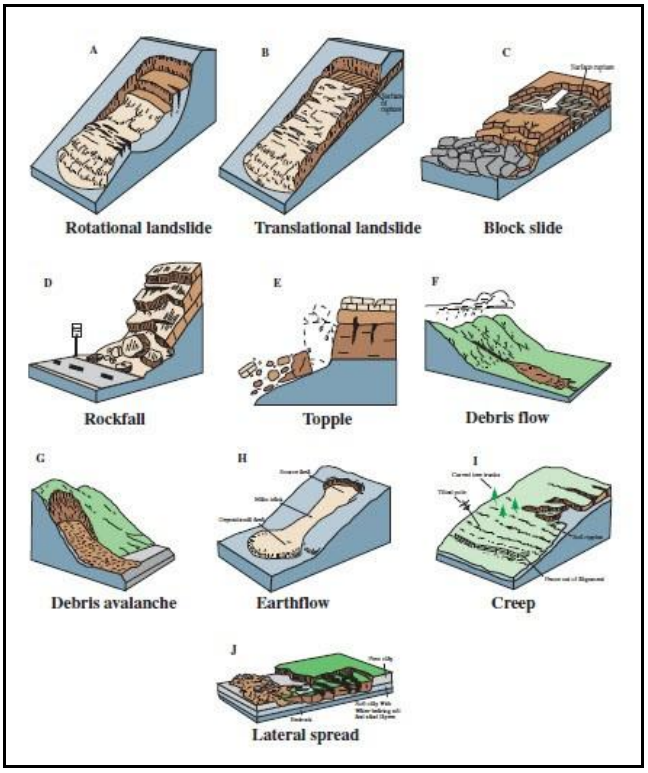

Figure 2.1. Landslide types (USGS, 2004)

Landslide directly affect physical elements at risk by a range of impact mechanisms, including: burial, collision impact, earth pressures, differential shearing in tension, compression or torque, plastic deformation (flow), by object displacement and by removal or deformation of valued ground, such as productive soil and foundation substrate (Glade et al, 2004)

2.3. Concept of Perception

Community perception about risk plays an important role to know how the people anticipate the negative impact of landslides occurrences. White (1973) defines perception as process by which individuals organize exterior stimuli in order to form some concept of an event or situation. Another definition given by Wankat (1993), perception refers to the ways that we process information or become aware of the world around us. Risk perception is characterized as the intuitive judgment of individuals and groups of risks in the context of limited and uncertain information (Slovic, 2000). Westen and Kingma (2011) defined risk perception is about how individuals, communities or governments perceive/judge/evaluate/rank the level of risk. People risk perceptions are very important considerations when developing policies and management strategies for dealing with landslide, for example in deciding the type of disaster mitigation programs in prone areas. The level of local community awareness related with landslide hazard is largely determined by their perceptions to landslides and information that they obtained related to landslide hazards.

Risk perception depends on the individual's judgment and involves considerable subjectivity, governed by psychological factors (Finlay and Robin, 1997). Risk perception is influenced by internal and external factors. The internal factors which influence the risk perception of ordinary people are: the frequency and intensity of personal experience towards the past similar events, the personality factors (e.g. fate control, different view of nature), the tolerance of dissonance – information, and people's interpretation of their experience of events. Meanwhile, the external factors are related with the characteristics of the hazard including magnitude, duration, frequency, temporal spacing, the public education programs of natural hazard and source of information (Paton, Smith et al, 2008 cited in Rianto, 2009). Wachinger and Renn (2010) develop a structured framework of risk perception that provides an integrative and systematic perspective on risk perception into four context levels (see Figure 2.2).

Each level of risk perception consists of two subsections; those are collective influences and personal manifestations. The first level is heuristics of information processing comprise collective heuristic and individual common sense. The second level is cognitive and affective factors include the reference-knowledge, stigmata, personal beliefs and emotional affections. The third level is social and political institutions: The third level refers to the social and political institutions that individuals and groups associate with either the cause of the risk or the risk itself. On the third level, collective influence consist of three elements, those are social value and trust, economic and political structure and organizational constraints and personal manifestations comprise personal value and interests, social economic status and media influence. The last level is cultural background consist of four elements;

cultural institutions, political, societal and economic culture, personal identity and sense on meaning and worldviews.

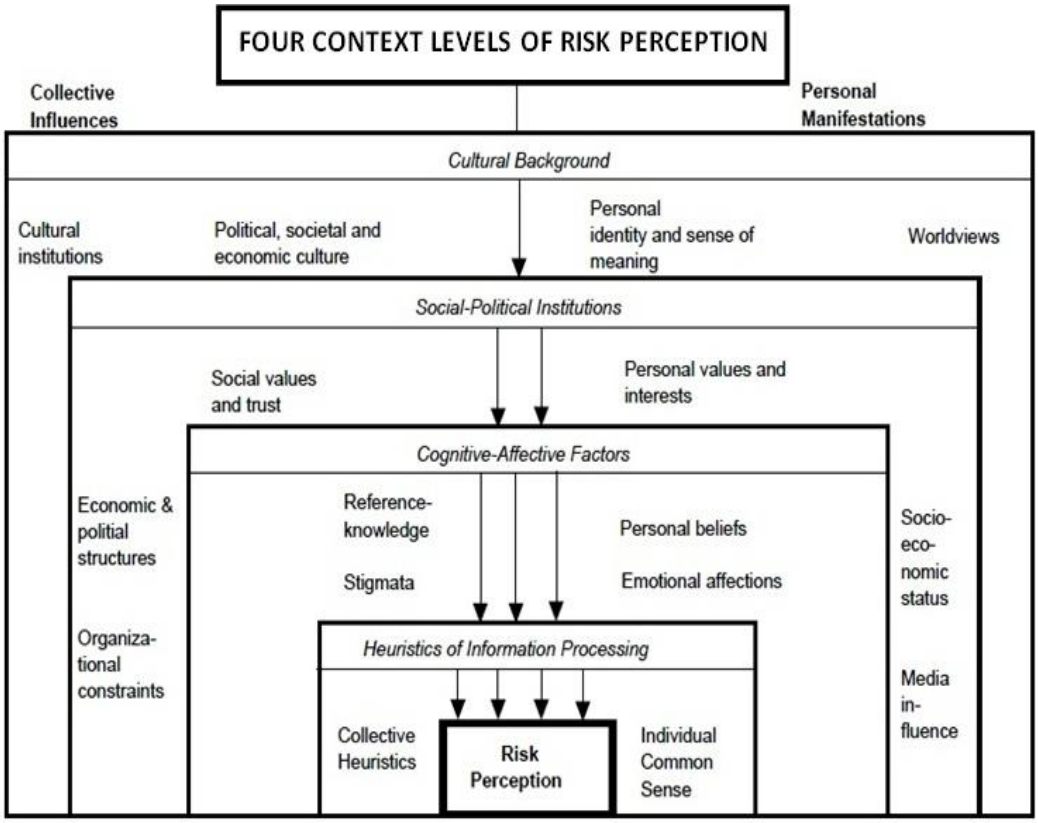

Figure 2.2. Four context levels of risk perception

2.4. Terminology of Coping Strategies

Knowing the coping strategies is important to determine what type of the disaster risk reduction program that should be done by institution especially for local government institution. According to Brahmi and Poumphone (2002), coping means the managing of resources in difficult situations. It includes finding ways to solve problems, to handle stress or to develop defence mechanisms. Coping strategies refer to a set of measures taken by the communities for obtaining resources in time of adversity and disaster. They are based on their experience, social structures, resources and their capacities to combine them. Twigg (2004) divides coping strategies into four broad categories:

A. Economic/material: one of the principal elements in this category is economic diversification. Having more than one source of income (or food) is invaluable during times of stress, when some economic activities become impossible.

B. Structural/technological: this category is quite broad, including land management systems as well as what is more usually thought of as technology, such as building materials and construction methods.

C. Social/organisational: this heading includes indigenous organisations that provide support in countering disasters: kinship networks, mutual aid and self-help groups. The family is a fundamental social mechanism for reducing risk. Extended kin relations are networks for exchange, mutual assistance and social contact.

D. Cultural: cultural factors include risk perception and religious views, which are frequently connected.

Analysis of typology coping strategies is useful for decision-makers for designing more effective programs for landslide mitigation. The difference between "coping strategies" versus "coping capacities" is subtle, with "strategies" referring to an active decision-making process with an implicit awareness of choices, whereas "capacities" is synonymous to "abilities", a more passive term (Rieux et al, 2011). Communities have their own way of defining when conditions have worsened so much that they constitute a crisis or disaster. This threshold varies between communities, according to their vulnerabilities and the threats they face (Twigg, 2004).

2.5. Concept of Risk Governance Framework

Landslide is one types of hazard that frequently occur in mountainous areas. Landslide caused many casualties and huge economic losses. The enormous negative impact due to landslides can be reduced by means of effective disaster risk management. According to UN-ISDR (2009), disaster risk management is the systematic process of using administrative directives, organizations, and operational skills and capacities to implement strategies, policies and improved coping capacities in order to lessen the adverse impacts of hazards and the possibility of disaster. To address the landslide problem, all stakeholder need to develop a better understanding of landslide hazard and to make proper decisions on disaster risk reduction programs. Renn (2005) defined stakeholders as socially organized groups that are or will be affected by the outcome of the event or the activity from which the risk originates and/or by the risk management options taken to counter the risk.

Analysis of risk governance framework related to landslide is a significant role to improve disaster management system and to reduce the damage and casualties caused by landslides. Governance is the sum of the many ways individuals and institutions, public and private, manage their common affairs. It is a continuing process through which conflicting or diverse interests may be accommodated and co-operative action may be taken. It includes formal institutions and regimes empowered to enforce compliance, as well as informal arrangements that people and institutions either have agreed to or perceive to be in their interest (Commission on

Global Governance 1995) cited from Walker et al, 2010. According to Renn (2007) governance is the actions, processes, laws, traditions and institutions by which authority is exercised and decisions are taken and implemented. Risk is an uncertain (positive or negative) consequence of an event or an activity with respect to something that human's value. Risk governance refers to the actions, processes, laws, traditions and institutions by which decisions about risk handling are prepared, taken and implemented.

IRGC (2008) define risk governance framework as a comprehensive approach to help understand, analyse and manage important risk issues for which there are deficits in risk governance structures and processes. According to Renn (2005), risk governance involves the translation of the substance and core principles of governance to the context of risk and risk-related decision making. Risk governance includes the totality of actors, rules, conventions, processes, and mechanisms concerned with how relevant risk information is collected, analysed and communicated and management decisions are taken. The general concept of risk governance framework modified from IRGC by Westen and Kingma (2011) can be displayed on the Figure 2.3.

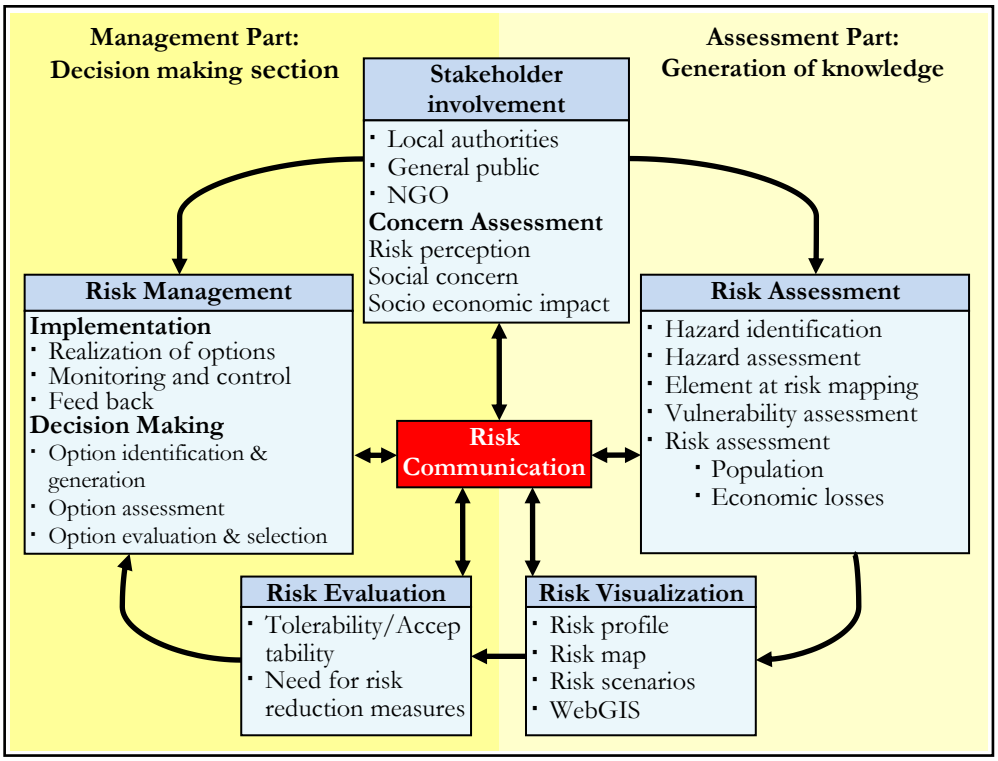

Figure 2.3. Risk Governance Framework by IRGC (2006), modified by Westen and Kingma (2011).

According to Figure 2.3, there are two different spheres on the risk governance framework: the technical sphere focusing on the generation of knowledge and information on risk and the management sphere, focusing on decision making and implementation of actions. A framework for risk governance integrating scientific, economic, social and cultural aspects and includes the effective engagement of stakeholders. There are seven components of risk governance including stakeholder involvement, risk management, risk assessment, risk evaluation, risk visualization and risk communication.

The aim of risk governance is to involve the various stakeholders within all aspects of risk management. The involvement of local people is in the process is a very important component. There are many stakeholders involved in the risk management framework. The most important ones are the general public, decision makers and technical staff (Westen and Kingma, 2011).

There are several definitions related elements of risk governance framework. Risk management is the creation and evaluation of options for initiating or changing human activities or (natural and artificial) structures with the objective of increasing the net benefit to human society and preventing harm to humans and what they value, as well as the implementation of chosen options and the monitoring of their effectiveness (Renn, 2008). Risk assessment is the task of identifying and exploring, preferably in quantified terms, the types, intensities and likelihood of the (normally undesired) consequences related to a risk. Risk assessment comprises hazard identification and estimation, exposure, and vulnerability assessment and risk estimation (Renn, 2008). Risk evaluation is the process of determining the value-based components of making a judgement on risk. This includes risk–benefit balancing or incorporating quality-of-life implications and may also involve looking at such issues as the potential for social mobilization or at pre-risk issues, such as choice of technology and the social need of a particular operation giving rise to the risk (Renn, 2008). Risk visualization is one of the important processes in risk governance since risk is a spatially varying phenomenon, Geographic Information Systems (GIS) technology is now the standard tool for the production and presentation of risk information (Westen and Kingma, 2011).

One of the most essential parts of risk governance is risk communication. According to Westen and Kingma (2011), risk communication is the interactive exchange of information about risks among risk assessors, managers, news media, interested groups and the general public. Risk communication focusing on the imminent threat of an extreme event is referred to as a warning and is meant to produce an appropriate emergency response. On the other hand a risk communication program can also focus on the long-term potential for such events to happen, and is then called a hazard awareness program, intended to produce long-term hazard adjustments.

CHAPTER III
STUDY AREA AND RESEARCH METHOD

Chapter three explains characteristic of study area and method of the research. Brief information related of characteristics of study area comprise general information of Karanganyar, general overview of Tawangmangu Sub-district, landslide susceptibility of Tawangmangu Sub-district and characteristic of Tengklik Village and Tawangmangu Village. The research method including data collection, data processing and data analysis as well as sampling method and questionnaire was discussed in this chapter.

3.1. General Information of Karanganyar

Analysis risk governance framework was conducted on district scope in Karanganyar Regency and sub-district scope in Tawangmangu. Karanganyar Regency is one of the regency in Central Java province. It is located between 110°40" - 110°70" east longitude and 7°28 - 7°46" south latitude. The Karanganyar Regency bordered by Sragen Regency at the north, East Java Province at east, Wonogiri and Sukoharjo Regency at the south and Surakarta and Boyolali Regency at the west (BPS, 2011).

Karanganyar regency has a relatively high area with an average elevation about 511 meters above sea level. The lowest area located in Jaten Sub-district with 90 meters and the highest area located in Tawangmangu Sub-district with elevation more than 2000 meters above sea level. The average rainfall 2.601 mm per year and the daily temperature 22°C - 31°C and has tropical climate (BPS, 2011).

The wide area of Karanganyar is 77,378.64 Ha, comprises of 17 sub-districts and 177 villages. Base on census in 2009, population in Karanganyar District was 872,821 people. Most of people work in agricultural sector (30.58%), industrial sector as much 14.49%, building labour 6.81%, trading as much 6.22% and the rest as civil servant, entrepreneur and services (BPS, 2011). The location of Karanganyar Regency can be seen on the Figure 3.1.

Karanganyar District is one of the districts in Central Java Province that have a high susceptibility to disaster. Base on the record data that published by Regional Disaster Mitigation Agency (BPBD), during 2011 recorded 34 landslide events, 15 windstorms events, 3 flood events and 29 fire events.

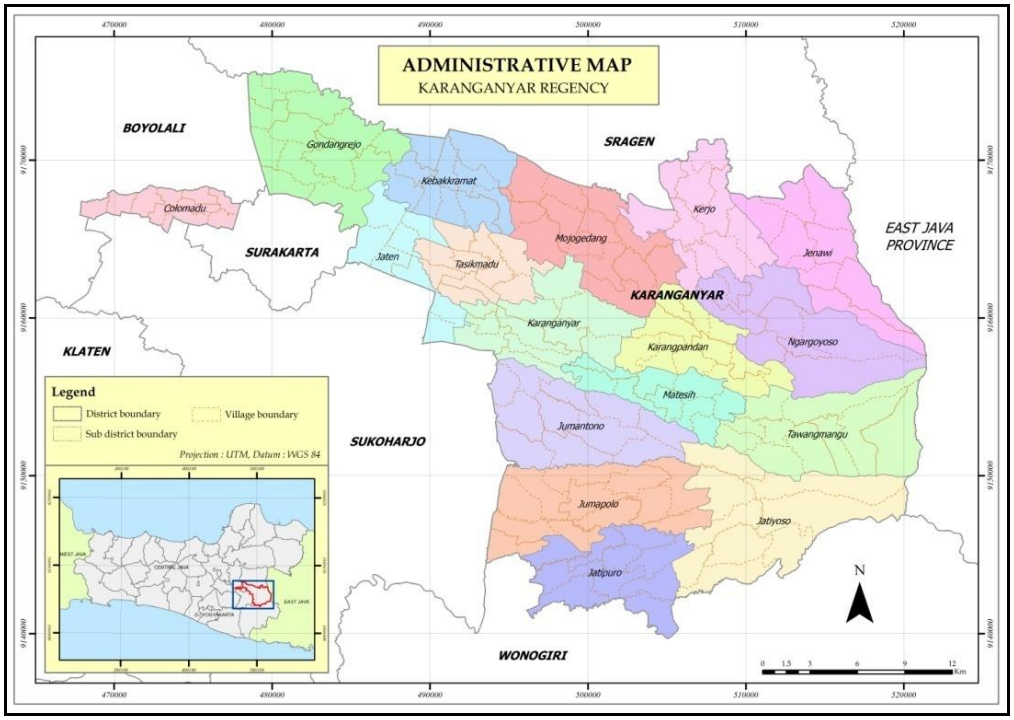

Figure 3.1. The administrative map of Karanganyar District

3.2. General Overview of Tawangmangu Sub-district

Analysis risk governance framework on sub-district scope was conducted in Tawangmangu Sub-district, Karanganyar District, Central Java Province, Indonesia. The total area of Tawangmangu Sub-district is 70.03 km^2 with an average altitude 1,200 meters above sea level. It has boundaries as follow; Ngargoyoso Sub-district in the North, Jatiyoso Sub-district in the South, Karangpandan and Matesih Sub-district in the West, and East Java Province in the East.

According to BPS (2012) administratively, Tawangmangu Sub-district is divided into ten villages consist of Tengklik, Gondosuli, Plumbon, Bandardawung, Sepanjang, Karanglo, Nglebak, Tawangmangu, Kalisoro, and Blumbang. This area also consists of 41 sub-villages (*dusun*), 86 dukuh, 99 RW (*Rukun Warga*), and 345 RT (*Rukun Tetangga*). Population in Tawangmangu is 42,979, consisting of men 21,525 and women 21,454. The most populous village is Tawangmangu Village with 8,643 people whereas the lowest populated area is Gondosuli Village with 3,176 people. Tawangmangu Village is the highest dense area (2,526 people/km^2) while Gondosuli Village is the lowest dense area (181 people/km^2).

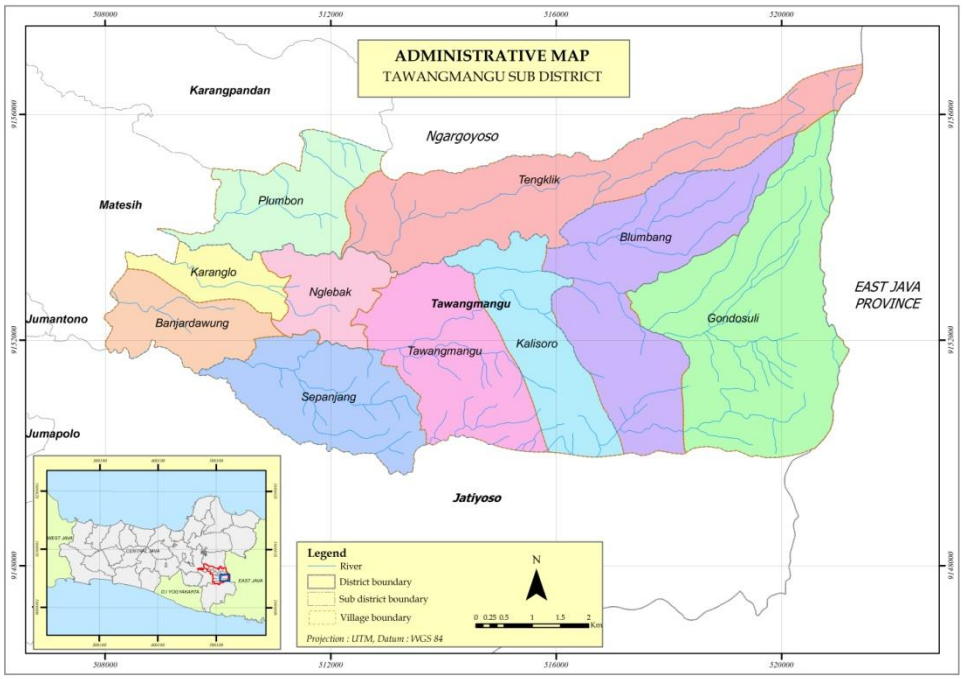

Figure 3.2. The administrative map of Tawangmangu Sub-district

This region is close to Lawu Volcano that has highest altitude 3,265 meters above sea level. Most of the areas (65%) are located on a steep relief with a slope more than 35%. The study area mainly consists of soil depth of more than 90 cm and dominated by sandy soil that makes this area susceptible to landslide (Wati et al, 2010). Settlement and agricultural land use are the most rapid developed land use in study area.

Figure 3.3

Figure 3.4

Figure 3.5

Figure 3.6

Figure 3.3. Vegetable garden as a largest landuse
Figure 3.4. Settlement in prone areas
Figure 3.5. Pine forest at hillside
Figure 3.6. Agriculrural practices at steep slope

Land in lower part of Lawu Volcano is intensively used for agricultural activities (33.9%) and settlement area (13.4%). The agricultural land and settlement including villa and hotel are also found in undulating and hilly area. On the other side, the upper part of Lawu Volcano and steep slope areas are allocated as forest (49.7%), particularly protected forest (Perhutani, 2006). The large conversion of land use from forest to agriculture, settlement, hotel, villa and high rainfall intensity (254 mm/month) become the triggering factors of landslides in this area.

3.3. Landslide Susceptibility of Tawangmangu Sub-district

Landslides are one of the disasters that are frequently occurred in Tawangmangu Sub-district. Based on modified data from Wati (2010) which was collected from the village office, sub-district office and field survey showed the landslides events in Tawangmangu from 2005 till 2010 as many as 42 times that spread in all villages in Tawangmangu Sub-district.

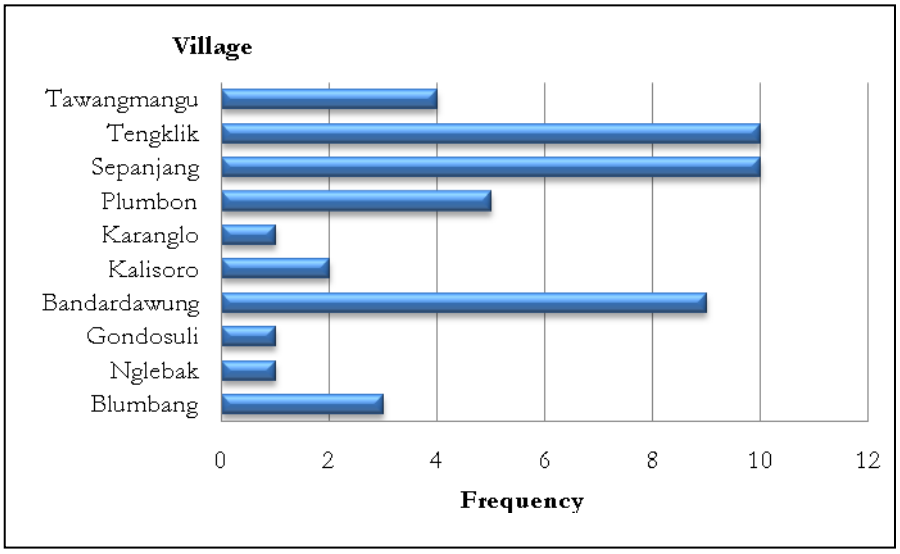

Figure 3.7. Landside events in Tawangmangu Sub-district 2005-2010

Soeters and Westen (1996) observed that there are five elements considered landslide influencing factors: geomorphology, for instances geomorphological sub unit, land form; topography or morphology, for instances digital terrain model and its derivation (slope, aspect, curvature); geology or engineering geology, for instances lithology, material of sequences; land use; Hydrology, for instances proximity to drainage, catchment areas, temperature, evaporation, rainfall.

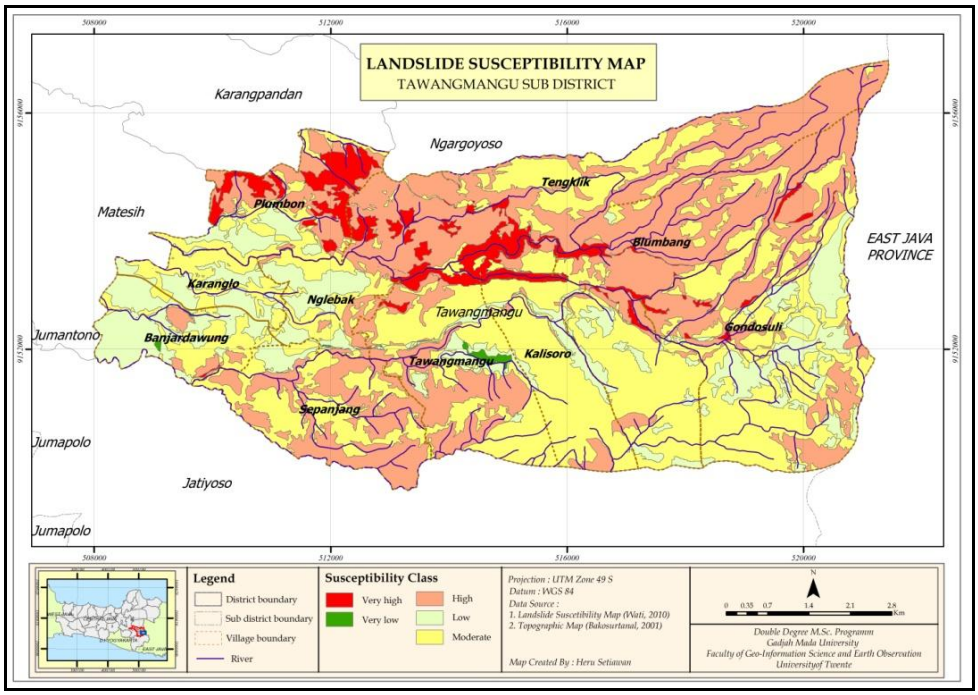

Figure 3.8. Landslide susceptibility map of Tawangmangu Sub-district

Base on the landslide susceptibility map of Karanganyar, most of area in Tawangmangu Sub-district can be categorized in medium level of susceptibility. The results of spatial data analysis related susceptibility to landslide show that most of area in the Tawangmangu Sub-districts categorized in medium susceptibility class was covering 2,674.888 Ha (42.7%). The second is high susceptibility class with area extent 2,332.051 Ha (37.3%), and then areas with low susceptibility class that covering 909,222 Ha (14.5%). The wide of areas that categorized in very high susceptibility class is 321.839 Ha (5.1%) and the smallest area is area in very low susceptibility with area extent 21.02 Ha (0.3%).

Landslide in Tawangmangu mostly was caused by high rainfall intensity and lithology condition (Kristijono et al, 2008). Average monthly rainfall based on rainfall gauge measurements in Blumbang Village and Tawangmangu Village is 254 mm/month (Wati, 2010). Lithology in Tawangmangu dominated by volcanic breccias and tuffs that have been weathered into sandy loam and chunks of rock from small to large. The lithology characteristics influence several physical aspects in study area, e.g. soil development, slope stability, and land productivity. The physical properties of soils derived from the weathering of rocks in the form of a soft sandy loam, easily destroyed when exposed to water and a whole because it has been over the limit of saturation.

Figure 3.9

Figure 3.10

Figure 3.11

Figure 3.12

Figure 3.9. Landslide on the forest area
Figure 3.10. Landslide on the settlement
Figure 3.11. Landslide on the side of road
Figure 3.12. Road damage because of landslide

3.4. Characteristic of Tengklik Village and Tawangmangu Village

Primary data including community perception and coping strategies was taken in Tengklik Village and Tawangmangu Village. The area of Tawangmangu Village is 337, 39 Ha consist of 6.84 Ha paddy field, 177, 24 dry land and the rest 153,30 Ha for others purposes. There are five sub-villages in Tawangmangu, consist of Tawangmangu, Nano, Beji, Nglurah, and Ngledoksari and divided to 12 *Rukun Warga* (RW) and 51 *Rukun Tetangga* (RT). The population of Tawangmangu Village is 8,643 people where it is dominated by male on 4,345 people and female 4,298 (BPS, 2012).

Figure 3.13. Landslide direction and the damage of infrastructure because of landslide in Tengklik Village

The wide area of Tengklik is 810.78 Ha; consist of 45.51 Ha paddy field; 248. 50 dry land and the rest 516.77 Ha for others purposes. Tengklik Village consists of 4 sub-villages; there are Plalar, Guyon, Sodong and Selere, 12 RW and 36 RT. The number of people in Tengklik Village is 3,716 people consist of female 1,864 people and male 1,852 people (BPS, 2012).

Base on interpretation using Quickbird imagery and direct observation, the geographic condition of both villages is hilly areas dominated by agricultural land and forests. The Tengklik village has a forest area wider than forest in Tawangmangu village. The contrast condition of two villages can be seen on the pattern of settlement. The pattern of settlement in the Tengklik Village tend to small groups that separate each other and the pattern of settlement in Tawangmangu tend to concentrate on a single point.

Figure 3.14. Direction of landslide and susceptible house in Tawangmangu and Tengklik Village

3.5. Research Method

This research applied a case study approach that took place at four sub-villages in Tengklik Village consisting of Plalar Sub-village, Guyon Sub-village, Sodong Sub-village and Salere Sub-village and one sub-village in Tawangmangu village namely Ngledoksari Sub-village. Site selection of this research was conducted in Tawangmangu Sub-district because base on disaster susceptibility map issued by Regional Development Planning Agency (2009), Tawangmangu Sub-district is an area that has a high level of susceptibility to landslides. Tengklik Village and village Tawangmangu Village that located in Tawangmangu Sub-district was selected as location for respondents because based on historical data, the largest landslide in Tawangmangu Sub-district occurred in 2007 located in Tengklik Village and Tawangmangu Village. Landslides that were occurred in Tengklik Village caused 33 houses collapsed and hundreds of people were evacuate while the landslide that occurred in Tawangmangu Village resulted 34 people died.

Type of research is survey method with the household as the unit of analysis. Survey methods used to obtain the data of respondents that were approached using questionnaires and interviews with the community and key respondent. Random sampling technique was applied to take sample of respondents from the population. By sampling method, the characteristic of population will be known. The information collected from the respondents was analyzed using statistical method. This analysis was also used to obtain information on the level of perception, level of coping strategy and level of people acceptation towards landslide risk reduction program undertaken by the government and other stakeholders. Analysis risk

governance framework was conducted to determine the level of stakeholder involvement, disaster management systems and communication patterns among stakeholders in disaster management activities. Analysis of risk governance framework was done at district and sub district scope. The stages consist of data collection, data processing, and data analysis. All of process explained in the description below.

3.5.1. Data collection

There are two type of data that required on this research, comprise primary data and secondary data.

1. Primary data collection

Primary data is data collected and observed directly in the field. The primary data in this study include:

A. Questionnaire data and interviews with head offices involved in disaster management in Karanganyar District and Tawangmangu Sub-district in the context of risk governance framework analysis. In the scope of Karanganyar District, questionnaires data and interviews were conducted to 24 agencies and in the scope of Tawangmangu Sub-district were conducted to six agencies.

Figure 3.15

Figure 3.16

Figure 3.17

Figure 3.18

Figure 3.15. Office interview in Karanganyar
Figure 3.16. Office interview in Tengklik
Figure 3.17. Household interview in Tengklik
Figure 3.18. Household interview in Tawangmangu

B. Questionnaire data and interviews conducted on the population by 93 respondents to obtain data about perception, coping strategy and the people acceptation to landslide risk reduction programs by the government and other stakeholders.

C. Small group discussion with the head of sub-village to determinate sub-villages boundary and historical landslide data includes location of landslide, damage / casualties caused by landslides and the magnitude of the landslide.

Figure 3.19

Figure 3.20

Figure 3.21

Figure 3.19. Record landslide events by head of sub-village
Figure 3.20. Simple discussion with head of sub-village
Figure 3.21. Deliniation of sub-village boundary by head of sub-village

2. Secondary data collection

Secondary data collection through collecting data and information from institution or other sources that related to the research such as Village offices, Regional Disaster Management Agency, Sub-district office and others. The secondary data on this research consist of:

A. Landslide susceptibility map was obtained from Regional Development Planning Agency (2009) and Wati (2010).

B. The characteristic of Karanganyar, the people population in Tengklik Villange and Tawangmangu Village was retrieved from Tengklik Village Office, Tawangmangu Village Office and Centre of Statistic Bureau (BPS).

C. High resolution satellite imagery was obtained from National Land Agency (BPN).

D. Administrative boundary map was obtained from Indonesian National Agency of Survey and Mapping Coordination (Bakosurtanal).

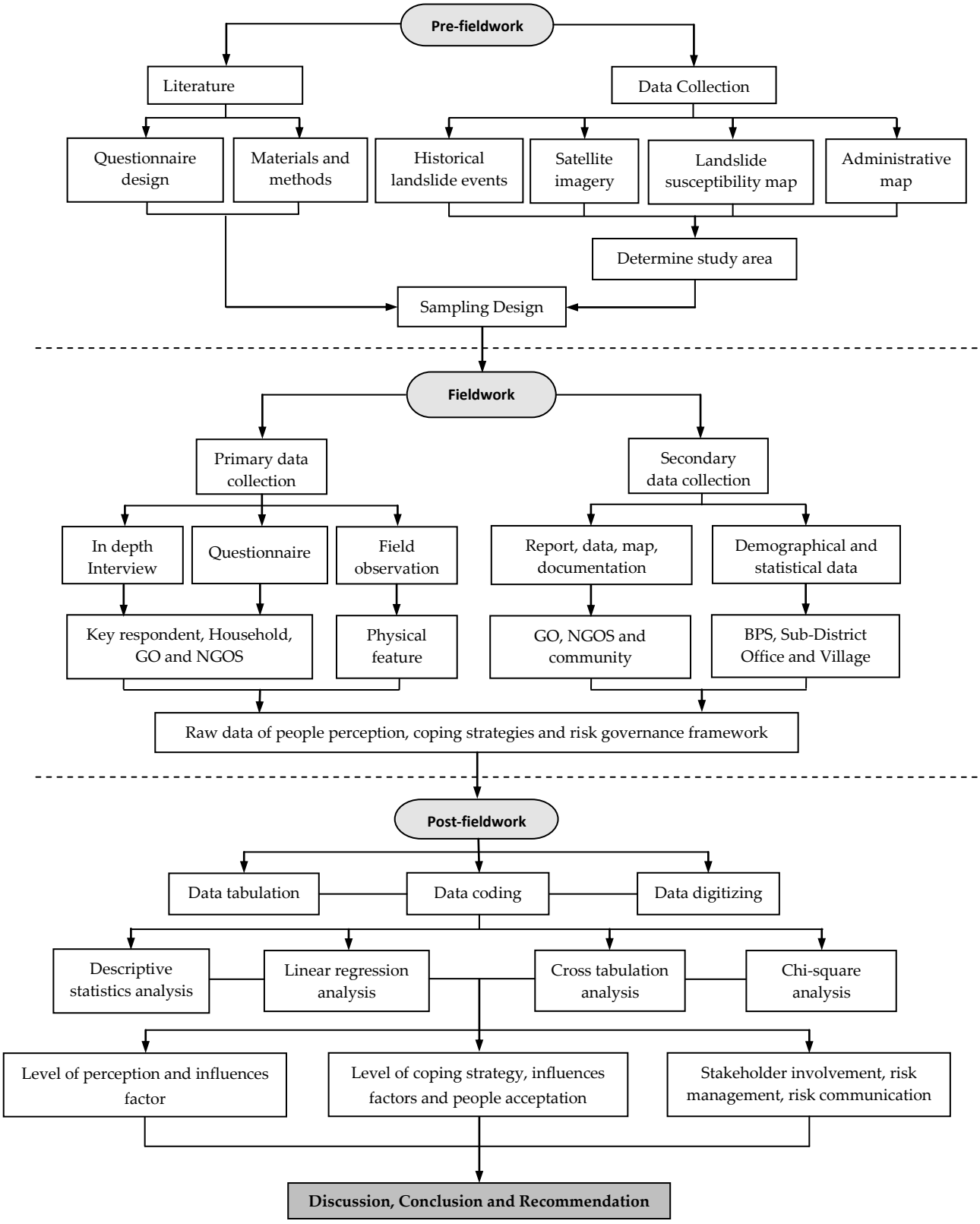

Figure 3.22. Research Flowchart

3.5.2. Data Processing

Data processing was done after the data collection in the field is completed. Some of the activities carried out at this stage are:

1. Data Tabulation

Data Tabulation is a step to input data based on results in the field. Data is placed in a table according to analysis needs. Data can be entered from the field in the original form or can be the sum of points which questions have been answered by the respondents. Data input activities is done using Microsoft Office Excel 2007. This is done in order to make it easier when it will be analyzed using SPSS 19. There are 4 types of data to be inputted, those are:

A. The data was obtained from questionnaire and interviews with the respondents. These data amounted to 93 respondents from the five villages. There are 54 items questions from each of respondents to be recapitalized and tabulated.
B. The data was obtained from questionnaire and interviews with stakeholders at the district level. The amount of data that must be inputted was derived from 24 respondents represent 24 agencies, each of agency contained 30 items statements that should be recaps and tabulated
C. The data was obtained from questionnaire and interviews with stakeholders at sub-district level. The amount of data that must be inputted was derived from 24 respondents represent 6 institutions, each of questionnaire contained 23 items statements that should be recaps and tabulated
D. Interview data in the form of a sound recording of recorder device was transferred to the computer. There is additional information from the key respondent is written as a discussion of the research.

2. Data Coding

Data coding is creating of specified codes in each category of data includes creating category to the same data type. Specified code is symbol in the form of letters or numbers to provide identity data. The code has the meaning as quantitative data (score). Quantification or transforming data into quantitative data can be done by giving a score to the type of data by follow the rules of the measurement scale. Data coding is done after of the input data is completed. In this study, data coding was done to some parameters considered influence the perception, people acceptation and coping strategy. Scoring to the several parameters can be displayed on the Table 3.1.

Table 3.1. Scoring to independent and dependent variables

No.	Criteria	Score	Type of data
1.	Age (year)	20 - 29 is 1 ; 30 - 39 is 2 ; 40 - 49 is 3 ; 50 - 59 is 4 ; > 60 is 5	Ordinal
2.	Gender	Male is 1 ; Female is 2	Nominal
3.	Education	Elementary school or under is 1 ; Junior high school is 2 ; Senior High School is 3 ; University is 4	Ordinal
4.	Occupation	Farmer is 1 ; Trader is 2 ; Civil servant is 3 ; Private sector is 4 ; Others is 5	Nominal
5.	Income per-month	Under minimum regional wage is 1 ; up to minimum regional wage is 2	Ordinal
6.	Building type	Permanent is 1 ; Semi permanent is 2 ; Not permanent is 3	Nominal
7.	Landslide experience	Never is 1 ; Once is 2 ; Twice is 3 ; More than twice is 3	Ordinal
8.	Household size	1 - 2 is 1 ; 3 - 4 is 2 ; 5 - 6 is 3 ; > 6 is 4	Ordinal
9.	Level of perception	Low is 1 ; Moderate is 2 ; High is 3	Ordinal
10.	Level of coping strategy	Low is 1 ; Moderate is 2 ; High is 4	Ordinal
11.	Level of people acceptation	Low is 1 ; Moderate is 2 ; High is 5	Ordinal

3. Data Digitizing

Data digitizing activities is done using ArchGIS 9.3 software. Data digitizing activities on this research conducted on the sub-village boundaries made manually by head of sub-village to be changed in the digital form. Digitizing activity was also conducted to determine the position of respondents was obtained using GPS device to display in a digital map.

3.5.3. Data Analysis

The data analysis process included several techniques, as follow:

1. Descriptive statistics analysis

Descriptive statistics analysis is used to describe the basic features of the data in a study. They provide simple summaries about the sample and the measures. In a research study produced lots of measures and a large number of people on any measure. By descriptive statistics application will help us to simply large amounts of data in a sensible way. Each descriptive statistic reduces lots of data into a simpler

summary. On this research, descriptive statistic analysis is used to analyze characteristic respondent including age, income, household size, gender, marital status, education, occupation, building type and landslide experience.

2. Multiple linear regression analysis

Multiple linear regression analysis is a powerful technique used for predicting the unknown value of a variable from the known value of another variable. Multiple linear regression analysis is widely used in biological, behavioural and social sciences to describe possible relationships between variables. In this research, multiple linear regression analysis was applied to know the factors influencing landslide risk perception, people coping strategy and people acceptation. Null hypothesis (H0) stated that independent variables (age, income, household size, gender, marital status, education, occupation, building type and landslide experience) not have significant influence with the level of dependent variables (people perception, people coping strategy and people acceptation). The acceptance of hypothesis was taken based on the value of significance probability (*P-value*) and significance level (α) = 5%. If the *p-value* > α (0.05) the null hypothesis is accepted, if the *p-value* ≤ α (0.05) the null hypothesis is rejected.

3. Cross-tabulation analysis

Cross-tabulation analysis also known as contingency table analysis, is most often used to analyze categorical (nominal measurement scale) data. A cross-tabulation is a two (or more) dimensional table that records the number (frequency) of respondents that have the specific characteristics described in the cells of the table. Cross-tabulation tables provide a lot of information about the relationship between the variables. In this research, cross tabulation analysis was applied to know the level of respondent's perception, people coping strategy and people acceptation in each village (Plalar, Sodong, Guyon, Salere and Ngledoksari).

4. The Chi-square analysis

The chi-square statistic is the primary statistic used for testing the statistical significance of the cross-tabulation table. Chi-square analysis applied to know whether the two variables are independent or not. In this research, chi-square test is used to determine the difference of the level of dependent variables (people perception, people coping strategy and people acceptation) within five sub-villages (Guyon, Plalar, Salere, Sodong and Ngledoksari). Null hypothesis stated that there is no difference of people perception, people coping strategy and people acceptation in five sub-villages. The acceptance of hypothesis will be taken based on the value of significance probability (*P-value*) and significance level (α) = 5%. If the *p-value* > α (0.05) the null hypothesis is accepted, if the *p-value* ≤ α (0.05) the null hypothesis is rejected.

3.5.4. Sampling design

The simple random sampling method was applied base on the mapping unit classification. The mapping unit generated base on village unit, the smallest structural authorities unit. For each household respondent, one individual was selected as a sample. The head of the household was selected as a sample of each household. The respondents were distributed proportionally by considering the number of people in each sub-village. Sampling method was applied because by taking sample, it will save time, money, and energy. According to Sugiyono (2007), the amount of respondent can be determined using formula:

$$S = \frac{N . P . Q . \lambda^2}{d^2(N-1) + P . Q . \lambda^2}$$

Where: λ^2 = *Error standard = 1* d = *Standard deviation = 0.05*
$P = Q$ = *Probability = 0.5* S = *Total sample*
N = *Population*

Total households in study area are 1,411 households. Base on Sugiyono's formulation, the total minimum respondent that must be taken is 93 household. Sub-village used as a mapping unit where respondents were taken at each sub-village. To determining the boundaries of the sub-village can be done using ArcGIS 9.3 software based on interview with key respondents (head of sub-village). Settlement identification is done by manual interpretation of Quickbird imagery. Field observation was used as a tool to validate the manual interpretation of Quickbird imagery.

The number of respondent for every village decided with the household consideration. Seventy eight respondents were taken in Tengklik Village and 16 respondents were taken in Tawangmangu Village. The respondent in each village was taken randomly and distributed evenly in each sub-village. The number of sample for every village can be seen on the Table 3.2.

Table 3.2. Sampling unit determination

No	Village	Sub-village	Number of Household	Percentage (%)	Number of Samples
1.	Tawangmangu	Ngledoksari	235	17	(17/100)*93=16
2.	Tengklik	Plalar	210	15	(15/100)*93=14
		Guyon	249	18	(18/100)*93=16
		Sodong	378	27	(27/100)*93=25
		Selere	339	24	(24/100)*93=22
Total			1,411	100	93

Spatial distribution of the respondents for each sub-village described on the Figure 3.23 – 3.27:

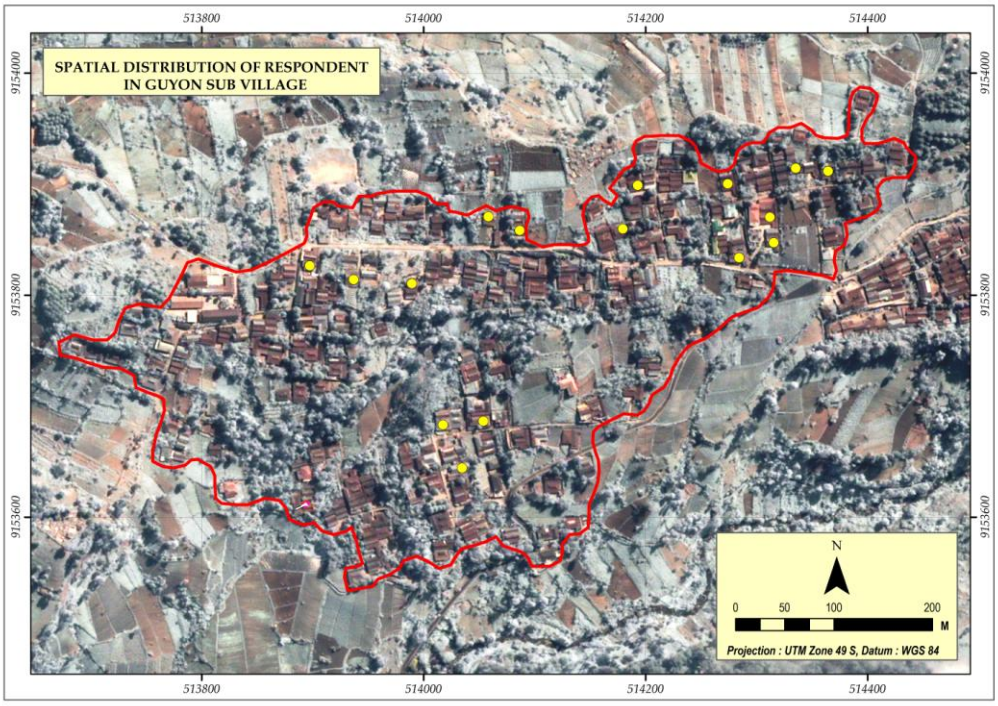

Figure 3.23. Spatial distribution of the respondents at Guyon Sub-village

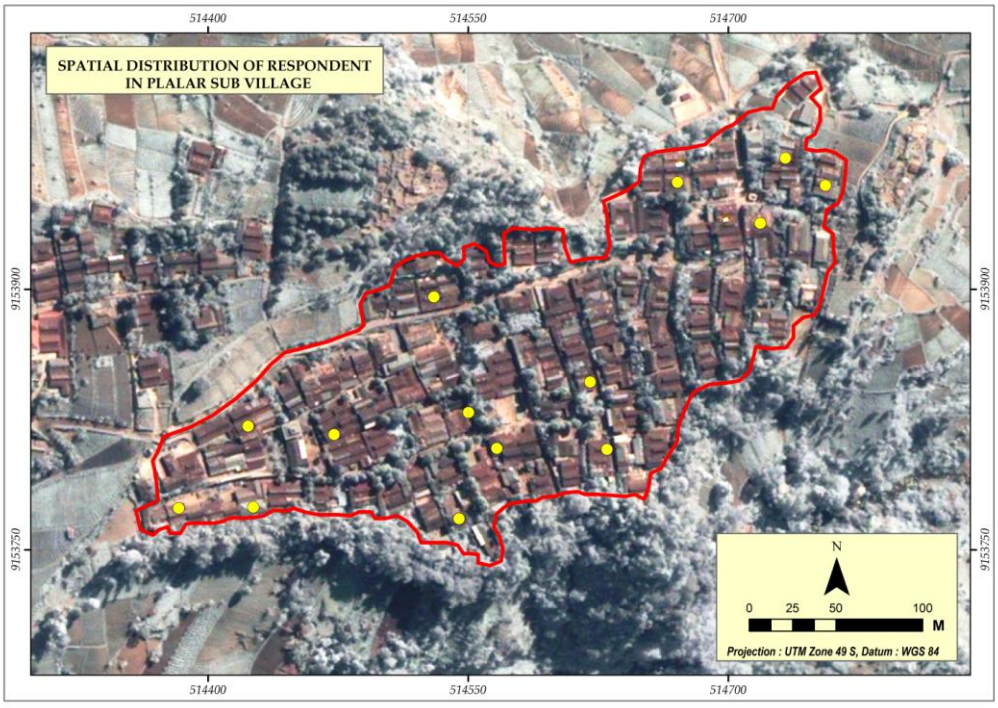

Figure 3.24. Spatial distribution of the respondents at Plalar Sub-village

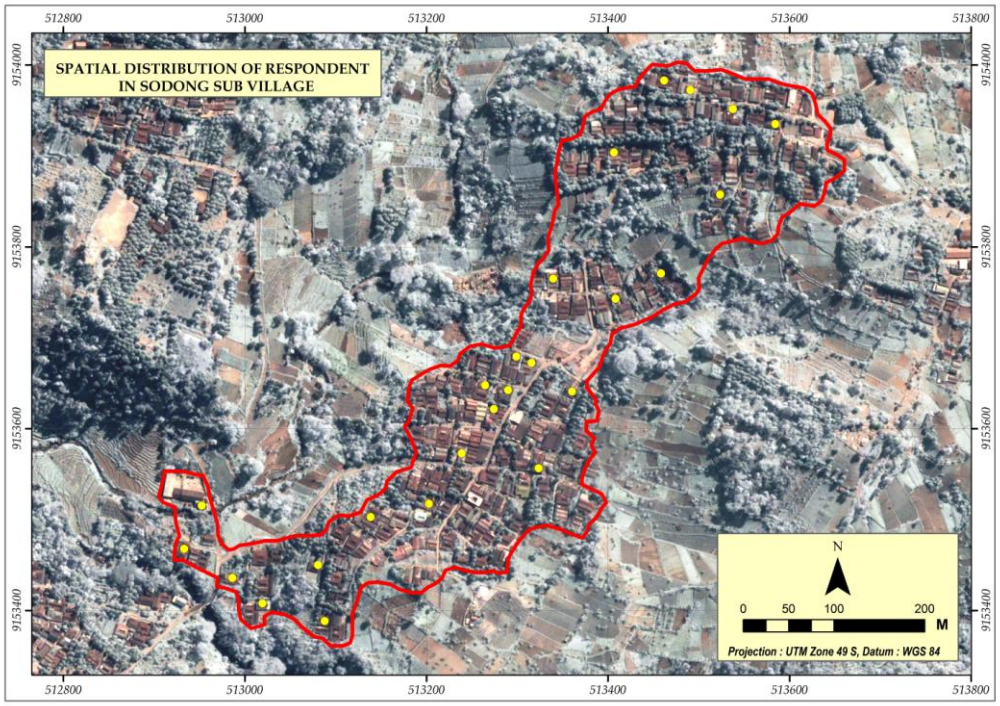

Figure 3.25. Spatial distribution of the respondents at Sodong Sub-village

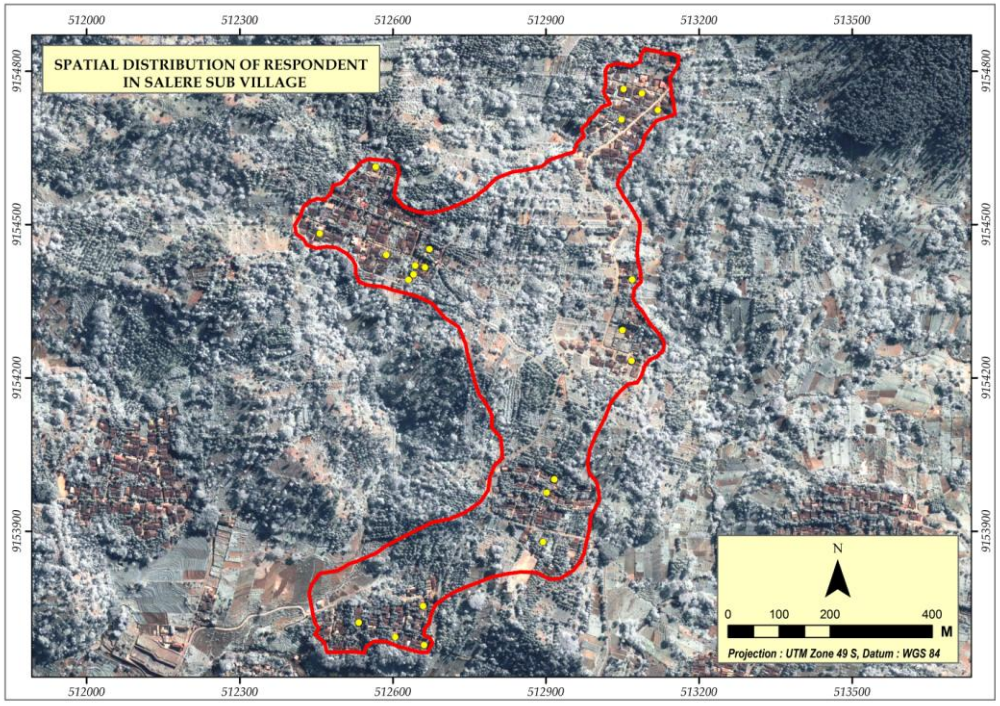

Figure 3.26. Spatial distribution of the respondents at Salere Sub-village

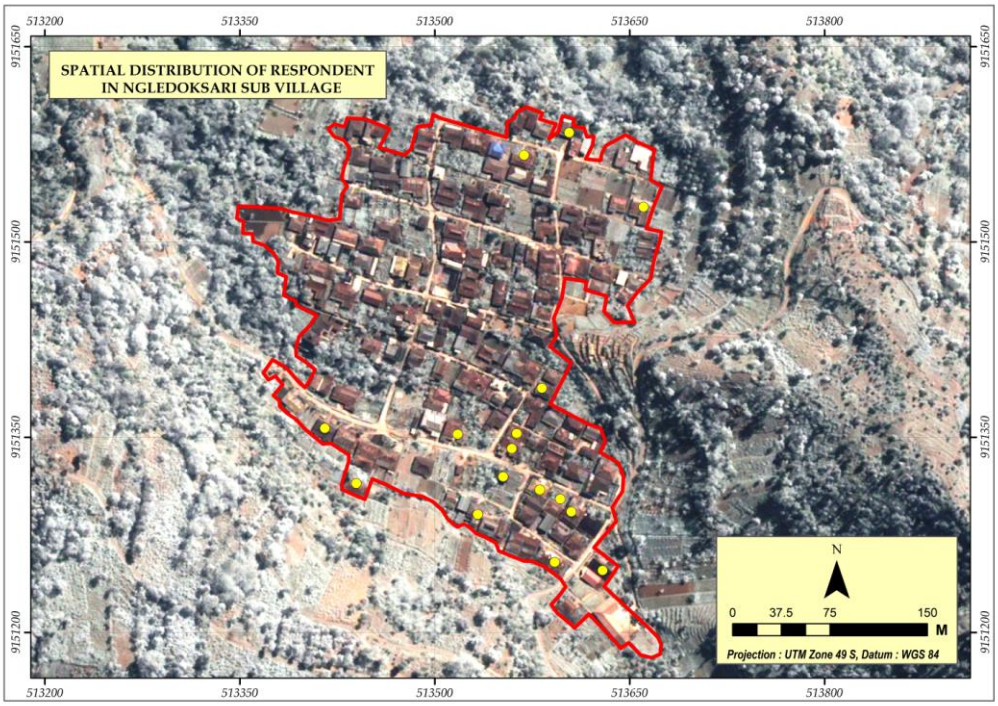

Figure 3.27. Spatial distribution of the respondents at Ngledoksari Sub-village

3.5.5. Questionnaire

The questionnaire with close and open ended questions used in order to collect the primary data from household survey in two villages (Tengklik and Tawangmangu). The questions in the questionnaire consist of two types of question; those are included close ended question and open ended question. Open question is used to give opportunity for respondent to explore their opinion. The close ended question is used to know the response of respondent to the questions in the questionnaire with "agree" till "disagree". The answer scored using *Likert scale* as 5 if "strongly agree" till 1 if "strongly disagree" (Albaum, 1997). *Likert scales* are commonly used in the psychology questionnaire survey to transform qualitative data into quantitative data to make it amenable for statistical analysis.

A Likert scale measures the extent to which a person agrees or disagrees with the question on the questionnaire. The most common scale is 1 to 5. The answer of question will be scaled as 1=strongly disagree, 2=disagree, 3=not sure, 4=agree, and 5=strongly agree. Scores are summed to obtain a combined score. The result of combined score was divided in three classes, namely: low, moderate and high to know the level of perception, coping strategies and people acceptation disaster risk reduction program. Interviews and questionnaire with the head of institution (GO and NGOs) are mostly related with the risk governance framework. Close and open question was asked to head of institution at district scope and sub-district scope. Close question was analyzed using *Likert scale* and open question was analyzed

descriptively. Field observation was conducted to know the landslide location, natural sign, the existence of early warning system and several physical features of community's coping strategies.

Questionnaire used to interview with local people as many as 93 respondents, 24 institutions at district level and 6 institutions at sub-district level. In this research, there are three types of questionnaire consist of questionnaire for household, questionnaires for stakeholders at the district level and a questionnaire for stakeholder at sub-district level. In addition, some list of question was also created as guide the interviews with key respondent. Questionnaire for households composed of 54 open and closed questions. Questionnaire for households is used as a tool to assess the level of perception, coping strategy and people acceptation of risk reduction program conducted by government and other stakeholders. The perception of every respondent was identified by analyzing the question number 12, 13, 20, 22 and 24 (see appendix 1). The level of people coping strategy was identified by analyzing the question number 28-32, 34-38 and 40-41 (see appendix 1). The level of people acceptation to risk reduction program was identified by analyzing the question number 44-53 (see appendix 1). The answers were graded as 5 if "strongly agree" till 1 if "strongly disagree".

Questionnaires for the analysis of risk governance framework at district level comprise of 30 questions which are all closed questions (see appendix 2). Stakeholder involvement on risk governance framework was identified by analyzing the question number 1-9 (see appendix 2). Risk management was identified by analyzing the question number 10-24 (see appendix 2). Risk communication was identified by analyzing the question number 25-30 (see appendix 2). The answers were graded as 5 if "strongly agree" till 1 if "strongly disagree." To sharpen the analysis was also made a list of questions to guide the interview activity.

Questionnaires for the analysis of risk governance framework at sub-district level comprised 23 questions which are all closed questions (see appendix 3). Stakeholder involvement on risk governance framework was identified by analyzing the question number 1-6 (see appendix 3). Risk management was identified by analyzing the question number 7-18 (see appendix 3). Risk communication was identified by analyzing the question number 19-23 (see appendix 3). The answers were graded as 5 if "strongly agree" till 1 if "strongly disagree."

3.5.6. Equipment and software

This research used some equipment and software, those are:

1. Equipment: Global Positioning System (GPS), recorder device, digital camera, printer, printed thematic map, printed satellite imageries, questionnaire sheet and list of question for interview, stationery.
2. Software: Microsoft Office 2007 (Word, Excel, Powerpoint), ArcGIS 9.3 for spatial data processing, SPSS 19 for statistical data processing.

CHAPTER IV
CHARACTERISTIC OF RESPONDENTS

This chapter describes characteristic of respondents including age, gender, education, household size, occupation, income, building type and people experience to the landslide. Characteristic of respondents pre-assumed has correlations with the level of landslide risk perception and the coping strategy of local community.

4.1. Introduction

To determine the level of local people perception to landslide, the first thing to do is identify the characteristic of population. According to Heryanti (2010), risk perception has been influenced by two groups of variables: situational factors and cognitive factors. Situational factors were measured using analysis of characteristic of respondent and cognitive factors were measured using analysis of people knowledge related to landslide. To determine characteristic of population and people knowledge, sampling technique was applied for 93 respondents were spread proportionally in each sub-village. It is assumed that characteristics of the population directly or indirectly influence the level of perception related to landslide.

4.2. Characteristic of Respondents

Descriptive statistic analysis was used to analysis characteristic of respondents. There are several parameters was assessed base on: age, gender, education, household size, occupation, income, building types and people experience to the landslide.

4.2.1. Age Distribution

The age of respondents is ranging from 23 to 82 years old, and most of respondent have age class 2 is aged between 30 -39 years old (see table 3.1) with percentage 32.3%. According to BPS (Central Bureau of Statistics), productive age of Indonesian people between 15-64 years, whereas non-productive age population is less than 15 years and up to 64 years old. From age distribution data can be seen, most of respondent's age in productive age with percentage 91.4% and the non-productive age by 8.6%. Productive age is working age in which humans can work optimally. Age of respondent is analyzed for this research because base on pre-assumption the age of respondent has significant relationship with the level of people perception and coping strategy. The distribution of respondent based on their age class can be seen in Figure 4.1.

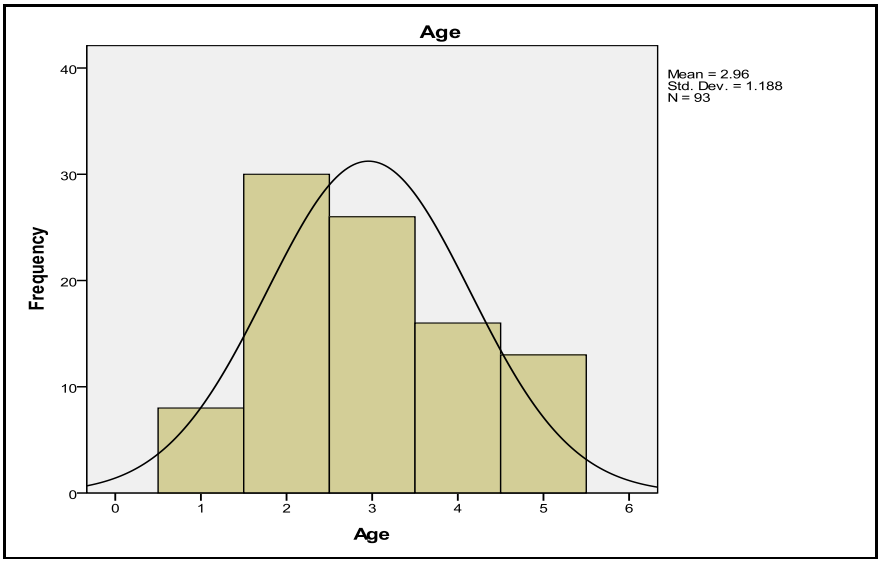

Figure 4.1. Histogram of age distribution of respondent

4.2.2. Gender

Gender of respondents is considered as one variable that influencing the variation people perception and coping strategy within community. It is assumed there is correlation between variable of gender of respondents with the people's perception and coping strategy. Based on field survey is obtained the percentage of male respondents higher than female respondents. The total of respondents 69 percent or 64 respondents were male, while the rest 31 percent or 29 respondents were female. The distribution of respondent based on the gender can be seen in Figure 4.2.

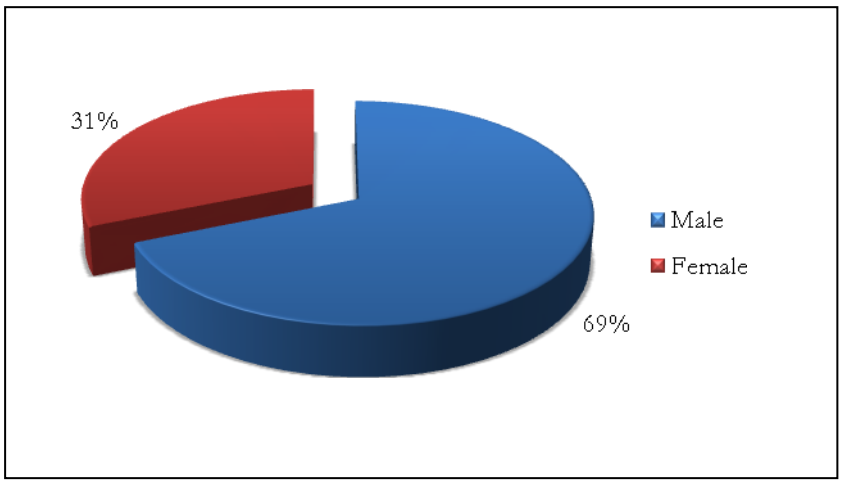

Figure 4.2. Distribution of respondents by gender

4.2.3. Education Level

The education level of the respondents is illustrated in Figure 4.3, contained of four levels from "Elementary school and under" level till "university". Elementary school and under have meaning respondents who graduated from elementary school, respondent who did not finish in elementary school and respondent who never attended school.

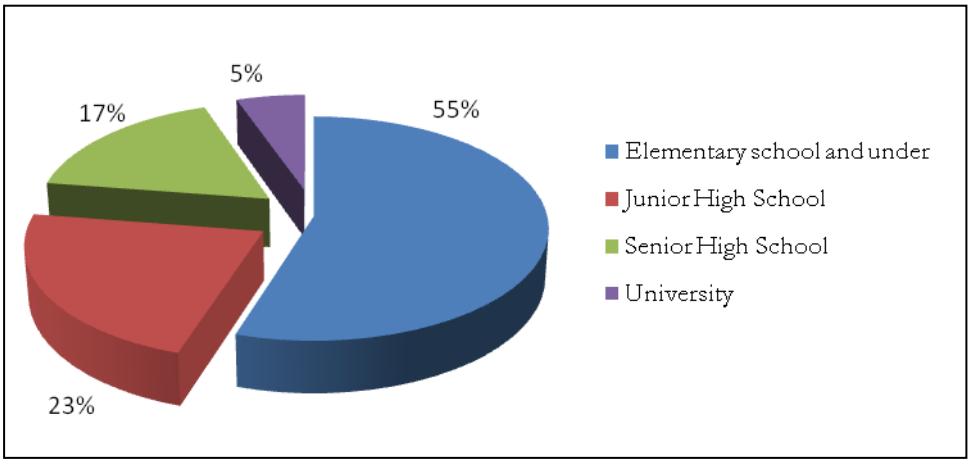

Figure 4.3. Distribution of respondents by education level

Education of respondent dominated by "Elementary school and under" with the percentage 55% or 51 respondent, followed by junior high school (23%), senior high school 17% and university 5% or 5 respondent. Education of respondent is analyzed for this research because base on pre-assumption the education of respondents has relationship with the level of people perception and coping strategy. Well educated people assumed have more knowledge which influences the people perception and coping strategy related to landslide. The higher the education level, assumed higher the level of perception and coping strategy.

4.2.4. Occupation Type

There are five types of respondents' occupation found during the fieldwork. The occupation as farmer (46.2%) dominates the respondent's occupation, followed by private employees with 20.4% respondent. Private employees are including factory employee and transport company worker. 18.3% of respondent is categorized in the "others occupation" to accommodate the respondent that have non-permanent job such as respondents who sometimes as farm worker and sometimes as construction worker. 10.8 % respondent has occupation as trader and the less percentage of respondents (4.3%) as civil servant. The type of occupation of the respondent is considered as a variable in this research with the pre-assumption that occupation has

relation with the level of people perception and coping strategy related to landslide. Figure 4.4. shows the distribution of respondents based on their occupation.

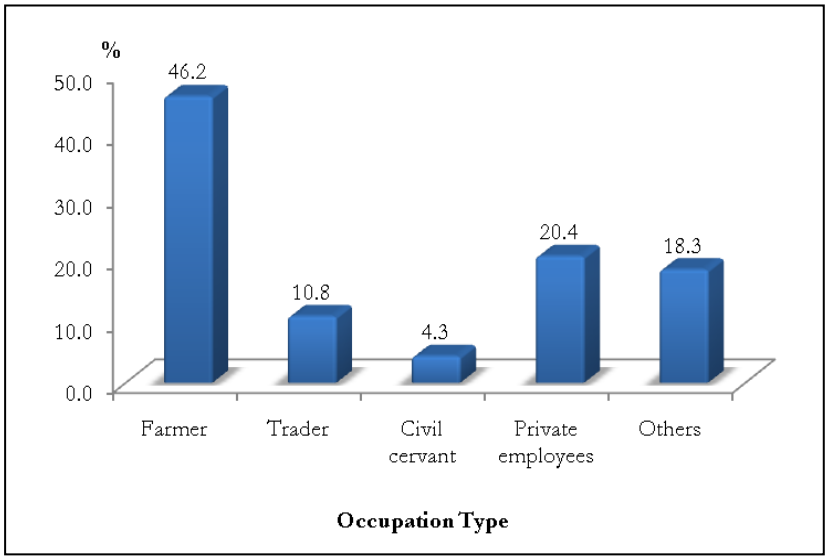

Figure 4.4. Distribution of respondents based on the type of occupation

4.2.5. Income per-month

The income per-month of the respondents is illustrated in Figure 4.5, contained of two levels. The first level is less than Rp 846,000.00 and the second level is more than Rp 846,000.00. The basic assessment for the amount of income used as Rp 846,000.00 because base on the local regulation, the minimum wage of labour in 2012 is Rp 846,000.00.

Regional Minimum Wage (UMR) is limit or minimum standards used by employers or industries to pay salaries to employees, according to calculations based on the minimum standard living at the regional location of business. The government regulates wages through the regulation published by The Minister of labour No.05/Men/1989 about Minimum Wage. From the field survey showed that 52% of respondent have income more than Rp 846,000.00 and 48% respondent has income less than Rp 846,000.00. Income of respondent is analyzed in this research because base on pre-assumption the income level of respondents has correlation with the level of people perception and coping strategy.

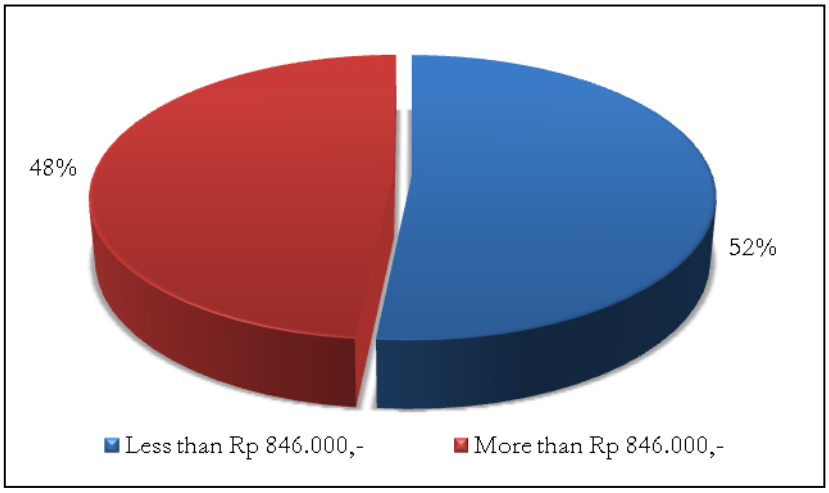

Figure 4.5. Distribution of respondents based on the level of income

4.2.6. Household Size

The households size of the interviewed respondents ranging from 1 to 8 member of family. The size of the surveyed households was dominated by the household with the 3 to 4 of family member (58%), followed by 5 to 6 member with 24% of respondents, 14% with 1-2 member and 4% with more than 6 member. The information about the households' size is considered to be important to understand the economic condition of households. Figure 4.6 shows the distribution of respondents based on the number of family member.

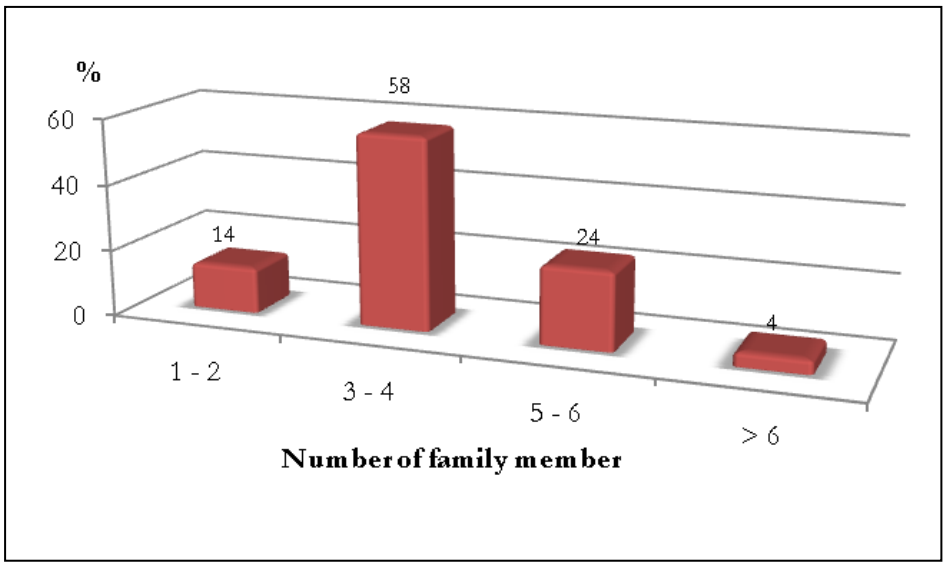

Figure 4.6. Distribution of respondents based on household size

4.2.7. Building Type

Figure 4.7 shows the building type of the respondents. Most of respondents have permanent building (70%). The figure indicates that only 17% of the total respondents have semi permanent building and 13% of respondent have non-permanent house. Permanent building can be identified by looking at the building wall made of brick or brick and cement floor. Semi-permanent building characterized by a partial wall of brick and partly of wood, zinc and bamboo, while a non-permanent building is whole house walls made of bamboo, wood or zinc. Type of building is assumed to have correlation with the level perception and way people preparing their house for landslide event.

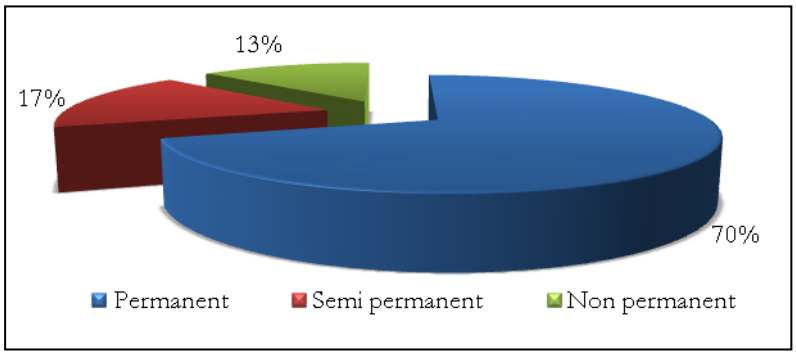

Figure 4.7. Distribution of respondents based on the type of building

Figure 4.8

Figure 4.9

Figure 4.10

Figure 4.11

Figure 4.8. Non-permanent building made of wood
Figure 4.9. Non-permanent building made of zinc
Figure 4.10. Semi-permanent building made of brick and wood
Figure 4.11. Permanent building made of brick and concrete

4.2.8. Landslide Experience

Landslide experience to be one of the factors that pre-assumed has correlation with the level of people perception and coping strategy. Bell (2007) cited from Heryanti (2010) indicated that experience was the most influential factor in shaping the perception and (mitigative) behaviour. This is based on the assumption that the higher of experience dealing with landslide, the higher level of perception and coping strategy. The results field survey showed the majority of respondents (50%) experienced the landslide more than twice. Respondents who have experienced to face a landslide twice are 24% and 26% of respondent have once experienced in landslide. Figure 4.12 shows the distribution of respondent base on the experience to landslide.

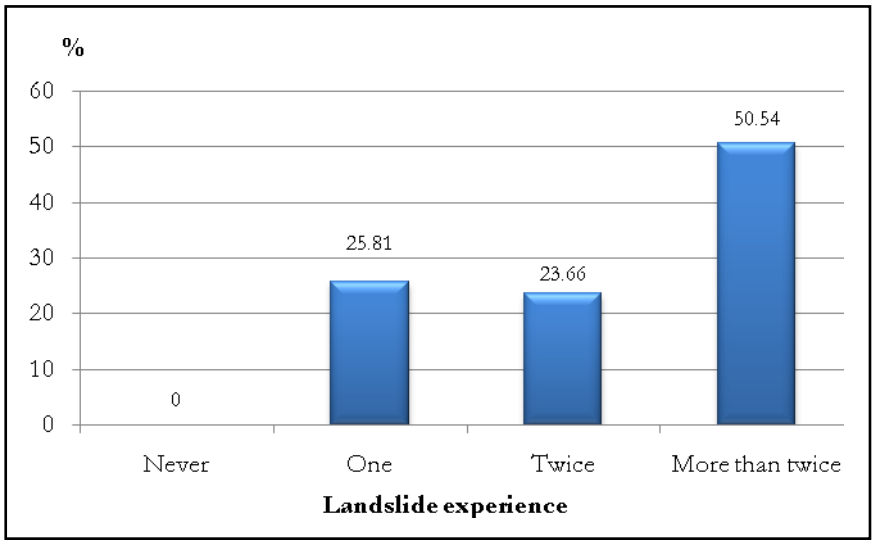

Figure 4.12 The distribution of respondent base on the experience to landslide

4.3. Summary and Conclusion

This chapter has explained the characteristic of respondents in Tawangmangu Village and Tengklik Village. There are eight factors of characteristic respondents that pre-assumed has significant relation with the level of landslide risk perception and the coping strategy of local community comprise age, gender, education, household size, occupational types, income, building type and people experience to the landslide.

Totally, the amount of sample that must be taken is 93 respondents consisted of 69% were men and 31% were women. The age of respondents is ranging from 23 to 82 years old, 41% respondents were between 23 and 39 years old, 45 % were 40 to 59 years old and 13% were 61 years old or older. Base on the monthly income, 48 % of the respondents reported monthly incomes lower than Rp 846,000.00 and 52% more than Rp 846,000.00. As regards level of education, 55% of respondents had attended elementary school or under, 23% junior high school, 17% senior high school and 5% had a university degree. Regarding the occupation type, at the time of data collection 46% of the sample were farmer, while 11% were trader and self-employed, 4% were civil servant, 20% were private employees and 18% have non-permanent occupation.

The size of the surveyed households was dominated by the household with the 3 to 4 of family member (58%), followed by 5 to 6 member with 24% of respondents, 14% with 1-2 member and 4% with more than 6 member. Most of respondents have permanent building (70%), 17% semi permanent and 13% of respondent have non- permanent house. Regarding on the landslide experience, the majority of respondents (50%) experienced the landslide more than twice, while 24% respondents were twice and 26% respondent have once experienced in landslide

CHAPTER V
LOCAL PEOPLE PERCEPTION OF LANDSLIDE

This chapter discusses perception of local people perception related to landslide. To know the people perception related to landslide, questionnaire with close and open ended question was used as a tool in this research. This section also describes factors that assumed have correlation to landslide using statistical analysis.

5.1. Introduction

According to Westen and Kingma (2011) the level of risk perception depend on their personal situation, cultural and religious background, social background, economic level, political background, level of awareness, media exposure, other risks and risk reduction situation.

People perception about risk plays an important role to know how the people anticipate the negative impact of landslides occurrences. By knowing the people perception will know how respond of local people to survive and to cope from landslides in the future. By knowing the level of local people's perceptions of the landslides, it is helpful for the government and other stakeholders to design appropriate programs to reduce the risk of landslide.

5.2. People Perception to Landslide

This sub section describes perception of local people related with landslide. People's perception related to landslides has relationship with the knowledge of people about landslides. Some things related knowledge of people about landslide such as landslide definition, the location of the landslide, landslide types and physical loss and non-physical due to landslides are discussed in this sub chapter.

5.2.1. Landslide definition

In general, people in the study sites have a high level of understanding on landslides. According to the Table 5.1, as much as 40% of the population answered the definition of landslide as a mass of rock and soil that fallout, 33% of respondents answered down slope movement of soil from a steep slope and the lowest answer is the down slope movement of soil and rock from a steep slope chosen by 27% of respondent. From the result of questionnaire was known that nobody who choose others answer. The results indicate that the population in the study area knows the definition of landslide.

Table 5.1. The definition of landslide according to the local people

No	Landslide Definition	Frequency (f)	Percentage (%)
1.	Down slope movement of soil from a steep slope	31	33
2.	Down slope movement of soil and rock from a steep slope	25	27
3.	Mass rock and soil that fallout	37	40
4.	Others answers	0	0
Total		***93***	***100***

5.2.2. Causal factors of landslide

Base on the field survey and interview with local people in Tengklik Village and Tawangmangu Village, perception of people regarding with the causal factors of landslide can be seen on the Table 5.2.

Table 5.2. Perception of people related with the causal factors of landslide

No	Causal Factors of Landslide	Frequency (f)	Percentage (%)
1.	Deforestation	33	35
2.	Bad drainage system	17	18
3.	Heavy rainfall in long time	17	18
4.	Steep slope topography	12	13
5.	Unstable soil	14	15
6.	Hilly topography	1	1
Total		***93***	***100***

Base on the data that displayed on the Table 5.2, most of people declared that the causal factor of landslide is deforestation with 35% respondents. Bad drainage system and heavy rainfall in long time are the causal factors of landslide that chosen by 17 respondents (18%), followed by unstable soil and steep slope topography with 15% and 13% respectively. Hilly topography is the lowest causal factors of landslide with percentage 1% respondents. Interview related the time of landslide occurrence with respondents declare that all of respondents answer in the same opinion, that is rainy season and the characteristic rainfall that causes landslide is heavy rainfall in long time.

5.2.3. Landslide location

Perceptions of people about landslide location can be seen in Table 5.2. Base on the data on the Table 5.3, it can be seen that the highest landslide location is in steep slope by the number of respondents 63 people (68%). Furthermore, mountain area was chosen by 29% of respondents. Cliff on the river side and cliff on the road was chosen 2% and 1% of respondents respectively. By looking at these results can be explained that the knowledge of the local people about landslide location is high. This is evidenced by answers to questionnaires from 100% of respondents claim to know the location of the landslide occurrences and no respondents who answered with "don't know" and "plain areas".

Table 5.3. The landslide location according to the local people

No	Landslide Location	Frequency (f)	Percentage (%)
1.	Mountain area	27	29
2.	Steep slopes	63	68
3.	The cliffs on the river side	2	2
4.	The cliffs on the road side	1	1
5.	Plain areas	0	0
6.	Do not know	0	0
7.	Other answers	0	0
Total		***93***	***100***

The historical landslide data was obtained from simple focus group discussion. The simple group discussion with the head of sub-village was conducted to obtain information related to the location of landslide, the time of landslide events, magnitude of landslide and the damage caused by landslide. The indicators that be used to describe the magnitude level of landslide are the big landslide event is the occurrence of landslide that more than house, the moderate landslide can be identified by the area of landslide that more than a car and smaller than house and the lowest level magnitude of landslide is smaller than a car.

Participatory mapping using printed satellite imagery of Tengklik Village was conducted to define landslide location. Using printed satellite imagery, each of head of sub-village was asked to draw the landslide location and sub-village boundary. Head of each sub-village wrote the time of landslide events, the impact of landslide and magnitude of landslide. The red point indicated the big landslide; the blue point indicated the medium of landslide. The low magnitude of landslide never has been occurred in Tengklik Village.

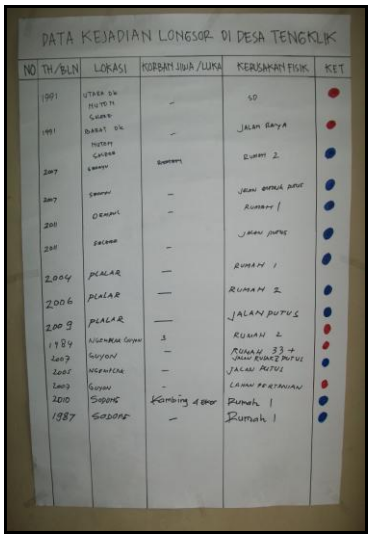

Figure 5.1

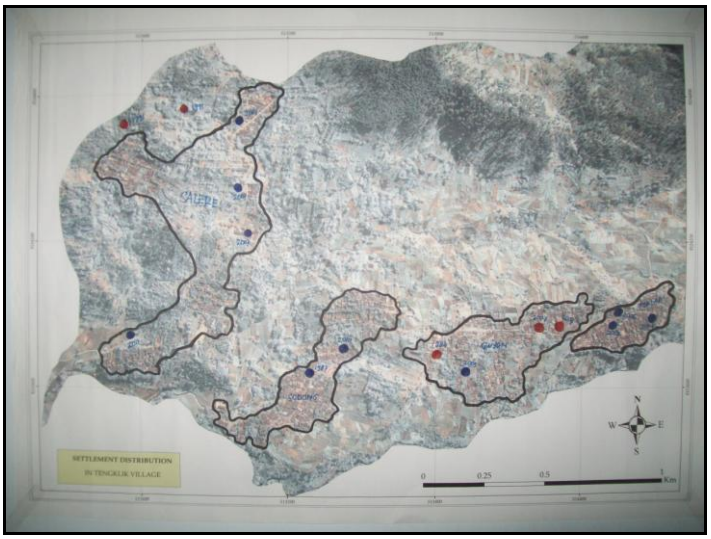

Figure 5.2

Figure 5.1. Historical landslide events in Tengklik Village
Figure 5.2. The simple landslide inventory map

Base on the Figure 5.1 and Figure 5.2 can be explained that landslide in Tengklik Village was occurred in 15 times. The biggest landslide event was occurred in 2007 that causes 33 houses collapse, street network was broken and damage to agricultural land.

5.2.4. Landslide type

To know the perception of respondents about the type of landslide in their village was used the picture of the type of landslide including, slide, debris flow, rock fall, topple and lateral spread (see Appendix 1). Respondents were asked to choose one of the landslide type picture accords with landslide in their village. Base on the field survey was known that most of people choose topple type (47%), followed by slide (24%). Four percent of respondents don't know the type of landslide in their village. Base on the field observation, the landslide type in study area can be categorized in slide type. Slide is the movement of soil, debris or rock along a distinct surface of rupture which separates the slide material from the more stable underlying material. This type of landslide is divided into two: rotational and translational slide (Highland et al, 2008). Perceptions of people about landslide type can be seen in Table 5.4.

Table 5.4. The landslide type according to the local people

No	Landslide Type	Frequency (f)	Percentage (%)
1.	Slide	22	24
2.	Debris flow	4	4
3.	Rock fall	8	9
4.	Topple	44	47
5.	Lateral spread	11	12
6.	Do not know	4	4
7.	Other answers	0	0
Total		***93***	***100***

5.2.5. Physical loss

Perceptions of people about the physical loss due to landslide in their village can be seen in Table 5.5. Base on the data on the Table 5.4, it can be seen that the most of respondent (71%) declare that landslide cause the house damage, followed by agricultural destruction with 22% respondent. Loss of live stock was chosen by 2% respondent and 3% respondents choose no loss.

Table 5.5. The physical loss due to landslide according to the local people

No	Physical Loss due to Landslide	Frequency (f)	Percentage (%)
1.	Agriculture destruction	20	22
2.	House damage	66	71
3.	Loss of livestock	2	2
4.	No loss	3	3
5.	Other answers	2	2
Total		***93***	100

5.2.6. Non-physical loss

Perceptions of people about the non-physical loss due to landslide in their village can be seen in Table 5.6. Base on the data on the Table 5.6, it can be seen that the most of respondent (66%) explain that landslide cause the trauma, followed by injury with 22% respondent and death (12%).

Table 5.6. The non-physical loss due to landslide according to people

No	Non-Physical Loss due to Landslide	Frequency (f)	Percentage (%)
1.	Injury	14	15
2.	Death	11	12
3.	Trauma	61	66
4.	Disability	0	0
5.	No loss	6	6
6.	Other answers	1	1
Total		***93***	***100***

5.3. The Level of Landslide Perception

Risk perception is a subjective opinion of people about the risk, its characteristics, and its severity, include multiple factors: the individual's knowledge of the objective risks, the individual's expectations about his or her own experience to risks, and his or her ability to mitigate or cope with the adverse events if they occur (Rianto, 2009). Risk perception is characterized as the intuitive judgment of individuals and groups of risks in the context of limited and uncertain information (Slovic, 2000).

In this research, the level of people perception is divided into three levels; High, Moderate and Low levels. Indicators which are used to assess the respondent's perception are the accumulation of the questionnaire answers. The level of respondent's perception was identified by analyzing the question number 12, 13, 20, 22 and 24 (see appendix 1). The answers were graded as 5 if "strongly agree" till 1 if "strongly disagree". The answer of all respondents was accumulated and the result was identified the highest and lowest values. Base on the calculation of data was known that the minimum value is 9, the maximum value is 25 and the average is 20 (see Appendix 4). Difference of the lowest and highest values is interval. From the calculation, the value used is 16 as interval derived from the maximum value (25) minus the minimum value (9). To get three classes of perception, interval value is divided into three. This is value that used as a basis for class divisions to the people perception. The result of calculation was categorized in three classes: Low (9-13), Moderate (14-19) and High (20-25). Respondents with a high perception level mean having the knowledge of landslides is high. Some indicators of knowledge about landslide according to the question in the questionnaire are definition of landslide, location of landslide, the time of landslide occurrences, causal factor of landslide and the effects caused by the landslide. Spatial distribution of the level of respondent's perception to landslide was displayed on the Appendix 5.

Base on the graphic that was displayed on Figure 5.3 describes that the level of people perception related with landslide dominated in high and moderate level. Totally, 46.2% respondents have moderate level of risk perception, 47.3% have high level and only 6.5% respondents that have low level of perception. On the high level of perception, the highest percentage is 72% respondents in Sodong Sub-village and the lowest percentage is 31.3% in Guyon Sub-village. The highest percentage of the moderate level of perception is 68.8% respondents in Guyon Sub-village and the lowest percentage is 24% in Sodong Sub-village. On the low level of perception, the highest percentage is 13.6% respondents in Salere Sub-village and the lowest percentage is 0% in Guyon Sub-village. This indicates the success of training and dissemination programs about landslide conducted by the government and non government organisation to local people in Guyon and Ngledoksari after the landslide event in 2007. This program generated improving the people knowledge about landslide.

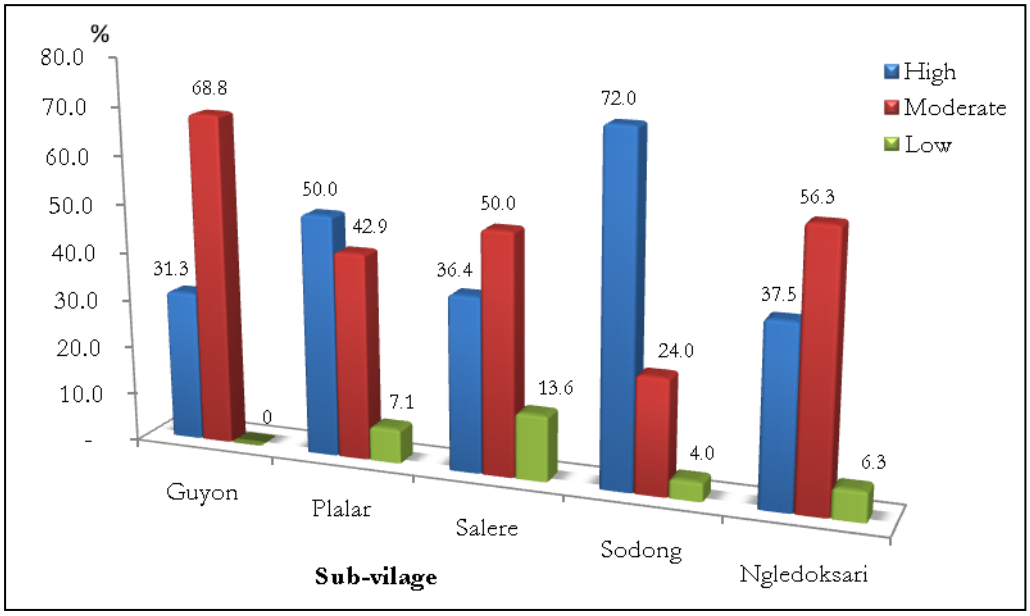

Figure 5.3. The level of people perception related landslide within 5 sub-villages

5.4. Cross Tabulation with Chi-square Analysis

Statistical analysis using cross-tabulation with chi-square analysis is needed to determine the differences level of perception among respondents in five sub-villages (Guyon, Plalar, Salere, Sodong and Ngledoksari). Statistical analysis was conducted using software SPSS 19. Cross tabulation tables provide a wealth of information about the relationship between the level of perception and sub-village. On the SPSS program, crosstab facility not only displays information about the relation between two or more variables but also calculates the level of differences between one variable and other variables. Statistical tool on SPSS that was used to assess the

degree of relationship between rows and columns is called chi-square test. The Table 5.7 below is the first output of the statistical analysis using cross-tabulation with chi-square analysis.

Table 5.7. Case processing summary of people perception

Case Processing Summary						
	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
People_perception * Sub_village	93	100.0%	0	.0%	93	100.0%

The first output of statistical processing is case processing summary table. Case processing summary shows the number of cases that will be analyzed. From the Table 5.7, it is known that cross-tabulation with chi-square analysis was conducted on people perception variables and sub-village variables. There are 93 data that will be processed and no data missing or lost, so the validation rate of 100%. The second output of the statistical analysis using cross-tabulation with chi-square analysis was cross tabulation between people perception and sub-village. The second output can be seen on the Table 5.8.

Table 5.8. Cross tabulation between people perception and sub-village

People_perception * Sub_village Crosstabulation							
Count							
		Sub_village					Total
		Guyon	Plalar	Salere	Sodong	Ngledoksari	
People_ perception	Low	0	1	3	1	1	6
	Moderate	11	6	11	6	9	43
	High	5	7	8	18	6	44
Total		16	14	22	25	16	93

Cross tabulation is a summary of the data presented in table form. The Table 5.8 shows cross tabulation between people perception and sub-village. In the table it can be seen that the amount of people is the low level perception is 6 respondents that was scattered in Plalar Sub-village 1 respondent, Salere 3 respondents, Sodong and Ngledoksari have the same number with 1 respondent. People who have moderate level of perception is 43 respondents spread across Guyon Sub-village 11 respondents, Plalar 6 respondents, Salere 11 respondents, 9 respondents in Ngledoksari and 6 respondents in Sodong Sub- village. Population with a high level of perception amounted to 44 respondents with a composition in Guyon Sub-village 5 respondents, Plalar 7 respondents, Salere 8 respondents, 18 respondents in Sodong and 6 respondents in Ngledoksari.

The third output of the statistical analysis using cross-tabulation with chi-square analysis is chi-square test table. The result of the chi-square test is used to determine the difference of people perception related to landslide within five sub-villages (Guyon, Plalar, Salere, Sodong and Ngledoksari). Chi-square test used the null hypothesis (H0) which stated that there is no difference of people perception in five sub-villages. The result from the test as mentioned on the Table 5.9.

Table 5.9. Chi-square tests of people perception

Chi-Square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	12.911[a]	8	.115
Likelihood Ratio	13.616	8	.092
Linear-by-Linear Association	.682	1	.409
N of Valid Cases	93		
a. 5 cells (33.3%) have expected count less than 5. The minimum expected count is .90.			

There are two methods for decision making on the chi-square analysis. The first method is basic for decision making was determined by looking at the ratio between the value of calculated chi-square and the value of chi-square table. Null hypothesis is accepted if the value of calculated chi-square is less than the value of chi-square table and the opposite, null hypothesis is rejected if the value of calculated chi-square is greater than the value of chi-square table. Table 5.3 is the result of analysis using chi-square test. Value of calculated chi-square look at in SPSS output section *Pearson Chi-square* was 12.911. Chi-square table values calculated using significance level (α) = 5% or 0.05. Degrees of freedom (*df*) is 8 obtained from the formula: (number of rows-1) x (number of columns-1), because there are 3 rows and 5 columns, the *df* value = (3-1) x (5-1) = 8. From the chi-square distribution table with significance level 0.05 and degree of freedom 8 was obtained the value of chi-square table 15.507. Because of the value of calculated chi-square (12.911) less than the value of chi-square table (15.507), null hypothesis is accepted, meaning that there was no difference of people perception related to landslide within five sub-villages.

The second method is base on the value of significance probability (*P-value*). Null hypothesis is accepted if the *P-value* > 0.05, and null hypothesis is rejected if *P-value* < 0.05. From Table 5.9, it can be seen that the value of *Asymp. Sig. (2-sided)* is 0.115 or more than 0.05 (0.115 > 0.05), the decision is H0 is accepted, meaning that there was no differences of people perception related to landslide within five sub-villages. The two methods of decision-making produced the same conclusion that was no difference of people perception related to landslide within five sub-villages.

5.5. The Factors Influencing Landslide Risk Perception

The multiple linear regression analysis was used to determine the factors that influence the level of people perception related to landslide. Multiple linear regression analysis is used to know correlation between dependent variable and one or more independent variables. To carry out this analysis, the researcher was used SPSS 19 software. Before conducting an analysis of factors that influence perception, the first thing to do is analysis to the factors that have correlation with the level of people perception related to landslide. As described earlier in the Chapter IV, there are several factors that are pre-assumed having correlation with the level of perception. The factors that are pre-assumed have correlation with the perception is the age, gender, education, occupation, income, household size, building type and landslide experience. The first output table of multiple linear regression analysis is a correlation table. Correlations conducted to determine the factors associated with level of people perception. The results of correlation analysis are presented in the Table 5.10:

Table 5.10. Correlation analysis of people perception

Correlations	
Independent variable	**Sig. (1-tailed)**
Age	.000*
Gender	.080
Education	.000*
Occupation	.003*
Income	.000*
household size	.048*
Building_type	.000*
Landslide_exp	.235

The null hypothesis used in this analysis is independent variables (age, gender, education, occupation, income, household size, building type and landslide experience) do not have a correlation with the dependent variable (people perception). Probability value (*P-value*) was used 0.05. Decision-making is based on the null hypothesis that will be accepted if the value of *Sig. (1-tailed)* > 0.05. From calculations process using SPSS software can be seen that there are five variables that have a *sig. (1-tailed)* < 0.05, those are age, education, occupation, income, household size and building type. It can be concluded that the variables that have a correlation with the local people perception are age, education, occupation, income, household size and building type. Model summary is the second output of the multiple linear regression analysis using the SPSS.

Table 5.11 Model summary of people perception

Model Summary[b]				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.792[a]	.626	.591	.392
a. Predictors: (Constant), Landslide_exp, Household_size, Income, Occupation, Gender, Age, Education, Building_type b. Dependent Variable: People_perception				

From the Table 5.11, it can be seen that the *R-value* is 0.792. *R-value* describes the strength of the relationship between dependent and independent variables. R-*value* > 0.5 stated that the relationship between dependent and independent variables is very strong. The value of *Adjusted R-square* is 0.591 stated that 59.1% variation in the dependent variable (perception) can be explained by variations in the independent variable. *Standard error of the estimate* (*SEE*) is 0.392. The smaller the *SEE* will make the appropriate regression model to predict the dependent variable. The third output of the multiple linear regression analysis is *anova* table.

Table 5.12. Anova table of people perception

ANOVA[b]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	21.597	8	2.700	17.612	.000[a]
	Residual	12.876	84	.153		
	Total	34.473	92			
a. Predictors: (Constant), Landslide_exp, Household_size, Income, Occupation, Gender, Age, Education, Building_type b. Dependent Variable: People_perception						

The null hypothesis (H0) stated jointly independent variable not influences on the level of people perception. The null hypothesis will be accepted if *calculated F* < *F-table*. From the Table 5.12 can be seen the value of *calculated F* is 17,612, while the value of *F-table* on significance (α) = 0.05 and degrees of freedom 1 = 8 and degrees of freedom 2 = 84 obtained value of *F-table* = 2.051. The value of *calculated F* > *F-table* means that null hypothesis rejected, the conclusion is jointly independent variable influences the independent variable (the level of perception). Basis for decision making by using a probability value indicates that the *significant value* is 0.000. Base on the significant value, since the probability value (*P-value*) is less than 0.05 and null hypothesis is rejected it means jointly independent variable influences the independent variable (the level of perception). Decision-making using the F-table and the probability value obtain the same conclusion that jointly independent variable influences the independent variable (the level of perception). Table 5.13 is the fourth output of the multiple linear regression analysis using SPSS.

Table 5.13. Coefficients of people perception

Coefficients[a]					
Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	2.314	.359		6.443	.000
Age	-.178	.044	-.346	-4.074	.000*
Gender	-.097	.107	-.074	-.912	.364
Education	.313	.061	.478	5.128	.000*
Occupation	.001	.029	.003	.034	.973
Income	.175	.103	.143	1.688	.095
Household_size	.007	.059	.008	.112	.911
Building_type	.030	.086	.035	.348	.729
Landslide_exp	-.034	.053	-.047	-.655	.514
a. Dependent Variable: People_perception					

In the first output (correlation) explained that there are five variables that have correlation with the level of perception that are age, education, occupation, income, household size and building type. In the third output (*anova*) explained that jointly independent variables influences the level of perception. The last output on the multiple linear regression analysis is coefficients. Coefficients tested the influence of one by one independent variables with the dependence factor (the level of people perception) using *T-test*. The null hypothesis stated that partially the independent variables not have significant influence with the level of people perception (dependent variables). A method for decision-making is done using a probability value (*P-value*) 0.05. If the significance value > 0.05, null hypothesis is accepted. Base on the Table 5.12 can be seen there are only two variables that have significant influence to the people perception, that are age and education. Findings from this study indicated that two predictor variables, age and education, have a significant influence with the variation of local people perception to landslide.

The respond of two significant predictor variable (age and education) to the regression can be seen on the value of *Unstandardized Beta Coefficients*. Constant coefficient have a positive value (2.314) which states that assuming the absence of predictor variables, the level of people perception tends an increase. Regression coefficient for age variable is negative (-.178), meaning that by assuming the absence of other independent variable, the increasing of age level will be followed by the decline of perception level. The young people tend to have higher level of perception than elderly people. Regression coefficient for education variable is positive (.313), meaning that by assuming the absence of other independent variable, the increasing of education level will be followed by the raise of perception level. The people with high level education tend to have higher level of perception than people who have low level education.

5.6. Summary and Conclusion

Chapter V discussed the perception of local people related to landslide. General discussion in this chapter is divided into two section; the people perception of landslide in general and statistical analysis of the factors that influence the level of the people perception of the landslide. People perception to the landslide generally include: landslide definition, causal factors of landslide, landslide location, landslide type, physical loss and non-physical loss.

Perceptions regarding the definition of landslides declared that most respondents (40%) answered mass of rock and soil that fallout. Deforestation is a major cause of the landslide chosen by 35% respondents, while the location of the landslide occurred dominated in steep slopes area with 68% respondents. Type landslides that have occurred in the study area were Topple (47%). Losses caused by landslides consisting of physical and non-physical losses. Perception population regarding the major physical losses caused by landslides is house damage (71%), while the non-physical is trauma (66%).

The level of people perception related with landslide dominated in high and moderate with 47% and 46% respectively. The result of chi-square test declared there was no correlation between rows and columns or between the level of people perceptions and the domicile of respondents (sub-village).

The multiple linear regression analysis produced 4 output tables. The first output is a correlation table. The result of correlation test states that the variables that have a correlation with the perception are age, education, occupation, income, household size and building type. The second output is model summary table. Base on the model summary table can be seen that there is a strong relationship between the level of perception and independent variables (age, gender, education, occupation, income, household size and building type and landslide experience).

The third output is *anova* table. Base on the analysis *anova* table stated that jointly independent variable influences the dependent variable (the level of perception). Fourth output is coefficients table. Coefficients table explained the significant factors that influence the level of perception. From the results of the T-test concluded that there are only two variables that have significant effect to the people perception, that are age and education.

CHAPTER VI
LOCAL PEOPLE COPING STRATEGY

This chapter discusses coping strategy of local people both household and community related to landslide in the study area. To know the people coping strategy related to landslide, questionnaire with close and open ended question was used as a tool in this research. The discussions about the types of coping strategy are categorized into four types, which are: economic/material, technological/structural, social/organizational and cultural coping strategy. Base on the time, the discussion of coping strategy was divided in three phase, which are before, during and after the landslide occurrences. This chapter also describes analysis about people acceptation on risk reduction program conducted by government and non government organization. In the last section explained socio-economic factors of respondents that assumed have correlation to coping strategy and the correlation among people perception, people coping strategy and people acceptation using statistical analysis.

6.1.1. Introduction

Coping strategies refer to the application of indigenous knowledge in the face of hazards such as landslides (Twigg , 2004). People who live in susceptible areas have specified strategy to deal with disaster and to adapt with environment around it. An analysis of the level of coping strategy for communities in disaster-prone areas is essential to reduce the negative impact caused by the disaster. Coping strategy not only conducted by local community but also by government and non government organization. Analysis about the people acceptation on risk reduction program conducted by government and non government organization is very important to synchronize between the pretention of the community and stakeholders related to disaster risk reduction programs undertaken by government and other stakeholders. This analysis is also useful as input for the government and policy makers to plan appropriate programs in disaster risk reduction at the study areas.

6.2. Local People Coping Strategy

Local people who live in the study area realized that they were living in prone areas. Environmental conditions that make them trying applied a specific coping strategy in face of landslides that can occur at any time. Coping Strategy that be conducted by local people related with landslide can be performed in the scope of household and community.

6.2.1. Household coping strategy

Coping strategy was conducted by household can be divided into three type, which are technological/structural, economic and social coping strategy. Before

discussing about the coping strategy undertaken by the household, first performed is analysis of the motivation of people to live in prone areas.

Table 6.1. The motivation of people to live in prone areas

No	Motivation living in prone areas	Frequency (f)	Percentage (%)
1.	Own properties	24	26
2.	Has no other land	49	53
3.	Close to family	19	20
4.	Ancestral properties	1	1
5.	Cheap price	0	0
6.	Better access	0	0
7.	Other answers	0	0
Total		***93***	***100***

Base on the data that displayed on the Table 6.1, most of people stated that the reason they live in prone areas is has no other land with 35% respondents. Followed by own properties and close to family that chosen by 24 respondents (26%) and 19 respondents (20%) respectively. By looking at the reasons contained in Table 6.1 above, the disaster risk reduction efforts focused on strengthening / increasing levels of coping strategy and not on relocation efforts**.**

The majority of people have jobs as farmers, therefore coping strategy effort not only be applied at around the house but also at agricultural land. This was done to avoid the loss of agricultural product due to landslides. The people coping strategy was applied on agricultural land can be seen on the Table 6.2

Table 6.2. Coping strategy of household at agricultural land

No	Coping strategy on agricultural land	Frequency (f)	Percentage (%)
1.	Build and repair drainage system	35	38
2.	Planting tress	30	32
3.	Construct retaining wall	12	13
4.	Build terraces	16	17
7.	Other answers	0	0
Total		***93***	***100***

From Table 6.2 can be explained that coping strategy conducted by people on agricultural land include build and repair drainage systems (38%), planting tress (32%), construct retaining wall (13%) and build terraces (17%).

Figure 6.1

Figure 6.2

Figure 6.3

Figure 6.4

Figure 6.1. Planting tress in agricultural land
Figure 6.2. Build terraces
Figure 6.3. Build drainage system
Figure 6.4. Construct retaining wall in agricultural land

Based on people perception analysis was discussed in previous chapter, people in Tawangmangu Village and Tengklik Village very aware that they are living in landslide-prone areas. Since landslides big event in 2007 in this area that caused so much physical and non-physical loss, the local people applied the various coping strategy in order to avoid negative impacts due to landslides. Various coping strategy undertaken by each household depend on to the capacity of each other. To know the coping strategy undertaken by the household, interviews with open and close-ended question to 93 respondents was conducted by researcher. Base on the household interview and field observation, several coping strategy conducted by household to deal with landslide. The household coping strategy divided in three times, which are before, during and after landslide. The coping strategy conducted by household before landslide occurrence that obtained from field survey is shown in Table 6.3.

Table 6.3. Household coping strategy before landslide occurrence

Coping Strategy Type	Before Landslide Occurrence
Economic coping strategy	1. Saving money to anticipate when there are unexpected needs.
	2. Build a simple animal husbandry (sheep, cattle, chickens).
	3. Build a small shop to increase family income.
	4. Selling wood especially *Sengon* wood (*Albizia falcataria*) harvested from agricultural land by agro forestry system.
	5. Selling flowers seedling to raise family income.
	6. Selling the fruits (banana) harvested from the agricultural land to raise family income.
	7. Participate in the *Arisan*.
	8. Selling vegetables harvested from agricultural land.
	9. Cultivation of vegetables, trees, flowers and fruits on agricultural land.
	10. Preparing the "health card" in the village office to anticipate if the family illness or injury (only for poor people).
Structural coping strategy	1. Construct retaining wall on steep slope around the house.
	2. Build house using concrete and brick.
	3. Build terraces in the agricultural land.
	4. Construct and repair water channels.
	5. Renovate and reinforced house damage cause of a crack.
	6. Closing and pile up cracks in the soil around the house.

Based on the data shown in Table 6.3, can be explained there are two types of coping strategy conducted by household before landslide which are economic coping strategy and structural coping strategy. In term of economic coping strategy, most of household activities focused on increasing the family income by selling agricultural products. Participate in "*Arisan"* is the one activities in economic coping strategy. *Arisan* is a social gathering with limited membership who agrees to meet for a defined period in order to save and borrow together. In every meeting member would put money of the same amount in a pot and then draw a lottery. The one who wins the draw will collect the money. The following period, they will do the same except that the one who already won will not participate in the draw. In the course of the *Arisan*, the amount paid to other members will equal the amount received when the *Arisan* is held. This method of saving is a popular alternative to the risks of saving at home, where family and relatives may demand access to savings. Besides sell vegetables as the main product of the agricultural, household also sells other product such as wood, flowers seedling and fruit.

Figure 6.5

Figure 6.6

Figure 6.7

Figure 6.8

Figure 6.5. Selling flowers seedling
Figure 6.6. Build a simple animal husbandry
Figure 6.7. Selling *Sengon* wood
Figure 6.8. Build a small shop

In addition, for poor household, economic coping strategy is carried out before the disaster is preparing the "health card" in the village office to anticipate if the family illness or injury. Health card is a social insurance only for poor people for health services and the costs paid by the government. Structural coping strategy conducted by household more focusing on strengthening the house construction, repairing water channel especially on agricultural land and closing and pile up cracks in the soil around the house.

Coping strategy conducted by household during landslide occurrence comprise economic coping strategy and social coping strategy (see Table 6.4). Activities on economic coping strategy during landslide event is securing good and valuable asset. There are 8 social coping strategy activities that be done by people during landslide events. The most important activities are run to safe place, evacuate family and inform the landslide event to the local authorities.

Table 6.4. Household coping strategy during landslide occurrence

Coping Strategy Type	During Landslide Occurrence
Economic coping strategy	1. Securing the goods / valuable assets.
Social coping strategy	1. Inform the head of village, sub-village and others stakeholders about landslide occurrence.
	2. Ask for assistance to relevant institutions.
	3. Disseminate information to neighbours and other people about landslide occurrence.
	4. Evacuate the family members who have high vulnerability such as elderly, children and women.
	5. Run to the safe place and stay at safer place.
	6. Stay in the house and praying to God.
	7. Helping each other to evacuate people.
	8. Night patrol to secure assets and oversee the landslide subsequent.

The type of coping strategy conducted by household after the landslide events are shown on the Table 6.5. Base on the information on the Table 6.5, there are three type of coping strategy conducted by household after landslide events which are economic coping strategy, structural coping strategy and social coping strategy. Economic coping strategy was focused on borrowing money from bank or relative. The money will be used to renovate or to build house that damage because of landslide. On the structural coping strategy, the first activities are cleaning the house from landslide materials. There are seven activities in social coping strategy. Helping each other is one important think in social coping strategy. Most of people joint in "*Pengajian"* that conducted periodically every Friday. *Pengajian* is the group is formed in order to study about Islamic religion and pray together. This group usually organizes regular learning activities under the guidance of people who know about the religion of Islam called *ustadz* atau *kyai.*

Table. 6.5. Household coping strategy after landslide occurrence

Coping Strategy Type	After Landslide Occurrence
Economic coping strategy	1. Borrowing money from bank, *Koperasi* or relative.
	2. Continue to participate in the *Arisan*.
	3. Sell assets from agricultural products (wood, flower, fruit, and vegetables).
	4. Looking for extra income with other businesses.
Structural coping strategy	1. Cleaning the house from landslide materials (soil and rock).
	2. Cough up the house using bamboo/ wood pole to avoid collapse.
	3. Repairing the damage house.
	4. Build the new house in saving place using concrete and brick.
	5. Renovate and reinforced house in case of cracks due to creep.
	6. Construct and repair the retaining wall on steep slope around the house.
	7. Construct and repair water channels.
Social coping strategy	1. Helping other's community member to repair the house.
	2. Helping the neighbour to clear the slide material away.
	3. Night patrol to secure assets and oversee the landslide subsequent.
	4. Praying to God together with other people (*Pengajian*).
	5. Move to another location within the same village in endanger situation.

6.2.2. Community's coping strategy

People who live in disaster-prone areas have a high spirit of togetherness. This is a valuable asset for the people because they are having the same threat. Various strategies to cope the disaster performed together. It is also applied by the people in the study area. They do various coping strategy in the face of landslide thread. The results of interviews with open and closed questions to the 93 respondents and in-depth interview with head of village about coping strategy conducted by communities presented in the Table 6.6.

Table 6.6. Community's coping strategy before landslide occurrence

Coping Strategy Type	Before Landslide Occurrence
Economic coping strategy	1. Forming the *Arisan* which consists of a group of ladies, gentlemen and youth groups.
	2. Collect the money, building materials from all resident for the cost of road construction and repairing water channel.
	3. Establish *Koperasi* as a place to save and borrow money for members.
Structural coping strategy	1. Construct gabions along the river slope and road slope.
	2. Construct and repair road using concrete materials.
	3. Construct retaining wall on steep slope (road side).
	4. Install, check and repair EWS device.
	5. Construct and repair water channels.
	6. Closing and store up soil cracks using rocks and soil.
Social coping strategy	1. Plant trees along the river bank and on the steep slope.
	2. Held a meeting before rainy season to discuss the best action for protecting the community from landslide.
	3. Praying together was done by members of resident (*Pengajian*).
	4. Night patrol to secure assets and oversee the landslide threat.
	5. Preparing evacuation shelter such as a mosque, school and village hall.
	6. Participate in disaster socialization programs.
Cultural coping strategy	1. Held traditional ceremony is called "*Ruwahan*" and "*Suroan*" every year.

From the data shown in Table 6.6 can be explained that there are four types of coping strategy applied by community before landslide occurrence which are economic coping strategy, structural coping strategy, social coping strategy and cultural coping strategy. In economic coping strategy there are 3 items strategy carried by community. Of the three most important activity is collect the money and building materials from all residents for the cost of road construction and repairing water channels. The community establish *Koperasi* to save and borrow money. *Koperasi* is a unique form of business entity that is different from other forms of business entities. The main aim of *Koperasi* is to achieve member's prosperity and not to achieve maximum profit. Through this objective, all of *Koperasi* activities aimed to improve the member prosperity. Structural coping strategy identified in study area including physical measurement for example construct gabions along the river slope and road slope, construct and repair road using concrete etc. Construction of public facilities such as roads, water channels, retaining wall and installation of gabion worked by *Gotong royong*. *Gotong royong* is a term commonly used in Indonesia means working together to achieve a desirable outcome. Local government assistance in the

form of materials such as cement, iron and wire gabions, while construction is done by the community. There are some strategies employed by respondents before the landslide in term of social coping strategy. The most important thing is held a meeting among residents that was conducted before rainy season to discuss the best action for protecting the community from landslide

On the cultural coping strategy there are two types traditional ceremony carried out by community which are "*Suroan*" and "*Ruwahan*". "*Suroan*" and "Ruwahan" essentially have the same activity; the difference is only on access of time. *Ruwahan* held on Tuesday *Kliwon* in *Ruwah* month while the *Suroan* held on the night of 1 on the *Suro* month. All of ceremony conducted base on the Javanese calendar (*Hijra*). The purposes of these ceremonies are to ask the gods to be given abundant harvest and hope that the people are protected from natural disasters. During the ceremony people gathered in one place (the field) with the crops and food. Furthermore, food and agricultural products were distributed to others as a symbol of gratitude to God for the bountiful harvest. The next event is the reading of Qur'an (moslem holy book) together. Community echoes Qur'an together and then perform prayer in order to avoid disaster. The highlight of the event was the implementation of arts and traditional entertainment. There are a variety of traditional entertainment such as "*Tayup*" and puppets. *Tayu*p is a traditional Javanese dance accompanied by singing and traditional Javanese music while the puppet is a traditional art form of stuffed imitation of people and so on, made of leather or wood carvings and so on that can be used to portray the characters in traditional drama performance and played by the person was called "*Dalang*".

Table. 6.7. Community's coping strategy during landslide occurrence

Coping Strategy Type	During Landslide Occurrence
Social coping strategy	1. Preparing the location or safe place for evacuation purposes.
	2. Report and inform the landslide event as soon as possible to the local authority through the head of sub-village.
	3. Ask for assistance to local authorities both GO and NGOs.
	4. Preparing food, drinking water and other essential needs.
	5. Help the other people to go to the safe place.
	6. Night patrols are conducted to anticipate subsequent landslides and securing community assets.
	7. Helping each other to evacuate the village member to the safer place.
	8. Distributing information related the landslide events to other person or community

During the landslide occurrence, people living in the study areas do not have many choices in coping strategy. Base on the data displayed in Table 6.7 only social coping strategy which was applied by local people. In the social coping strategy the

community applied some activities comprises preparing evacuation places and ask for assistance to local authorities both GO and NGOs. The most important think in this phase is report and inform the landslide event as soon as possible to the local authority through the head of sub-village. This is very useful for people to get help quickly.

Figure 6.9

Figure 6.10

Figure 6.11

Figure 6.9. Mosque as evacuation place
Figure 6.10. Village hall as evacuation places
Figure 6.11. School as evacuation place

Table. 6.8. Community's coping strategy after landslide occurrence

Coping Strategy Type	After Landslide Occurrence
Economic coping strategy	1. Help distribute aid (money) to affected communities.
	2. Giving soft loan to people through *Koperasi*.
	3. Financial assistance for the victims by collecting from people who are not affected by landslides.
Structural coping strategy	1. Construct and repair water channels.
	2. Construct gabions along the river slope and road slope.
	3. Construct and repair road using concrete materials.
	4. Construct retaining wall on steep slope (road side).
	5. Build and repair the temporary evacuation building (mosques, schools).
	6. Build security post.
	7. Improving public facilities are cracked or damaged due to ground movement.
Social coping strategy	1. Help clean the house from landslide material.
	2. Help build and repair houses that collapsed damaged due to landslides.
	3. Plant more trees on the steep slope and along the river bank.
	4. Help build terraces and canal water in agricultural land.
	5. Ask grant or aid to GO and NGOs to improve public facilities (roads, retaining wall and gabion).
	6. Night patrols are conducted to anticipate subsequent landslides and securing community assets.
	7. Working together with neighbours to clean up the landslide material from the road.

After the landslide event, there are tree coping strategy which applied by community consist of economic, social and structural coping strategy (see Table 6.8). Economic coping strategy focusing on gives the loans to the landslides victims through *Koperasi*. The cash money will be used to renovate house damaged by landslides. Structural coping strategy focused to improve and repair public facilities for example roads and water channel were damaged due to landslides. Social coping strategy is focused on working together with neighbours to clean up the landslide material from house and from the road.

Figure 6.12

Figure 6.13

Figure 6.14

Figure 6.15

Figure 6.12. *Pengajian*
Figure 6.13. *Arisan*
Figure 6.14. Clean the road from landslide materials
Figure 6.15. Night patrol/security post

Figure 6.16

Figure 6.17

Figure 6.18

Figure 6.16. Construct and repair road using concrete materials
Figure 6.17. Construct and repair water channels
Figure 6.18. Construct retaining wall on steep slope (road side)

6.3. The Level of Coping Strategy

In this research, the people coping strategies are divided into three levels; High, Moderate and Low. Indicators which are used to assess the level of respondent's coping strategies are the accumulation of the questionnaire answers. There are twelve questions used as an indicator to assess the level of respondents coping strategies, those are question numbers 28-32, 34-38 and 40-41 (see appendix 1). The answers were graded as 5 if "strongly agree" till 1 if "strongly disagree". The answer of all respondents was accumulated and the result was identified the highest and lowest values. Base on the calculation of data was known that the minimum value is 27, the maximum value is 55 and the average is 44 (see Appendix 4). Difference of the lowest and highest values is interval. From the calculation, the value used is 28 as interval derived from the maximum value (55) minus the minimum value (27). To get three levels of coping strategy, the value of the interval is divided into three. This is value that used as a basis for class divisions to the people coping strategies. The result of calculation was categorized in three levels: Low (27-34), Moderate (35-45) and High (46-55). Respondents with high levels coping strategies means having a high level of preparedness in the face of landslides. Based on the indicator level coping strategies contained in the questionnaire, respondents with a high level of coping strategy has been to understand and apply the various techniques of coping strategy in anticipating the occurrence of landslides.

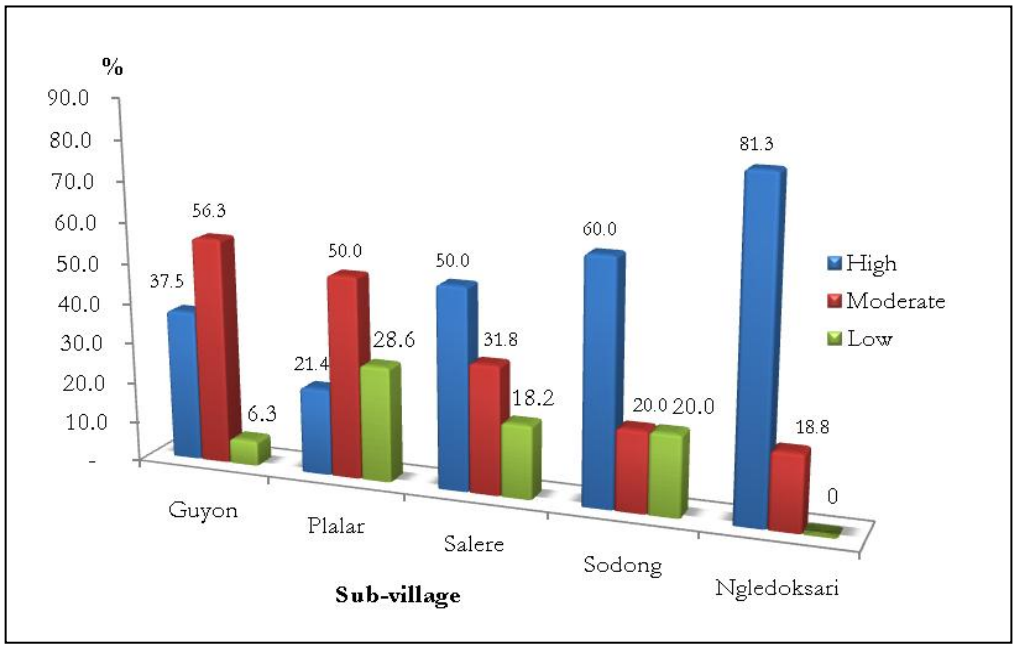

Figure 6.19. The level of people coping strategy related landslide within 5 sub-villages

Base on the graphic that was displayed on Figure 6.19, it can be seen that generally, the level of people coping strategy dominated by high and moderate level. Totally, 51.6% respondents have high level, 33.3% have moderate level and only 15.1% respondents that have low level of coping strategy. At high levels of coping strategy, the highest percentage is Ngledoksari Sub-village with 81.3% respondents and the lowest percentage is Plalar Sub-village with 21.4% respondents. At moderate levels of coping strategy, Guyon Sub-village is the highest percentage with 56.3% respondents and the lowest percentage is Ngledoksari Sub-village with 18.8% respondents. Coping strategy at a low level, dominated by respondent in Plalar Sub-village with 28.6% respondents and the lowest percentage is Ngledoksari Sub-village with no respondent in low level (0%). It describes that the people in Ngledoksari Sub-village implement coping strategy higher than other sub-villages in the face of landslide.

6.4. Cross-Tabulation with Chi-square Analysis

Statistical analysis using cross-tabulation with chi-square analysis is needed to determine the difference of people coping strategy within five sub-villages (Guyon, Plalar, Salere, Sodong and Ngledoksari). The first output of statistical processing is case processing summary that shown on the Table 6.9. From the Table 6.9, it is known that cross-tabulation with chi-square analysis was conducted on people coping strategy variables and sub-village variables. There are 93 data that was processed and no data missing or lost, so the validation rate of 100%.

Table 6.9. Case processing summary of people coping strategy

Case Processing Summary						
	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Coping_strategy * Sub_village	93	100.0%	0	.0%	93	100.0%

The second output of statistical analysis using cross-tabulation with chi-square is cross tabulation between the level of people coping strategy and sub-village (see Table 6.10). The low level coping strategy is 14 respondents that was spread in Guyon Sub-village 1 respondent, Plalar Sub-village 4 respondent, Salere 4 respondents, Sodong 5 respondent and Ngledokasri 0 respondent. People who have moderate level of coping strategy is 31 respondents spread across Guyon Sub-village 9 respondents, Plalar 7 respondents, Salere 7 respondents, 3 respondents in Ngledoksari and 5 respondents in Sodong Sub- village. Population with a high level of coping strategy amounted to 48 respondents with a composition in Guyon Sub-village 6 respondents, Plalar 3 respondents, Salere 11 respondents, 15 respondents in Sodong and 13 respondents in Ngledoksari.

Table 6.10. Cross tabulation between level of coping strategy and sub-village

Coping_strategy * Sub_village Crosstabulation							
Count							
		Sub_village					Total
		Guyon	Plalar	Salere	Sodong	Ngledoksari	
Coping_strategy	Low	1	4	4	5	0	14
	Moderate	9	7	7	5	3	31
	High	6	3	11	15	13	48
Total		16	14	22	25	16	93

The third output of statistical analysis using cross-tabulation with chi-square is chi-square test between the level of people coping strategy and sub-village (see Table 6.11). The result of the chi-square test is used to determine the difference of people coping strategy related to landslide within five sub-villages (Guyon, Plalar, Salere, Sodong and Ngledoksari). Null hypothesis stated there is no difference of people coping strategy in five sub-villages. The result from the test as mentioned on the Table

Table 6.11. Chi-square tests of people coping strategy

Chi-square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	17.701[a]	8	.024*
Likelihood Ratio	20.112	8	.010
Linear-by-Linear Association	5.914	1	.015
N of Valid Cases	93		
a. 6 cells (40.0%) have expected count less than 5. The minimum expected count is 2.11.			

Base on the ratio between the value of calculated chi-square and the value of chi-square table obtained that calculated chi-square is 17.701. The value of Chi-square table using significance level (α) = 5% and degrees of freedom (*df*) = 8 is 15.507. Because of the value of calculated chi-square (17.701) more than the value of chi-square table (15.507), H0 is rejected, meaning that there was a difference level of people coping strategy in five sub-villages. Base on the value of significance probability (*P-value*), can be seen that the value of *Asymp. Sig. (2-sided)* is 0.024 or less than 0.05 (0.024 < 0.05), meaning that there was a difference level of people coping strategy in five sub-villages.

6.5. The Factors Influencing People Coping Strategy

There are several factors that are assumed to have a correlation with the level of coping strategy comprise age, gender, education, occupation, income, household size, building type and landslide experience. The results of correlation analysis are presented in the Table 6.12:

Table 6.12. Correlation analysis of people coping strategy

Correlations	
Independent variable	**Sig. (1-tailed)**
Age	.000*
Gender	.000*
Education	.000*
Occupation	.389
Income	.000*
household size	.063
Building_type	.000*
Landslide_exp	.027*

The null hypothesis stated that independent variables do not have a correlation with the dependent variable (people coping strategy). Probability value (*P-value*) was used 0.05. Decision-making is based on the null hypothesis that will be accepted if the value of *Sig. (1-tailed)* > 0.05. From calculations process using SPSS software can be seen that there are six variables that have a *sig. (1-tailed)* < 0.05, which are age, gender, education, income, building type and landslide experiences. It can be concluded that the variables that have a correlation with the people coping strategy are age, gender, education, income, building type and landslide experiences. Model summary is the second output of the multiple linear regression analysis.

Table 6.13. Model summary of people coping strategy

Model Summary[b]				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.853[a]	.728	.702	.401
a. Predictors: (Constant), Landslide_exp, Household_size, Income, Occupation, Gender, Age, Education, Building_type b. Dependent Variable: Coping_strategy				

From the Table 6.13, it can be seen that the *R-value* is 0.853. *R-value* describes the strength of the relationship between dependent and independent variables. *R-value* > 0.5 stated that the relationship between dependent and independent variables is very strong. The third output of the multiple linear regression analysis using SPSS was *anova* table.

Table 6.14. Anova table of people coping strategy

ANOVA[b]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	36.073	8	4.509	28.065	.000[a]
	Residual	13.496	84	.161		
	Total	49.570	92			
a. Predictors: (Constant), Landslide_exp, Household_size, Income, Occupation, Gender, Age, Education, Building_type b. Dependent Variable: Coping_strategy						

The null hypothesis (H0) stated jointly independent variable not influences on coping strategy. The null hypothesis will be accepted if *calculated F* < *F-table*. The significance level (α) is used 0.05 (5%). From the Table 6.14 can be seen the value of *calculated F* is 28.065 and the value of *F-table* with degrees of freedom (*df*)1 = 8 and degrees of freedom 2 = 84 is 2.051. The value of *calculated F* > *F-table* means that null hypothesis rejected. The probability value (*P-value*) indicates that the *significant value* is 0.000. The significant value less than 0.05 indicated null hypothesis was rejected. Decision-making using the *F-table* and the probability value (*P-value*) obtained the same conclusion that jointly independent variable influences the independent variable. The fourth output of the multiple linear regression analysis using SPSS displayed on the Table 6.15.

Table 6.15. Coefficients of people coping strategy

Coefficients[a]					
Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	2.625	.368		7.140	.000
Age	.004	.045	.007	.100	.920
Gender	-.096	.109	-.061	-.879	.382
Education	.195	.063	.248	3.116	.003*
Occupation	-.032	.030	-.071	-1.067	.289
Income	.366	.106	.250	3.455	.001*
Household_size	.047	.060	.047	.793	.430
Building_type	-.511	.088	-.497	-5.823	.000*
Landslide_exp	-.098	.054	-.113	-1.829	.071
a. Dependent Variable: Coping_strategy					

The fourth output of multiple linear regression analyzed the influence of one by one of independent factors to the dependence factor (the level of people coping strategy) using *T-test*. The null hypothesis stated that partially the independent variables not have significant influence with the level of people coping strategy (dependent variables). The decision-making is done using a probability value (*P-value*) 0.05. If the significance value > 0.05, null hypothesis is accepted. Base on the Table

5.12 can be seen there are only three variables that have significant influence to the level of people coping strategy, that are education, income and building type.

The respond of significant predictor variable (education, income and building type) to the regression can be seen on the value of *Unstandardized Beta Coefficients*. Constant coefficient have a positive value (2.625) which states that assuming the absence of predictor variables, the level of people coping strategy tends an increase. Regression coefficient for education variable is positive (.195), meaning that by assuming the absence of other independent variable, the increasing of education level will be followed by the raise of coping strategy level. The people with high level education have higher knowledge related with various types of coping strategies to deal with landslide. The people who have high education level tend to have higher level of perception than people who have low level education.

Regression coefficient for income variable is positive (.366), meaning that by assuming the absence of other independent variable, the increasing of income level will be followed by the raise of coping strategy level. People with higher income have the chance to apply various types coping strategy to deal with landslides. With the money they had they built a permanent house, building a retaining wall around the house to minimize risk in the event of landslides. Regression coefficient for building type variable is negative states that by assuming the absence of other independents variable, the increasing of building type level will be followed by the decline of coping strategies. Base on the data coding, permanent building given a score 1, semi permanent building given a score 2 and non permanent building given score 3. The people who have high income would build permanent house because by live in the permanent house the people feel more secure than in the non permanent and semi permanent house. The people who have permanent house tend to have higher level of coping strategy than people who have non-permanent or semi permanent house.

6.6. The People Acceptation of Landslide Risk Reduction Programs

Governments together with other stakeholders undertake a wide range of programs to prevent the occurrence of landslides and to minimize the negative impact because of landslide. Various programs on disaster risk reduction undertaken by the government and other stakeholders can be grouped into two categories which are structural and non-structural. Table 6.16 explains the various program conducted by government and other stakeholders.

Table 6.16. Landslide risk reduction programs in Tengklik and Tawangmangu

Structural measurement	1. Installing early warning system (EWS) device and monitoring land movement device.
	2. Help to construct road, gabion, drainage system and retaining wall.

	3. Installing the landslide warning board and evacuation route signs.
	4. Help people clearing the landslides material and help to search landslide victims.
	5. Building a permanent health posts in prone areas.
Non Structural measurement	1. Dissemination of information to the local people through face to face meeting and poster.
	2. Evacuation drill conducted in susceptible areas.
	3. Give assistance to the affected population.
	4. Provide tree seedlings and fruit seedlings the public for people for reforestation.
	5. Provide first aid to the victims of landslide.
	6. Providing food, clean water and other major needs in the event of a disaster.
	7. Coordinate with other stakeholders, community leaders and community members related landslide mitigation.
	8. Mapping landslide-prone areas and include them in spatial planning.
	9. Monitoring and identification location that susceptible to landslide.
	10. Identified the house and people who live in prone areas.
	11. Reforestation.

Some of structural measures picture taken during fieldwork can be seen on the figure below:

Figure 6.20

Figure 6.21

Figure 6.22

Figure 6.23

Figure 6.24

Figure 6.25

Figure 6.20. Monitoring land movement device
Figure 6.21. Early warning system (EWS) device
Figure 6.22. Construct gabion on the steep slope
Figure 6.23. Retaining wall along main road
Figure 6.24. Information board of road construction
Figure 6.25. Construct drainage system

Some of non-structural measures picture taken during fieldwork can be seen on the figure below:

Figure 6.26

Figure 6.27

Figure 6.28

Figure 6.29

Figure 6.30

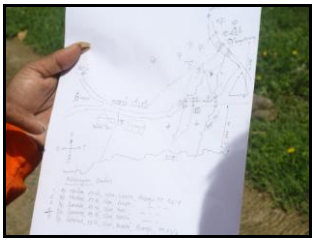

Figure 6.31

Figure 6.26. Evacuation sign
Figure 6.27. Landslide warning board
Figure 6.28. Clinic in Tengklik Village
Figure 6.29. Identify crack on the road
Figure 6.30. Poster related landslide
Figure 6.31. Sketch map to identified vulnerable house

The level of public acceptation to the landslide risk reduction programs shown in the Table 6.17.

Table 6.17. Cross tabulation the level of people acceptation and sub-village

People_ acceptation * Sub_village Crosstabulation							
Count							
		Sub_village					Total
		Guyon	Plalar	Salere	Sodong	Ngledoksari	
People_ acceptation	Low	9	7	7	7	1	31
	Moderate	6	5	10	13	1	35
	High	1	2	5	5	14	27
Total		16	14	22	25	16	93

Spatial distribution of the level of respondent's acceptation to landslide risk reduction program was displayed on the Appendix 7. Generally, the level of people acceptation within five sub-villages is moderate level. The low level people acceptation is 31 respondents that was spread in Guyon Sub-village 9 respondent, Plalar Sub-village 7 respondent, Salere 7 respondents, Sodong 7 respondent and Ngledokasri 1 respondent. People who have moderate level of coping strategy is 35 respondents was spread across Guyon Sub-village 6 respondents, Plalar 5 respondents, Salere 10 respondents, 13 respondents in Sodong and 1 respondent in

Ngledoksari Sub-village. Population with a high level of people acceptation amounted to 27 respondents with a composition in Guyon Sub-village 1 respondents, Plalar 2 respondents, Salere 5 respondents, 5 respondents in Sodong and 14 respondents in Ngledoksari.

Figure 6.32. Evacuation drill

Chi-square test is used to determine the difference of people acceptation related to landslide risk reduction programs within five sub-villages (Guyon, Plalar, Salere, Sodong and Ngledoksari). Chi-square test used the null hypothesis (H0) which stated that there is no difference level of people acceptation in five sub-villages. The result from the test as mentioned on the Table 6.18.

Table 6.18. Chi-square test of people acceptation

Chi-Square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	37.119[a]	8	.000*
Likelihood Ratio	35.487	8	.000
Linear-by-Linear Association	19.854	1	.000
N of Valid Cases	93		
a. 4 cells (26.7%) have expected count less than 5. The minimum expected count is 4.06.			

Base on the ratio between the value of calculated chi-square and the value of chi-square table obtained that calculated chi-square is 37.119. The value of Chi-square table using significance level (α) = 5% and degree of freedom (*df*) = 8 is 15.507. Because of the value of calculated chi-square (37.119) more than the value of chi-square table (15.507) meaning that null hypothesis is rejected, so there was a differences level of people acceptation in five sub-villages. Base on the value of

significance probability (*P-value*), can be seen that the value of *Asymp. Sig. (2-sided)* is 0.00 or less than 0.05 (0.00 < 0.05), the decision is H0 is rejected, meaning that there was a differences level of people acceptation in five sub-villages.

There are several factors that are assumed have a correlation with the level of people acceptation comprise age, gender, education, occupation, income, household size, building type and landslide experience. The result from correlation analysis as mentioned in the Table 6.19.

Table 6.19. Correlation of people acceptation

Correlations	
Independent variable	**Sig. (1-tailed)**
Age	.000*
Gender	.091
Education	.011*
Occupation	.411
Income	.017*
Household size	.447
Building_type	.194
Landslide_exp	.000*

The null hypothesis stated that independent variables (age, gender, education, occupation, income, household size, building type and landslide experience) do not have a correlation with the dependent variable (people acceptation). Probability value (*P-value*) was used 0.05. Decision-making is based on the null hypothesis that will be accepted if the value of *Sig. (1-tailed)* > 0.05. From calculations process using SPSS software can be seen that there are four variables that have a *sig. (1-tailed)* < 0.05, which are age, education, income and landslide experiences. It can be concluded variables that have a correlation with the people acceptation are age, education, income and landslide experiences.

Coefficients table is one of the outputs of the multiple linear regression analysis to know the influence of one by one independent variable with the dependence variable. The coefficients table as mentioned in the Table 6.20.

Table 6.20. Coefficients value of variables of people acceptation

Coefficients[a]					
Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	2.915	.597		4.880	.000
Age	.227	.073	.341	3.128	.002*
Gender	-.423	.178	-.249	-2.382	.019*
Education	.021	.102	.025	.209	.835
Occupation	.085	.048	.177	1.767	.081
Income	-.253	.172	-.160	-1.469	.146
Household_size	.068	.097	.062	.701	.485
Building_type	.097	.143	.087	.677	.500
Landslide_exp	-.382	.087	-.406	-4.371	.000*
a. Dependent Variable: People_acceptation					

The null hypothesis stated partially the independents variables not have significant influence with the independent variables. The decision-making is done using a probability value 0.05. If the significance value > 0.05, null hypothesis is accepted. Base on the Table 6.20 can be seen there are only three variables that have significant influence to the people acceptation on landslide risk reduction programs, those are age, gender and landslide experience.

6.7. Correlation of people perception, people coping strategy and people acceptation

Correlation analysis using SPSS is used to determine the correlation and patterns of correlation among people perception, people coping strategy and people acceptation of landslide risk reduction programs. Correlations were used in this analysis is *Bivariate Pearson and Spearman Correlation*. To find out the strength and weakness of the correlation between two variables were tested used the correlation coefficient value whose value ranges between -1 and 1.

If the value of correlation coefficient is 1 or -1 indicates that there is perfect correlation between two variables, while the correlation coefficient value is null or close to null indicates that the two tested variables have no correlation. The pattern of correlation between the two variables can be determined by looking at the value of the correlation coefficient. If the correlation coefficient is positive indicates that the correlation among the two variables is directly proportional (unidirectional) and if the correlation coefficient value is negative meaning that the correlation among two variables is inversely proportional.

6.7.1. Correlation between people perception and people coping strategy

The discussion about people perception in the previous section stated that the level of people perception related to landslides dominated by moderate and high level (see Figure 5.3). An analysis of the level of people coping strategy states that the level of local communities coping strategy to landslides dominated by high and moderate levels (see Figure 6.19). The correlations between perception and coping strategy people were known by statistical calculation using correlation analysis as follow:

Table 6.21. Correlation between people perception and coping strategy

Correlations			
		People_ perception	Coping_ strategy
People_perception	Pearson Correlation	1	.535**
	Sig. (2-tailed)		.000
	N	93	93
Coping_strategy	Pearson Correlation	.535**	1
	Sig. (2-tailed)	.000	
	N	93	93
**. Correlation is significant at the 0.01 level (2-tailed).			

Base on the Table 6. 21 can be explained that the correlation coefficient between perception and people coping strategy is 0.535. Correlation coefficient is higher than 0.5 indicates that the correlation between perception and coping strategy is strong. A positive correlation coefficient shows the correlation between people perception and coping strategy is directly proportional means that the raise of the perception will follow the increasing of the coping strategy.

Null hypothesis (H0) states that there is no correlation between people perceptions and people coping strategy and the alternative hypothesis (H1) stated that there is a correlation between people perception and coping strategy. H0 is accepted if the value of correlation coefficient is less than the critical value of correlation (*r_table*) and the opposite, H0 is rejected if the value of correlation coefficient is greater than the value of *r_table*. Analysis using the ratio between the value of the correlation coefficient and the critical value of correlation (*r_table*) states that the value correlation coefficient (0.535) is greater than the critical value of correlation (0.204). Critical value of correlation obtained on the degree of significance 5% (0.05) and the degree of freedom (*df*) = N-2 =93-2 = 91. Thus there is a significant correlation between people perception and people coping strategy.

Analysis using the value of significance probability (*P-value*) states that H0 is accepted if the probability > 0.05, and H0 is rejected if probability < 0.05. From Table 6.21, it can be seen that the value of *Asymp. Sig. (2-sided)* is 0.000 or less than 0.05 (0.000 <0.05), the decision is H0 is rejected, meaning that there was significant

correlation between perception people and people coping strategy. The two methods of decision-making produced the same conclusion that there was a significant correlation between people perception and people coping strategy.

6.7.2. Correlation between people perception and people acceptation

From the Table 6.22, it can be seen that the correlation coefficient between perception and people acceptation is -0.255. Correlation coefficient is close to null shows that the correlation between people perception and people acceptation are weak. Negative values of correlation coefficient indicate the correlation between people perception and people acceptation is inversely proportional, means that the raise of the people perception will follow the declining of the people acceptation.

Table 6.22. Correlation between people perception and people acceptation

Correlations			
		People_perception	People_acceptation
People_perception	Pearson Correlation	1	-.255*
	Sig. (2-tailed)		.014
	N	93	93
People_acceptation	Pearson Correlation	-.255*	1
	Sig. (2-tailed)	.014	
	N	93	93
*. Correlation is significant at the 0.05 level (2-tailed).			

Analysis using the ratio between the value of the correlation coefficient with the critical value of correlation (*r_table*) states that correlation coefficient values (-0.255) is greater than the critical value of correlation (0.204). Thus there is a significant correlation between the perception people and people acceptation. From the Table 6.22, it can be seen that the value of *Asymp. Sig. (2-sided)* is 0.014 or less than 0.05 (0.014 < 0.05), meaning that there was a significant correlation between people perception and people acceptation. The two methods of decision-making produced the same conclusion that there was a significant correlation between people perception and people acceptation.

6.7.3. Correlation between coping strategy and people acceptation

From the Table 6.23, it can be seen that correlation coefficient between people coping strategy and people acceptation is -0.085. The value of correlation coefficient is close to null shows that the correlation between people coping strategy and people acceptation is very weak. Negative correlation coefficient values indicate the relationship between people coping strategy and people acceptation is inversely proportional, means that the raise of the people coping strategy will follow the declining of the people acceptation.

Table 6.23. Correlation between people perception and people acceptation

Correlations			
		People_ acceptation	Coping_ strategy
People_acceptation	Pearson Correlation	1	-.085
	Sig. (2-tailed)		.419
	N	93	93
Coping_strategy	Pearson Correlation	-.085	1
	Sig. (2-tailed)	.419	
	N	93	93

Analysis using the ratio between the value of the correlation coefficient and the critical value of correlation (*r_table*) states that correlation coefficient values (-0.085) is less than the critical value of correlation (0.204). Thus it can be stated that there was no significant correlation between people coping strategy and people acceptation. Analysis using the value of significance probability (*P-value*) stated that the value of *Asymp. Sig. (2-sided)* is 0.419 or greater than 0.05 (0.419 > 0.05), meaning that there was no correlation between people coping strategy and people acceptation. Finally, the two methods of decision-making produced the same conclusion that there was no correlation between people coping strategy and people acceptation.

6.8. Summary and Conclusion

Chapter VI discussed the coping strategy conducted by household and communities related to landslide. Economic coping strategy undertaken by household focused on increasing income. Structural coping strategy focused on strengthening building, social coping strategies focused on participate on social gathering activities such as *Pengajian* and *Arisan*.

Coping strategy conducted by communities consisted of economic coping strategy that focused on strengthening *Koperasi* institutions and *Arisan*, structural / technological coping strategy is focused on the improvement of public facilities such as roads and water channel. Social coping strategy focused on night patrol activities, *Pengajian* and meetings in order to assist people who affected by landslides

From the statistical analysis can be explained that there is a difference between the levels of coping strategy in each sub-village. The factors correlated with coping strategies are age, gender, education, income, building type and landslide experiences. While the factors that influence the level of coping strategy is education, income and building type.

Analysis of the level of people acceptation related risk reduction program conducted by government and other stakeholder showed that there is a difference in the level of people acceptation in each sub-village. Factors that have correlation with the level of people acceptation is age, education, income and landslide experiences while the factors that influence the level of people acceptation is age, gender and landslide experience.

Correlation analysis among people perception, people coping strategy and people acceptation stated that there was a significant correlation between people perception and people coping strategy. The correlation between people perception and coping strategy is directly proportional means that the raise of the people perception will follow the increasing of the coping strategy. Correlation between people perception and people acceptation was a significant correlation and there was no correlation between people coping strategy and people acceptation.

CHAPTER VII
ANALYSIS OF RISK GOVERNANCE FRAMEWORK

This chapter explains the analysis of risk governance framework at the district and sub-district scope. The discussion comprises analysis of stakeholder involvement, risk management and risk communication. To analysis risk governance framework, questionnaire with close ended question and in-depth interview was conducted to stakeholders both government and non government institution. This section also describes the role of stakeholder on the disaster management at district and sub-district scope.

7.1. Introduction

Governance is the processes and institutions, both formal and informal, that guide and restrain the collective activities of a group (Nye and Donahue, 2000 cited from Lomagin, 2010). According to Kingma (2011), the term "governance" refers to the capacity of actors, social groups and institutions to build an organizational consensus, to agree on the contribution of each partner and on a common vision. IRGC (2008) mentioned that Risk governance includes the totality of actors, rules, conventions, processes, and mechanisms concerned with how relevant risk information is collected, analyzed and communicated and management decisions are taken.

According to the IRGC (2011), risk governance framework consists of five basic components include a pre-assessment, risk management, risk appraisal, tolerability and acceptability judgment and risk communication. Modification of the risk governance framework by Westen and Kingma (2011) produced six elements in the risk governance framework include stakeholder involvement, risk management, risk assessment, risk evaluation, risk communication and risk communication. Analysis risk governance framework in this study refers simply to modified risk governance framework by Westen and Kingma (2011). In this research, a discussion of risk governance framework is limited to the three components that comprise the stakeholder involvement, risk management and risk communication. Analysis of risk governance framework was done at the district scope (Karanganyar District) and the sub-district scope (Tawangmangu Sub-district).

7.2. Analysis risk governance framework at district scope

Analysis of risk governance framework at the district scope was done using a questionnaire tools with close-ended question and in-depth interviews with stakeholders, both government and non government institution. Questionnaire and interviews were conducted to 24 agencies both government and non government

agencies that engaged in disaster management activities in Karanganyar District both directly and indirectly. Total closed questions in the questionnaire for the analysis of risk governance is 30 questions consisting of 9 questions for the analysis of stakeholder involvement, 15 questions for the analysis of risk management and 6 questions for risk communication analysis (see Appendix 2). The discussion of each component is presented in the following section.

7.2.1. Stakeholder involvement

Stakeholder involvement is one of important component in the risk governance framework. Analysis of stakeholder involvement is important to done for know the level of (GO and NGOs) role in disaster mitigation activities. The level of stakeholder involvement is obtained by calculating the answer of respondents (head of institution) from the questionnaire. The answer from respondents were calculated from 1 to 5 based on the degree of their agreement; 1 for strongly disagree, 2 for disagree, 3 for not sure, 4 for agree, and 5 for strongly agree. Base on the calculation of data was known that the minimum value is 32, the maximum value is 42. The result of calculation was divided in three classes: Low (31-34), Moderate (35-38), and High (39-42).

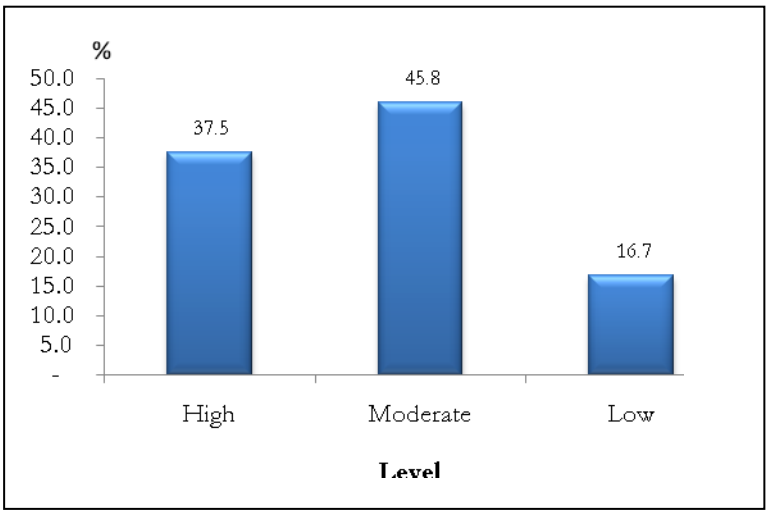

Figure 7.1. The level of stakeholder involvement at district scope

Base on the graphic displayed on Figure 7.1 describes that 45.8% of respondents stated that stakeholder involvement in Karanganyar District categorized in the moderate level, 37.5% respondents stated that the level of stakeholder involvement of the risk governance framework is high and the rest (16.7%) respondents stated that stakeholder involvement of the risk governance framework is low.

The role of stakeholders in disaster management activities at Karanganyayar is necessary to reduce the negative impact of disasters. Most of Karanganyar areas have a high level of susceptibility to landslides. Karanganyar consists of 17 sub-districts and 8 of them are very susceptible to landslides. The presence of government and non-government organizations is needed in mitigation and recovery because of landslides.

From Table 7.1 can be seen that in total, there are 36 organizations involved in disaster management in Karanyanyar District, comprising 19 government organization (GO) and 17 non government organization (NGOs). Based on the interviews, there are 17 main organizations directly involved in disaster management which consists of five government agencies and 12 non government organizations. These organizations regularly hold meetings in order to discuss the activities of disaster mitigation in Karanganyar. Five major government agencies are Regional Disaster Mitigation Agency (BPBD), Indonesian Police, Indonesian Army, Karanganyar People Security Agency, while 12 non-governmental organizations consisting of Search And Rescue, TAGANA, RAPI, FKPB, PPNI , Sekber PA, PMI, Anak Gunung Lawu (AGL), MDMC, FPB, Tisaga Buana and Rescue MTA.

Figure 7.2

Figure 7.3

Figure 7.4

Figure 7.5

Figure 7.6

Figure 7.7

Figure 7.2. The meetings among stakeholder conducted regularly
Figure 7.3. The participation of GO and NGOs in disaster response
Figure 7.4. Joint training in search and rescue activities
Figure 7.5. Socialization of landslide disaster mitigation to students
Figure 7.6. Inauguration landslide early warning system by The regents
Figure 7.7. Socialization of landslide disaster mitigation to local people using audio visual media

Table 7.1. Organizations involved in disaster management in Karanganyar

No	Government Organization (GO)	Non Government Organization (NGOs)
1.	*Badan Penanggulangan Bencana Daerah(BPBD)* Regional Disaster Mitigation Agency	*SAR Karanganyar* Karanganyar Search And Rescue
2.	*Dinas Sosial Tenaga Kerja dan Transmigrasi* Social, Labor and Transmigration Agency	Muhammadiyah Disaster Management Centre (MDMC)
3.	*Badan Perencanaan Pembangunan Daerah* Regional Planning and Development Agency	*Rumah Sakit PKU Muhammadiyah* PKU Muhammadiyah Hospital
4.	*Badan Kesatuan Bangsa dan Politik (Bakesbangpol)* National Unity and Politics Agency	Tisaga Buana LDII Karanganyar
5.	*Dinas Pendidikan Pemuda dan Olahraga* Education, Youth and Sport Agency	BAGUNA
6.	*Kodim 0727 Karanganyar* Indonesian Army Karanganyar District	*Forum Peduli Bencana (FPB)* Disaster Care Forum
7.	*Satuan Polisi Pamong Praja (Satpol PP)* Civil Police Unit	*Forum komunikasi Peduli Bencana (FKPB)* Disaster Care Communication Forum
8.	*Dinas Kesehatan* Health Agency	Rescue Majelis Taklim Alquran (MTA)
9.	*Dinas Pekerjaan Umum* Public Work Agency	*Sekretariat Bersama Peduli Alam (Sekber PA)* Natural Care Secretariat
10.	*Kepolisian Resort Karanganyar (Polres)* Indonesian Police Karanganyar District	Taruna Tanggap Bencana (TAGANA)
11.	*Rumah Sakit Umum Daerah Karanganyar* Karanganyar Public Hospital	*PT. PERHUTANI* National Forest Company
12.	*Radio Pejuang Bencana* Pejuang Bencana Radio	Karanganyar Emergency (KE)
13.	*Radio Siaran Pemerintah Daerah Karanganyar* Karanganyar Government Radio	Anak Gunung Lawu (AGL)
14.	*Unit Pemadam Kebakaran Karanganyar* Karanganyar Fire Brigade	*Radio Antar Penduduk Indonesia (RAPI)* Indonesian Inhabitant Radio
15.	*Linmas Inti Kabupaten Karanganyar* Karanganyar People Security Agency	*Persatuan Perawat Nasional Indonesia (PPNI)* Indonesian Nurses Association
16.	*Dinas perhubungan, komunikasi dan informasi* Transportation, Communication and Information Agency	*Palang Merah Indonesia (PMI)Cab. Karanganyar* Indonesian Red Cross of Karanganyar
17.	*Dinas Pertanian, Tanaman Pangan, Perkebunan dan Kehutanan* Agriculture and Forestry Agency	Tisaga Buana LDII Karanganyar
18.	*Badan Geologi* Geology Agency	
19.	*Perguruan Tinggi* University	

The assessment of stakeholder involvement is done by asking respondent to answer the questionnaire. The simple briefing was conducted to avoid miss perception on the fill out questionnaire activities by respondents. Respondent consists of 24 organizations including 13 government organizations and 11 non-governmental organizations involved either directly or indirectly in disaster management activities in Karanganyar District. Table 7.2 is the response of respondents to the questionnaire statements about stakeholder involvement in risk governance framework.

Table 7.2. Response of respondents on stakeholder involvement

No	Statements	Response (%)				
		SA	A	NS	D	SD
1.	Involvement of stakeholders both GO and NGOs in disaster management has been well organized	54	42	4	0	0
2.	The existence of overall data related stakeholders and their role in disaster management well-documented	21	63	17	0	0
3.	The mutual sharing of information among stakeholders related to disaster management program carried out regularly	29	58	13	0	0
4.	The existence of an agreement among stakeholders related with the role and position of each stakeholder in disaster management	33	58	8	0	0
5.	No overlapping roles of each stakeholder in disaster management	33	50	17	0	0
6.	A pattern of horizontal and vertical relationship of each stakeholder are clearly defined	13	58	29	0	0
7.	All stakeholders have a high level of trust and pursuance to the institution designated as a leader in disaster management	38	58	4	0	0
8.	There is sufficient space to accommodate participation of NGOs in disaster activities	21	63	8	8	0
9.	There is active participation from NGOs and community in disaster activities	29	54	17	0	0

Apposition :

SA : Strongly Agree NS : Not Sure SD : Strongly Disagree
A : Agree D : Disagree

On the stakeholder involvement analysis, there are 9 statements in the questionnaire as a tool to define the level of stakeholder involvement on risk governance framework. On the first statement about the involvement of stakeholders in disaster management has been well organized, response of respondent indicated that the majority of respondents strongly agree and agree (54% and 42%) while the rest (4%) were not sure. Response from the respondent in accordance with result of interviews stating that most of the institutions involved in the disaster in Karanganyar District has well organized. The second statement about the existence of the data overall related stakeholders and their role in disaster management is well-documented response states that 21% of respondents stated strongly agreed, 63% agreed and 17 respondent expressed not sure. Basically every organization already has the duties and functions are clear and each of them conducted duties and functions accord with the role.

The response of respondents to the third statement about mutual sharing information among stakeholders related to disaster management program carried out regularly dominated with 58% agree, 29% strongly agree and 13% not sure. Sharing information about the programs of each institution was conducted by meeting held by BPBD. The fourth statement is the existence of an agreement among stakeholders related with the role and position of each stakeholder in disaster management. Highest response of the respondent was 58% agree; strongly agree 33% and 8% not sure. The role and position of each stakeholder, especially government organizations, is regulated by the decision letter of the regent or the regulations issued by the council.

Statement 5 is associated with a statement 6. Statement 5 "there is no overlapping role of each stakeholder in disaster management" and statements 6 "The pattern of horizontal and vertical relationship each stakeholder are clearly defined". Response of respondent to the fifth statement 50% agree, 33% strongly agreed and 17% not sure and a response to the sixth statement of the respondent was 58% agree, 13% strongly agree and 29% not sure. Not entirely respondent stated that on the field does not overlapping roles of each institution even though each of organization has duties and functions are clear.

Statement 7 is all stakeholders have a high level of trust and pursuance to the institution designated as a leader in disaster management. Response respondents to the seventh statement 7 claim was 58% agree, strongly agree 38% and 4% not sure. According to interviews with BPBD states that in an emergency situation BPBD is the holder of command. It has been agreed by all stakeholders and all of stakeholders have high level of trust to BPBD. Statement 8 and 9 were dealing with the role of NGOs in disaster activities. Responses of respondent stated generally agree that the government has provided adequate space for community to participate in the disaster activities at Karangayar District.

7.2.2. Risk management

Analysis of the risk management level is derived by calculating the answer of respondents (head of institution) from the questionnaire. The answer from respondents were calculated from 1 to 5 based on the degree of their agreement; 1 for strongly disagree, 2 for disagree, 3 for not sure, 4 for agree, and 5 for strongly agree. Base on the data calculation was known that the minimum value is 39, the maximum value is 68. The result of calculation was divided in three classes: Low (39-48), Moderate (49-58), and High (59-68).

Base on the Figure 7.8 can be seen that 45.8% of respondents stated that risk management at Karanganyar categorized into high and moderate level, 8.3.5% respondents stated that the risk management of the risk governance framework categorized on the low level.

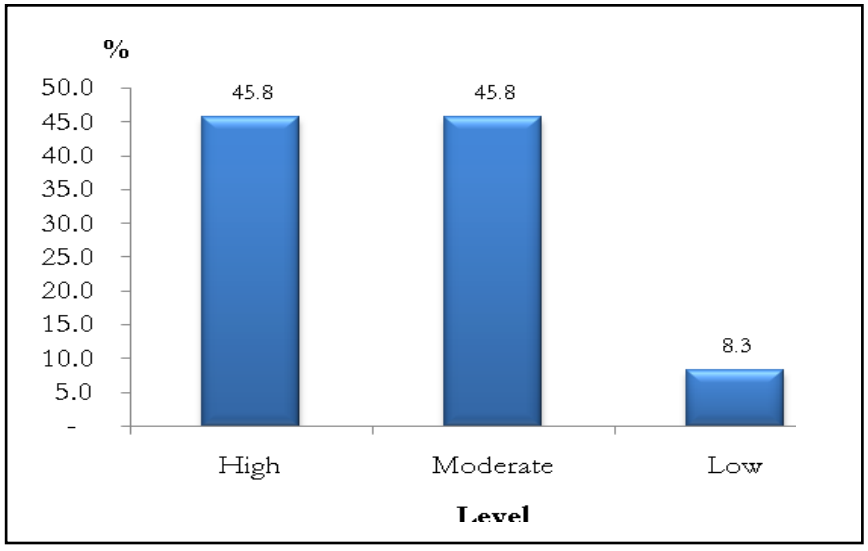

Figure 7.8. The level of risk management at district scope

The assessment of risk management is done by asking respondent to answer the questionnaire. Compilation of respondent's response to the statements on the questionnaire sheet can be seen on the table 7.3. Totally, there are 15 statements to analysis risk management on the risk governance framework.

Table 7.3. Response of respondents on risk management

No	Statements	Response (%)				
		SA	A	NS	D	SD
1.	The availability of a comprehensive spatial plan that accommodates disaster aspects	29	54	17	0	0
2.	The availability of regulation both regional regulation (PERDA) or decree of local leader (regent) related to disaster	25	42	21	8	4
3.	Active participation of NGOs, local communities and local leaders in disaster management planning	33	29	17	21	0
4.	Disaster management programs are available and well implemented at district scope	13	54	33	0	0
5.	Mechanism of coordination and responsibilities distribution among stakeholders in disaster monitoring activities are clearly defined	25	67	8	0	0
6.	Regular evacuation drill conducted at prone areas	46	42	4	4	4
7.	Rescue teams, evacuation routes, rescue equipped, shelters, warehouses for emergency food and clean water supplies available at the district scope	29	38	21	13	0
8.	The existence of an institution designated as a leader in disaster management	42	42	13	4	0
9.	Statistical data about landslide events are available in a table or chart and updated regularly	13	50	29	4	4
10.	Availability of risk maps and updating regularly	17	33	29	21	0
11.	Landslide warning board installed in every prone areas	29	33	29	4	4
12.	Validation of the disaster risk assessment by checking the conditions on the field	25	46	4	25	0
13.	Analysis of community resilience in the face of disaster has been done	4	46	42	8	0
14.	Analysis of the cultural, religious, social and economic background of people who live in prone areas has been conducted by authority	13	50	29	8	0
15.	Analysis of the level of community preparedness to face the disasters has been done	17	63	17	4	0

Apposition :

SA : Strongly Agree NS : Not Sure SD : Strongly Disagree

A : Agree D : Disagree

The response of respondents to the first statement about availability of a comprehensive plan that accommodates spatial aspects of disaster is 29% strongly agree, 54% agree and 17% not sure. Institution that concentrates in spatial planning aspect at Karanganyar District is *Bappeda*. Disaster aspects were accommodated by *Bappeda* in spatial planning district. This is proved by the publication of a report by *Bappeda* entitled "Mapping of disaster prone regions in the district of Karanganyar". The second statement is availability of regulation both local regulation (*Perda*) and decree of local leaders (Regent) related to disaster. Highest response of the respondent was 42% agree, 25% strongly agree, 21% not sure, 8% disagree and 4% strongly disagree. There are two regulations about the disaster at Karanganyar District. The first is Regional Regulation No. 14 Year 2012 about the guidelines on emergency disaster relief. The second regulation is Regional Regulation No. 8 Year 2011 about organization, rules and function of Regional Disaster Management Agencies.

The third statement is active participation by NGOs, local communities and local leaders in disaster management planning. Response of respondent to this statement was declared 33% strongly agree, 29% agree, 17 % not sure and 21% disagree. The high response of respondents that stated disagrees that indicate the minimal role of NGOs, local communities and local leaders in disaster management planning. Response of respondents to the four statement is 13% strongly agree; 54% agree and 33% not sure. The high response of respondent that stated "not sure" indicates the disaster management programs are available but not well implemented. The major obstacle in the implementation of disaster management programs is the lack of funds. The response of respondents to the fifth statement is 25% strongly agree; 67% agree and 8% not sure. The division of responsibilities among stakeholders especially government organizations have been clearly defined by the publication of regulations about the duties and functions of each organization. The majority of non-governmental organizations involved in during landslide event, but some of NGOs also have a role in pre-disaster and post-disaster for example Indonesian Red Cross (PMI) and MDMC.

The response respondents to the sixth statement claim that 46% strongly agree; 42% agree, 4% not sure, 4% disagree and 4% strongly disagree. Activities evacuation drill was conducted in landslides prone areas but not done regularly. Landslides prone areas are quite large and lack of budget are two reasons that said by respondents, therefore evacuation drill not done in all of landslides prone areas. The seventh statement is rescue teams, evacuation routes, rescue equipped, shelters, warehouses for emergency food and clean water supplies available at the district scope. Response of respondents to this statement is 29% strongly agree; 38% agree; 21% not sure and 13% disagrees. The results of the interview with respondents stated that the rescue team has been more than enough in Karanganyar. From the BPBD data, the number of rescue team overall is 1,123 personnel. From

observations in the field, there are some prone areas that have been installed of evacuation sign and warning sign of landslide. For the rescue equipment is not quite and need to be added. Shelter, warehouses for emergency food and clean water supply are not found in the study areas. Local people exerted public facilities such as mosques and schools for evacuation places. The planning for shelter has been made by authority but construction has not been implemented. Response of respondent to the statement eighth is 42% strongly agree; 42% agree; 13% not sure and 4% disagrees. In accordance with regional regulations stated that the assigned institution to be a leader in disaster management is BPBD (Regional Disaster Mitigation Agency).

Response of respondents to the ninth statement is 13% strongly agree, 50% agree; 29% not sure, disagree 4% and 4% strongly disagree. The record of statistical data related with historical landslide events was recorded by BPBD and updated every year. The form of record is tabulation consist of month the disaster events, type of disaster and the location of disaster. Response of respondent to the statement tenth is 17% strongly agree; 33% agree; 29% not sure and 21% disagrees. Based on observations in the field, landslide susceptibility map is available that issued by *Bappeda* in 2009, updating susceptibility maps on districts scale will be done every five years. On a sub-district scale, the landslide susceptibility map was not found. Landslide susceptibility map on village scale was found in Tengklik Village that created by the student of Gadjah Mada University.

The eleventh statement is Landslide warning board installed in every prone area. Response of respondents to this statement is 29% strongly agree; 33% agree; 29% not sure, 4% disagree and 4% strongly disagree. Base on observation in the study area, landslide warning boards are installed by the university. The response of respondents to the twelfth statement claim that 25% strongly agree; 46% agree; 4% not sure and 25% disagrees. Validation of the disaster risk assessment carried out by making a simple sketch vulnerability map of houses and people who live in prone areas. Response of respondent to the statement analysis of community resilience in the face of disaster has been done is 4% strongly agree; 46% agree; 42% not sure and 8% disagree. Respondent's response is known that many respondents who stated not sure, this is indicates that community resilience analysis never or rarely done by the stakeholders.

Response of respondents to the statement 14 is 13% strongly agree, 50% agree; 29% not sure and 8% disagrees. Analysis of the social and economic aspects of people who living in disaster-prone areas is needed to know the resilience of the community to face the landslide. Resilience is a system to return in its original condition after experiencing a catastrophic disruption to either survive or adapt to environmental conditions. Statement to fourteen closely related to the fifteen statements that analysis of the level of community preparedness to face the disasters has been done. The response of respondents claims that 17% strongly agree; 63%

agree; 17% not sure and 4% disagrees. Analysis the level of community preparedness to face landslide is very important to be conducted to know the level of community preparedness to face the landslides. If the results of analysis stating that the level of preparedness is low, the government and other stakeholders should make efforts to raise the level of community preparedness to reduce the negative impact because of landslide.

Activities of risk management can be divided into two phase; pre-disaster and post-disaster phase. Activities on the pre-disaster phase are divided into two categories, namely mitigation and preparedness included prevention. Activities undertaken in the post-disaster phase is divided into two stages, response and recovery included development. The Table 7.4 is list of organization both GO and NGOs that involved on risk management.

Table 7.4. List of organizations involved on risk management phase

Pre-disaster	Post-disaster
Mitigation 1. Regional Disaster Mitigation Agency 2. Public Work Agency 3. Education, Youth and Sport Agency 4. Indonesian Red Cross 5. University 6. Transportation, Communication and Information Agency 7. Agriculture and Forestry Agency 8. Geology Agency 9. Pejuang Bencana Radio 10. Karanganyar Government Radio 11. Health Agency **Preparedness and Prevention** 1. Regional Disaster Mitigation Agency 2. Regional Planning and Development Agency 3. Public Work Agency 4. University 5. Geology Agency 6. Parliament	**Response** 1. Regional Disaster Mitigation Agency 2. Social, Labour and Transmigration Agency 3. District Military Command 4. Civil Police Unit 5. Indonesian Police Department 6. Regional Public Hospital 7. Pejuang Bencana Radio 8. Karanganyar Government Radio 9. Karanganyar Search And Rescue 10. MDMC 11. PKU Muhammadiyah Hospital 12. Indonesian Red Cross 13. Tisaga Buana 14. BAGUNA 15. RAPI 16. Disaster Communication Forum 17. Rescue MTA 18. Sekretariat Bersama Peduli Alam 19. TAGANA 20. Karanganyar Emergency (KE) 21. Indonesian Nurses Association 22. Anak Gunung Lawu (AGL) 23. Karanganyar Fire Brigade 24. Karanganyar People Security Agency 25. Disaster Care Forum **Recovery & Development** 1. Regional Disaster Mitigation Agency 2. Public Work Agency 3. Social, Labor and Transmigration Agency 4. District Military Command 5. Regional Public Hospital 6. PKU Muhammadiyah Hospital

All of institution conducted disaster risk reduction program to minimize the negative impact of landslide. Some of institution conducted programs in all of phase the disaster (pre-disaster and post-disaster), but some of them conducted specifically on pre-disaster or post-disaster. BPBD as a leader of institution conducted program in all phase of risk management. They are three categories of disaster risk reduction program conducted by BPBD comprise the prevention and preparedness programs, emergency and logistic program and rehabilitation and construction. Details of activities conducted by stakeholders in the risk management based on phase of disaster is presented table 7.5.

Table 7.5. The Landslide risk reduction programs conducted by stakeholder

Pre-disaster	Post-disaster
Mitigation **A. Structural Mitigation** 1. Constructed infrastructure to prevent the occurrence of landslides such as the constructed retaining wall, gabion wire, concrete road, and constructed water channel 2. Constructed supporting facilities such as permanent health centre in disaster prone areas 3. Constructed early warning system and land movement detection device 4. Constructed landslide warning board and evacuation sign. **B. Non Structural Mitigation** 1. Dissemination about landslide to the school children 2. Dissemination about landslide to the people who live in prone areas 3. Conducted evacuation drill/disaster simulation in prone areas 4. Conducted training to community organizations (NGO)and to local residents about landslide mitigation and disaster response 5. Conducted capacity building training of volunteers / staff in emergency condition 6. Coordinated and communicated to relevant agencies for disaster planning activities 7. Periodic monitoring of the disaster prone areas 8. Simple analysis of building vulnerability, people vulnerability and public facility vulnerability. 9. Produced and installed posters about ways to prevent landslides and landslide recognition signs 10. Socialized to the public about the agency that should be contacted in emergency condition	**Response** 1. Coordinate with relevant agencies for emergency management 2. Evacuating the victims buried by landslides 3. Cleaned the landslide material from the house, road or public facility. 4. Constructed the temporary public kitchen to provides food and other basic need 5. Constructed camp to accommodate refugees and volunteers 6. Dispatch medical personnel and deliver aid medicines needed by the victim 7. Collect and manage donations of money, food, medicines derived from elements of society and government 8. Secure the asset (property) left for displaced people

Preparedness	Recovery & Development
1. Developed and updated landslide susceptibility map 2. Planned for the shelter construction or permanent evacuation building 3. Maintenance and repaired EWS and ground movement detection device 4. Published regulations involved landslide aspect on the spatial planning product 5. Published regulations about establishment of disaster management agency at the district scope 6. Issued a regulation about guidelines of disaster emergency relief. 7. Allocated of budget (APBD) for disaster aspect 8. Purchase of equipment and needed in SAR	1. Built and repaired people's houses was damaged by landslides 2. Improvements of public facilities (roads, bridges, mosques, schools, drainage, retaining wall) were damaged by landslides 3. Help on recovery of trauma 4. Distributed assistance in the form of money or building materials to the affected people 5. Provided medical care to the landslide victims

7.2.3. Risk communication

Analysis of the risk communication level is derived by calculating the answer of respondents (head of institution) from the questionnaire. The answer from respondents were calculated from 1 to 5 based on the degree of their agreement; 1 for strongly disagree, 2 for disagree, 3 for not sure, 4 for agree, and 5 for strongly agree. Base on the data calculation was known that the minimum value is 16, the maximum value is 27. The result of calculation was divided in three classes: Low (16-19), Moderate (20-23) and High (24-27).

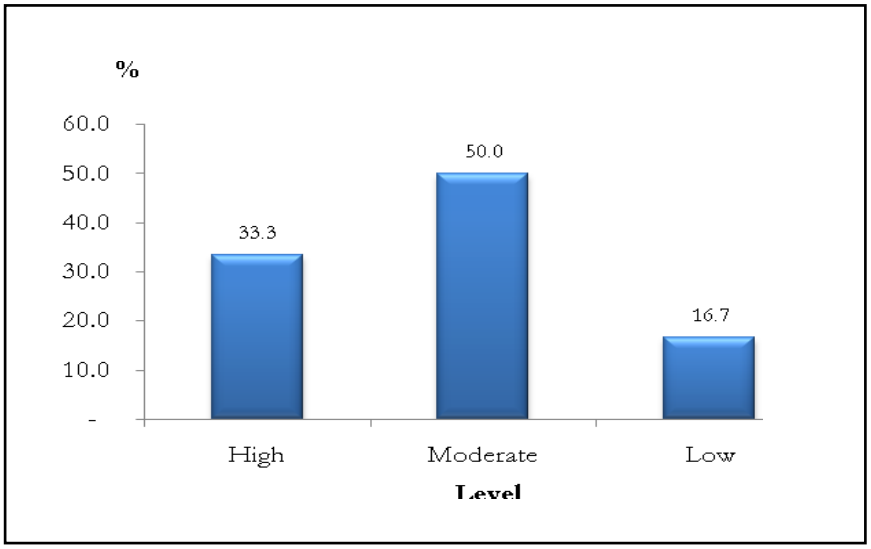

Figure 7.9. The level of risk communication at district scope

Figure 7.9 explains that 50% of respondents stated that risk communication in Karanganyar District categorized as moderate level, 33.3% respondents have

opinion that risk communication among stakeholders categorized into high level and 16.7% of respondents stated that risk communication among stakeholders, including the low level.

The assessment of risk communication is done by asking respondent to answer the questionnaire. Compilation of respondents response to statements contained in the questionnaire is shown in Table 7.6. Totally, the number of statements that are used to assess risk communication on risk governance framework is 6 statements.

Table 7.6. Response of respondents on risk communication

No.	Statements	Response (%)				
		SA	A	NS	D	SD
1.	Face to face meeting in a form of seminar, workshop, conference, and training have been done	25	46	25	4	0
2.	Distribution of print out materials such as leaflet, pamphlet, brochure, poster, booklet have been done	4	25	50	21	0
3.	Coordination and meeting with community leader, volunteer, head of women's group, pray groups (*Pengajian*) have been conducted	17	50	29	4	0
4.	Dissemination of disaster information in local languages to local people	8	67	17	8	0
5.	Installation of EWS (early warning system), socialization and simulations in disaster-prone areas has been done	21	50	17	8	4
6.	Patterns of communication and coordination between stakeholders and people in an emergency condition have defined and tested	17	58	21	0	4

Apposition :

SA : Strongly Agree NS : Not Sure SD : Strongly Disagree

A : Agree D : Disagree

Response of respondents to the first statement is 25% strongly agree; 46% agree 25% not sure and 4% disagree. Face to face meetings have been done by BPBD and other stakeholder trough coordination forums with other stakeholders. Response of respondent to the second statement is 4% strongly agree, 25% agree, 50% not sure and 21% disagree. Base on the observation during field work, dissemination of print out materials for example posters have been done by stakeholder in study areas. Poster mounted at the village office and at the gathering points.

Response of respondent to the third statement is 17% strongly agree, 50% agree; 29% not sure and 4% disagrees. The third statement is closely related to the fourth statements. Respondent's response to the fourth statement claim that 8% strongly agree; 67% agree, 17% not sure and 8% disagree. Meetings with the community and dissemination of disaster information were conducted by institution through attending community forums.

Response of respondents to the fifth statement is 21% agree fully, 50% agree, 17% not sure, 8% disagree and 4% strongly disagree. Based on observations during fieldwork, EWS device has been installed in study area (Ngeldoksari Sub-village and Guyon Sub-village). Geological Faculty of Gadjah Mada University together with regional government institutions installed EWS device in Tengklik Village and Tawangmangu Village. Base on observation during fieldwork, EWS device not well maintained and need to be repaired. For future maintenance, cooperation with the local community in the form of training is needed to reduce dependence on the institutions that installed these tools. In addition, ground movement monitoring equipment was also installed by the Geology Agency. Response to the sixth statement is 17% strongly agree; 58% agree; 21% not sure and 4% strongly disagrees. The interview with the respondent stated that BPBD is an organization that plays a central role as a leader in emergency condition related to disaster.

7.3. Analysis risk governance framework at sub-district scope

Analysis of risk governance framework at the sub-district scope was done using a questionnaire tools with close-ended question and in-depth interviews with stakeholders. Organizations involved in disaster management at sub-district scope are Indonesian Army of Tawangmangu (*Koramil Tawangmangu*), Indonesian Police of Tawangmangu (*Polsek Tawangmangu*), Tawangmangu Sub-district Office, Tawangmangu Clinic (*Puskesmas*), Tengklik Village Office and Tawangmangu Village Office. Totally, the numbers of respondents are 24 people that representing their institutions.

Totally, the number of statements in the questionnaire for the analysis of risk governance framework at sub-district scope is 23 questions consisting of 6 questions for the analysis of stakeholder involvement, 12 questions for the analysis of risk management and 5 questions for risk communication analysis. The discussion of each component is presented in the following section.

7.3.1. Stakeholder involvement

Analysis the level of stakeholder involvement is obtained by calculating the answer of 24 respondents (4 respondents for each institution) from the questionnaire. The answer from respondents were calculated from 1 to 5 based on the degree of their agreement; 1 for strongly disagree, 2 for disagree, 3 for not sure, 4

for agree, and 5 for strongly agree. Base on the calculation of data was known that the minimum value is 18, the maximum value is 27. The result of calculation was divided in three classes: Low (18-20), Moderate (21-24), and High (25-28).

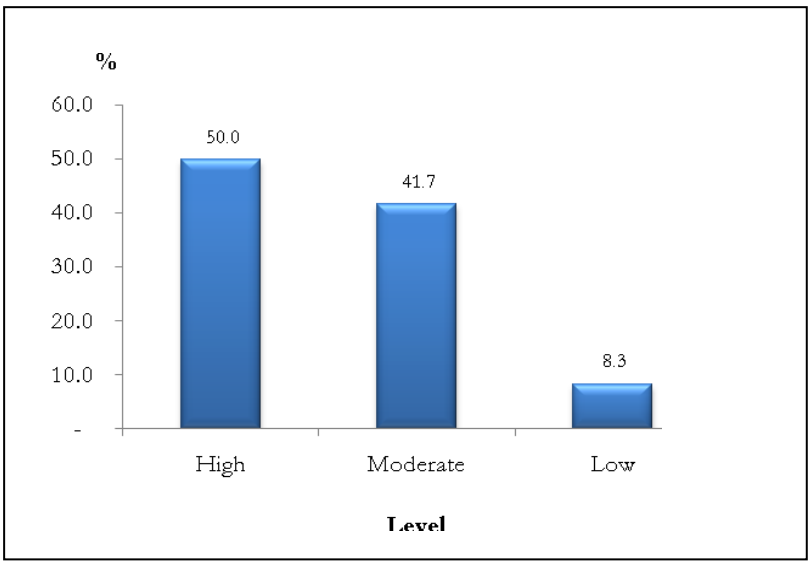

Figure 7.10. The level of stakeholder involvement at sub-district scope

Figure 7.10 describes that 50% of respondents stated that stakeholder involvement in Tawangmangu Sub-district categorized in the high level, 41.7% respondents stated that the level of stakeholder involvement of the risk governance framework is moderate and the rest (8.3%) respondents stated that the level of stakeholder involvement at sub-district level is low.

7.3.2. Risk management

Analysis the level of risk management is obtained by calculating the answer of 24 respondents (4 respondents for each institution) from the questionnaire. The answer from respondents were calculated from 1 to 5 based on the degree of their agreement; 1 for strongly disagree, 2 for disagree, 3 for not sure, 4 for agree, and 5 for strongly agree. Base on the calculation of data was known that the minimum value is 30, the maximum value is 48. The result of calculation was divided in three classes: Low (30-35), Moderate (36-42), and High (42-48).

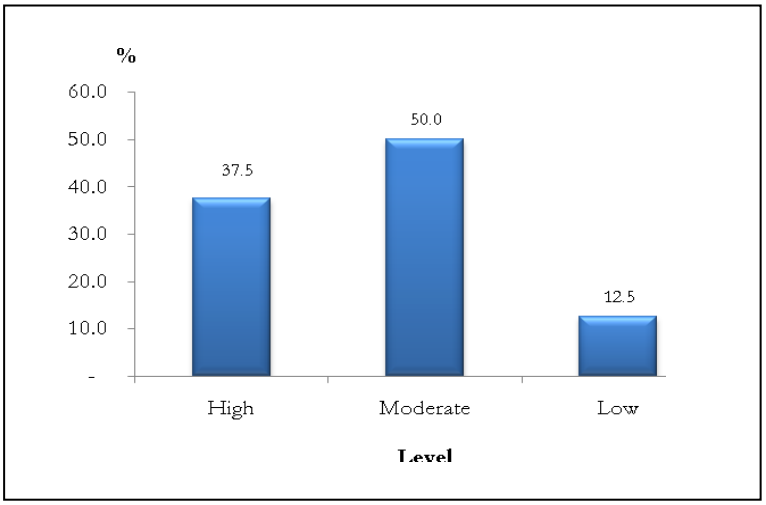

Figure 7.11. The level of risk management at sub-district scope

Figure 7.11 describes that 37.5% of respondents stated that risk management level in Tawangmangu Sub-district categorized in the high level, 50% respondents stated that the level of risk management of the risk governance framework is moderate and the rest (12.5%) respondents stated that the level of risk management at sub-district level is low.

7.3.3. Risk communication

Analysis the level of risk communication is obtained by calculating the answer of 24 respondents (4 respondents for each institution) from the questionnaire. The answer from respondents were calculated from 1 to 5 based on the degree of their agreement; 1 for strongly disagree, 2 for disagree, 3 for not sure, 4 for agree, and 5 for strongly agree. Base on the calculation of data was known that the minimum value is 16, the maximum value is 22. The result of calculation was divided in three classes: Low (16-17), Moderate (18-20), and High (21-22).

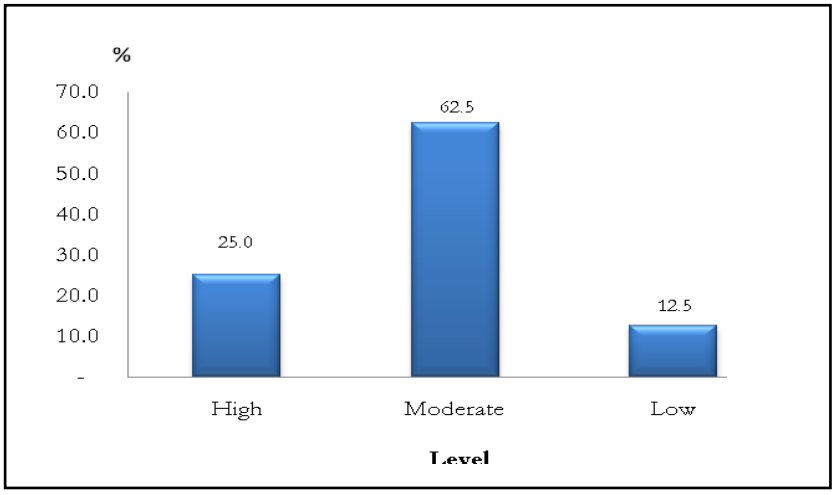

Figure 7.12. The level of risk communication at sub-district scope

Figure 7.12 describes that 25% of respondents stated that risk communication level in Tawangmangu Sub-district categorized in the high level, 62.5% respondents stated that the level of risk management of the risk governance framework is moderate and the rest (12.5%) respondents stated that the level of risk management at sub-district level is low.

7.4. Components that need to be improved

In this study, analysis of risk governance framework is conducted on three components comprise stakeholder involvement, risk management and risk communication. The assessment of the three components carried out using questionnaire and in-depth interview. To know the components that needs to be improved by giving a score to each of the statements in the questionnaire. The answer from respondents were calculated from 1 to 5 based on the degree of their agreement; 1 for strongly disagree, 2 for disagree, 3 for not sure, 4 for agree, and 5 for strongly agree.

At the district scope there are 24 respondents representing 24 institutions in the Karanganyar District involved in disaster activities. Base on the accumulation of calculation data was known that the minimum value is 75 and the maximum value is 108. The result of calculation was divided in three classes: Low (75-85), Moderate (86-96), and High (97-108). At the sub-district scope there are 24 respondents representing six institutions in the Tawangmangu Sub-district involved in disaster activities. Base on the accumulation of calculation data was known that the minimum value is 54 and the maximum value is 102. The result of calculation was divided in three classes: Low (54-69), Moderate (70-85), and High (86-102).

Responses of respondents to the statement in the questionnaire are divided in three classes. High category means the statement in the questionnaire has been implemented and runs with good condition, moderate category means that parts of the statement in the questionnaire have been implemented but needs improvement, and low category means that statement in the questionnaire has not been implemented and should be improved immediately.

7.4.1. Stakeholder involvement

Totally, the number of statements in the questionnaire for the analysis of stakeholder involvement at sub-district scope is 9 statements (see table 7.2). The calculation of respondent's responses to the statements in the questionnaire, indicating that in general, stakeholder involvement at the district scope is high. Base on the data calculation, the minimum score on the stakeholder involvement is 92 and the maximum score is 108. Base on the score calculation, it can be seen that statement on the stakeholder involvement can be categorized on the two classes, those are high category and moderate category. There are three statements included in the moderate category those are: the existence of overall data related stakeholders

and their role in disaster management well-documented; a pattern of horizontal and vertical relationship of each stakeholder are clearly defined; there is sufficient space to accommodate participation of NGOs in disaster activities. This analysis shows that there are three components that need to be slightly improved; those are data management, the pattern of relationships among stakeholders and increased participation of NGOs in disaster activities.

Assessment of stakeholder involvement component on the sub-district scope was conducted using 6 statements on the questionnaire. Base on the data calculation, the accumulative score indicates that all of elements on the stakeholder involvement were categorized on the high category. The minimum score on the stakeholder involvement at sub-district scope is 88 and the maximum score is 102. It can be concluded that overall, stakeholder involvement at the sub-district is good. This is evidenced by no statements are included in the low category or moderate category. All statements in stakeholder involvement categorized in high category.

7.4.2. Risk management

The assessment of risk management component at the district scope was done using 15 statements (see table 7.3). Base on the data calculation, the minimum score on the risk management analysis is 83 and the maximum score is 101. So, the statements on the questionnaire can be categorized on the three classes, low, moderate and high. Base on the data analysis, there are 9 elements on the risk management components that categorized on the moderate category, 4 elements included on the high category and 2 elements that categorized in the low category. Four elements are included on the high category consist of the statement number 1, 5, 6 and 8. Nine elements are included in the moderate category comprises the statement number 2, 3, 4, 7, 9, 11, 12, 14 and 15 (see table 7.3). Statement 10 and 13 (see table 7.3) are the two elements included in the low category. Statement 10 is availability of risk maps and updating regularly and statements 13 is analysis of community resilience in the face of disaster has been done.

Base on the interviews during fieldwork can be explained that Karanganyar District not have any documents about landslide risk map and the report about analysis of community resilience in the face of disaster. Base on the explanation above, there are two elements that need to be improved on the risk management. The first is developing landslide risk map. The simple multi hazard map is available in BPBD, but the landslide risk map is not is not available. The local government (BPBD) have to produce landslide risk map to anticipate the landslide event. The landslide risk map can be made by local government and work together with science institution or university. The second element that must be improved is the analysis of community resilience. As defined by the UN-ISDR (2004), resilience refers to the capacity of a system, community or society to resist or to change in order that it may obtain an acceptable level in functioning and structure. Community resilience analysis

is one of elements that need to be improved because by community resilience analysis the negative impact of disaster can be minimize and to know the community's ability to reduce the recovery period after landslide events.

Assessment of stakeholder involvement component on the sub-district level was conducted using 12 statements on the questionnaire. Base on the data calculation, the minimum score on the stakeholder involvement at sub-district level is 54 and the maximum score is 101. Seven elements are included on the high category consist of the statement number 10, 11, 14, 15, 16, 17 and 18 (see the Appendix 3). Three elements are included in the moderate category comprises the statement number 8, 9 and 12 (see the Appendix 3). Statement 7 and 13 are the two elements included in the low category. Statement 7 is the existence of specialized institutions at the sub-district level which deal with disaster and statements 13 is the presence of microfinance institutions that help the community when disaster strikes. Base on the interviews and observations in the field show that there are no specialized institutions at the sub-district that deal on disaster mitigation. Specialized institutions dealing with disaster is formed only at the district level. For the sub-district level, the disaster management is a part of sub-district office. There are no specific financial institutions that help the community when disaster strikes such as insurance for the building or agricultural product that damages because of landslide.

7.4.3. Risk communication

To define the elements that must be improved on the risk communication at district level, five number statements on the questionnaire was used as a tool. Base on the data calculation, the minimum score on the risk communication is 75 and the maximum score is 94. Base on the score calculation, it can be seen that statement on the risk communication can be categorized on the two classes, those are low category and moderate category. Results of the assessment of risk communication showed there were no elements included in a high category. There are five elements are included on the moderate category consist of the statement number 1, 3, 4, 5 and 6 (see table 7.4). One element included in the low category and need to be improved is statement number 2 (see table 7.4). Statement number 2 is distribution of print out materials such as leaflet, pamphlet, brochure, poster, booklet have been done. Dissemination of information related to landslide need to be improved using poster or audio visual media. It is proposed to increase community's preparedness and community's mitigation on the landslide occurrences on the future.

Assessment of risk communication component on the sub-district level was conducted using five statements on the questionnaire. Base on the data calculation, the accumulative score indicates that most of elements were categorized on the high category. The minimum score on the risk communication at sub-district level is 63 and the maximum score is 102. There is only one statement that included on the low category, which is statement 21. Statement 21 is installation disaster warning board

and published printed materials related to disaster. Observations in the field show that there are several warning boards installed in some prone areas. Improvements can be focused on the addition of landslide warning board and evacuation sign in the settlement areas that susceptible to landslide.

7.5. Summary and Conclusion

This chapter explored four sub-objectives of the analysis of risk governance framework, comprises analysis of stakeholder involvement, analysis of risk management, analysis of risk communication and analysis components that need to be improved on the risk governance framework both at the district level and sub-district level.

Base on the data analysis, the level of stakeholder involvement at the district level showed that the level of stakeholder involvement on disaster activities in Karanganyar is moderate till high. Analysis of stakeholder involvement at the sub-district level showed that generally, the level stakeholder involvement at sub-district level was categorized on the high level. There are 36 organizations both GO and NGOs involved in disaster activities in Karanyanyar. Some elements of stakeholder involvement that have been done including the mutual sharing of information and the determination of relationships pattern among stakeholders in order to avoid overlapping roles in disaster mitigation activities.

Generally, the risk management of Karanganyar District was categorized on the moderate level and high level. Risk management level in Tawangmangu Sub-district categorized on the moderate level. BPBD is institution that designated to be leader in term of disaster management activities both pre-disaster and post-disaster. Elements of the risk management that has been done including the planning of disaster risk reduction program in conjunction with other stakeholders and producing regulations on disasters that accommodate aspects of disaster on the spatial planning product.

In general, the analysis of risk communication in district scope showed that risk communication at the Karanganyar was categorized in the moderate level. Analysis of risk communication in Tawangmangu sub-district was categorized in the moderate level. Some of activities related risk communication comprises coordination among institutions and face to face meetings with local people through *Pengajian* and other informal meetings. Beside it, dissemination of information on landslides to local people uses posters, film and installation landslide warning board.

Analysis of components of risk governance framework that need to be improved shows that on the stakeholder involvement improvement must be done on the three elements, those are data management, the pattern of relationships among stakeholders and increased participation of NGOs in disaster activities. There are two elements that need improvement on the risk management component; those are

constructed and updated landslide risk map and enhancement of microfinance role in helping the community when disaster strikes. Improvements to the risk communication component must be done to the dissemination of information about the landslide to the local community.

CHAPTER VIII
CONCLUSION AND RECOMMENDATIONS

This chapter describes some conclusions, contribution of this research and recommendations base on the discussion from chapter 1 to chapter 7. The conclusions would refer to the research objectives and research questions. This chapter also describes some recommendations for future research and for all of stakeholder on disaster mitigation especially for Karangananyar District and Tawangmangu Sub-district authority.

8.1. Conclusion

The research related to people perception on landslide becomes important because by knowing the people perception about landslide will be known the response of people to survive and to cope from landslide in the future. People's perception of landslides at the research site categorized on the high and moderate levels. Thus, the level of people's knowledge related to landslides can also be categorized in the high and moderate. The level of people's perception of landslides was influenced by two factors, those are education and age. The higher of education level of respondents, the higher of perception level, whereas the older age of respondent, the lower of perception level related to landslides.

There was a positive correlation between people perception and people coping strategy, meaning that the raise of the perception will follow the increasing of the coping strategy. The high level of people perception related to landslides have affected the level of people coping strategy will be high. Coping Strategy that be conducted by local people related with landslide can be performed in the household scope and community scope. On the household scope, coping strategies focusing on increasing income by selling agricultural product, strengthening building, applied soil conservation on agricultural land and participate in *pengajian* and *arisan*. On the community scope, coping strategies focusing on strengthening *koperasi* and *arisan*, construct public facilities such as roads, water channel, installation of gabion and retaining wall, night patrol activities and held traditional ceremony was called *Ruwahan* and *Suroan*. The levels of coping strategy influenced by the level of education, income and building type. The increasing levels of people education will be foollowed by increase of people knowledge to the various types of coping strategies. It will have an impact on the raise of public awareness both individuals and community in applying the various coping strategies to deal with landslides. Income and building type are an indicator of social economic of respondents. The higher the income indicate the higher coping strategies levels. The higher levels of income also affects the type of building. People with high income levels would build permanent houses that made of brick and concrete. The permanent house has a

higher strength than semi-permanent or not permanent building. So that, people with permanent building has a lower level of vulnerability than the people who live in the non- permanent or semi-permanent building.

Society either individually or in groups have done various coping startegy to prevent the occurences of landslides in the future and to minimize negative impacts due to landslides. Beside the local community, government and non-government organizations are also implementing coping strategies to reduce the risk of landslides. Landslide risk reduction program conducted by the government and non-government sometimes does not in line with the wishes and expectations of the people who live in landslide prone areas, so that, it is necessary to analyze of the level of public acceptation to the landslide risk reduction programs undertaken by government and non-government organizations. The government as a main actor and the owner of authority on disaster mitigation conducted various landslide risk reduction programs that carried out before, during and after landslide occurrences. Landslide risk reduction programs conducted by the government and non-government organizations have to evaluate in order to avoid overlapping of programs and to minimize miss communication among stakeholders. Analysis of risk governance framework is one of tools that can be used to evaluate the governance of disaster within the district and sub-district scope. In this research, there are three elements of risk governance framework that analyzed including the stakeholder involvement, risk management and risk communication.

The results of analysis is showed that stakeholder involvement at Karanganyar District categorized in the moderate level and at Tawangmangu Sub-district categorized in the high level. Risk management at Karanganyar categorized at the high and moderate level and at Tawangmangu Sub-district categorized in the high level. Risk communication in Karanganyar District categorized as moderate level and at Tawangmangu Sub-district categorized in the high level. There are several components that need to be improved including data management, the pattern of relationships among stakeholders, participation of NGOs in disaster activities, constructed and updated landslide risk map, enhancement of microfinance role in helping the community when disaster strikes and enhancement of dissemination about landslide to the local community.

8.2. Contribution of this research

1. The methodology of this research can be adopted by local government to conduct the project in a broader scope (districts), thereby will be known the level of perception and coping strategy in each sub-district. By conducting this project, disaster risk reduction programs will be implemented in the right location.
2. Analysis of the people perception related to landslide will be useful for local government determining the appropriate landslide reduction program

accordance with the local community pretention. Analysis of the people acceptation of the landslide risk reduction program is very useful for evaluating the effectiveness of the landslide risk reduction program conducted by the government and other stakeholders to minimize the impact due to landslide.

3. By understanding household coping strategies and community's coping strategies through the results of this research, the local government and non-government organizations know the various coping strategy that has been done by local community. Analysis of the coping strategy is also useful for local authority in determining the appropriate coping strategy both the type and the location.
4. The result of analysis risk governance framework is useful for local government in determining which components that needs to be improved. By this research will be known what elements are at a low level and require improvement. This analysis also can be used as priority scale in determining the landslide risk reduction program that will be applied at the prone areas.

8.3. Recommendations

1. Analysis of people acceptation to landslide risk reduction program and analysis of community's coping strategy related to landslide was conducted using questionnaire and interview with key respondent. In order to obtain the accurate results, it should be checked with Focus Group Discussion (FGD) with many stakeholders including local people, Government Organization (GO) and Non Government Organization (NGOs).
2. Analysis of local people perception and people coping strategies related with landslide conducted on the areas that was categorized on the high level susceptibility to landslide, to obtain a detailed and better result for the future research, analysis of people perception and people coping strategies can be conducted on the different level susceptibility to landslide.
3. Analysis of risk governance framework at district scope and sub-district scope was conducted on the three elements, those are stakeholder involvement, risk management and risk communication. Regarding the comprehensiveness of the research result, for the further research, analysis of risk governance framework can be conducted to other elements, those are risk assessment, risk evaluation and risk visualization.
4. Since analysis of risk governance framework on the district scope and sub-district scope was conducted using questionnaire and in-depth interview, in order to enhance the accuracy of the research on the analysis of risk governance framework, further research may carried out workshops with Government Organization (GO) and Non Government Organization (NGOs).

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APPENDICES

Appendix 1. The Questionnaire for household survey

Researcher	:	Heru Setiawan
Contact	:	setiawan29742@itc.nl
Research Title	:	Analysis of Local Risk Governance Framework and Community's Coping Strategies in Relation to Landslide: A Casestudy in Tawangmangu Sub-District, Karanganyar Regency, Indonesia
University	:	Geoinformation for Spatial Planning and Disaster Risk Management, UGM-ITC

This information will only be used for scientific research

Questionaire no	:	
Date	:	
Time of interview	:	
Respondent's name	:	
GPS	:	a)Lat : b)Long :
Village	:	
Sub Village	:	

A. Respondent's Profile

1.	Age	:	
2.	Sex	:	□ Male □ Female
3.	Marital status	:	□ Married □ Widower □ Widow
4.	Education	:	
5.	Length of stay	:	
6.	Origin	:	□ Native □ Outsider
7.	Occupation	:	
8.	Income per month	:	□ < Rp 846.000,- □ ≥ Rp 846.000,-
9.	Household Size	:	
10.	Building ownership	:	□ Own □ Rent □ Other :
11.	Building type	:	□ Permanent □ Semi permanent □ Non permanent

B. People perception

12. I realize (know) that my family live in landslide prone area?
    □ Strongly agree □ Agree □ Not Sure □ Disagree □ Strongly disagree
13. I know where the landslide usually happened
    □ Strongly agree □ Agree □ Not Sure □ Disagree □ Strongly disagree
14. Where is the usual occurrence of landslides?
    A. Mountainarea B. Steep slopes C. The cliffs on the river side
    D. The cliffs on the road side E. Plains F. Don't know G. Other:

15. What is the type of land movement that frequently occurred in your village?
A. B. C. D. E. F. Don't knows G. Other:

16. Have you experienced in landslide event(s) before?
A. No B. Yes, once C. Yes, twice D. Yes, more than twice
17. How big the landslide event in your experience? (spatial distribution)
A. Low B. Medium C. High

Indicate:
Low : the size of landslides smaller than cars
Medium : the size of landslides smaller than house
High : the size of landslides bigger than house

18. What the loss material impact in your (family) experience because of landslide?
A. Agriculture destruction B. House damage C. Loss of livestock
D. No loss E. Other:
19. What the loss immaterial impact in your (family) experience because of landslide?
A. Injury B. Death C. Trauma D. Disability
E. No loss F. Other :
20. I know the landslide definition
□ Strongly agree □ Agree □ Not Sure □ Disagree □ Strongly disagree
21. Can you explain what the landslide is?
A. Down slope movement of soil, rock or both from a steep slope due to the steepness of the slope
B. Down slope movement of soil from a steep slope
C. Rock and soil fallout
D. Other:
22. I know the causal factors of landslide
□ Strongly agree □ Agree □ Not Sure □ Disagree □ Strongly disagree
23. What the causal factors of landslides?
A. Deforestation B. Bad drainage system
C. Heavy rainfall in long time D. Steep slope topography
E. Unstable soil F. Hilly topograp
24. I know when the landslide usually happened
□ Strongly agree □ Agree □ Not Sure □ Disagree □ Strongly disagree
25. When landslides occur frequently (time/month)?
A. The rainy season B. The dry season; month:
C. Don't know D. Other:
26. Which characteristic of rainfalls do the landslides occurred?
A. Low intensity rainfall; short periods B. Low intensity rainfall; long periods
C. Heavy rains for short periods D. Heavy rains for long periods

C. People coping strategies

27. What is the reason living in this area?
    A. Own properties B. Cheap price C. Has no other land D. Ancestral properties E. Close to family F. Better access G. Other:
28. I know the one / several coping strategies dealing with landslide for my house
    □ Strongly agree □ Agree □ Not Sure □ Disagree □ Strongly disagree
29. My family applied some coping strategies in order to reduce the impact of landslide?
    □ Strongly agree □ Agree □ Not Sure □ Disagree □ Strongly disagree
30. I have saving money to prepare from landslide hazard occurrences
    □ Strongly agree □ Agree □ Not Sure □ Disagree □ Strongly disagree
31. I have life insurance to prepare from landslide hazard occurrences
    □ Strongly agree □ Agree □ Not Sure □ Disagree □ Strongly disagree
32. I have second job/other income to anticipate my main job cannot functioned because of landslide
    □ Strongly agree □ Agree □ Not Sure □ Disagree □ Strongly disagree
33. What kind of second job/other income do you have?
34. Our community have traditional ceremony to combat with landslide
    □ Strongly agree □ Agree □ Not Sure □ Disagree □ Strongly disagree
35. Our community have prominent figure as a leader related to cope with landslide
    □ Strongly agree □ Agree □ Not Sure □ Disagree □ Strongly disagree
36. I fell secure with my coping strategies related with landslide
    □ Strongly agree □ Agree □ Not Sure □ Disagree □ Strongly disagree
37. Landslides cause the significant damage on my agricultural land
    □ Strongly agree □ Agree □ Not Sure □ Disagree □ Strongly disagree
38. I know how to cope the landslide hazard in my agricultural land
    □ Strongly agree □ Agree □ Not Sure □ Disagree □ Strongly disagree
39. Could you mention, what are the coping strategies that can be applied in agricultural land?
40. Our community have significant role to deal with landslides
    □ Strongly agree □ Agree □ Not Sure □ Disagree □ Strongly disagree
41. Our community have several strategies to deal with landslides
    □ Strongly agree □ Agree □ Not Sure □ Disagree □ Strongly disagree
42. Household's coping strategies

Phase / Coping Strategies	Before Disaster	During Disaster	After Disaster
Structural			
Social			
Economy			
Cultural			

43. Community's coping strategies

Phase / Coping Strategies	Before Disaster	During Disaster	After Disaster
Structural			
Social			
Economy			
Cultural			

D. People acceptation of Landslide Risk Reduction Programs

44. You ever received information from the government or other agency about landslides reduction program in this area?
□ Strongly agree □ Agree □ Not Sure □ Disagree □ Strongly disagree

45. The people need some programs in order to mitigate landslide risk
□ Strongly agree □ Agree □ Not Sure □ Disagree □ Strongly disagree

46. The stakeholders receive people opinion related disaster risk reduction program
□ Strongly agree □ Agree □ Not Sure □ Disagree □ Strongly disagree

47. The people fell satisfied with government and non government assistance
□ Strongly agree □ Agree □ Not Sure □ Disagree □ Strongly disagree

48. The assistance from government and NGO accord with people pretention
□ Strongly agree □ Agree □ Not Sure □ Disagree □ Strongly disagree

49. Landslide risk reduction programs and people coping strategies should be work together
□ Strongly agree □ Agree □ Not Sure □ Disagree □ Strongly disagree

50. The landslide risk reduction programs make the people feel more secure
□ Strongly agree □ Agree □ Not Sure □ Disagree □ Strongly disagree

51. The landslide risk reduction programs give advantages for people as individually and community
□ Strongly agree □ Agree □ Not Sure □ Disagree □ Strongly disagree

52. The disaster reduction program still running right now?
□ Strongly agree □ Agree □ Not Sure □ Disagree □ Strongly disagree

53. Mitigation facilities from stakeholders are enough for villagers to cope the landslide risk
□ Strongly agree □ Agree □ Not Sure □ Disagree □ Strongly disagree

54. What your hope to GO and NGO about disaster management dealing with landslide?

END OF QUESTIONNAIRES

Thank you very much for your help and kind cooperation

Appendix 2. Monitoring sheet of risk governance framework at the district scope

Component	No.	Statements	SA	A	NS	D	SD
Stakeholder involvement	1.	Involvement of stakeholders both GO and NGOs in disaster management has been well organized	□	□	□	□	□
	2.	The existence of overall data related stakeholders and their role in disaster management well-documented	□	□	□	□	□
	3.	The mutual sharing of information among stakeholders related to disaster management program carried out regularly	□	□	□	□	□
	4.	The existence of an agreement among stakeholders related with the role and position of each stakeholder in disaster management	□	□	□	□	□
	5.	No overlapping roles of each stakeholder in disaster management	□	□	□	□	□
	6.	A pattern of horizontal and vertical relationship of each stakeholder are clearly defined	□	□	□	□	□
	7.	All stakeholders have a high level of trust and pursuance to the institution designated as a leader in disaster management	□	□	□	□	□
	8.	There is sufficient space to accommodate participation of NGOs and community in disaster activities	□	□	□	□	□
	9.	There is active participation from NGOs and community in disaster activities	□	□	□	□	□
Risk management	10.	The availability of a comprehensive spatial plan that accommodates disaster aspects	□	□	□	□	□
	11.	The availability of regulation both local regulation (*Perda*) or decree of local leader (*Bupati*) related to disaster	□	□	□	□	□
	12.	Active participation by NGOs, local communities and local leaders in disaster management planning	□	□	□	□	□
	13.	Disaster management programs are available and well implemented at district level	□	□	□	□	□
	14.	Mechanism of coordination and responsibilities distribution among stakeholders in disaster monitoring activities are clearly defined	□	□	□	□	□
	15.	Regular evacuation drill conducted at prone areas	□	□	□	□	□
	16.	Rescue teams, evacuation routes, rescue equipped, shelters, warehouses for emergency food and clean water supplies available at the district scope	□	□	□	□	□
	17.	The existence of an institution designated as a leader in disaster management	□	□	□	□	□
	18.	Statistical data about landslide events are available in a table or chart and updated regularly	□	□	□	□	□
	19.	Availability of risk maps and updating regularly	□	□	□	□	□
	20.	Landslide warning board installed in every prone areas	□	□	□	□	□
	21.	Validation of the disaster risk assessment by checking the conditions on the field	□	□	□	□	□
	22.	Analysis of community resilience in the face of disaster has been done	□	□	□	□	□

	23.	Analysis of the cultural, religious, social and economic background of people who live in prone areas has been conducted by authority	□	□	□	□	□
	24	Analysis of the level of community preparedness to face the disasters has been done	□	□	□	□	□
Risk communication	25.	Face to face meeting in a form of seminar, workshop, conference, and training have been done	□	□	□	□	□
	26.	Distribution of print out materials such as leaflet, pamphlet, brochure, poster, booklet have been done	□	□	□	□	□
	27.	Coordination and meeting with community leader, volunteer, head of women's group, pray groups () have been conducted	□	□	□	□	□
	28.	Dissemination of disaster information in local languages to local people	□	□	□	□	□
	29.	Installation of EWS (early warning system), socialization and simulations in disaster-prone areas has been done	□	□	□	□	□
	30.	Patterns of communication and coordination between stakeholders and people in an emergency condition have defined and tested	□	□	□	□	□

Apposition :

SA	:	Strongly agree
A	:	Agree
NS	:	Not Sure
D	:	Disagree
SD	:	Strongly disagree

Appendix 3. Monitoring sheet of risk governance framework at the sub-district scope

Component	No.	Statements	SA	A	NS	D	SD
Stakeholder involvement	1.	Involvement of stakeholders both GO, NGO and community in disaster management has been well organized	□	□	□	□	□
	2.	The existence of the overall data about stakeholders that involved in disaster management well-documented	□	□	□	□	□
	3.	There is no overlapping roles of each stakeholder in disaster management	□	□	□	□	□
	4.	The existence of coordination pattern among stakeholders in disaster management	□	□	□	□	□
	5.	There is sufficient space to accommodate the participation of NGOs and community	□	□	□	□	□
	6.	Active participation from NGOs and community in the activities of disaster	□	□	□	□	□
Risk management	7.	The existence of specialized institutions at the sub-district level which deal with disaster	□	□	□	□	□
	8.	The existence of regulations related with disaster	□	□	□	□	□
	9.	Simulated disaster and evacuation drills have been conducted periodically	□	□	□	□	□
	10.	Availability of programs related to disaster well implemented	□	□	□	□	□
	11.	Coordination mechanisms and a clear division of responsibilities between the stakeholders in the activities of disaster	□	□	□	□	□
	12.	The existence of the community as a force trained on disaster response volunteers.	□	□	□	□	□
	13.	The presence of microfinance institutions that help the community when disaster strikes	□	□	□	□	□
	14.	The availability of data identifying communities that vulnerable to landslide	□	□	□	□	□
	15.	The absence of data identifying the resources and assets held by the public in the face of landslides	□	□	□	□	□
	16.	The availability of simple map about residential or agricultural areas that prone to landslide	□	□	□	□	□
	17.	The availability of statistical data in tables / charts form related with landslide events in a complete and up-to-date	□	□	□	□	□
	18.	The availability of reports or documents concerning landslide events and landslide incident documentation	□	□	□	□	□
Risk communication	19.	Face to face meetings between all agencies at sub-district level in relation to the disaster are conducted regularly	□	□	□	□	□
	20.	Community meetings with local government related to the disaster are conducted regularly	□	□	□	□	□
	21.	Installation disaster warning board and published printed materials related to landslide	□	□	□	□	□
	22.	The use of traditional and modern media as a means of communication between people related to disaster	□	□	□	□	□
	23.	The patterns of communication and coordination among the people related to emergency conditions have been decided	□	□	□	□	□

Appendix 4. Data Recapitulation of household survey

No	Name	Sub village	Age class	Gender	Education	Occupation	Income	Household size	Building type	Landslide experience	Perception						
											12	13	20	22	24	Total	Level
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*	*16*	*17*	*18*
1	Sumanto	Guyon	4	1	3	5	2	4	1	4	5	4	5	5	5	24	3
2	Panikem	Guyon	3	2	1	1	1	5	3	4	4	3	3	4	4	18	2
3	Warsini	Guyon	2	2	2	2	1	4	1	4	4	4	3	4	4	19	2
4	Podo	Guyon	4	1	1	1	2	2	1	4	3	4	3	3	4	17	2
5	Sadiman	Guyon	3	1	3	5	2	4	1	4	5	5	4	5	5	24	3
6	Suparman	Guyon	2	1	1	1	1	4	1	4	4	4	3	3	5	19	2
7	Narno	Guyon	2	1	2	1	1	4	2	3	5	5	4	5	5	24	3
8	Sangat Kromokarso	Guyon	4	1	1	1	1	4	2	4	3	4	3	3	4	17	2
9	Wagiman	Guyon	3	1	1	1	2	3	2	4	4	4	5	5	4	22	3
10	Painah	Guyon	4	2	1	1	1	3	3	4	4	4	4	4	3	19	2
11	Tuki	Guyon	1	2	2	1	1	4	2	4	5	4	3	4	4	20	3
12	Giyono	Guyon	3	1	1	1	1	5	1	4	4	4	2	4	4	18	2
13	Sulami Santoso	Guyon	2	1	1	1	2	4	1	4	4	4	3	3	4	18	2
14	Giman	Guyon	2	1	1	1	2	3	1	3	4	4	3	2	4	17	2
15	Kasikem	Guyon	5	2	1	1	1	3	3	4	2	3	3	3	3	14	2
16	Ngadiman Sumarjo	Guyon	2	1	1	1	2	3	1	4	4	4	3	3	5	19	2
17	Suwarno	Plalar	2	1	3	1	2	4	1	4	4	4	5	5	4	22	3
18	Trigondo	Plalar	2	1	1	5	1	4	2	4	4	3	3	3	4	17	2
19	Sugino	Plalar	4	1	1	1	2	2	1	2	4	4	4	4	4	20	3
20	Suharmo	Plalar	3	1	2	5	2	3	1	4	5	5	4	4	5	23	3
21	Kamsosawirjo	Plalar	4	1	1	5	1	6	3	4	4	3	3	3	4	17	2
22	Suparmi	Plalar	2	2	3	2	1	5	1	4	5	4	5	5	4	23	3
23	Mulyadi	Plalar	3	1	1	1	2	4	1	4	4	4	4	4	4	20	3
24	Ambar	Plalar	1	1	2	4	1	2	2	4	5	5	4	4	5	23	3
25	Waqiyah	Plalar	5	2	1	1	1	1	3	4	4	4	3	2	4	17	2
26	Sayem	Plalar	4	2	1	5	1	7	3	4	4	3	4	3	4	18	2
27	Giyem	Plalar	5	2	1	5	1	4	2	3	3	2	2	2	3	12	1
28	Paidi	Plalar	2	2	2	1	1	5	2	4	4	5	4	4	4	21	3
29	Paiyem	Plalar	5	2	1	5	1	2	3	2	2	3	3	3	3	14	2
30	Supardi	Plalar	2	1	1	5	1	6	2	4	4	3	4	4	4	19	2
31	Bambang	Salere	1	1	3	4	2	4	1	3	5	4	5	4	4	22	3
32	Kromosuwiryo	Salere	5	2	1	1	1	1	3	3	3	2	2	3	3	13	1

Appendix 4.Continuation

No	Coping Strategy														People acceptance											
	28	29	30	31	32	34	35	36	37	38	40	41	Total	Level	44	45	46	47	48	49	50	51	52	53	Total	Level
1	*19*	*20*	*21*	*22*	*23*	*24*	*25*	*26*	*27*	*28*	*29*	*30*	*31*	*32*	*33*	*34*	*35*	*36*	*37*	*38*	*39*	*40*	*41*	*42*	*43*	*44*
1	5	5	5	2	4	4	3	4	3	3	5	5	48	3	4	5	2	4	3	3	4	5	5	4	39	2
2	4	4	2	2	1	4	4	2	4	5	5	4	41	2	1	4	1	4	4	4	3	4	3	3	31	1
3	5	4	1	3	1	5	5	2	5	4	5	4	44	2	5	4	4	2	1	3	1	3	5	3	31	1
4	3	3	3	2	1	5	5	3	4	5	4	4	42	2	2	5	2	4	4	4	4	5	4	4	38	2
5	5	5	5	3	4	4	3	4	2	3	5	5	48	3	5	5	2	2	1	3	2	3	5	2	30	1
6	4	4	2	2	1	4	4	2	4	5	5	4	41	2	5	5	4	1	1	3	1	3	5	3	31	1
7	5	5	3	1	2	4	4	4	3	4	4	5	44	2	5	4	2	1	1	2	2	4	4	1	26	1
8	4	4	2	3	1	5	5	2	4	4	5	4	43	2	4	4	2	4	4	4	4	4	4	3	37	2
9	4	5	4	2	2	4	5	4	5	4	5	5	49	3	4	5	4	3	1	3	2	3	5	3	33	2
10	5	5	3	1	2	4	4	4	3	4	4	5	44	2	3	5	2	4	4	5	4	4	4	4	39	2
11	5	5	3	3	1	4	5	2	4	4	5	4	45	2	3	4	4	4	4	5	2	4	3	3	36	2
12	4	4	4	2	4	3	3	4	5	3	5	4	45	2	5	4	4	2	1	1	1	3	4	1	26	1
13	4	5	4	2	4	4	5	4	4	4	4	5	49	3	5	5	2	1	1	1	2	4	5	3	29	1
14	4	4	2	2	2	5	5	4	5	5	5	5	48	3	4	5	4	2	2	3	2	3	4	1	30	1
15	3	3	1	1	1	4	2	2	4	4	5	4	34	1	4	4	2	5	5	4	4	4	5	4	41	3
16	5	4	4	2	4	3	4	3	5	4	5	5	48	3	5	5	3	1	2	1	2	4	5	3	31	1
17	4	5	5	3	3	4	5	4	4	4	4	4	49	3	4	4	2	2	2	3	2	4	4	2	29	1
18	4	4	2	2	3	4	4	4	4	4	5	5	45	2	3	5	2	2	5	5	2	4	3	3	34	2
19	4	5	4	2	1	2	5	4	4	4	4	4	43	2	4	3	1	4	4	2	4	2	3	3	30	1
20	5	5	4	2	1	5	5	4	5	3	5	5	49	3	4	4	1	1	1	2	4	2	4	2	25	1
21	3	3	1	1	1	4	3	1	4	4	3	4	32	1	5	5	4	4	4	4	3	5	4	4	42	3
22	4	5	5	3	5	4	4	4	2	4	5	4	49	3	4	5	2	2	2	3	2	4	4	2	30	1
23	4	5	2	3	4	2	4	4	4	4	4	4	44	2	4	4	1	1	2	2	4	2	4	4	28	1
24	4	5	2	2	4	3	4	4	4	3	5	5	45	2	4	4	1	1	3	2	2	4	3	4	28	1
25	4	4	1	1	1	3	3	2	4	4	4	4	35	1	4	4	2	5	5	2	4	4	4	4	38	2
26	2	3	1	1	1	4	3	2	3	4	2	3	29	1	5	5	4	3	3	4	3	5	4	4	40	2
27	4	5	1	2	2	4	5	4	4	4	4	5	44	2	3	4	1	5	5	4	5	4	2	4	37	2
28	4	4	1	1	1	2	4	4	4	4	4	4	37	2	4	4	2	1	1	2	4	2	4	2	26	1
29	4	3	1	1	1	4	3	1	4	4	4	4	34	1	4	5	4	4	4	4	4	5	4	3	41	3
30	4	4	2	2	2	4	4	4	4	4	4	4	42	2	3	5	2	2	5	5	2	4	3	3	34	2
31	4	5	5	3	2	4	5	4	4	4	4	4	48	3	4	4	3	3	2	3	2	4	4	2	31	1
32	3	3	1	1	1	4	3	1	4	4	3	4	32	1	5	5	4	3	3	4	3	5	4	4	40	2

Appendix 4.Continuation

No	Name	Sub village	Age class	Gender	Education	Occupation	Income	Household size	Building type	Landslide experience	Perception						
											12	13	20	22	24	Total	Level
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*	*16*	*17*	*18*
33	Cipto	Salere	4	1	1	1	2	6	1	3	4	4	3	4	4	19	2
34	Sastro Tukiman	Salere	3	1	1	1	1	5	1	3	4	4	4	4	3	19	2
35	Nurcholis	Salere	2	1	3	4	2	4	1	2	5	4	5	4	4	22	3
36	Giyatmi	Salere	2	2	4	4	1	3	1	4	5	4	5	3	4	21	3
37	Gito Purnomo	Salere	2	1	3	3	2	4	1	3	4	4	5	4	4	21	3
38	Linem	Salere	3	2	1	1	2	5	2	2	4	3	3	3	4	17	2
39	Supriyanto	Salere	1	1	3	4	2	3	1	3	5	4	5	4	3	21	3
40	Narso Wiyono	Salere	4	1	1	1	1	8	1	2	4	4	3	4	4	19	2
41	Siswanto	Salere	4	1	1	1	1	3	1	2	4	3	4	3	4	18	2
42	Srisularni	Salere	2	2	4	3	2	8	1	3	5	5	4	4	5	23	3
43	Winanto	Salere	1	1	2	4	2	4	1	2	5	4	5	4	4	22	3
44	Sugiarto	Salere	2	1	1	5	2	7	2	3	4	4	3	4	4	19	2
45	Warti	Salere	2	2	1	2	1	2	1	3	4	4	3	4	4	19	2
46	Sodikromo	Salere	5	1	1	1	1	2	3	4	1	2	1	2	3	9	1
47	Darso Wiyono	Salere	4	1	1	1	2	4	1	4	4	4	2	3	4	17	2
48	Wardoyo	Salere	2	1	1	5	2	3	2	4	3	4	4	3	4	18	2
49	Giyanto	Salere	2	1	2	5	1	3	1	4	4	4	4	3	4	19	2
50	Sri lestari	Salere	2	2	3	4	2	3	1	3	4	4	5	4	4	21	3
51	Kartosentono	Salere	5	2	1	1	1	2	2	2	1	2	2	3	3	11	1
52	Narti	Salere	3	2	1	2	1	4	2	3	4	4	3	3	4	18	2
53	Supardi	Sodong	3	1	2	1	2	4	1	3	4	5	4	4	5	22	3
54	Harto Wiyono	Sodong	3	1	1	1	1	3	1	4	3	4	2	3	4	16	2
55	Minah	Sodong	5	2	1	5	1	3	3	4	1	2	3	3	3	12	1
56	Ratmono	Sodong	3	1	2	1	2	3	1	3	4	4	4	4	4	20	3
57	Sunarno	Sodong	3	1	3	1	2	4	1	4	5	5	5	5	5	25	3
58	Paino	Sodong	1	1	2	4	2	3	1	4	5	5	3	3	4	20	3
59	Edi Pamungkas	Sodong	2	1	3	5	2	4	1	4	5	4	5	5	5	24	3
60	Warsiti	Sodong	3	2	1	5	1	3	3	3	5	4	4	5	4	22	3
61	Tamin Kromoyono	Sodong	5	1	1	1	1	5	1	4	4	4	3	2	5	18	2
62	Srimulyani	Sodong	2	2	3	4	2	4	1	4	5	4	4	4	5	22	3
63	Sumanto	Sodong	3	1	2	4	2	4	1	4	4	5	3	4	4	20	3
64	Amin Mulyono	Sodong	3	1	2	2	2	4	1	4	4	3	3	4	5	19	2

Appendix 4.Continuation

No	Coping Strategy														People acceptance											
	28	29	30	31	32	34	35	36	37	38	40	41	Total	Level	44	45	46	47	48	49	50	51	52	53	Total	Level
1	*19*	*20*	*21*	*22*	*23*	*24*	*25*	*26*	*27*	*28*	*29*	*30*	*31*	*32*	*33*	*34*	*35*	*36*	*37*	*38*	*39*	*40*	*41*	*42*	*43*	*44*
33	4	5	4	3	5	4	4	3	4	4	4	4	48	3	3	4	1	4	4	4	3	4	4	4	35	2
34	4	5	1	2	2	4	5	4	4	4	4	4	43	2	4	4	1	4	2	4	3	3	4	3	32	1
35	4	5	5	3	5	4	4	4	2	4	5	4	49	3	4	5	4	4	4	4	4	4	4	4	41	3
36	4	4	4	3	4	4	4	4	4	4	4	4	47	3	4	4	4	3	3	3	4	4	3	1	33	2
37	4	5	4	1	4	5	5	4	4	4	4	5	49	3	4	5	2	3	2	3	2	3	4	2	30	1
38	4	4	1	2	2	4	4	4	4	4	4	4	41	2	3	5	2	2	5	5	2	4	3	3	34	2
39	4	5	5	3	1	5	5	4	4	3	5	4	48	3	4	5	3	4	3	4	4	5	5	4	41	3
40	4	5	1	2	3	4	5	4	4	4	4	4	44	2	3	4	1	4	4	4	4	4	4	3	35	2
41	4	5	4	2	4	4	4	4	4	3	4	4	46	3	4	4	4	4	3	4	3	4	3	2	35	2
42	5	5	5	3	2	3	3	4	4	4	5	5	48	3	4	5	1	2	1	2	1	3	4	1	24	1
43	4	5	5	3	4	4	4	4	4	4	4	4	49	3	4	4	4	4	4	4	4	4	4	4	40	2
44	4	5	1	3	2	4	5	4	4	4	4	4	44	2	5	5	5	1	3	5	4	5	5	4	42	3
45	4	5	1	3	1	4	5	3	4	4	4	4	42	2	4	4	1	4	2	4	3	4	4	3	33	2
46	2	3	1	1	1	4	3	2	3	4	2	1	27	1	2	5	4	5	4	4	4	5	4	4	41	3
47	4	4	5	3	5	5	5	4	4	4	5	4	52	3	4	5	4	3	3	4	3	4	3	2	35	2
48	4	5	1	2	2	4	5	4	4	4	4	4	43	2	2	4	1	2	4	4	5	4	2	3	31	1
49	4	5	1	3	3	4	5	3	4	4	4	4	44	2	4	4	1	4	2	4	3	4	4	3	33	2
50	4	5	5	3	3	4	5	4	4	4	4	4	49	3	4	4	2	2	2	3	2	4	4	2	29	1
51	4	3	1	1	1	4	3	1	4	4	4	4	34	1	2	5	4	5	4	4	4	5	4	4	41	3
52	4	3	1	1	1	4	3	2	4	4	4	4	35	1	4	4	1	4	2	4	3	3	4	3	32	1
53	4	4	4	3	5	4	5	4	4	4	4	4	49	3	4	4	3	3	3	4	3	3	4	5	36	2
54	4	4	1	2	2	4	5	3	4	5	5	5	44	2	5	5	4	2	2	4	4	5	5	4	40	2
55	2	3	1	1	1	4	3	2	3	4	2	1	27	1	2	5	4	5	4	4	4	5	4	4	41	3
56	4	4	4	2	2	4	4	4	4	4	5	5	46	3	5	5	5	3	3	4	3	5	4	4	41	3
57	5	5	4	3	4	4	3	4	4	4	5	4	49	3	4	4	2	2	1	3	2	3	5	2	28	1
58	4	4	5	2	2	5	4	4	5	4	5	5	49	3	4	4	4	1	1	4	4	4	4	4	34	2
59	5	5	5	2	2	5	4	4	3	4	5	4	48	3	5	5	2	2	2	2	2	4	4	2	30	1
60	4	3	1	1	1	4	3	1	4	4	4	4	34	1	4	4	4	1	1	3	3	3	4	4	31	1
61	4	4	4	2	2	5	2	3	4	5	5	5	45	2	2	5	4	5	4	4	4	5	4	4	41	3
62	5	5	5	3	3	4	3	4	4	5	5	5	51	3	5	5	2	3	2	3	2	5	4	2	33	2
63	5	4	4	2	2	5	4	4	5	4	5	5	49	3	5	5	4	3	3	4	3	4	4	4	39	2
64	4	4	3	2	4	4	4	4	4	4	4	1	42	2	4	4	3	1	1	3	3	3	5	4	31	1

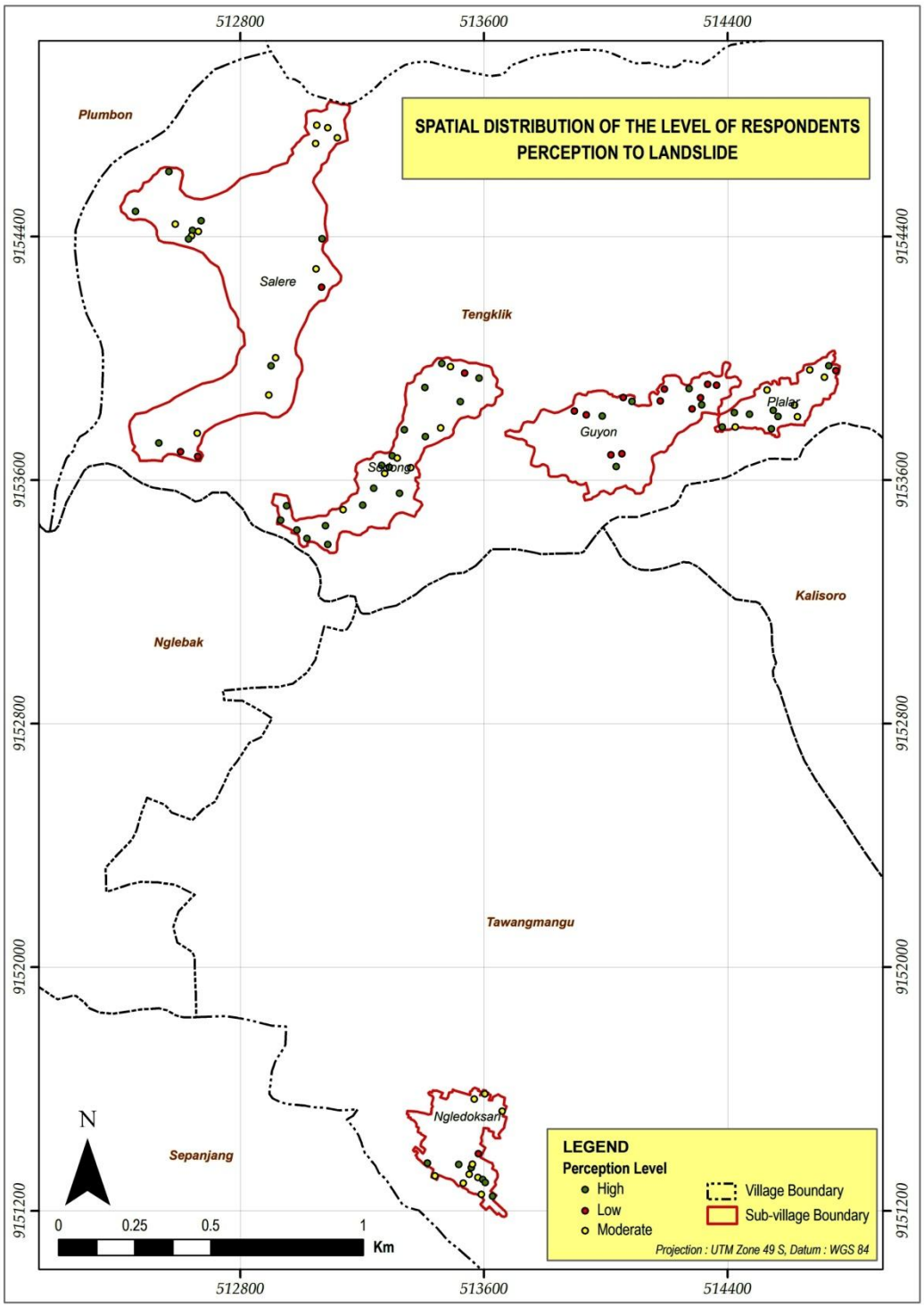
Appendix 4.Continuation

No	Name	Sub village	Age class	Gender	Education	Occupation	Income	Household size	Building type	Landslide experience	Perception						
											12	13	20	22	24	Total	Level
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*	*16*	*17*	*18*
65	Hardoyo	Sodong	2	1	4	4	2	5	1	4	5	5	5	5	5	25	3
66	Sarni	Sodong	2	2	1	5	1	4	2	4	5	4	3	4	5	21	3
67	Gito	Sodong	3	1	2	4	2	6	1	4	4	5	4	4	4	21	3
68	Lilik Kranoto	Sodong	2	1	2	4	2	4	1	3	4	5	5	5	4	23	3
69	Dewi	Sodong	1	2	2	4	2	4	1	4	5	5	5	5	5	25	3
70	Suhartini	Sodong	2	2	4	3	2	4	1	4	5	5	5	5	5	25	3
71	Edy Rahmanto	Sodong	3	1	3	3	2	4	1	4	5	5	5	5	5	25	3
72	Yoyok Subagyo	Sodong	3	1	2	4	2	4	1	3	4	5	4	4	5	22	3
73	Karyo Sumanto	Sodong	4	1	1	1	1	4	1	4	3	4	2	3	4	16	2
74	Marinem	Sodong	5	2	1	5	1	2	3	3	3	3	2	2	4	14	2
75	Iman Loso	Sodong	3	1	1	1	1	5	2	4	4	4	3	3	4	18	2
76	Beti Susilowati	Sodong	1	2	3	4	2	5	1	3	5	4	4	5	5	23	3
77	Wagiman	Sodong	3	1	4	4	2	5	1	3	5	4	5	5	5	24	3
78	Ratno	Ngledoksari	3	1	3	2	2	3	1	2	4	5	5	5	5	24	3
79	Wagimin	Ngledoksari	3	1	1	1	2	4	1	2	4	4	3	4	4	19	2
80	Nyami	Ngledoksari	4	2	1	1	1	2	1	2	4	4	2	3	4	17	2
81	Senen	Ngledoksari	4	1	1	1	1	3	1	2	4	4	3	4	4	19	2
82	Wiryorejo	Ngledoksari	5	1	1	1	1	2	1	2	3	2	1	2	2	10	1
83	Parti	Ngledoksari	4	2	1	2	1	4	1	2	4	3	2	3	5	17	2
84	Jumadi	Ngledoksari	2	1	2	4	2	5	1	2	5	4	5	5	5	24	3
85	Basyir	Ngledoksari	2	1	2	4	1	5	1	2	5	4	4	5	4	22	3
86	Gudel	Ngledoksari	5	1	1	1	1	6	1	2	4	4	2	4	4	18	2
87	Jamin	Ngledoksari	3	1	2	2	1	3	1	2	5	4	5	4	4	22	3
88	Poniman	Ngledoksari	2	1	1	1	1	3	1	2	4	5	2	3	4	18	2
89	Siman	Ngledoksari	5	1	1	1	1	2	1	2	5	4	2	3	5	19	2
90	Ayub	Ngledoksari	2	1	3	2	2	5	1	2	4	4	5	5	5	23	3
91	Yahman	Ngledoksari	3	1	1	2	1	5	1	2	4	4	3	3	4	18	2
92	Parjo	Ngledoksari	3	1	2	1	1	5	1	2	5	4	5	5	5	24	3
93	Loso	Ngledoksari	4	1	1	1	2	5	1	2	4	4	2	4	5	19	2

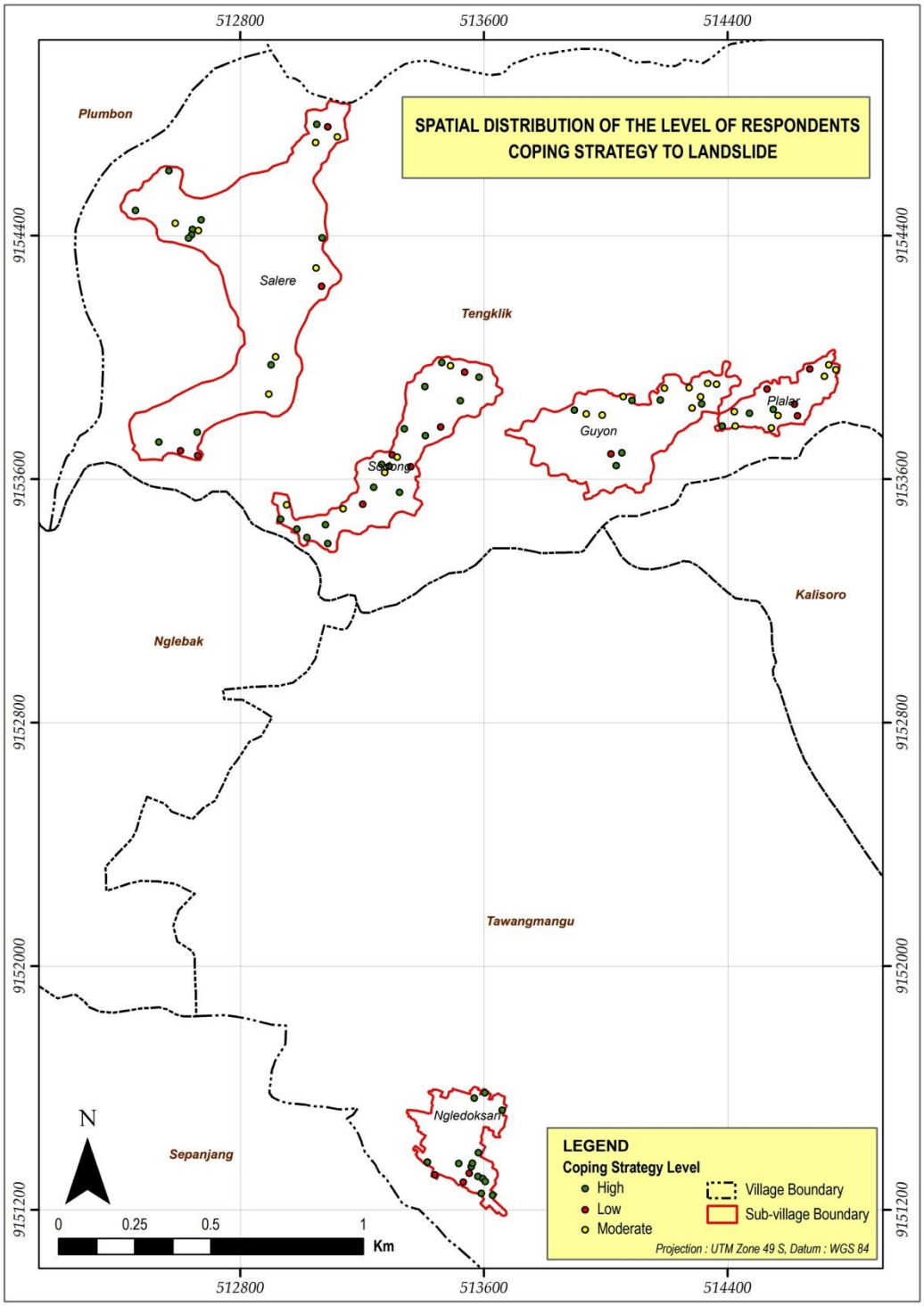
Appendix 4.Continuation

No	Coping Strategy														People acceptance											
	28	29	30	31	32	34	35	36	37	38	40	41	Total	Level	44	45	46	47	48	49	50	51	52	53	Total	Level
1	*19*	*20*	*21*	*22*	*23*	*24*	*25*	*26*	*27*	*28*	*29*	*30*	*31*	*32*	*33*	*34*	*35*	*36*	*37*	*38*	*39*	*40*	*41*	*42*	*43*	*44*
65	5	5	5	3	2	3	3	4	4	4	5	5	48	3	5	5	1	1	2	2	1	3	4	1	25	1
66	4	4	1	2	1	4	4	2	3	4	4	2	35	1	4	4	4	1	1	4	4	4	4	4	34	2
67	4	4	4	2	2	5	4	4	5	4	5	5	48	3	4	5	4	2	2	4	4	5	4	4	38	2
68	4	4	5	2	4	4	4	4	5	4	4	4	48	3	5	5	4	3	1	4	4	5	4	5	40	2
69	5	5	3	2	1	4	5	4	3	4	4	5	45	2	4	4	4	2	1	4	3	5	4	4	35	2
70	5	5	5	2	2	4	3	4	4	5	5	4	48	3	5	5	2	2	1	2	1	3	4	1	26	1
71	5	5	5	3	2	4	3	4	4	4	5	5	49	3	5	5	3	2	1	3	2	4	4	5	34	2
72	4	4	4	2	2	4	5	4	5	4	5	5	48	3	5	5	5	1	3	4	4	5	5	4	41	3
73	3	3	1	3	3	5	2	3	4	4	5	5	41	2	3	5	5	4	3	4	4	5	4	4	41	3
74	2	4	1	2	1	3	4	2	4	4	2	3	32	1	2	5	4	4	4	4	4	5	4	4	40	2
75	4	4	1	2	1	4	4	1	3	4	4	2	34	1	5	5	4	2	3	4	4	5	4	4	40	2
76	5	5	5	3	3	4	3	4	4	4	5	5	50	3	4	4	3	2	1	2	2	3	4	4	29	1
77	5	5	5	4	3	4	3	4	4	5	5	5	52	3	4	4	4	1	3	3	4	5	4	4	36	2
78	5	5	4	3	1	5	5	4	3	4	5	5	49	3	4	5	5	4	4	4	4	4	5	4	43	3
79	5	5	4	3	4	5	5	4	5	5	5	5	55	3	2	5	4	4	4	4	5	5	4	2	39	2
80	5	4	2	2	2	4	5	4	4	5	5	4	46	3	5	4	3	2	2	3	2	4	5	2	32	1
81	5	4	2	2	2	5	5	4	4	5	4	5	47	3	5	5	4	5	5	5	5	5	5	4	48	3
82	5	4	2	2	2	4	4	4	2	5	5	4	43	2	4	5	5	4	4	4	4	4	5	4	43	3
83	5	5	1	2	2	5	4	5	4	5	4	4	46	3	5	4	5	4	5	5	5	5	5	5	48	3
84	5	4	4	3	4	5	4	4	5	5	5	4	52	3	5	5	4	5	5	4	5	5	4	5	47	3
85	4	4	2	2	1	4	4	3	4	5	5	4	42	2	5	4	5	4	5	5	4	4	5	4	45	3
86	4	4	2	2	2	4	5	3	5	5	5	5	46	3	4	5	4	4	5	5	4	5	4	5	45	3
87	5	4	1	2	4	4	4	4	4	5	5	5	47	3	5	5	4	4	5	4	4	5	5	4	45	3
88	4	5	2	2	2	4	4	4	5	4	4	5	45	2	5	4	5	5	4	5	4	5	5	4	46	3
89	4	5	2	2	2	5	5	3	4	4	5	5	46	3	5	4	5	4	5	4	5	5	4	4	45	3
90	5	5	4	3	2	5	5	4	5	5	5	4	52	3	5	4	5	5	5	4	5	5	5	4	47	3
91	4	5	1	2	2	5	4	5	5	4	5	4	46	3	5	5	5	5	5	4	5	5	4	5	48	3
92	5	4	1	2	2	5	4	5	5	5	5	4	47	3	5	5	4	5	5	4	5	5	5	5	48	3
93	5	4	4	3	2	4	5	4	4	5	5	4	49	3	5	4	5	5	5	4	5	4	5	5	47	3

Appendix 5. Spatial distribution of the level of respondent's perception to landslide



Appendix 6. Spatial distribution of the level of respondent's coping strategy to landslide



Appendix 7. Spatial distribution of the level of respondent's acceptation to landslide risk reduction program