DOCTORAL DISSERTATION

STUDY ON DISASTER MANAGEMENT SYTEM UNDER DECENTRALIZATION SYSTEM IN INDONESIA

インドネシアにおける地方分権下での災害管理システムに関する研究

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Abbreviations

APBN	Annual National Development Budget
APBD	Annual Local Development Budget
BAKORNAS	National Coordination Agency for Disaster Management (old) in Indonesia
BAPPENAS	National Development Planning Agency
BAPPEDA	Regional Development Planning Agency
BMKG	Indonesian Meteorological and Geophysics Agency Indonesia
BNPB	Indonesian National Disaster Management Agency
BPBD	Regional National Disaster Management Agency
DPR	National Legislation Council (Indonesian Parliament)
DPRD	Local Legislation Council (provincial/municipal parliament)
DML	Disaster Management Law
HFA	Hyogo Framework for Action
IDR	Indonesia Rupiah
KEPPRES	Presidential Decree
KEPMEN	Minister Decree
MOHA	Ministry of Home Affair
MOF	Ministry of Finance
NGO	Non-Governmental Organizations
PERDA	Local regulation
PP	Government Regulation
RAN	National Action Plan
RENAS	National plan for disaster management
RPB	Regional plan for disaster management
RPJMD	Regional Medium-Term Development Planning
RPJMN	National Medium-Term Development Planning
SATLAK	Municipal Level Coordinating Agency for Disaster Management (old)
SATKORLAK	Provincial Level Coordinating Agency for Disaster Management (old)
UNDP	United Nations Development Program
UNISDR	the United Nations Office for Disaster Risk Reduction

ABSTRACT

Introduction

Some evidence shows that natural disasters have a significant impact on developing countries. The increasing number of people causes natural disasters that tend not to be deadly (compared to several decades or centuries ago) to be a natural disaster that has a significant impact: number of the death toll, affected people, and economic losses. Developing countries are the countries most affected by natural disasters. Based on the United Nations for Development Program (UNDP), even though the number of developing countries only covers about 11% of the total areas at high risk for disasters, in the 1980 to 2000 period, more than 53% of deaths from natural disasters came from these areas. The lack of human resources capacity, lack of knowledge and awareness of the people, and poor disaster governance have caused developing countries to be very vulnerable to the effects of natural disasters. This is coupled with the concentration of population in high-risk areas but without adequate mitigation.

Geographically Indonesia is located on the epicenter of disaster areas called the _ring of fire.' This area stretches from the mainland of Japan, rotates clockwise to Australia, Papua New Guinea, East Timor, the continent of Asia until returning to Japan. Moreover, geologically Indonesia is also located at the confluence of three tectonic plates, namely: the Eurasian plate (covering the European and Asian Continents), the Indo-Australian plate (covering the Australian Continent and the surrounding Ocean), and the Pacific Ocean plate. This geographical condition causes Indonesia exposed to geological disasters frequently, such as tsunami, earthquakes, and volcanic eruptions. Data and information on disasters from the National Disaster Management Agency (BNPB) shows that a natural disaster has increased significantly over the past decade.

The implementation of disaster management can be more effective if each actor understands their role and capacities in every stage of the disaster. The local government as the primary responsibility for disaster management must understand the characteristics of each actor. The position of the local government is in a unique and strategic position, as it becomes the liaison between the higher-level of governments with communities. Local governments should also be able to build disaster

management systems that fit the natural hazard and vulnerability characteristics. The study of the role of local government in disaster management is hardly new. Many studies try to analyze the role and capability of local governments in managing disaster emergency response, especially during the massive scale of the disaster. Several studies have attempted to look deeper into disaster management by local governments not only in the emergency phase but comprehensively in all stages of the disaster. In addition, some literature also tries to look at disaster emergency management from the perspective of broader cooperation with other stakeholders both from government and non-government actors. Very few studies focus on the role of local government in disaster management in all stages of disaster from the context of decentralization.

This dissertation pioneered its assessment of disaster management with a decentralized strategy using a mixed method between quantitative and qualitative approaches. In this dissertation, it was hypothesized that the decentralization of disaster management had a significant influence on the role of local governments in the national disaster management system. Besides, we assume that the decentralization of disaster management will also significantly improve the level of local government capability in disaster management.

The primary goal of this study is to identify the consequence of decentralization on the disaster management system in Indonesia. The objectives of this study are: (1) Identifying the outline, opportunity, and challenges in disaster management under decentralization; (2) identify the roles of stakeholders and evaluate the inter-organizational relationships representing different sectors (government and non-government sectors) at the local level; and (3) examine local capability in managing disaster and identifying the factor that influenced them.

For achieving the objectives, this research uses a combination of quantitative and qualitative approaches. The reason for choosing a mixed approach between quantitative and qualitative is based on the assumption that the combined approach will be superior compared to using the single method approach. Also, the mixed approach allows researchers to be able to analyze several research questions at the same time. The combination of quantitative and qualitative research can also understand a phenomenon well so that the real fact is obtained because it is approached from various points of view.

Decentralization and disaster management system in Indonesia

Decentralization in Indonesia in the reform period began with the enactment of Law No. 22 of 1999 on Local Governments, or better known as the law of local autonomy. This law changed the overall implementation of governance in Indonesia. This paradigm shift became known as the 'big bang decentralization' in Indonesia. This _big bang decentralization' is changing Indonesia from the most centralized country in the world become the most decentralized country in the world, due to hand over almost all authorities transferred to the provincial and municipality government.

In a disaster management context, Law Number 24 of 2007 on Disaster Management Law (DML) establishes the foundation for the disaster management legal framework in Indonesia. DML is hailed as the first comprehensive regulation which describes national and local government responsibilities, community rights and obligations, roles of corporations and international organizations, the disaster management stages, and specifications, and disaster aid finance and management. DML mentioned that the local governments become primary responsibility in disaster management. This responsibility, in accordance with Article 6, including disaster risk reduction and integrating disaster risk reduction into development planning; the protection of society from the impact of the disaster; guarantee the fulfillment of the rights of refugees fairly and in accordance with the minimum service standards; conducting post-disaster recovery; allocate a budget for disaster risk reduction activities; and maintenance of essential documents from the impact of disasters.

Disaster management system following decentralization in Indonesia: regulation, institution establishment, planning, and budgeting

This study found that before decentralization, the MOHA played the dominant role and the MOF also played a significant role. After decentralization, in addition to the MOHA and the MOF, the BNPB also now plays a leading role in disaster management. The disaster management institutions at the local level, namely, the provincial and municipal BPBDs, remain supporting actors, but they play a vital role in coordinating the disaster network. However, provincial and municipal BPBDs lack many horizontal network links with other key actors at the same level. A framework for a decentralized disaster management system has been established, but the capacity of provincial and municipal BPBDs and the overall network remain underdeveloped, with national institutions

continuing to play a leading role. This study has revealed several issues in the decentralized disaster management system, with most related to BPBDs. It appears that empowering BPBDs is a crucial means to enhance the disaster management system in Indonesia. Although the BNPB, the MOHA, and the MOF continue to occupy significant roles in the disaster management system, the BNPB can be expected to be involved more heavily in the disaster management system because, from Social Network Analysis (SNA), it is clear that the BNPB is directly connected with both provincial and municipal BPBDs. To enhance the horizontal network in respect of BPBDs with other institutions at the same level is also required and, about this point, not only the BNPB but also the MOHA can be expected to be influential because, as our analysis reveals, the MOHA is directly connected with some of the provincial institutions. Horizontal network building also holds possibilities for promoting the participation of experts in local disaster management planning.

Stakeholder and social network analysis on the decentralized disaster management system

This study found that the allocation of the actor in the disaster management system in Indonesia is reflected fragmentation in each phase of a disaster. Each phase has a pattern. Based on the analysis, the study area can be divided into three different models: municipality focusing on preparedness and response activity; municipality focusing on response and recovery; and municipality concentrate on prevention and mitigation, preparedness and response activity. The analysis reveals that the government sector still has substantial power and leadership in all stages of disaster management. The role of the non-government sector is also significant, especially in the response phase. The role of non-governmental actors in the response phase's activities is crucial to fill the gaps left by the government, especially in the event of a major disaster. However, Stakeholder Analysis (SA) also demonstrated a significant impact on the role of non-government actors, especially from civil society (NGOs) and the private sector, to take a strategic part in the system. This role is supported by the adequate resources of each actor so that with high power impact has an impact in the decision-making process.

Local government capability in managing the disaster

The SEM model confirms that local capability in disaster management is a continuous process. 'Budget allocation' has a fundamental role in the sequence of capability in managing the disaster. With the correlation with ‗organization,' it can assume that the increase in the ‗budget allocation'

for disaster management will enhance the local ‚organizational' in managing disasters. We found that ‚organization' will affect the local ‚institution' in managing the disaster. Next, the enhancement local ‚institution' will influence the preparation of ‚planning' activities of disaster management and the ‚delivery' of public services to the society. This statement is in line with the opinion of several experts who explain that structured disaster management arrangements at the local level will significantly affect overall disaster management performance (CFE-DMHA 2015) (Hagelsteen and Burke 2016). Through SEM models, we also found that the only external variable 'relationship with parliament' influences the local capability, especially through the variable ‚institution' and ‚organizational.' In the context of disaster management, this can mean that good cooperation and relations between local authority and the local politician has a positive influence on improving capability through ‚institution' and ‚organization.'

Conclusion and recommendation

In this dissertation, we also identified several challenges in the decentralized disaster management system in Indonesia, such as inconsistencies in regulations issued by various institutions at the central level which caused difficulties for local governments in building local institutions for disaster management. Also, this study also revealed some limitations that are typical conditions in developing countries in managing disasters, such as lack of funds and human resources to establish local disaster management institutions (provincial/municipal BPBDs) and lack of participation of experts in the preparation of disaster management plans. We suggest the requirement for a straight bureaucratic line connecting BNPB and BPBDs was one of the critical points in this study. In the context of decentralized disaster management, BNPB can be expected to be involved more intensely in the disaster management system at the local level because, from the SNA, it is clear that BNPB is directly connected with provincial and city BPBDs.

Our analysis also revealed that the government sector still has strong strength and leadership at all stages of disaster management. However, despite not being significant, decentralization of disaster management has also increased the role of non-government actors at the local level. The part of the non-government sector is significant, especially in supporting emergency phase activities. The amount of resources needed to carry out activities during an emergency makes these activities unable to be carried out only by the government itself. Resource support from other actors makes the implementation of emergency response more effective and faster. We recommend the local

government to increase the role of the organization in the policy-making process. The transfer of authority, especially to lower level governments, such as Kecamatan (districts) and Desa (villages), is an excellent option to deliver public services in disaster management to the community.

Local ‗organization' needs to contribute to the overall utilization of disaster management institutions. 'Relationship with parliament' is another external factor that influences the local capability, especially through the variable ‗institution' and 'organization.' In the context of disaster management, this can mean that good cooperation and relations between BPBD and the local politician has a positive influence on improving `institution` and ‗organization.` This study recommends strengthening the local ‗organization' in managing disasters. Based on the analysis, it is noticed that ‗organization' is the essential capability-forming variable and represents a bottleneck in the SEM model. Shifting the paradigm of disaster management requires the local government as a major player. However, on the ground, the local government has limitations on ‗organization' in the scope of disaster management. Rush against important responsibilities, causing the local government to be forced to strengthen ‗organization' as a priority.

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CHAPTER 1

INTRODUCTION

1.1 Background

Decentralization in Indonesia in the reform period began with the enactment of Law No. 22 of 1999 on Local Governments, or better known as the law of local autonomy. This law changed the overall implementation of governance in Indonesia. This paradigm shift became known as the big-bang decentralization in Indonesia (Faguet, 2014). Big bang decentralization Indonesia is changing Indonesia from the most centralized country in the world become the most decentralized country in the world, due to hand over almost all authorities transferred to the provincial government and regency/city (Oberman, Dobbs, Budiman, Thompson, & Rossé, 2012).

Geographically Indonesia is located on the epicenter of disaster areas called the ‗ring of fire.‘ Moreover, geologically Indonesia is also located at the confluence of three tectonic plates, namely: the Eurasian plate (covering the European and Asian Continents), the Indo-Australian plate (covering the Australian Continent and the surrounding Ocean), and the Pacific Ocean plate (Anantasari et al. 2017). This geographical condition causes Indonesia exposed to geological disasters frequently, such as tsunami, earthquakes, and volcanic eruptions. Data and information on disasters from the National Disaster Management Agency (BNPB) shows that a natural disaster has increased significantly over the past decade (BNPB 2010b).

The global disaster management paradigm changed in 2005 with the establishment of the Hyogo Framework for Action (HFA). HFA produces some essential substances in reducing losses due to natural disasters, for example, the number of deaths, social, economic and environmental degradation. As a follow-up to the HFA, the government of Indonesia established the Disaster Management Law (DML) in 2007. DML has a significant influence on disaster management efforts in Indonesia, both from national to local level. In the institutional context, DML provides a mandate to establish particular institutions that handle disasters at national and local levels, not only in emergency phase but also in stages before the disaster (prevention and preparedness) and post-disaster recovery.

This study will discuss how DML provides significant changes to disaster management in Indonesia, both at the central and local levels. Also, related to decentralization, this research will also emphasize the role of local government as a logical consequence of decentralization which has a position as a key actor in disaster management in Indonesia. Field studies were carried out in several cities as a form of case studies to find out the real impact of this disaster management paradigm change in Indonesia.

In the concept of decentralization in Indonesia, the municipality is an autonomous region which represents the actual implementation of decentralization by having broad and responsible autonomy rights (Erland Danny Darmawan Spv et al. 2008). While the provincial position is representative of the central government, it does not have a hierarchical relationship with the municipal government (Sistiana and Makmur 2004). In line with the decentralization throughout all governance sectors, in 2007, the Indonesian government implemented a Disaster Management Law (DML) as an application of the HFA at the state level. The primary purpose of this new legislation was to bring the government closer to the people by increasing participation and democratization, thereby creating a disaster management system that was efficient and more transparent (Rossum and Krukkert 2010). Before and after decentralization, the number of actors in the disaster management system and their roles and networking relationships could be expected to differ. One way to understand how the new disaster management system has been implemented is to examine which institutions play a vital role.

In decentralization of disaster management, local government plays an essential role. According to Koresawa, one of the reasons why often the disaster management system does not work effectively especially when the emergency phase is due to the lack of development of stakeholders, especially at the local level (Koresawa 2014). This unpreparedness of stakeholders at the local level will have a further impact by causing a lack of preparedness in some of the sensitive issues of disaster management. Active communication, especially the mutual opinion among stakeholders including the community can significantly reduce the impact of natural disasters in the future (Madan and Routray 2015). However, some studies on disaster management system found that municipality in Indonesia is developing very slowly when compared to the national level (Djalante, Thomalla, Sinapoy, et al. 2012) (Setiadi, Birkmann, and Buckle 2009). Few of problems related to lack financial capacity, lack of human resources, lack of collaboration and coordination become the obstacle to increasing the role of the municipality as a leading actor in disaster management

(Djalante, Thomalla, Sinapoy, et al. 2012). Some literature has identified this limitation related to local capability (Kusumasari and Alam 2012) (Djalante, Thomalla, Sabaruddin, et al. 2012). Regarding the role of the municipality as a principal actor in disaster management, analysis of this local capability in managing disaster is fundamental. By understanding the character of the capability of the municipality, we can understand the opportunities and problems of disaster management at the local level.

1.2 Problem statement

Literature review shows that natural disasters have a significant impact on developing countries. Coppola in Wilde et al. (2009) explained the existence of a phenomenon that causes why natural disasters in the modern era to be a phenomenon that is so destructive and causes the significant number of the death toll and economic losses (Wilde et al. 2009). First, the author explained that the increase in population is the most contributing factor in this context. The increasing number of people causes natural disasters that tend not to be deadly (compared to several decades or centuries ago) to be a natural disaster that has a significant impact: number of the death toll, affected people, and economic losses. Next, the author also highlighted that developing countries are the countries most affected by natural disasters. Based on the United Nations for Development Program (UNDP), even though the number of developing countries only covers about 11% of the total areas at high risk for disasters, in the 1980 to 2000 period, more than 53% of deaths from natural disasters came from these areas (UNDP 2015). The lack of human resources capacity, lack of knowledge and awareness of the people, and poor disaster governance have caused developing countries to be very vulnerable to the effects of natural disasters. This is coupled with the concentration of population in high-risk areas but without adequate mitigation.

Disasters occurring locally and effective disaster management systems are essential to mitigating the impact of disasters (Garschagen 2016). The implementation of disaster management can be more effective if each actor understands their role and capacities in every stage of disaster (Erland Danny Darmawan Spv et al. 2008). The local government as the primary responsibility for disaster management must understand the characteristics of each actor (Baba and Tanaka 2015). In the implementation of disaster management, local governments cannot act and make their decisions. But the position of the local government is in a unique and strategic position, as it becomes the liaison between higher-level of governments with communities. Local governments should also be

able to build disaster management systems that fit the natural hazard and vulnerability characteristics.

The study of the role of local government in disaster management is hardly new. Many studies try to analyze the role and capability of local governments in managing disaster emergency response, especially during the massive scale of the disaster. Several studies have attempted to look deeper into disaster management by local governments not only in the emergency phase but comprehensively in all stages of the disaster. In addition, some literature also tries to look at disaster emergency management from the perspective of broader cooperation with other stakeholders both from government and non-government actors. Very few studies focus on the role of local government in disaster management in all stages of disaster from the context of decentralization.

In this study, we prefer Indonesia as a case study because it is an interesting country for exploring disaster management within the framework of decentralization. The factor of ―Bigbang decentralization" which transformed Indonesia from one of the most centralized into one of the most decentralized countries in the world. Besides, in a disaster management context, Indonesia is one of the pioneers in the paradigm shift in disaster management after the 2004 Indian Ocean tsunami. This study is significant for other Asian and developing countries to understand the concept of decentralization in disaster management in Indonesia so that they can learn.

1.3 Research objective

The primary goal of this study is to identify the consequence of decentralization on the disaster management system in Indonesia and to determine the role of local actors and local capability in managing the disaster. At the national level, this study will examine the role and position of the local government about other actors at a higher government level. Then, at the local level, we tried to do an assessment using a case study to identify the role of stakeholder. Also, we will also demonstrate the developments of the disaster management system under decentralization in Indonesia. The following are the objectives of the study:

1. To identify the role of the actors in the implementation of disaster management at the national level and analyze the relationship among the actors.
2. To identify the role of the actors in the implementation of disaster management at the local level and analyze the relationship among the actors.

3. To identify the local capability in managing disaster and identifying the factor that influenced them.

1.4 Organization of this study

This dissertation is divided into the chapters according to the thematic approach (see **Fig.1**).
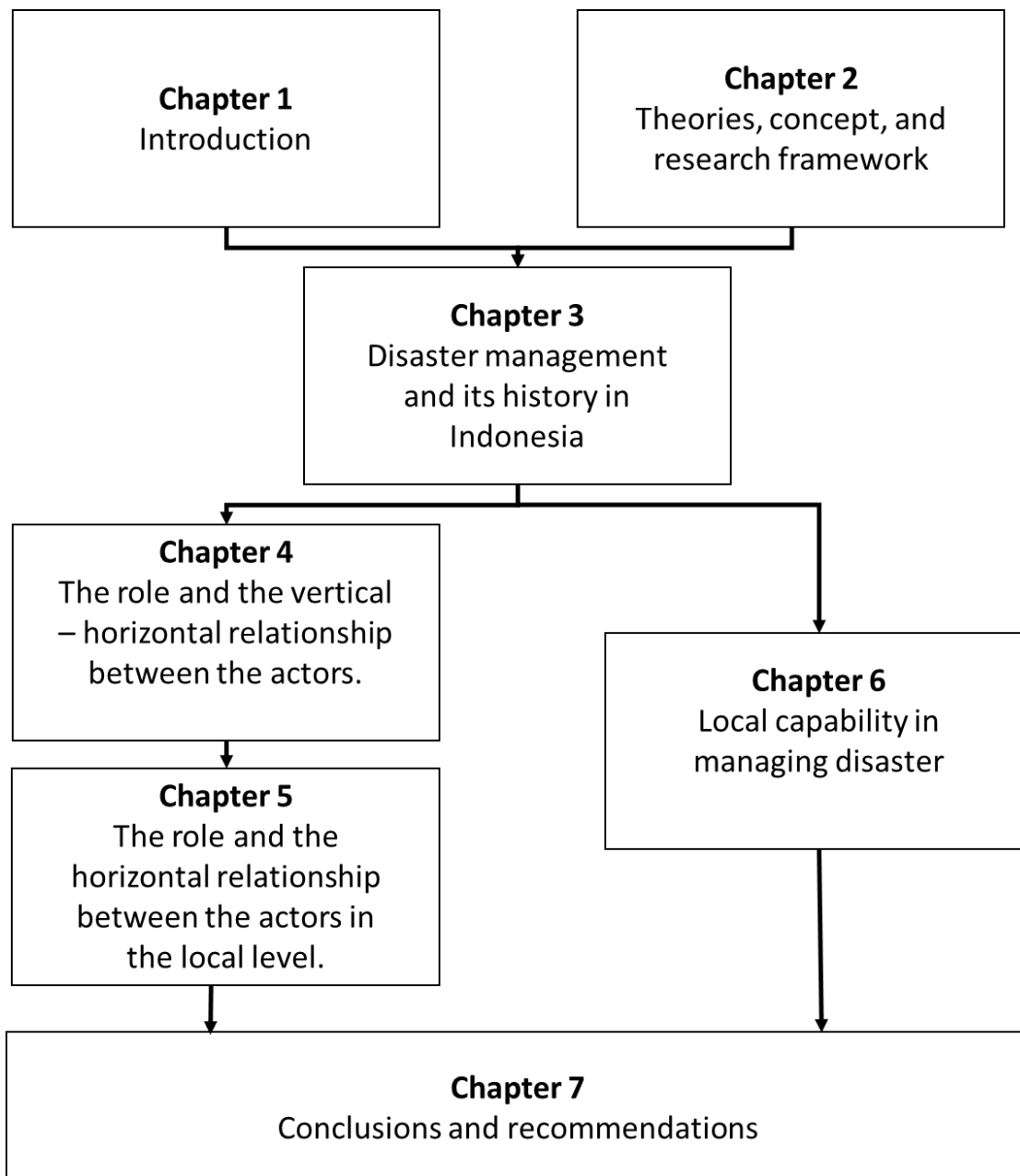
Figure 1. 1 Organization of the study

This dissertation represents a total of seven chapters. **Figure 1.1** presents the overall research structure for this study.

Chapter 1 is discussing the introduction of the research. In this chapter, the dissertation is introducing the background of this study, a problem occurring for the implementation of decentralization of disaster management in Indonesia. This chapter is also representing the research question and the objectives of this study. The methodology and definition of terms this research are also discussed in this chapter.

Chapter 2 discussing literature reviews about debates on decentralization and disaster management and research framework used in this study.

Chapter 3 is a discussion about provides an overview of the history of disaster management systems in Indonesia. Besides, it will also show the role of the decentralization system in Indonesia.

Chapter 4 of this dissertation discusses how decentralization has affected changes in the disaster management system in Indonesia. Also, we examined changes to the disaster management system and the opportunities and challenges arising following decentralization, as well as how vertical and horizontal relationships between government actors have changed in Indonesia. First, we found that decentralization had a positive effect on the implementation of disaster management concerning regulation, institutional establishment, budgeting, and planning. Second, despite general improvements, challenges remain, including regulatory inconsistencies, a lack of funding and capacity for local institutional establishments, a lack of participation of experts, a strong dependence on the central government, and an increased corruption rate. Third, while a decentralized disaster management system framework has been established, the local government's capacity and the overall network remain limited, with national institutions playing a leading role.

In this dissertation **Chapter, 5** discussed the roles of stakeholders and to evaluate the inter-organizational relationship representing different sector (government and non-government sectors) at the local level. In this paper, we try to demonstrate stakeholder analysis (SA) to identify the role and assess the power, and leadership of the actors. Next, we will demonstrate social network

analysis (SNA) to determine the relationship between the actors and examine the key actor on the implementation of disaster management.

Chapter 6 discussed discusses this gap by examining interrelation between each variable of local capability and the relationship between variables of capability and external factors. Additionally, we make recommendations to develop capability based on the municipality's characteristics. Structural equation modeling (SEM) approach is applied to analyze data obtained from surveys of 106 municipalities in Indonesia. Our findings prove that there is a complicated relationship between the variables that build up local capabilities and some external factors that influence them. We found that 'budget allocation' has a fundamental role in the sequence of capability in managing the disaster.

Chapter 7 is a discussion of the conclusion of this research. This chapter is also discussing and recommends the overall research result, and it also discusses the originality of this research.

1.5 Research methodology

The selection of the research methodology is based on the objectives and data obtained from the study. In general, this research uses a combination of quantitative and qualitative approaches. The reason for choosing a mixed approach between quantitative and qualitative is based on the assumption that the combined approach will be superior compared to using the single method approach. Also, the mixed approach allows researchers to be able to analyze several research questions at the same time. The combination of quantitative and qualitative research can also understand a phenomenon well so that the real fact is obtained because it is approached from various points of view. Besides, this approach is intended to check the reality of the data or information obtained by researchers from multiple points of view by reducing as much bias as possible when collecting and analyzing data.

The summary of the research methodology shows in **Table 1.1**.

Table 1.1 Research methodology

Chapter	Objectives	Research methodology
Chapter 4	To identify the role of the actors in the implementation of disaster management at the national level and analyze the vertical-horizontal relationship among the actors.	Data collection: • An in-depth interview with a national and local government official. • Direct observation • Focus group discussion (FGD) Analytical tool: • Explanatory data analysis • Social network analysis (SNA): degree of centrality, betweenness of centrality, and closeness of centrality
Chapter 5	To identify the role of the actors in the implementation of disaster management at the local level and analyze the horizontal relationship among the actors.	Data collection: • An in-depth interview with a local government official. • Direct observation Analytical tool: • Stakeholder analysis • Social network analysis (SNA): degree of centrality, betweenness of centrality, and closeness of centrality • Explanatory analysis
Chapter 6	Examine local capability in managing disaster and identifying the factor that influenced them.	Data collection: • Questionnaire survey: government officer of the Regional Disaster Management Agency (BPBD) • An in-depth interview with a local government official. Analytical tool: • Explanatory factor analysis (EFA) • Confirmatory factor analysis (CFA) • Structural equation modeling analysis (SEM) • Explanatory analysis

1.6 Definition of terms

a. Disaster

Many scholars define disaster as a phenomenon that disrupts the human life pattern, social structures, government systems, infrastructure, and the environment. The United Nations International Strategy for Disaster Reduction (UN-ISDR) defines disaster as an event that occurs suddenly or slowly, caused by nature or humans, causing death, property and environmental damage (UNISDR 2009). This event is also beyond the ability of the community to deal with it with all its resources. In line with this definition, Lindell also argued that disasters are a severe disruption to society that causes widespread and perceived losses by the community and the environment where the impact exceeds human capacity to overcome them with available resources (Lindell 2013). Disasters are extraordinary natural events that occur in, and affected communities do not have sufficient capacity to deal with them (Carter 1991). Natural resources cause impacts that can cause suffering to the community in the form of human lives, property losses, and environmental damage (Zahra 2010) (Ainuddin and Routray 2012) (Few et al. 2016). Also, natural disasters also cause damage to the results of development that has been achieved such as damage to infrastructure, public facilities, and various other losses (Republic 2013).

Furthermore, according to Newnham (2007), disaster is an unusual occurrence caused by nature or human activity, including in it the impact of technical errors that trigger responses from the community, community, individuals and the environment to provide widespread enthusiasm (Newnham et al. 2007). Disasters are serious disturbances that have a direct impact on the life of a community or community such as economic losses, environmental damage and the occurrence of disasters that affect the ability of the community to deal with it following their resources (Henderson 2004) (Wilkins, Dr, and Mccarthy n.d.). Triggers, hazards, and vulnerabilities that are interrelated, causing the emergence of risk to the community in a region (UNDP 2015).

As mentioned above, it can be generalized that disasters have several criteria as follows: first, there are events caused by natural and human factors. These events can occur suddenly or slowly. Then, the event caused death, economic loss, social losses, environmental losses, etc. Then the critical point is that the event exceeds the community's ability to be able to overcome it.

b. Decentralization

Decentralization is generally known as the transfer of government authority by the central government to the local government, or commonly called delegation of authority. Thus, the delegate loses that authority, all of them turn to the local government as the recipient of the delegation. However, according to Devas (1997), the understanding and interpretation of decentralization turned out to be very diverse, and the approach to decentralization varied considerably from one country to another country (Devas 1997). However, in general, the definition and scope of decentralization have been referred to as the opinion of Rondinelli. He argues that decentralization is the transfer of authority and responsibility of government functions from the central government to local governments, semi-governmental institutions, and the private sector (Rondinelli, Nellis, and Cheema 1983) (Cheema and Rondinelli 2007). As a comparison, both also refer to the opinions of Turner and Hulme (1997) who argue that decentralization includes delegation of authority in the context of providing services to the community, from government institutions at the central level to officials or government institutions that are closer to the people (Studies 2012). Decentralization is a tool to achieve the goal of providing better public services and creating a more democratic decision-making process.

There are three primary objectives of decentralization. First, political objectives, to create democratic political structures and infrastructure based on popular sovereignty (Rondinelli et al. 1983); secondly, administrative purposes, local governments led by regional heads and in partnership with the local parliament can carry out their functions (Bardhan 2002). Thirdly, socio-economic purposes, realizing the utilization of social capital, intellectual capital and public financial capital to create broader community welfare (Hofman and Kaiser 2002).

Rondinelli et al. (1983) classifies decentralization based on its objectives into four forms, namely political decentralization, fiscal decentralization, market decentralization, and administrative decentralization.

- Political decentralization,

  Transfer of decision-making authority to lower government units or the community or representative institutions of the people.

- Economic decentralization,

  Transfer of authority relating to the public sector from the government to the private sector.

- Administrative decentralization,

  Transfer of authority and functions between central government units and non-central government units (sub-national government).

- Fiscal decentralization,

  Transfer of authority in the fiscal field which aims to provide opportunities for local government to explore various sources of funds.

c. Disaster management

Some academia defines disaster management as a science that studies disasters and all aspects related to disasters, especially hazards, vulnerability, and capacity. Disaster management is a dynamic process about the operation of management functions, namely planning, organizing, actuating, and monitoring. Disaster management aims to prevent the community from disasters by reducing the possibility of the emergence of hazards and overcoming vulnerabilities.

In general, the scholar divides disaster management into five models of disaster management, namely:

- Disaster management continuum model.

  This model may be the most popular model because it consists of clear stages so that it is easier to implement. The phases of disaster management in this model include mitigation, preparedness, early warning, emergency relief, and recovery (Alexander, Allen, and

Bindoff 2013) (Liu Jie1, Shu Shichang1 2017)(Liu Jie1, Shu Shichang1 2017) (Tri Widodo W . Utomo 2009).

- Pre-during-post disaster model.

This disaster management model divides the stages of activities around disasters. Some activities need to be carried out before a disaster strikes, during a disaster, and after a disaster. This model is often combined with a disaster management continuum model (Hasanzadeh and Bashiri 2016).

- Contract-expand model.

This model assumes that all the stages in disaster management (mitigation, preparedness, early warning, emergency relief, and recovery) should be carried out in disaster-prone areas (Guha-sapir, Hoyois, and Below 2014) (Swyngedouw 2003).

- The crunch and release model.

This disaster management emphasizes efforts to reduce vulnerability to overcome disasters. If the community is not vulnerable, then the disaster will also be less likely to occur even if the hazard still occurs (Daramola et al. 2016) (Wisner et al. 2003) (Schilderinck 2009).

- Disaster risk reduction framework.

This model emphasizes disaster management efforts to identify disaster risks regarding both vulnerability and hazard and to develop the capacity to reduce these risks (Ngenyam, Environmental, and Kingdom 2014) (Watson 2015) (Güzey 2016).

Another approach is the disaster management cycle (see **Figure 1.2**), which consists of two major activities. The first is before the disaster (pre-disaster) and after the disaster (post-disaster). Activities after a disaster can be in the form of disaster response/emergency response and disaster recovery. Activities carried out before the disaster can be activities such as disaster prevention, preparedness, and mitigation. The standard or basic format of disaster management as stated by Nick Carter in the book The Disaster Management Cycle is described below (Carter 1991):
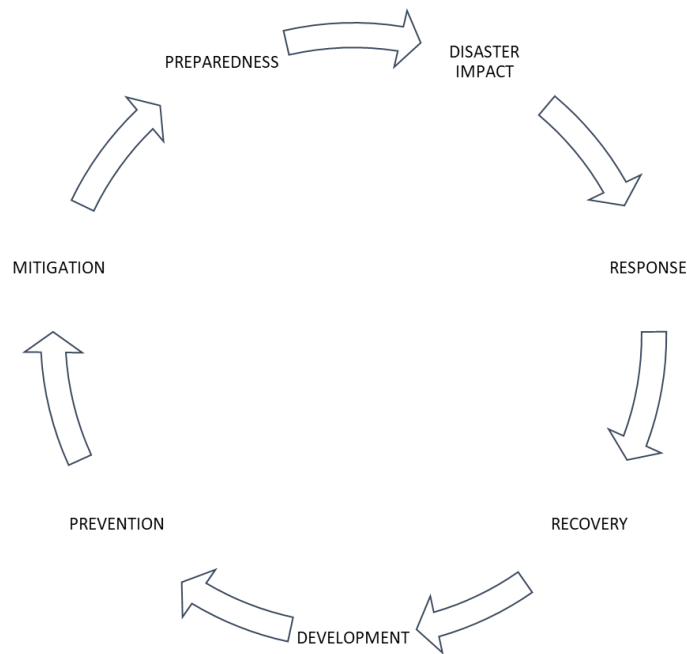
Figure 1. 2 Disaster management cycle (Carter 1991)

Disaster management is not stand alone activity. Disaster management is related to various aspects and requires a multi-disciplinary approach. Various actors involved in disaster management must work together and equate perceptions about disasters through a system or policy agreed upon by the disaster management system. Through disaster management programs or activities are also carried out in each phase by stakeholders comprehensively and continuously. So that it can be concluded that, disaster management is an entire activity that includes aspects of disaster planning and management, before, during and after a disaster and carried out by all elements, government, civil society and business-corporations to prevent loss of life, reduce human suffering, providing information to the public and authorities regarding risks, and reducing damage to vital infrastructure, property and casualty of economic resources.

Disaster risk reduction (DRR) is a new concept as the establishment of the conventional disaster management paradigm that not only emphasizing the emergency response aspect but the overall phase of a disaster. The goal of implementing the DRR is to minimize the adverse impacts that may occur before the disaster (Chmutina and Bosher 2015a). DRR is

also seen as an activity carried out to reduce the consequences that might arise when the disaster strikes (Hagelsteen and Burke 2016a).

DRR attempts to minimize the number of victims and damage through planning following some procedures, and applications in dealing with disasters (Setiadi et al. 2009). DRR aims to reduce the socio-economic problems that will arise after a disaster, deal with the consequences that will appear, and ensure that the policies and programs implemented will not increase the disaster risk (Initiatives 2015). Minimizing the risks caused by disasters, in DRR concept, the community plays an essential role in building resilience based on the community needs. Community involvement in this activity is called community-based disaster risk reduction (CBDRR) which is the internalization of DRR (Chmutina and Bosher 2015b) (Muhammad et al. n.d.).

d. Local government

In general, the researchers divided the concept of local government into three definitions. The first concept refers to institutions. In this context, the local government applies to the institutions that lead to the implementation of local government activities. This institution is driving the daily operations of local government. Therefore, these institutions are interpreted as local government or local authority. The second concept refers to government activities carried out by local governments. In the framework of the administration, the local government conducts regulatory activities. This activity is an essential function which is necessarily a function of policymaking at the local level which is used as the basis or direction in administering the government. The term commonly used in local government is the policy-making function and the policy-executing function. The local government in the third concept refers to the territory of government. The local government has the right to regulate and manage government affairs that have been transferred by the Central Government. The power to control this is realized by making local regulations according to the characteristics of the region.

De Guzman explained that several essential elements formed the local government (Guzman 2001):

- Local governments are political subsidies from the sovereignty of the nation and the State;
- Law regulates local governments;
- Local governments have government bodies chosen by residents;
- Local government organizes activities based on regulations;
- Local governments provide services within their jurisdiction.

Thus it can be said that the concept of local government encompasses organizations/ institutions/institutions, functions/activities of local governments. Some experts state that public services are most efficient when held at the closest level to the community because the local government understands the needs of the community (Bardhan 2002) (Devas 1997). Then the local government is considered more efficient in the use of public funds (Jiménez-Rubio 2011) (UNDP 1999). There is also an opinion that competition between regions will increase innovation (Erland Danny Darmawan Spv et al. 2008).

e. Social network

Some experts define networks as a combination of several relationships. The network contains nodes and mapping between nodes in a system. An interface can provide an overview of the interactions between nodes. Interactions or relationships that occur can be grouped into directional (two-way) relationships and non-directional (one-way) and transitive (balanced) relationships. According to Robert M.Z Lawang (Choi 2015), the network is a combination of the word 'net' and 'work,' so that it becomes a network, whose emphasis is on word 'work.' So the network can be understood as working in relationships between nodes as well as nets.

Social networks (Kunz, Kastelle, and Moran 2017) are relationships that are created between many actors in a group or between groups with other groups. The relationships that occur can be in the form of formal or informal interaction. The social network is an illustration or reflection of cooperation and coordination between actors based on active and reciprocal social ties (Hoppe and Reinelt 2010). Bryson argues that social networks are a network where 'ties' that connect one point to another in the network are social relations

(Bryson and Humphrey n.d.). Based on this type of bond, directly or indirectly who is a member of a social network is a person (person). It is possible, who is a member of a social network in the form of a group of people who represent the points, so it does not have to be represented by one person, for example, an organization, agency, government institution, or country (Groenen et al. 2016).

Mitchell (Corlew et al. 2015) argues that social networks are a set of unique or specific relationships that develop between groups of people. The characteristics of the connection can be used as a tool to interpret the social behavior motives of the people involved. Meanwhile, according to Barnes (Lienert, Schnetzer, and Ingold 2013) mentions two types of networks, namely the total network and part network. The total network is the entire network that is owned by individuals and covers various contexts or areas of life in society.

- Based on the above references it can be concluded that the components that make up a "network" are as follows:
- A group of people, organization, institution, objects, or events; usually represented by dots, which are termed as actors and nodes in network terminology.
- A set of bonds that connects a point to other points in the network. This bond is usually represented by a "line," which is a channel or path.

Flow, which in the diagram is illustrated by "arrows," there is something "flowing" from one point to another, through channels or paths that connect each point in the "network."

f. Capability

Some scholar explains that capability is the ability to utilize the resources owned in the organization to carry out specific or series of activities. The capability is often interpreted as the potential to carry out particular activities. Sometimes the term "proficiency" is used to refer to the ability to perform functional activities, while "capability" is considered how to combine these skills (Kusumasari, Alam, and Siddiqui 2010). According to Hubeis and Najib organizational capability is a set of resources that displays tasks or activities (Liu Jie1, Shu Shichang1 2017). What needs to be underlined in this concept is that capability can only be established if there is cooperation between various resources within the organization. In complex organizations, capability influences the organizational hierarchy

structure. The higher the level of capability, the more integration among lower-level capabilities. Therefore, in this case, it is necessary to combine the functional capabilities that exist within the organization (Kusumasari et al. 2010).

Sampurno explained capability as the ability to allocate and utilize the resources to fulfill the goal of the organization (Nada and Ali 2015). Organizational capability requires various integrations of resources. The capability is relatively difficult to transfer because it is based on resources that are a group rather than an individual. In addition, the capability is a concept used to refer to internal environmental conditions consisting of two strategic factors, namely strengths and weaknesses. Strength is a positive internal situation and ability, which allows the organization to have strategic advantages in achieving its goals. Whereas the weakness is the internal situation and inability which results in the organization not being able to achieve its goals (Kusumasari and Alam 2012).

In the context of disaster management, the capability is seen as the ability of an organization/institution to carry out its function/role in providing disaster management services to the community (Anantasari et al. 2017). Capability in disaster management does not represent just one resource, such as institutional, financial, technological or labor, but rather a way of allocating its resources to achieve the goals.

CHAPTER 2

LITERATURE REVIEW

2.1 Understanding the decentralization of disaster management

2.1.1 Introduction

Many experts argue that decentralization is a fundamental element in disaster management. In the context of governance, disaster management is considered to be more effective and efficient if implemented at the lowest level of government (J. M. Col 2007). In the principle of decentralization, the local government is the level of government that is most responsible for the achievement of the implementation of a program or activity planned and implemented by the government. In general, the decentralization of disaster management has several philosophies, among others: first, the decentralization of disaster management creates the existence of local governments to develop community resilience (Vaillancourt n.d.). Next, every authority for disaster management submitted to the local government must be able to create public awareness (Ainuddin et al. 2013a). Then, resistance is achieved through public services for disaster management (Du et al. 2016).

In the economic approach, decentralization on disaster management is also seen as an appropriate approach to address the needs of the community (Hayat and Amaratunga 2014). Decentralization has a crucial role in increasing community participation in economic, social and political activities related to the disaster. Besides, the decentralization process will develop the capacity of local leaders to solve problems accurately (Garschagen 2016). The learning process in decision making for local leaders is an important instrument to accelerate the recovery process due to disasters. Decentralized disaster management approaches will contribute directly or indirectly to the acceleration of disaster relief and minimize the possibility of more severe damage to development assets owned by the community. Systemic disaster management can help accelerate the recovery of the conditions of the social, cultural and economic resilience of the community in the face of disasters (Goh, Tan, and Lai 2015).

2.1.2 The benefits of decentralization of disaster management

Some scholars acknowledge that decentralization has benefits to improve efficiency, more responsive local governments, appropriate access, increased downward accountability, political involvement and community participation. Decentralization of disaster management is based on the assumption that this approach can enhance the role of local governments as the main actors responsible for disaster management (J. M. Col 2007). The position of local authorities in the context of decentralized disaster management is crucial because local governments are the ones who know about domestic natural hazards, and vulnerabilities. The local government also becomes an active channel for people to express their opinions (Becker 2009). Bae et al. (2016) also argue that decentralization is a very appropriate approach because of the characteristics of natural threats that differ from one region to another (Bae, Joo, and Won 2016). In addition, the occurrence of disasters that are often sudden and requires immediate handling is the main advantage of providing disaster management mandates to the local level (Rumbach 2015a). The authors also highlighted that the comparative advantage that local governments have many important issues related to pre-disaster preparation, such as the maintenance of urban infrastructure, disaster-sensitive buildings, land use regulations, and emergency planning.

2.1.3 The problem of decentralization of disaster management

Decentralization of disaster management is considered as one solution to creating effective disaster management. However, several prior studies have found that implementing decentralization on disaster management is not always effective. The primary cause of the ineffectiveness of decentralized disaster management is because the central government often only transfer the responsibility but is not followed by the transfer of other capabilities, such as human resources and financial resources (Raikes and McBean 2016) (J. M. Col 2007) (Gerber and Robinson 2009).

In addition, decentralization reforms for disaster management often intersect with coordination and political issues related to the scale of authority between levels of administration (Kapucu n.d.). Although scalar politics is one of the consequences of decentralization, this overlapping authority

makes the implementation of decentralization of disaster management unorganized (Marks and Lebel 2015). Sometimes decentralization creates the rejection of the level of government for political decisions, money allocations, and accountability - who is responsible for what? Although disaster risk management has been declared most effective at the local level, in practice there seems to be a question of whether decentralized local actors are indeed able to take effective action in disaster management. Several studies have examined the relationship between decentralization reform and disaster management. The widely cited study by Rumbach (2015) analyzed the impact of decentralization on disaster management policies in medium/small-sized cities. He based his qualitative case study research in West Bengal, India. The results lead to the conclusion that decentralization has not effectively closed the distance between citizens and the government (Rumbach 2015b). One explanation is that the opportunity to participate in local government is limited because no mechanism involves the community in decentralizing disaster management.

2.1.4 Summary

Table 2. 1 Advantages and problems on implementation of decentralized disaster management

Author	Advantages/problems
Col, 2007	Enhance the role of local governments as the main actors responsible for disaster management
Becker, 2009	The local government becomes an active channel for people to express their opinions.
Bae, Joo, & Won, 2016	Decentralization is a very appropriate approach because of the characteristics of natural threats that differ from one region to another
Rumbach, 2015	The occurrence of disasters that are often sudden and requires immediate handling is the main advantage of providing disaster management mandates to the local level
Raikes & McBean, 2016; Col, 2007; Gerber & Robinson, 2009	Central government often only transfer the responsibility but is not followed by the transfer of other capabilities, such as human resources and financial resources

Author	Advantages/problems
Kapucu, n.d	Decentralization reforms for disaster management often intersect with coordination and political issues related to the scale of authority between levels of administration
Marks & Lebel, 2015	overlapping authority makes the implementation of decentralization of disaster management unorganized
Rumbach, 2015	Decentralization has not effectively closed the distance between citizens and the government

2.2 Theories and concept of good disaster management

2.2.1 Disaster management as a government affair

In common, disaster is defined as an event that occurs in the community so that the community cannot overcome the impact. Disaster management is created in response to prevent the community from natural hazards or to reduce the effects of disasters by decreasing the level of vulnerability or increasing the level of capacity. Most researchers agree that disaster management is a cycle that consists of two main phases. The first phase is the pre-disaster, and the next period is post-disaster. In this study, we use the approach in the four stages in both phases of the disaster as a source of information, namely prevention and preparedness for the pre-disaster phase; response and recovery for the post-disaster period. (see **Table. 2.2**).

Table 2. 2 List of activities in every phase of disaster

Prevention and mitigation	Preparedness	Response	Recovery
Establish objectives	Emergency access and evacuation	Rescue and relief	Detailed damage assessment
Risk assessment	Emergency drill	Damage assessment	Treatments

Risk prevention and mitigation	Emergency response equipment	Protection of the heritage	Recovery and rehabilitation

Source: Mojtahedi & Oo (2017)

Disaster management recognizes disasters occur due to the collectivity of hazard components (H) that affect the natural and environmental conditions, as well as the level of vulnerability (V) and capacity (C) of a community (Reduction 2008). To reduce disaster risk, it is necessary to reduce the value of vulnerability by strengthening the capacity. This reduction is made within the empowerment of the community in managing the environment, recognizing threats, knowing the impacts that can be caused by the factors that lead to disasters (UNISDR, 2009).

Hazard or threat; is a natural or human activity condition, which has the potential to cause damage or loss of human life (Djalante, Thomalla, Sinapoy, et al. 2012). Hazards have the potential to cause disasters, but not all hazards always become disasters. Hazard assessment is interpreted as a way to understand the types and elements of threats that are at risk for the region and society. Disaster threat assessment based on the evaluation of the probability or likelihood of a disaster and the impact of a disaster or the effect of loss or damage caused by a disaster. The characteristics of threats in a region and society are different from other areas and communities. The threat character assessment is carried out according to the required level by identifying the elements at risk by various threats in specific locations (Khailani and Perera 2013a).

Next element is vulnerability; is a set of conditions and or a result of circumstances that negatively affect disaster prevention and mitigation efforts (Robinson, Oliveira, and Kayden 2017) (J. a Lassa 2010). These vulnerability factors include;

- Physical: Strength of building structures (houses, roads, bridges) against disaster threats
- Social: Demographic conditions (the type of sex, age, health, nutrition, community behavior) against disaster threats
- Economy: People's financial ability to deal with threats in their area
- Environment: Level of availability/scarcity of resources (land, water, air) and environmental damage that occurs.

Vulnerability assessment is carried out by analyzing and assessing the level of vulnerability of a community, region, and livelihood from risk factors (Gunasekera et al. 2015). Vulnerability assessments are determined by examining socio-cultural, resource / environmental, infrastructure and economic aspects of existing disaster threats and impacts.

Capacity is the strength and potential of individuals, families, and communities that enable them to prevent, reduce, be prepared, respond quickly or recover from an emergency and disaster (Du, Okazaki, and Ochiai 2017). Capacity assessment is carried out by identifying the status of the ability of individuals, communities, government or non-government institutions and other actors in dealing with threats with available resources to take precautionary, mitigating and prepared measures for emergencies, as well as addressing existing vulnerabilities with the capacity of the community (Erramilli 2009).

The risk (R) is the amount of loss or possibility of human casualties, economic damage and loss caused by specific hazards in an area at a particular time (Agency et al. 2011). Risk assessment is an assessment of the results of the evaluation of threats/hazards, vulnerabilities and capabilities/resilience of an area to disaster (Pollard et al. 2002). The results of the assessment in the form of a warning of disaster risk in an area. The results of the disaster risk assessment will be the basis for determining the priority scale of actions made in the form of work plans and recommendations to reduce disaster risk.

The relationship of disaster risk can be formulated as follows.

$$R \;=\; H\left(\frac{V}{C}\right)$$

R   Disaster Risk.

H   Hazard/threat; the frequency of a particular disaster tends to occur with a certain

intensity in a specific location.

V	Vulnerability; the expected loss (impact) in a particular area in a specific case of disaster occurs with a certain concentration. This variable calculation is usually defined as exposure (population, assets, etc.) multiplied by the sensitivity for the specific intensity of the disaster.
C	Capacity; the capacity available in the area to recover from specific disasters.

2.2.2 The role of local government in disaster management

Disaster management in the context of government includes several aspects such as policies, leadership, decision making, and financing related to disaster management activities in the pre-disaster and post-disaster stages (Garschagen 2016) (Meerpoël 2015). Building an effective disaster management system requires organizations at all levels of government to be able to make the right decisions at the appropriate time. In disaster management, the local government has an essential position in the government system. Several factors, such as having a close distance from the community by obtaining a permanent mandate, caused every policy taken by the local government to have a direct impact on the community (Kusumasari et al. 2010) (Larson 2002). In addition, local government is also considered to have a good understanding of local characteristics and threats, which is a significant factor in disaster management (Wilde et al. 2009). Also, in the context of emergencies, the local government is always becoming an initial reference of the community to fulfill their needs (Ainuddin et al. 2013b).

Prior literature highlights some qualifications for local governments to be able to manage disasters effectively, namely: the establishment of institutions, the preparation of comprehensive disaster management plans, and improvement of human resources (John J. C. of C. J. Col, 2007) (Ainuddin et al. 2013a). The establishment of institutions is an essential fundamental step to manage and organize every stakeholder involved in disaster management. Then, the local government must develop a comprehensive plan by identifying the resources that are owned and the resources needed when a specific disaster occurs. Furthermore, the regional government must have a capacity

building program for stakeholders, involving all elements - both the government and non-government sector. So it can be concluded that in disaster management, local government has a unique position and role to ensure coordination and synergy between stakeholders in the disaster management system. With all the advantages and limitations, the local government is the primary responsibility for disaster management at the local level.

2.3 Leadership factor in disaster management

Leadership is the ability of a leader to recognize the time and need to make changes, identify the direction of change, communicate change strategies to people in the organization, especially those who support reform and empower them to make changes and facilitate efforts to achieve change goals (Stefanovic et al. 2016). Through this approach, Carter proposes to define leadership characteristics in disaster management must have character and leadership skills. In this context, the leader is not only performing as a formal leader (Carter 1991). However, the role of the leader in disaster management must be able to take control of inviting various actors with their resources to play a broad role in disaster governance. Therefore it is fundamental for the leader to affirm the position of these actors and resources. In addition, due to the circumstances of the emergency that changes rapidly, the leaders are needed to understand the direction of the shift and must have the ability to manage any changes (Hoppe and Reinelt 2010).

The primary identity of leadership for disaster management is to provide a clear direction and objectives regarding disaster management policy. On the other hand, a leader is expected to be able to provide clarity on the control of resources. Steers (1996) argues that the primary variables in leadership are vision and commitment (Johnsen 1999). This variable does not change both in pre-disaster or post-disaster context. The idea of a leader in managing disasters will be communicated to all stakeholders, and the concept will be delivered to build the commitment of various parties to realize it collectively. Effective leadership requires the ability to develop a vision and the success of mobilizing followers (Wolensky and Wolensky 1990) (Chang, Wilkinson, and Seville n.d.). Thus the indicator of the effectiveness of a leader is the ability to create and operationalize a vision through mobilizing followers. Calman (1998) offers the concept of modern-leadership that encourages a person to achieve leadership effectiveness, through carefulness in choosing people (followers), sorting out their suggestions in determining policies and designing strategies to achieve

a vision that is believed and applying varied leadership styles (Sari, Noor, and Prasetyo 2014). This concept is very relevant to be applied when managing disasters. This concept is often referred to as contextual leadership.

Carter (1991) proposed the concept of "disaster management cycle" in disaster governance. In this cycle, several phases of disaster management are identified which have different characteristics and objectives, but each phase is a sequential one follows the other (Carter 1991). Each phase in disaster management requires different outcomes. The concept of the use of resources and the use of cooperation networks are also not the same for each phase. A leader is expected to have a vision and a way to raise different commitments for each phase of disaster management. Likewise, with the type of leadership applied, it will undoubtedly be different for each phase. The purpose of changing the type of leadership is to improve the effectiveness of leadership, where ultimately the effectiveness of each phase of disaster management will be obtained (Antonacopoulou and Bento 2003). The ability to carry out the concept of contextual leadership along with changes in each stage of disaster management is the basis for the application of various leadership styles.

Various types of leadership in each phase of disaster are not necessarily owned by one person, or a leader may not have such an entire leadership type. According to Goleman (2000), each type has different attributes and requires emotional intelligence whose range is wide enough (Hagelsteen and Burke 2016a). Thus it is necessary to develop a collective leadership system that will accommodate various types of leadership from multiple individuals. Each will complement each other, according to their strengths, so that it will increase the effectiveness of each phase of disaster management (Antonacopoulou and Bento 2003). The shared leadership system requires shared-vision of each who represents stakeholders. The more stakeholders, the more different the vision that might arise. Therefore, there are many requirements to develop this joint leadership system.

2.4 Social networking and disaster management

Disaster management is a system built in the multi-stakeholder approach. In this context, multi-stakeholders means actors consisting of government, non-government organizations, communities, private sectors, and other actors involved in all phases of disaster management (Bisri 2016) (Islam and Walkerden 2017). Many researchers conducted studies related to disaster management

networks during emergencies and recovery. Only a few studies have tried to examine the relationship between institutions in the pre-disaster phase. Gilman shows evidence that in recent years several countries and donor agencies are still looking for suitable concepts in the method of interagency cooperation in handling emergencies (Bisri 2016). Besides, Lassa also pointed out that the collaboration between disaster management agencies formed a complex network. In addition to the growing number of actors, network complexity is also shaped by informal relationships that are often more dominant than formal connections that link institutions in implementing disaster management (J. A. Lassa 2010).

Social networking is a method for analyzing social structures. The fundamental intention is to combine actors (people/ organizations/countries) as "nodes" and connections between actors as "ties." (Crabb et al. 2017) These nodes and linkages added to building the networks. In social network analysis, the structure that occurs in the present world is exactly similar to this network. In the beginning, the theoretical development of social networks had no significant progress until the emergence of the concept of "social capital." The concept of social capital goes beyond the traditional definition of capital that can be seen and calculated in nominal terms. In this concept, social relations and cooperation among actors in certain social structures through this networking relationship are all types of important "capital," which will bring benefits to both individuals and the community (Islam and Walkerden 2017).

In the context of disaster management, a shift in disaster management paradigm that focuses on risk reduction makes no longer an approach to how much economic loss or death toll. But how to reduce/minimize losses/deaths due to disasters. One element that supports the effectiveness of disaster management is if there is cooperation among all actors who contribute to disaster management following their function. From prior studies on disaster management, the role of social capital in disaster management can be identified. Some researchers tried to determine the position of social networks in disaster management, especially in the emergency phase (Nazli et al. 2015). Dynes recognizes that social networks and social capital are the most essential and reliable resources in an emergency (Zhao n.d.). The characteristics of both as capital that is not easily destroyed causes it to be vital to be a foundation in the recovery phase.

During emergencies, the debates of the researchers centered on common issues about how the roles and responsibilities of each institution in handling emergencies. Lakoff (1993) also emphasizes how

coordination between institutions must also consider the capacity and function of each institution (Schneider 2003). Because in the context of emergency handling that requires fast processing, mistakes made by an institution that does not have the ability will have a total failure consequence of a system. Also, several studies also highlighted the role of government in planning and controlling a system involving multi-stakeholders (Lin, Ho, and Shen 2017) (Islam and Walkerden 2017). So that some conclusions focus on how to implement a good emergency, is it more useful to be centralized or decentralized?

In the study of social networks in the pre-disaster phase, several researchers also highlighted the importance of social capital and social networks. Zhao believes that the development of social networks through the perspective of social capital is an essential element in building community preparedness (Zhao n.d.). In addition, the development of social capital and social networks in the pre-disaster phase will be more effective than during emergencies (Islam and Walkerden 2017). Several empirical studies have discussed the relationship between social network theory and social capital with disaster management. However, several studies have provided a comprehensive idea of how social networks are represented during emergency and post-disaster activities. One of the objectives of this dissertation will describe and discuss the role of social networks in the implementation of post-decentralization disaster management in Indonesia.

2.5 Theories and concept of capability in managing disaster

A consensus that the local government is the primary actor responsible for disaster management. Their unique position as a connection between the central government and the community makes the role of the local government is vital for the effectiveness of disaster management performance (Kusumasari et al. 2010) (Ainuddin and Routray 2012). Besides, the proper understanding of the local government for the domestic threats and vulnerabilities of the community makes it a core in reducing the impact of risk due to natural disasters (Ann Miller and Douglass 2015). Besides, along with the concept of decentralization, the central government has transferred most of the government affairs to make the local government a principal actor in disaster management activities (Marks and Lebel 2015) (Garschagen 2016) (Zahra 2010). From the context of community empowerment, the role of local government is also crucial in building a sense of locality and local wisdom in

developing the concept of community-based disaster risk reduction (Anantasari et al. 2017) (Kuribayashi et al. 2016).

Many reasons for studying the capabilities of local governments to support disaster management. According to Moynihan in Kusumasari (2014), people tend to be rational when facing disasters and have a general goal of returning to normal conditions, but are constrained by the limitations of their knowledge and other resources of how to recover to normal conditions. However, with great responsibility in managing disaster management, it was realized that the local government still had limitations. Anantasari et al. argued the local government's level capability in handling disasters, especially leadership, is still relatively weak (Anantasari et al. 2017). In addition, Boin in Kusumasari (2014) emphasizes that when the need to return to normal conditions has peaked, the ability of leaders of organizations and community leaders may be deficient. Errors usually committed by local governments when preventing disasters are often associated with rigid institutional beliefs, neglect of complaints from outside, difficulties in handling various sources of information, and a tendency to minimize hazards. Local decision makers even did not consider disaster management as an essential government affair. This matter is affected by the allocation of disaster management funds that are still insufficient in the local government budget.

Djalante (2012) suggested that strengthening capability at the central and local government levels was very important for the effectiveness of disaster governance (Djalante, Thomalla, Sabaruddin, et al. 2012). But she also stressed that increasing capability at the local level is a priority, due to several obstacles, such as financial and human resources. Capability cannot be seen as a single resource concept. So that capability cannot only be measured by how much is the allocation of funds, financial assets, or human resources (Kusumasari et al. 2010). But capability must also be seen from the ability to carry out a function, such as the ability to allocate resources, provide public services, and complete its tasks (Anantasari et al. 2017).

2.6 The gap between prior research and the conceptual framework of the study

2.6.1 The position of each study

Many studies have discussed the relationship between decentralization and disaster management. Several studies have also tried to measure positive and negative impacts on the implementation of

decentralization, especially with case studies in developing countries. Considering the positive and negative impacts of implementing decentralized disaster management, the debate must remain focused on the role of the local government as a key player in disaster management. This means that, although many studies find the weaknesses and shortcomings of local governments in managing disasters, disaster management must be the responsibility of the local government and central government should not withdraw the authority already granted.

First, this study tries to analyze the relationship between decentralization and disaster management systems in Indonesia through three studies (see **Figure 2.1**). The first study, the author attempts to understand the implementation of decentralization of disaster management in Indonesia from four factors, namely institution establishment, regulation, planning, and budgeting. These four factors are the essential elements of the formation of a disaster management system in Indonesia.
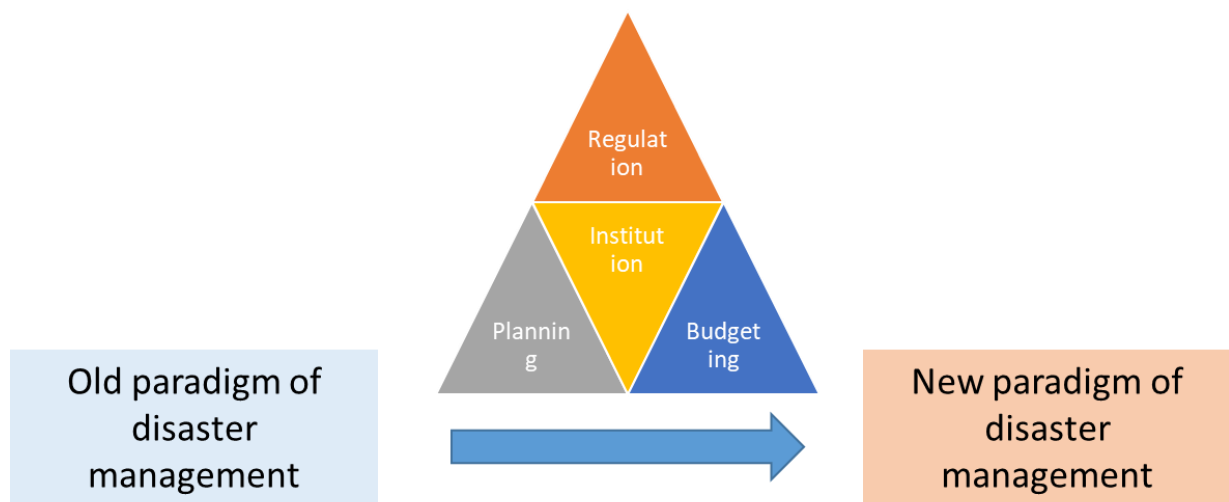
Figure 2. 1 Conceptual framework of the first study

Next, based on the four factors that make up the disaster management system in Indonesia, the author will analyze the patterns of social networks that are formed. We will compare disaster management networks that were created in the period before decentralization and after decentralization (see **Figure 2.2**). We will use the social network analysis methods used by Bisri, who tries to understand the characteristics of social networks from the degree of centrality aspect (Bisri 2016). According to Scott (2009), the degree of centrality is related to the concept of

sociometrist in identifying actor who acts as "key" namely the most famous in a network (Scott 2009). On the other hand, Hanneman and Riddle (2005) reveal that actor who becomes central roles occupy a favorable position because they have many relationships, they may have alternative ways to meet needs, and therefore not too dependent on others (Leon et al. 2017). As for Prell (2009) states that individuals who have the highest degree of centrality can be identified as leaders, or can also be the first to get information (Prell, Hubacek, and Reed 2009). In other words, actors who are central roles are not always formal leaders in groups or networks. This is in line with the findings of Malinick et al. (2013), who found that formal leaders do not occupy a central position in the network. In other words, formal leaders do not always have a significant relationship with the degree of centrality (Lin et al. 2017).

Before decentralization   **After decentralization**

Identify the actor

Included actors only from the government sector, does not involve non-government actors.

Identify the connection → Analyze the network

The identification of connection is based on the relation between actors carried out four elements:
- institutional,
- regulatory,
- planning, and
- budgeting.

Centrality analysis

Analyze the network ← Identify the connection

Identify the actor

Centrality analysis

Centrality analysis is based on three types of measurement:
- Degree of centrality,
- Betweenness of centrality, and
- Closeness of centrality.

Figure 2. 2 Conceptual frameworks of social network analysis

Our second study will analyze the role of stakeholders in disaster management at the local level. Stakeholders are people, or groups, or institutions that are involved in program activity, whether they are positive or negative or vice versa that may give/influence the program output (Rastogi et al. 2010). This stakeholder analysis is an essential instrument for understanding the social and institutional context of program activity (dos Muchangos, Tokai, and Hanashima 2017a). The things revealed by this tool can provide information about: who will be influenced by the program/project both positively and negatively. Then anyone who might affect the program/project either positively

or negatively. Then what individuals, groups, and institutions need to be involved in the program/project and how; and anyone whose capacity needs to be built to participate actively in it.

In this study, we will analyze two crucial aspects of stakeholders, namely stakeholders who have power and stakeholders who have leadership (see **Figure 2.3**). Power shows the level of authority that stakeholders have for the development of the program. This argument can be tested through ways of controlling and understanding their decision-making processes both directly and through the influence of the course of the program. This power can come from the status or authority that is owned, or through informal relations with the formal leaders (Rastogi et al. 2010). Furthermore, leadership relates to the level at which the achievement of the objectives of the disaster management program is highly dependent on the level of command of the relevant stakeholders (Schmeer 1999). Stakeholders who have a degree of leadership towards the program, in general, are those whose needs correspond to the program objectives.

In the context of stakeholder analysis (SA), assessment is often carried out subjectively. Besides, SA has limitations by only assessing each stakeholder individually without seeing the connection with another actor. In a dynamic system, it takes an inter-stakeholder communication that is modeled in a bond/connection (dos Muchangos et al. 2017a). In addition, by looking at the system as a network, almost no stakeholders stand alone. Stakeholders are seen as a group of actors who work together to achieve common goals. Therefore, SA can be combined with social network analysis to strengthen research findings.
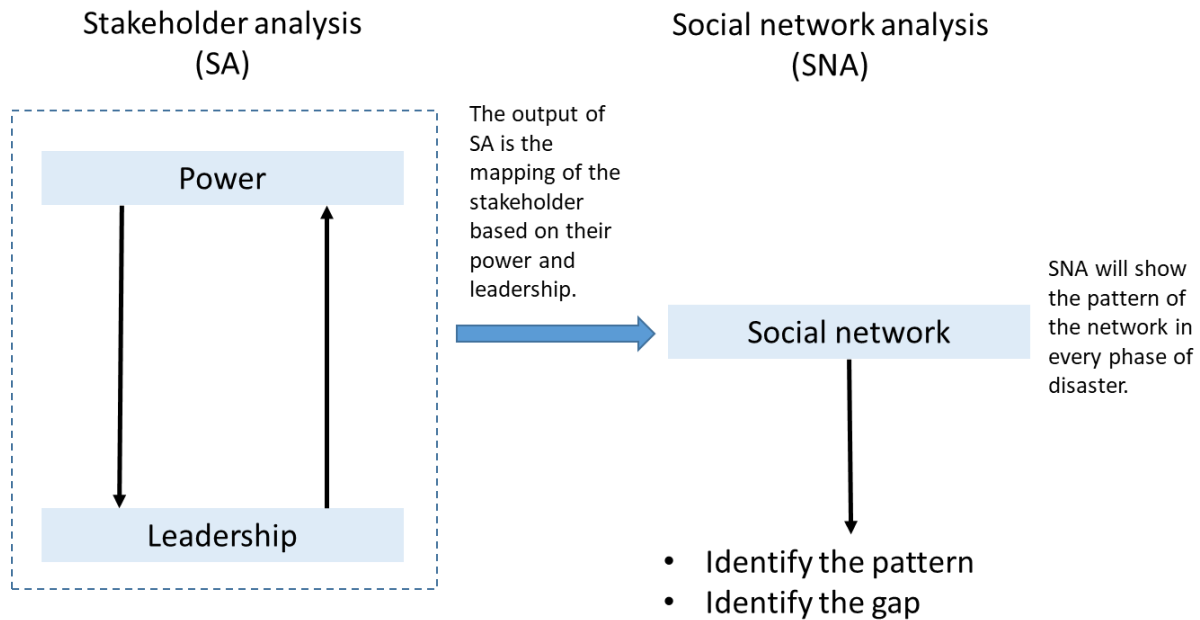
Figure 2. 3 Conceptual frameworks of SA and SNA

Although the combined approach between SA and SNA is not a new approach, especially in the fields of social, political, government and environmental (dos Muchangos et al. 2017a) (Mok et al. 2017) (Reed et al. 2009a) (Prell et al. 2009). But in the context of disaster management, there are yet not many previous studies that have tried to combine these two approaches. Most studies still discuss each analysis separately, especially analyzing emergency management in a specific disaster event. In this study, the authors conceptualize stakeholder roles and positions based on previous research, expand their ideas and develop definitions of the combined SA and SNA methods.

Next, our research will analyze the capability factor at the local level related to disaster management. We will adopt the methods from previous research as our reference in identifying the local capability. Most researchers agree that local governments represent as key actors in disaster management. However, some literature also finds that the role of local government still has several obstacles, including the lack of local capability in managing disasters. This low capability problem is mostly related to institutional challenges, such as lack of awareness at all levels, low capability in cooperation and coordination among various stakeholders at the local level (Setiadi et al. 2009). In addition, Deen highlighted the sub-national authority that does not have the capability in the field

during an emergency. This gap is similar to the structure of political governance, which does not have a systematic or consistent capability in the structure of disaster governance (Deen 2015).

Figure 2. 4 Variable of local capability in managing disaster

Source: Kusumasari et al., (2010)

2.6.2 The position of the dissertation

Decentralization is a fundamental element in disaster management. The supposed beneficial effect of decentralized disaster management is based on the assumption that it could increase the role of local governments as the leading actors responsible for disaster management (Ainuddin and Routray 2012). The role of local authorities is critical because local governments are usually the most well-informed concerning the domestic threat about potential disasters and vulnerabilities, as well as being an active channel for the public to express their opinions (Rumbach 2015a). This dissertation is expected to facilitate renewed discourse concerning disaster management systems operating at the

local level. In spite of its various limitations, local governments must be involved as a critical actor to develop disaster management systems for the people. Besides, while many researchers argue that local capability is a crucial factor in the effectiveness of disaster management, several studies have measured or analyzed the level of local capability in disaster management. However, the relationship between variables that make up local capability in managing disaster has not yet been ascertained. This study discusses this gap by examining interrelation between each variable of local capability and the relationship between variables of capability and external factors.

CHAPTER 3

DECENTRALIZATION AND DISASTER MANAGEMENT IN INDONESIA

3.1 The condition of Indonesia

The Republic of Indonesia (RI) or the Unitary State of the Republic of Indonesia (NKRI), or more commonly called Indonesia, is a country in Southeast Asia that is crossed by the equator and is located between the continents of Asia and Australia, and between the Pacific Ocean and the Indian Ocean. Indonesia is an archipelago based on latitude and longitude positions between 6o LU - 11o LS and 95o BT - 141o BT (Tito Latif Indra, SSi, MSi, Drs. Supriatna, MT, Tresvel Nazwil 2013). All regions of Indonesia are located in tropical climates; this is due to the location of Indonesia itself which is located at low latitudes. The average air humidity is high; this is because the islands in Indonesia are easily influenced by air circulation that comes from the seas surrounding it so that it receives a lot of rain (Sari et al. 2014). Geographically Indonesia is located between two oceans and two continents, namely the Pacific Ocean and the Indian Ocean, and the Continent of Asia and the Continent of Australia. Diverse socio-cultural community, this is inseparable from the Indonesian archipelago which is located adjacent to the Asian Continent so that it naturally receives influence from the continent (Kusumedi 2010). Then over time Indonesia also received influence from the Continent of Europe and America. The topography of the territory of Indonesia is very varied, and it affects the biographies of its people. Indonesia is traversed by two world mountain line namely the Pacific and the Mediterranean.

Based on the projection of the 2013 National Development Planning Agency (BAPPENAS) the population of Indonesia in 2018 reached 265 million (Sari 2016). The number consisted of 133.17 million male and 131.88 million female. More than 50% live on Java Island, which is the most populated island and the island where the capital of Jakarta is located. Most (95%) of Indonesia's population are Austronesian people, and there are also Melanesian, Polynesian and Micronesia ethnic groups, especially in Eastern Indonesia. Many Indonesians claim to be part of a more specific ethnic group, which is divided according to language and regional origins, such as Java, Sundanese, Madurese, Batak, and Minangkabau. Besides, there are also migrants with a minority of whom are

ethnic Chinese, Indians, and Arabs. In Indonesia, there are around 4 million ethnic Chinese populations. This number varies because only in 1930 and 2000 did the government conduct a census by classifying Indonesian people into their ethnic groups and descendants (Yelvina Andriani 2009).

3.2 Decentralization system in Indonesia

Based on some literature, the implementation of the idea of decentralization in Indonesia has been going on for a long time even before independence (1945). The concept of decentralization only reached its top in the reform era with the issuance of the Law on Local Government in 1999. However, the application of the concept of decentralization in Indonesia is considered by some academics still didn't show unsatisfactory results. There are still many lacks in its implementation, namely incompleteness of regulations, lack of local government, and the acceptance of the community. However, decentralization has become a necessity by considering the mandate of the Indonesian constitution. Thus, it becomes more valuable and then revisits the achievements and formulates the future agenda. This paper will attempt to summarize the brief history of decentralization and try to identify the positive and negative points that have been arising the implementing the idea of decentralization in Indonesia.

3.2.1 History of decentralization policy in Indonesia

Evolution of the decentralization policy in Indonesia has started from the pre-independence period when the Dutch and Japan colonization. Then a new chapter began in the post-independence in 1945 with marked flexibility for the Indonesia Government to be able to set up his government system. Some studies divide the period of government in Indonesia into four periods (before independence, the period of the Old Order, New Order period, and the period of reforms) as shown in **Figure 3.1** (Oswar 2014) (Beier and Ferrazzi 1998). However, in this paper, we divided the governance era in Indonesia into two major groups: the period before the big bang decentralization (1903 - 1998) and the period after the fall of the new order (1998 - now).

The idea of decentralization in the Dutch colonial era begins with the dissatisfaction of the indigenous peoples and the Dutch traders who assume power the Governor General as viceroy Netherlands in the Dutch East Indies (Indonesia) are too broad. Also, the Dutch East Indies

considered too large if only ruled by a governor-general. With a population that is growing, it is thus requiring a system to delegate authority to lower officials to be more effective governance (Green, 2005). In this period, the focus of a decentralized system rather than on how to improve public services to the community, but how to alleviate the burden of the colonial government budget (central government). Decentralization will share the responsibility of the budget with some local governments that are under the direct control of the central government (Matsui, 2003).

After independence, the old order regime develops the system of decentralization in Indonesia with the establishment of local governance marked by the enactment of several policies related to regional autonomy (Matsui 2003). In the beginning, preferred political decentralization is to transfer political powers from central to local governments while the fiscal and administrative decentralization has not been established yet (Green 2005).

After the fall of the old order period (1966), the government adopts a new system based on Law No 5 of 1974 on the Fundamentals of Local Governance System (Satria and Matsuda 2004). The local governance system during the period of the new order founded on three basic principles: First decentralization, such as transfer some of the government affairs to the local level, thus becoming domestic issues. Second, De-concentration, a delegation of authority from government to government officials in sub-national level. Third, assistance tasks; the assignment to participate in implementing government affairs assigned to local governments (Suprijadi 2010).
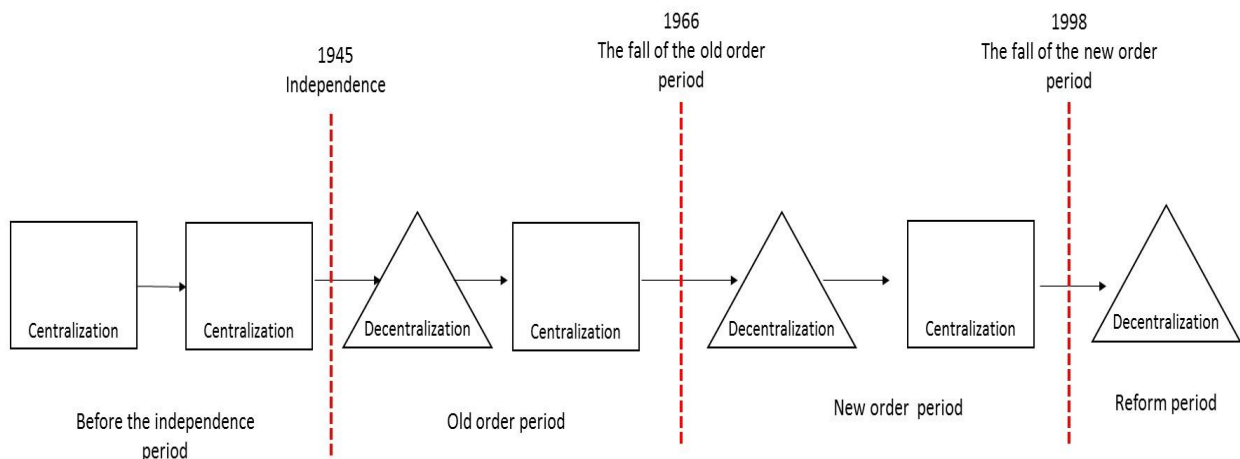
Figure 3. 1 Period of decentralization policy in Indonesia

Decentralization in Indonesia in the reform period began with the enactment of Law No. 22 of 1999 on Local Governments, or better known as the law of local autonomy. This law changed the overall implementation of governance in Indonesia. This paradigm shift became known as the 'big bang decentralization' in Indonesia (Faguet 2014). This ‗big bang decentralization' is changing Indonesia from the most centralized country in the world become the most decentralized country in the world, due to hand over almost all authorities transferred to the provincial and municipality government (Hofman and Kaiser 2002) (Shah and Thompson 2004).

3.2.2 Concept and implementation of decentralization in Indonesia

In general, there are nine fundamental changes brought about by the Law on local autonomy. As shown in **Table 3.1**, the law brought the changes related to the role and structure of local governments (both provincial and municipality), the division of resources between the central and local governments, and the relationship between the central and local governments. Indonesia's decentralized system in the post-1999 gives full authority to the local government to regulate and administer governmental affairs. Besides, local governments are also given the power to establish local regulations for the implementation of local autonomy.

In the period 1999 - 2016, there have been three changes related to the regulation of decentralization in Indonesia. As shown in **Table 3.2**, the first regulation of the decentralization was executed in 1999 in response to the demands for governance reform after the fall of the New Order regime. Second regulation assigned in 2004 as the answer to the problems that emerged in the previous law. Then the final regulations issued in 2014.

Table 3. 1 Nine fundamental changes in the regional autonomy law

• Using local democracy model of governance
• Decentralization system more dominant than centralization
• The relationship between the municipality and province become independent
• Flat and trim organizational models
• Supervision by the central government was persuasive
• Transfer of funds from the central government shifted from specific grant to the block grant
• Changing the function of parliament (legislative council) as a government partner
• Relations with the central government local governments are reciprocal
• Distribution of government affairs turned into the open-end arrangement by detailing the function of each province and municipality.

Law number 22 of 1999 or often called regional autonomy law, drafted by the government with two primary objectives (Satria and Matsuda 2004). First, it gives the foundation of political decentralization to the local government especially to open up the opportunity to choose the local leader. Second, provide access to a local government to be able to manage their natural resources and get a benefit for the development (Ghulam 2008). Decentralization offers a significant advantage for local governments to be able to determine the policy to optimize their resources without entirely relying on central government support. Moreover, regional autonomy also eliminates administration level relationship that previously used. This policy explains that the province is a representative of the central government and give a new position of the municipality as an autonomous region, not under the jurisdiction of the provincial (Matsui 2003) (Kristiansen and Pratikno 2006).

Table 3. 2 Decentralization policy in the reform era (1999 – now)

Series of policies	Autonomy principle	Content
Law No.22/1999 Local Governance	Decentralization	The division of authority between the central and local governments Strengthening the legislative authority Regency/City is an autonomous region
Law No.32/2004 Local Governance	Decentralization	Strengthening the role of the local community. No longer uses the principle of the division of authority between the central and local, but apply the principle of delegation of powers.
Law No. 23/2014 Local Governance	Decentralization	Strengthening the role of the provincial government as the representative of the central government.

After a few years, Law number 22 of 1999 has been getting some criticism due to the emergence of several problems. This issue arises because at the beginning the regional autonomy law is a radical change in the system of government in Indonesia (Rahmatunnisa 2014). Therefore the emergence of several challenges, shock, or conflicts accompanying the implementation of the regulation. Some of the criticisms put forward by researchers related to the application of Law No. 22/1999 is the ambiguity of the role of the provincial government as an autonomous region and administrative region (Kustiawan 2004). The big gap in finances between local government in natural resources (Rahmatunnisa 2014), and the absence mechanisms local communities in monitoring the local government (Satria and Matsuda 2004).

Based on these criticisms, in 2004 Law No. 32/2004 was issued as an amendment to the Law 22/1999. In Law No. 32/2004, the relationship between central and local use of the term distribution of affairs, not the transfer of authority as in the previous regulations (Kustiawan 2004). This distribution explained government affairs under the administration of the central government and other affairs that are held between the central government and local governments. There are six affairs which are under the control of the central government: religion, defense, security, monetary, justice, and foreign affairs. In addition to all these six affairs, all the affairs transferred to local governments as the 'concurrent affairs.'

After approximately ten years, the government and parliament to amend Law 32/2004 becoming Law 23/2014 to fix some essential points include enhancing the role of the governor as a representative of the central government in the regions and improve coordination that is vertical (central and local government relations) and horizontal (inter-local government cooperation) (Rahmatunnisa 2014).

3.2.3 Local government system in Indonesia

Decentralization in Indonesia was marked by the issuance of Law Number 22 of 1999 concerning Local Government and Law Number 25 of 1999 concerning Financial Balance between Central and Regional Governments, which was officially enacted as of January 1, 2001 (Rahmatunnisa 2014). Entering the reform era, which was markedly the insistence on a significant change in central and local relations, it is certain that decentralization has two primary missions: first, satisfying all regions by providing a high level of political participation (Utara 2012). This is manifested by 'political decentralization' from the center to the local and provides political opportunities and satisfaction to the community to enjoy the main symbol of local democracy (for example the election of governor/mayor). Then, secondly, satisfying natural resource-rich areas that had previously "rebelled" by giving them greater access to natural resources in their respective regions (Umum n.d.).

Concerning the division of government affairs, there is a specific division of functions. First, the affairs that are entirely the affairs of the Central Government include foreign policy, defense, security, monetary and fiscal national, justice, and religion. Second, concurrent affairs or affairs that can be managed jointly between the central, provincial, or municipality (Oswar 2014). The division of these functions is regulated by regulations using the criteria of externality, accountability, and efficiency to realize the proportionality of the division of government affairs so that there is clarity on who does what (Hidayat 2008). In joint affairs which are the authority of the region divided into two, namely obligatory affairs and matters of choice. Mandatory affairs are government affairs related to essential services such as primary education, health, fulfillment of minimum living needs, necessary environmental infrastructure and so on (Umum n.d.) whereas those that are optional are things that exist and have the potential to improve welfare.
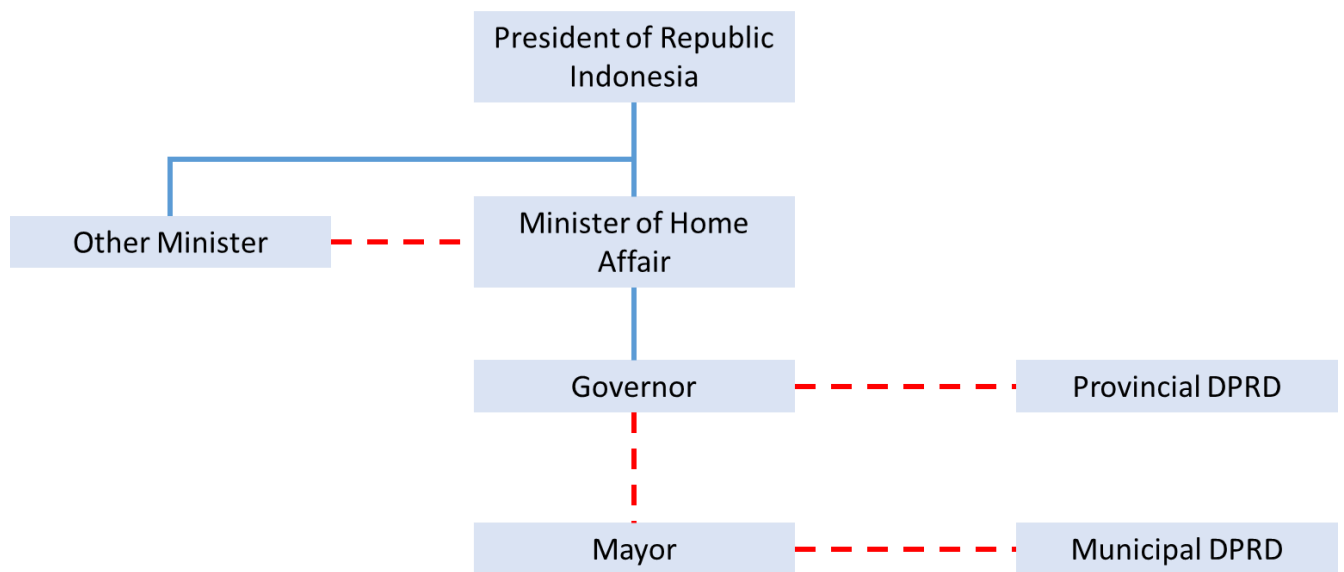
Figure 3. 2 Structural relationships of local government in Indonesia

Structural relations are relationships based on the level of government. The central government is the organizer of government affairs at the national level. And the local government is the organizer of government affairs in their respective regions along with the provincial/municipal parliament (DPRD) according to the principle of autonomy and decentralization, in the system and laws of the NKRI. Structurally the president is the highest authority in the administration of government affairs at the national level. The governor/mayor is the organizer of government affairs in their respective regions following the principle of autonomy as wide as possible. Structurally the relationship between the central and regional governments is regulated in Government Regulation Number 84 of 2000. Based on these local governments are given the opportunity to form institutions that are based on local needs. For more details, the structural relationship in the following chart can be seen in **Figure 3.2**.

Formally, based on the regulation, decentralization in Indonesia is marked as the transfer of government authority by the central government to the local government (provincial and municipal governments) within the framework of The Unitary State of the Republic of Indonesia (NKRI) (Kustiawan 2004). The political system and the administration of local governments in Indonesia

consist of two levels of government, namely the provincial and municipal government. In principle, the difference between responsibility and authority between the provincial government and the municipal government has to do with the scale of power (Brodjonegoro 2001). The municipal government's jurisdiction relates to the conditions and potential of natural resources, whereas the provincial government's jurisdiction relates to matters that impact or benefit the inter-municipal relationship (Samosir 2008). In managing the budget, provincial and municipal governments are granted the autonomy to control the local budget following the needs and priorities of the region. In the concept of decentralization in Indonesia, the municipality is an autonomous region which represents the actual implementation of decentralization by having broad and responsible autonomy rights (Erland Danny Darmawan Spv et al. 2008). While the provincial position is representative of the central government, it does not have a hierarchical relationship with the municipal government (Sistiana and Makmur 2004). Organizationally, provincial and municipal governments have autonomous government systems, and legislative bodies called provincial or municipal parliaments (DPRD).

3.3 Disaster in Indonesia

3.3.1 Geographical conditions

Indonesia is the largest archipelago country in the world (Oberman et al. 2012). Based on data from the Indonesia Geospatial Information Agency (BIG) in 2013, the number of islands in Indonesia is more or less 13,466 islands. The total area of Indonesia is 5,180,053 square kilometers, divided into the land area is 1,922,570 square kilometers (37.1%), and the area covered with water is 3,257,483 square kilometers (62.9%) (Government and Team 2009). Indonesia is a tropical country with two seasons. These conditions make the Indonesia territory become a center of biodiversity. Besides that also have disasters potentially from natural hazards. Floods, landslides, and droughts are frequent natural disasters in Indonesia.

Moreover, the disaster caused by natural hazards, the catastrophes also caused by a human being (human-made disasters) (OCHA 2012). In Indonesia, management, and utilization of forest areas that are not sustainable even pushing the conflict between man and wildlife. Several events wildlife conflict in several regions in Indonesia can be categorized as human-made disasters (OCHA 2014).

Tropical climate also allows the occurrence of outbreaks of disease because of the ease of vector breeding or migrate.

3.3.2 History of disaster in Indonesia

The history records that in Indonesia have occurred two most massive volcanic eruptions. 1815 Mount Tambora on the island of Sumbawa, West Nusa Tenggara, erupted and issued approximately 1.7 million tons of ash and volcanic material (Robock et al. 2002) (Zhang, Blender, and Fraedrich 2011). Most of these volcanic materials form a layer in the atmosphere that reflects sunlight into the atmosphere. Because sunlight that enters the atmosphere reduced a lot, the earth does not receive enough heat, and cold wave occurs (Robock et al. 2002). Cold wave to make 1816 called the ―year that does not have a summer" and led to crop failure in many areas and widespread hunger. In the same century, Mount Krakatoa erupted in 1883. The eruption of Mount Krakatoa is estimated to have a force equivalent to 200 megatons of TNT, roughly 13,000 times the explosive strength of the atomic bomb that destroyed Hiroshima in World War II (Deplus et al. 1995) (Sigurdsson 1990).

The most deadly disaster in the early 21st century also begins in Indonesia. On December 26th, 2004 a major earthquake occurred in the Indian Ocean west of Sumatra. This earthquake triggered a tsunami that killed more than 225,000 people in eleven countries and caused great destruction in many coastal areas in the countries affected (Phelps, Bunnell, and Miller 2011) (Lassa 2015). Throughout the twentieth century, only a few disasters that cause massive casualties like that. In Indonesia, the Indian Ocean earthquake and tsunami left an estimated 165,708 deaths and created economic loss worth more than US$ 4.45 billion (Guarnacci 2016).

Indonesia Disaster Data and Information (DIBI) showed that from 1815 until 2015, the disaster event in Indonesia was dominated by the hydro-meteorological disaster. Flood becomes the most occurring disaster with more than 31.3% while the second and third most occurring disaster phenomena were the storm (19.7%) and landslides (16.5%) (See **Figure 3.3**). Disaster event in Indonesia dominated by hydro-meteorological disasters, like floods, landslides, and storms. The number of geophysical disasters like earthquake and tsunami is less than 10 percent. There is some reason the disaster caused by hydro-meteorological is increasing especially in the last two decades in Indonesia: First, the climate change factor. Climate change will affect the disaster risk in several ways: increase the number of extreme weather, the number of climate hazards, and increase the vulnerability factor of the population to natural hazards, mainly through ecosystem degradation,

reduction in water and food supply, change to livelihoods (Setiadi et al. 2009). Climate change nowadays is everybody concern. The report from UNISDR said that climate change would affect all countries in the world, but poor people from the poorest countries are likely to suffer the most (Porter, Demeritt, and Dessai 2015).
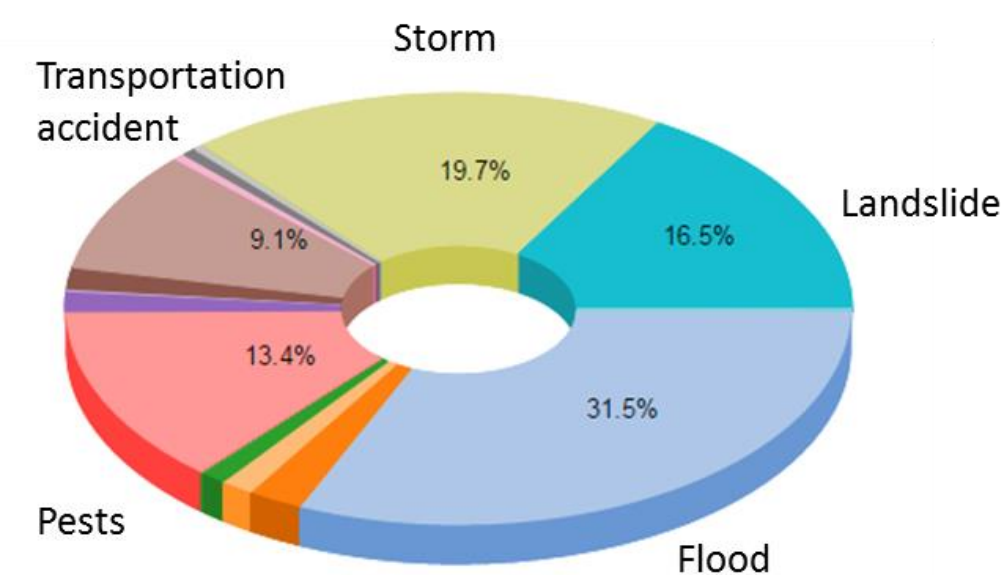
Figure 3. 3 Number of disaster in Indonesia 1815 - 2015

The second reason is environmental degradation. The increase in the world population has placed more growing demands of the land for the settlements (United Nations Population Division, 2011). The rate of environmental degradation and destruction still pose a threat to many countries that were increasing disaster events, such as floods and landslides (Harwitasari 2009). Moreover, the impact of global climate change affects Indonesia which consists of thousands of islands (Setiadi et al. 2009). The combination of environmental degradation and climate change is increasing the number of disaster, especially those that are hydro-meteorological disasters (Alexander et al. 2013).

National Disaster Management Agency (BNPB) also provide some data that showed the effects of natural disasters from 1815 to 2015 in Indonesia. From these data, it can be seen that the natural disasters caused more than 300 thousand people died, more than 20 thousand people are missing,

and more than 400 thousand people were injured (see **Figure 3.4**). This natural disaster events also generated more than 9 million people homeless. On the other hand, based on data from BAPPENAS, disasters from 2004 to 2014 caused economic losses of IDR 167 trillion (USD 15 billion). Damage to infrastructure and some sectors such as education and health are the most severely affected (Bappenas 2014).
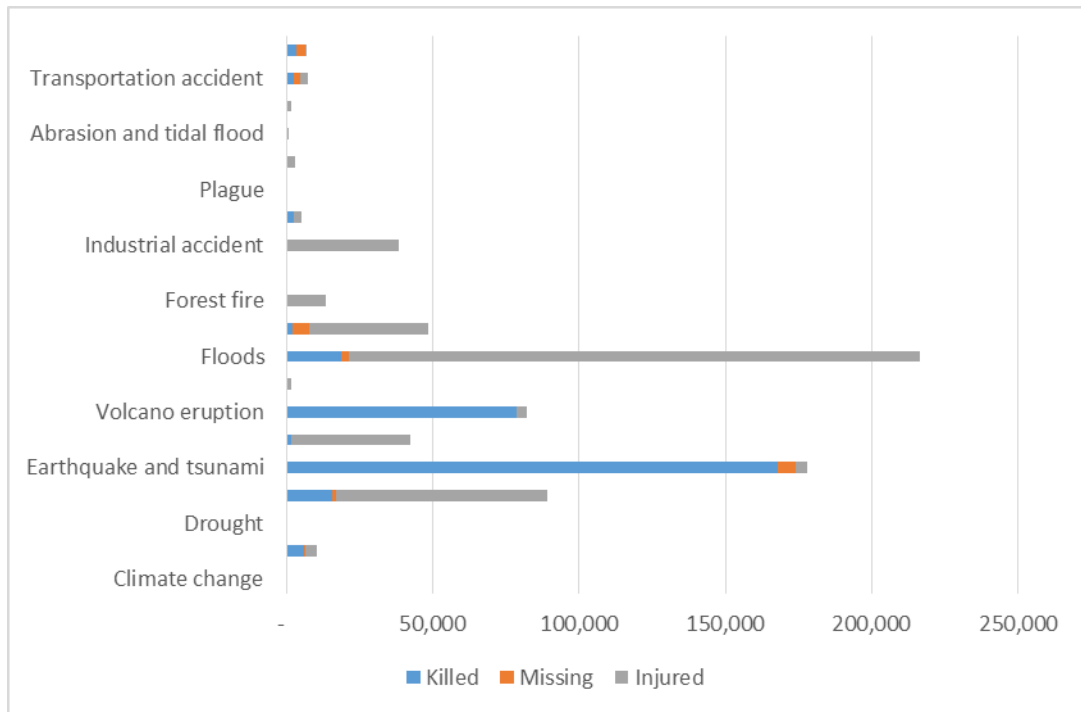
Figure 3. 4 The impact of disasters in Indonesia

BNPB on their report about The Impact of the Disaster in Indonesia year 1815 - 2015 found that the natural disasters that caused most people killed are disasters categorized as geological disasters, such as earthquakes and tsunamis (over 170 thousand people) and volcanic eruptions (more than 70 thousand people). Meanwhile, a disaster that causes most people homeless is flooded (caused more than 5 million people were displaced from 1815 to 2015) (see **Table 3.4**).

Table 3. 3 The impact of the disaster in Indonesia (1815 – 2015)

Disaster hazard	Killed	Missing	Injured
Climate change	137	0	55
Conflict	6,022	476	4,123
Drought	2	0	0
Earthquake	15,518	1,513	72,297
Earthquake and tsunami	167,779	6,333	3,988
Epidemic	1,515	0	41,080
Volcano eruption	78,627	7	3,603
Residential fire	332	6	1,437
Flood	18,934	2,548	195,018
Flash flood	2,307	5,376	40,826
Forest fire	37	0	13,485
Famine	55	0	112
Industrial accident	107	2	38,142
Landslide	2,449	219	2,490
Plague	40	0	0
Storm	346	41	2,744
Abrasion	160	49	228
Terrorism	324	0	1,233
Transportation accident	2,758	1,995	2,592
Tsunami	3,519	2,957	273
Total	**300,968**	**21,513**	**423,756**

3.4 Disaster management history in Indonesia

3.4.1 Paradigm and policy

From 1966 until today, Indonesia has adopted four types of disaster management paradigm:

1. Relief Paradigm / emergency response (in the1960s)

    The paradigm of relief/emergency response is focused on disaster management when the disaster has occurred through emergency relief efforts, such as food distribution, building the shelter, and health services. The main purpose of these activities is to alleviate the suffering of victims and repair the damage caused by disasters and immediately accelerate recovery efforts (Bidang and Dan n.d.).

2. Mitigation Paradigm (in the 1980s)

    In the paradigm of mitigation, disaster management focused on efforts to control the hazards and behavioral of individuals/communities that lead them more vulnerability to disasters with mitigating or minimize (physical/structural) the impact of the disaster (Henderson 2004). While mitigating against the patterns of behavior that are vulnerable through non-structural, such as counseling, relocation of settlements, building codes and spatial planning.

3. Development Paradigm (in the 1990s)

    Development paradigm is the paradigm in which disaster management, which focuses on the factors that inherent and cause the vulnerability of communities to disasters (BNPB 2013). Disaster management is associated with the development sectors, such as poverty, quality of life, land ownership, access to capital, little education, and technological innovation.

4. Disaster Risk Reduction Paradigm (in the 2000s)

    This paradigm is a combination of technical and scientific viewpoints on social, economic, political and environmental. Disaster management starting from analyzing disaster risks based threats/hazards and vulnerability, to improve the ability to manage and mitigate risk, and reduce the impact of disasters caused (Government and Team 2009). Disaster

management conducted jointly by all stakeholders, cross-sector and community empowerment.

A paradigm shift in disaster management is internationally marked by growing awareness of a disaster risk reduction that began in 1990. In Yokohama, May 1994 which produces the Yokohama Strategy and Plan of Action. UN Economic and Social Council issued Resolution No. 63 of 1999 on the International Decade for Disaster Reduction (1990 to 1999). Furthermore, attention to the implementation of the UN International Strategy for Disaster Risk Reduction (ISDR), then followed up by a conference of the world until born the Hyogo Framework for Action for Disaster Risk Reduction (UNISDR, Hyogo Framework for Action 2005-2015 2005).

Disaster Risk Reduction (DRR) is a systematic effort to develop and implement policies, strategies and actions that can minimize the loss of life or damage to assets and property from disasters through mitigation of structural (physical) and non-structural mitigation (non-physical). Disaster risk is a possibility of an impact assessment which is expected if the threat became a disaster.

Disaster risk reduction aims to reduce the level of damage and losses that could be caused by a disaster. Included in DRR activities is an adaptation to climate change. The lack of disaster risk reduction and adaptation to climate change such as the lack of preparedness and mitigation, impact on extensive scale damage in various forms. The loss includes aspects of the physical/material, as well as social, economic and psychosocial.

Disaster risk reduction implemented in all phases of disaster management and more driven implementation at the pre-disaster phase. In the pre-disaster phase, Disaster risk reduction is intended to strengthen the capacity and reduce the vulnerability of communities through activities of prevention and preparedness (Khailani and Perera 2013b). In the emergency phase, Disaster risk reduction focus on activities for the rescue effort and assets to reduce casualties and losses (Kapucu and Garayev 2011). In the post-disaster phase, Disaster risk reduction combined with the recovery and rehabilitation process to build a better one (Rezaei-Malek et al. 2016).

3.4.2 Institution

Before the National Disaster Management Agency (BNPB) given a mandate as a coordinator of the disaster management system in Indonesia, the Indonesia government has a long history of disaster management institution. Disaster management institutions in Indonesia began in 1966 by forming BPKKP (Family Helper and Victims of War Agency). This agency is considered a forerunner of the currently named BNPB (see **Table 3.4**).

BPKPP was initially formed by the government in 1945 to help victims of the war in defending Indonesian independence. After Indonesia gained its independence, in 1966 the government established the Central Natural Disaster Management Advisory Board (BP2BAP) through a Presidential Decree to handle natural disasters. Then due to the increasing frequency of natural disasters, the government realized the importance of managing natural disasters more planned and coordinated. Therefore, in 1967 the government formed the National Disaster Management Coordination Team (TKP2BA). Next TKP2BA will be upgraded to the National Disaster Management Coordinating Board (BAKORNAS PBA) which is coordinated by the Minister of Social Affairs and formed by a Presidential Decree. As an operational description of the Presidential Decree, the Minister of Home Affairs formed the Coordinating Unit for the Implementation of Natural Disaster Management (SATKORLAK PBA) for each province.

Then the Government began to realize that the disaster was not only a natural disaster but also a disaster caused by humans, such as transportation accidents and technological failures. That is the main reason for the replacement of the National Disaster Management Coordinating Board to be the National Disaster Management Coordinating Board (BAKORNAS PB). Based on the Presidential Decree, the scope of work of BAKORNAS PB was expanded, not only dealing with natural disasters but also disasters caused by humans. At this stage, disaster management has begun to be cross-sectoral, cross-actor, and coordinated across disciplines.

Table 3. 4 Institutional histories of disaster management in Indonesia

No	Year	Name of Agency	Legislation
1	1966	Family Helper Agency Victims of War Agency (BPKKP)	-
2	1966 - 1967	Advisory Board Natural Disaster Relief Center (BP2BAP)	Presidential Decree No. 256 of 1966
3	1967 - 1979	National Coordination Team for Natural Disaster Reduction (TKP2BA)	Decision No. 14 / U / KEP / I / 1967
4	1979 - 1990	National Coordinating Agency for Natural	Presidential Decree No. 28 of

No	Year	Name of Agency	Legislation
		Disaster Management (Bakornas PBA)	1979
		Implementation Coordination Unit of Natural Disaster Management (SATKORLAK PBA) in every province.	Ministry of Home Affairs with instruction no. 27 1979
5	1990 - 2000	National Coordinating Agency for Disaster Management (BAKORNAS PB)

BAKORNAS PB scope of work was expanded, not only deal with natural disasters but also human-made disasters | Presidential Decree No. 43 of 1990

Presidential Decree No. 106 of 1999. Disaster relief requires the handling of cross-sector, cross-actors, and interdisciplinary coordinated. |
6	2000 - 2005	National Coordinating Agency for Disaster Management and Refugees (BAKORNAS PBP)	Presidential Decree No. 3 which is updated by Presidential Decree No. 111 of 2001
7	2005 - 2008	National Coordinating Agency for Disaster Management (BAKORNAS PB)	Presidential Decree No. 83 of 2005
8	2008 - now	National Disaster Management Agency (BNPB)	President of the Republic of Indonesia Regulation No. 8 2008

Source: (Nasional and Bencana 2008b)

3.5 New paradigm of disaster management system in Indonesia

3.5.1 Paradigm shift from reactive to disaster risk

Law Number 24 of 2007 on Disaster Management Law (DML) establishes the foundation for the disaster management legal framework in Indonesia. DML is hailed as the first comprehensive regulation which describes national and local government responsibilities, community rights and obligations, roles of corporations and international organizations, the disaster management stages, and specifications, and disaster aid finance and management.

The implementation of disaster management in Indonesia, according to the mandate of DML is based on the Constitution of the Republic of Indonesia Year 1945. In Article 3, it is mentioned that the basics of disaster management include the humanitarianism; justice; equality in law and governance; balance, harmony; legal certainty; togetherness; environmental sustainability; and

science and technology. DML also mentioned the main principles of disaster management including fast and specific; priority; coordination and cohesion; efficient and effective; transparency and accountability; partnerships; empowerment; and non-discriminatory.

DML mentioned that the local governments become primary responsibility in disaster management. This responsibility, in accordance with Article 6, including disaster risk reduction and integrating disaster risk reduction into development planning; the protection of society from the impact of the disaster; guarantee the fulfillment of the rights of refugees fairly and in accordance with the minimum service standards; conducting post-disaster recovery; allocate a budget for disaster risk reduction activities; and maintenance of essential documents from the impact of disasters.

The disaster management system in Indonesia builds in four pillars of disaster management activity. These pillars are legislation, planning, institution, and financing. This system is derived from the Indonesian disaster management vision which aims to create a society that is resilient in the face of disaster (see **Figure 3.5**).
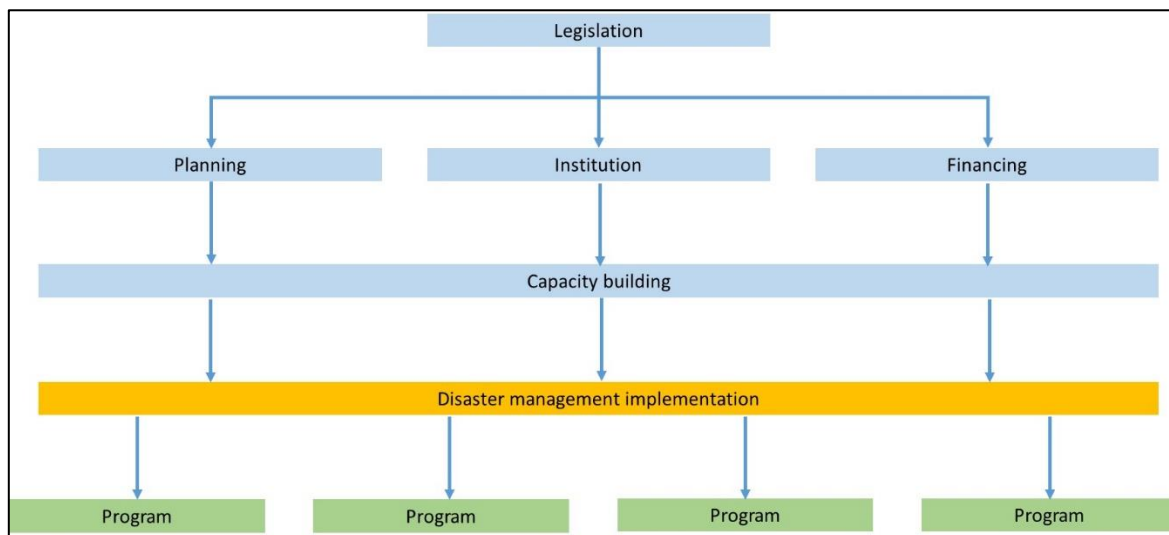
Figure 3. 5 Disaster Management System in Indonesia

Source: Adopt from BNPB, 2014

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Disaster risk reduction (DRR) paradigm changes the mindset of disaster management activities from the responsive approach into a preventive approach. In conducting the risk management activities, the government is carried out some stages: first separates the potential disasters that threaten the risk element. This action is known as prevention (risk avoidance). If the potential for disaster cannot be divided, then efforts are the reduction of risk (risk reduction) or known as mitigation. Mitigation can be done either structural or non-structural. When risk reduction activities have been done, but there is still a significant risk it is necessary to transfer risks to other parties instance through a disaster insurance system. If the third such action has been done, but there is still a risk, then the latter does accept the risk (risk acceptance) and undertake preparedness efforts. In risk management activities can be described in the program: prevention and mitigation; early warning; and preparedness (BNPB 2010b). Disaster risk reduction framework above suggests a link between DRR with sustainable development. In the context of sustainable development, efforts to build awareness through a series of activities with due regard to the risk assessment so that it appears a commitment from all parties to implement the DRR (Bappenas 2014).

To achieve these goals need the involvement of various institutions (Ministry / Agency), which acts as the leading agencies and supporting agencies (see **Figure 3.6**). The primary institution is an institution that has the lead role and coordinates disaster prevention activities. While relevant agencies work as support institution that assists the leading institution in achieving the target. DML states that BNPB has the function of coordinating the implementation of disaster management activities. This is different from the primary institution of programs that specifically categorized follow the characteristics of the disaster, where the major institution could be more than one agency.
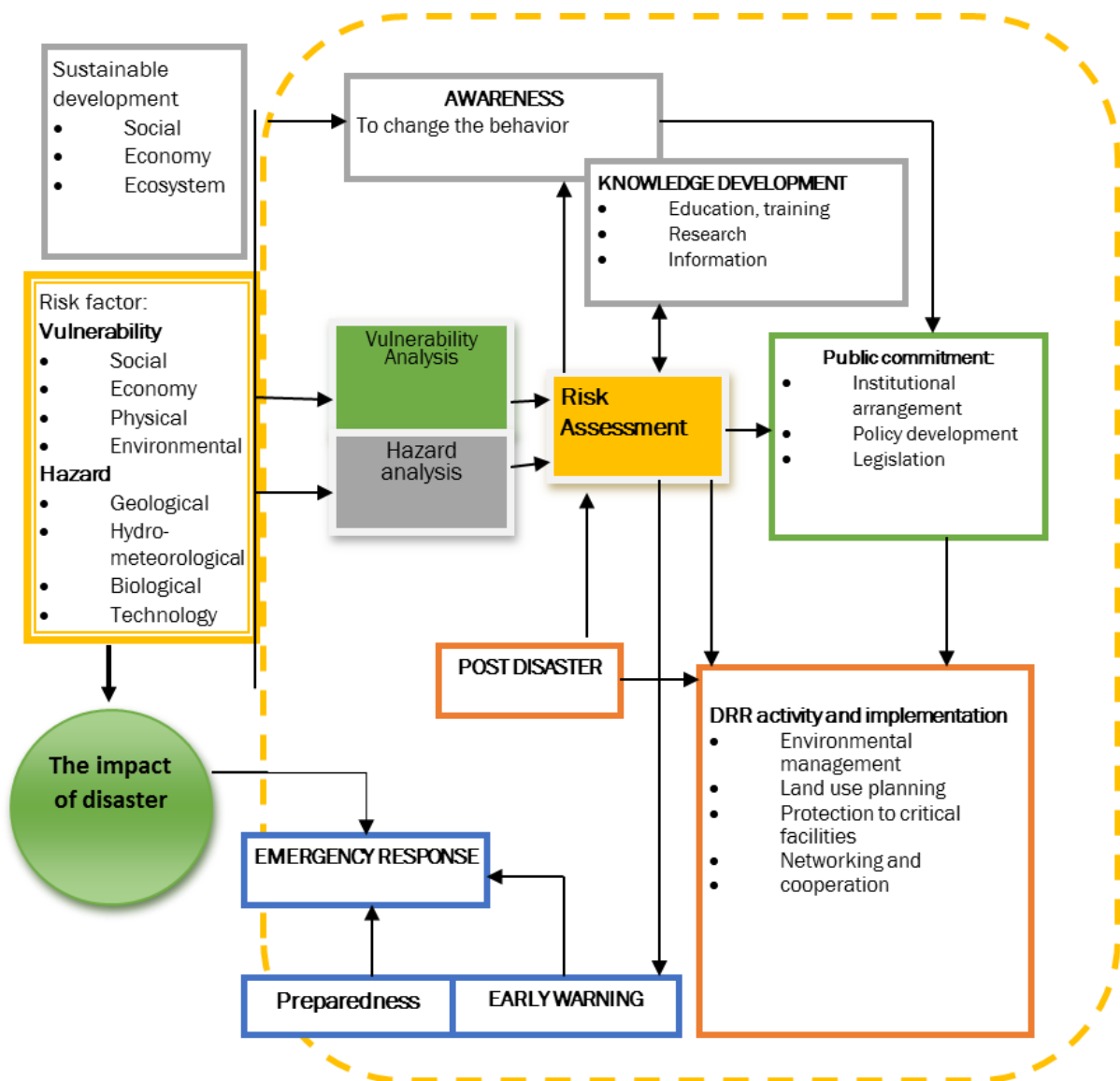
Figure 3. 6 Disaster risk reduction according to DML

Source: Adopt from BNPB, 2014

3.5.2 Institutional set up for disaster management

Based on DML, Indonesia Government established the disaster management institutions called the National Disaster Management Agency (BNPB) at the national level and Regional Disaster Management Agency (BPBD) at the local level. BNPB replaces the National Coordinating Board for Disaster Management (BAKORNAS-PB), and BPBD replaces SATKORLAK in provincial level and SATLAK in municipal level (BNPB, 2010).

Table 3.5: Comparison Function between BAKORNAS PB and BNPB

Factor	BAKORNAS PB	BNPB
Legal	President decree	Law
Institutional	Nonstructural/ad hoc agency and have responded to President	Structural minister-level agencies
Function	a. Provide national policy on disaster management and emergency response; b. Coordinate of activities and budget allocations across sectors in the implementation of disaster management and emergency response; c. Provide guidelines for disaster management and emergency response activities; d. Provide support, assistance and social services, health, infrastructure, information and communications, transportation and security and other support issues related to disasters and emergencies.	**Steering committee:** a. formulate the national disaster management policy; b. monitoring, and evaluating the implementation of disaster management. **Implementing:** Coordination, giving the command and execute disaster management operations.
Leader	Vice President	Head of BNPB
Committee member	Related ministry Head of the military (TNI) Head of the police department	Steering committee: a. Government Officials of Echelon I, or equivalent, which is proposed by the minister; b. Professional

Source: Adopt from BNPB, 2014

From the Table 3.5, regarding authority, it can be seen that BNPB has more extensive power than BAKORNAS PB because BNPB is a ministerial-level institution and have a broader function in all phases of the disaster (pre-disaster, emergency, and post-disaster) (see **Table 3.5**).

Based on DML, BNPB act as the primary agency that managed the disaster management at the national level. BNPB is a government agency under the President and led by the chief as minister-level officials. Besides responsible for formulating and establishing disaster relief and emergency response effectively and efficiently, BNPB also responsible for disaster management pre-disaster activities at national level.

BNPB cooperation with other ministries, institutions, and agencies to manage the disaster. For search and rescue activities, BNPB in collaboration with the Indonesian National Army (TNI), the Indonesian National Police (POLRI), the National SAR (Search and Rescue) Agency and the Indonesian Red Cross (PMI). For the handling of refugees, BNPB cooperates with the Ministry of Social Affairs (KEMENSOS). For the mapping of vulnerable areas, BNPB working with Geospatial Information Agency (BIG) and the ministry/agency which specifically deal with specific threats. For the development of early warning systems, BNPB cooperation with the Ministry of Energy and Mineral Resources (ESDM) and Meteorology, Climatology and Geophysics Agency (BMKG). For geological disasters, in collaboration with the Ministry of Public Works, Ministry of Agriculture, Ministry of Forestry. For Hydro-meteorological disasters, BNPB working together with BMKG, and supported by institutions associated with research such as the Ministry of Research and Technology (RISTEK), the Agency for the Assessment and Application of Technology (BPPT), Indonesian Institute of Sciences (LIPI) and also supported by the some universities (BNPB, 2010).

For the implementation of disaster management at the national level, BNPB in collaboration with other agencies establishes the National Disaster Management Plan (RENAS PB) with a term of five years. This plan describes the goal of the disaster management policy in the next five years. This plan outlines the type of hazards, vulnerability, and capacity. Next, this plan explains the disaster risk analysis which focuses on priority programs and activities that will be taken include the involvement of each agency/organization and the amount of required budget annually.

At the local level, BPDB established to play a unique role to manage disaster management. BPBD formed at the local level, both at the provincial and municipal. The primary function of BPBD is to

formulate and establish disaster management policy, carry out emergency response, and undertake coordination of the implementation of disaster management activities (Guna et al. 2013). BPBDs is local government agencies under the local leader, and the establishment and function need to follow the rules that drawn up by the Ministry of Home Affair as the supervisor of local government.

In a normal situation, disaster risk reduction activities implemented by the Ministry/Local Agency with a particular role or function (see **Figure 3.6**). For example, structural mitigation activities such as dams and flood control are the responsibility of the ministry or local agency of Public Works. Preparation of logistics for refugees in emergencies is the duty and responsibility of the ministry or local agency of Social Affairs. Moreover, capacity building of local government is the responsibility of the Ministry of Home Affair. In ordinary situations, BNPB and BPBDs also have a position as a coordinator and implementing the prevention, mitigation, and preparedness activities. One of the main reason why coordination is essential is that some disaster risk reduction activities will require cooperation between various agencies.
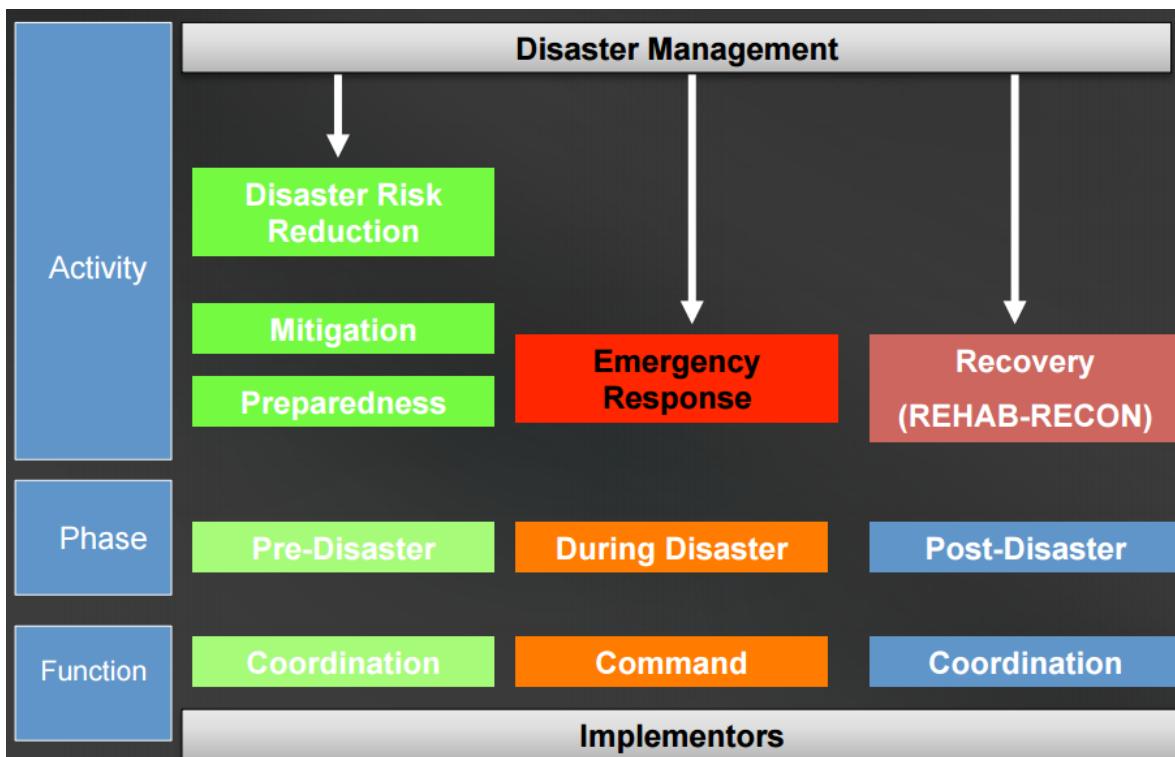
Figure 3. 7 The Function on BNPB/BPBDs
Source: Adopt from BNPB, 2014

During the emergencies, BNPB and BPBDs perform the functions of commander, coordinator and simultaneously manager of emergency response activities. In this situation, BNPB and BPBDs should organize the other agencies in emergency response operations, such as search and rescue and deliver the logistics. In post-disaster situations, BNPB and BPBDs back to perform its functions as coordinator and implementer of recovery activities, such as rehabilitation and reconstruction.

CHAPTER 4

DISASTER MANAGEMENT SYSTEM FOLLOWING DECENTRALIZATION IN INDONESIA: REGULATION, INSTITUTION ESTABLISHMENT, PLANNING, AND BUDGETING

4.1 Introduction

Disasters are nearly always experienced locally. It is very uncommon for a disaster to hit an entire country simultaneously. The literature on disaster management contends that the role of local government is essential in delivering effective disaster management. Local governments' unique position fosters an informed understanding of community needs (Kim et al. 2016). Building effective disaster governance is one of the most significant challenges faced by any country in efforts to reduce the effect of disasters. The Hyogo Framework for Action (HFA) was signed in 2005 and reinforced with the Sendai Framework for Action (SFA) in 2015, and one of the priorities of this global framework is to improve the functioning of local governments as key players in disaster management (Jones, Aryal, and Collins 2013).

Disaster management presents a significant challenge for governments, especially in developing countries. They face the numerous issues associated with a lack of human resources, political instability, and economic mismanagement by governments (Setiadi et al. 2009). As noted, the local government is expected to play a leading role in disaster management. Therefore decentralized disaster management systems should be developed, and this is another challenge for Asian developing countries, most of which are in the process of decentralization. Thus, to determine what type of decentralized disaster management system should be designed is a critical issue in those countries.

A consensus has emerged that the decentralization of the disaster management sector improves the effectiveness and responsiveness of disaster risk governance. Many researchers have acknowledged that decentralization can increase transparency (Swyngedouw 2003), strengthen local government, and improve the functions of government in providing public services (Kahkonen and Lanyi 2001). Some researchers, such as Tiebout (1956), Oates (1972), Tresch (1981), Breton (1996), and

Weingast (1995) have stated that public services are most efficient when managed at the closest level to the society they serve (Bardhan 2002) (Chu and Yang 2012)(Blackburn 2014)(Saavedra-costas 2009)(Erland Danny Darmawan Spv et al. 2008). Because local governments generally understand the needs of the people they serve better than other entities, it could be concluded that local governments are more likely to be capable of effectively using public funds, and that inter-regional rivalry may even increase innovation. Decentralization is a fundamental element in disaster management. The supposed beneficial effect of decentralized disaster management is based on the assumption that it could increase the role of local government as the leading actor responsible for disaster management (Ainuddin and Routray 2012). The role of local authorities is critical because local government is usually the best- informed concerning the domestic threat about potential disasters and vulnerabilities, as well as an active channel for the public to express their opinions (Rumbach 2015a). However, few studies have examined the relationship between decentralization and disaster management. The widely cited study by Rumbach (2015) analyzes the impact of decentralization on disaster management policy in medium to small-sized cities (Rumbach 2015a). His qualitative case study research was based in West Bengal, India, and he concluded that decentralization had yet to reduce the distance between citizens and the government adequately. One explanation for this was that opportunities for participation in local authorities were rare because there was no mechanism involving the community in the decentralization of disaster management.

Formally, based on the regulation, decentralization in Indonesia is marked as the transfer of government authority by the central government to the local government (provincial and municipal government) within the framework of The Unitary State of the Republic of Indonesia (NKRI) (Kustiawan 2004). The political system and administration of local government in Indonesia consist of two levels of government, namely the provincial government and municipal government. In principle, the difference between responsibility and authority between the provincial government and the municipal government is on the scale of power (Brodjonegoro 2001). The municipal government carries out jurisdiction that is following the conditions and the potential of natural resources. Whereas jurisdiction that is carried out by the provincial government are matters that have the impact or benefit of the inter-municipal relationship (Samosir 2008). In managing the budget, the provincial and municipal governments are given the autonomy to control the local budget following the needs and priorities of the region.

In the concept of decentralization in Indonesia, the municipality is an autonomous region which represents the actual implementation of decentralization by having broad and responsible autonomy rights (Erland Danny Darmawan Spv et al. 2008). While the provincial position is the representative of the central government, so it does not have a hierarchical relationship with the municipal government (Sistiana and Makmur 2004). Organizationally, provincial and municipal governments have autonomous government systems, and legislative bodies called provincial or municipal parliaments (DPRD).

The challenges of decentralized disaster management seem familiar to all developing countries. Marks and Lebel, in their study of the post-flood situation in Thailand (2011) explained that, despite being decentralized, the coordination between different levels of government remained weak (Marks and Lebel 2015). The state often adopted a policy and acted without coordination with local authorities; therefore, implementations were not practical. Sharma et al. have claimed that decentralization is an opportunity for local governments to manage disaster policy more broadly (Sharma, Scolobig, and Patt 2012). However, the author mentions that decentralization also sometimes increases the disaster risk, in situations where local governments may abusing the authority for seeking corruption due to the broader opportunity offered by decentralization (Sharma et al. 2012).

These circumstances should not be permitted to weaken the function of local government as the leading actor responsible for disaster management. Strengthening local government capacity is a reasonable approach for improving the quality of disaster management services for the people. This research is expected to facilitate renewed discourse concerning disaster management systems operating at the local level. Despite all its various limitations, the local government must be involved as a critical actor to develop disaster management systems for the people.

In this study, we take Indonesia as a case study because it is an interesting study site for exploring disaster management within the framework of decentralization. Nearly two decades ago, Indonesia applied the concept of decentralization almost simultaneously across the administrative, political and fiscal domains (Shah and Thompson 2004). ―Big-bang decentralization" changed Indonesia from one of the most centralized into one of the most decentralized countries globally (Leer 2016). Decentralization reform in Indonesia began with the enactment of Law No. 22 on Local Governments (1999), better known as the Local Autonomy Law. This legislation changed the overall implementation of the governance system in Indonesia (Sjahrir, Kis-Katos, and Schulze

2013). In line with the decentralization ethos throughout all governance sectors, in 2007 the Indonesian government implemented a Disaster Management Law (DML) as an application of the HFA at the state level. The primary purpose of this new legislation was to bring government closer to the people through increasing participation and democratization, thus creating a disaster management system that was efficient and more transparent (Rossum and Krukkert 2010). Disaster governance in Indonesia has developed based on four aspects, namely, the drafting of regulations, strong institutional establishments, comprehensive planning, and the availability of adequate funding. Concerning the fourth aspect, the funding provision is divided, based on equal responsibilities between the central, provincial, and municipal governments, under the principle of decentralization (Government and Team 2009).

The first objective of this study was to identify the outline of the disaster management system after the decentralization in Indonesia. The second objective was to understand how the disaster management system has changed, and the opportunities and challenges are arising following decentralization. Third objectives were to explore changes among key actors in the disaster management system, and horizontal and vertical networks in the disaster management system, before and after decentralization. And the last objective was to examine how challenges to the disaster management system under decentralization might be overcome.

4.2 Methodology

4.2.1 Data source

The data for this study was based on in-depth interviews with government officials, examination of official government documents, and direct observation at several study sites (see **Table 4.1** and **Figure 4.2**). In-depth interviews were conducted with 32 government officials involved in decentralization and disaster management in Indonesia at the national level (comprising representatives from the Ministry of Home Affairs, the National Disaster Management Agency, and the National Development Planning Agency), and with local governments (see **Table 4.2**). The majority of respondents were senior officials in each agency, with the following details: three directors, six sub-directorate heads (KASUBDIT), nine section heads (KASI), five chiefs of division (KABID), and nine senior staff.

The municipal government is targeted in this study because, in the Indonesia decentralization context, the municipal government is the level of local government that has broad autonomous authority (Sari et al. 2014). Besides that in the context of disaster management, municipal governments are the level of local governments whose primary responsibility is in the event of a disaster (Djalante, Thomalla, Sabaruddin, et al. 2012).

Table 4. 1 Data collection method

No	Methods	Activities
1.	In-depth interview	Conducted interview with 32 officials in national and local government level.
2.	Focus group discussion (FGD)	With local government official
3.	Direct observation	Following five national-level meeting organized by related ministries
4.	Literature review	Official documents related to decentralization & disaster management

We targeted interviews with representatives of local authorities especially those from institutions that have tasks related to disaster management in three cities (Bogor, Sleman, and Sidoarjo) (see **Figure 4.1**).

The selected location of the case studies in this study was not chosen randomly but by information-oriented sampling. Two criteria are set for case selection: (1) each municipality is selected based on the characteristics of different natural hazards. The concept of decentralization in Indonesia provides a broad opportunity for the local government to develop the region following its strength and opportunity (Kustiawan 2004) (Brodjonegoro 2004). Besides, the local government also formulate policies to overcome existing weaknesses and threats, including potential natural hazards (Ahmed 2009). The type of natural hazard is one of the foundations for the local government in developing disaster management systems and policies (BNPB 2010a). (2) The municipality is also

chosen based on the number of population. Municipalities with high population are expected to be able to develop a more structured disaster management system. Therefore we use population size as criteria. Based on the number of population, the Indonesian Government divides cities in Indonesia into four types: metropolitan (more than 1 million), big urban (500,000 to 1 million), medium urban (100,000 to 500,000), and small urban (less than 100,000). We selected case studied municipalities with a different type of disaster and different population size. We chose three municipalities as the location of the case study, namely Sidoarjo, Bogor, and Sleman. Sidoarjo is a metropolitan city located in East Java and has a vulnerability to flooding, then Bogor is a big urban type municipality located in West Java and is vulnerable to landslides. And Sleman is a medium urban type municipality, located in a Special Region of Yogyakarta, has experience of being affected by volcanic eruptions.

The selection of the study areas was based on differing characteristics of the primary natural hazards involved in the three regions. Bogor is a municipality located in West Java province and has a high prone level to landslides because of its predominantly hilly area. Next selected area is Sleman, municipality located in Special Province of Yogyakarta, affected by volcanic eruptions frequently. And the last selected case study is Sidoarjo, located in East Java province with a high level of flood risk. Interviews were conducted in March 2016, and interviewees were asked the following questions: 1) How does your agency develop the disaster management system?; 2) Who is influenced and affected by the relevant regulations and institutions?; 3) How does the DML influence the planning and budgeting system?; and 4) How do you develop cooperation with other institutions?

Table 4. 2 List of the respondents

Institution	Level of government	Number of respondents
Ministry of Home Affair (MOHA)	National	8
National Disaster Management Agency (BNPB)	National	7
National Development Planning Agency (BAPPENAS)	National	4
Ministry of Finance (MOF)	National	3
Regional Disaster Management Agency (BPBD) Bogor	Municipality	3
Regional Disaster Management Agency (BPBD) Sidoarjo	Municipality	3

Regional Disaster Management Agency (BPBD) Sleman	Municipality	4
TOTAL		**32**

Figure 4. 1 Location of selected areas

From interviews with central and local government officials, to be noted for the datasets, the respondent should mention the name of the institution (related to regulation, institutional establishment, planning, and budgeting), roles and relationships with the other institutions represented by respondents; so the author can verify the actuality of a recognized institution through regulation and the official documents. Non-governmental organizations, academia, donor agency, and non-standard and unidentified government institutions are not included in the dataset.

Figure 4. 2 Data collection activities

4.2.2 Analytical method

In this study, we used two types of approaches to analyzing data. The first analysis was to find out how disaster management experienced changes after decentralization; we used explanatory analysis by analyzing qualitative data obtained from interviews, focusing on discussion discussions, and direct observation. Next, to understand the structure of inter-governmental relationships in the context of disaster management implementation, we analyzed the dataset using social network analysis (SNA). SNA is a quantitative approach for examining the strength of relationships among stakeholders in a system (Dos Muchangos, Tokai, and Hanashima 2017). It offers a method for

analyzing patterns of social interaction occurring between individuals within a particular community (Abbasi and Kapucu 2012)(Groenen et al. 2016) as well as statistical methods to uncover relationships among individuals within a specific population (Lienert et al. 2013). SNA was used to examine the relationship between actors (individuals and particular organizations) and calculate the extent to which each actor played a role in the network (Bisri 2013). The UCINET 6.0 Social Network Analysis program was used to carry out SNA.

To compare networks before and after decentralization of disaster management, we used density measurements. The primary goal of these measurements is to understand the proportion of all relationships that exist in a network (Bisri 2016). By using density measurements, information concerning the number of connections made or the ties connecting each actor in a network can be obtained. After analyzing the density of each network, we then examined the centrality of each network. Centrality analysis determines the importance of a node based solely on the relationship structure (Lassa 2015). This analysis aims to answer the fundamental question: who is an essential or central actor in the network? For this purpose, we focused on three aspects of centrality: ‚degree of centrality,‘ ‚betweenness of centrality,‘ and ‚closeness of centrality.‘

The ‚degree of centrality‘ is defined as the number of bonds that a node has. In a network, the actor with the highest degree of centrality is regarded as the key actor of the network. Next, the ‚betweenness of centrality‘ is calculated by summing all the shortest paths containing the nodes. Betweenness centrality shows how often a node is passed through by another node to go to a particular node on the network. This value serves to determine the role of actors who become bridges or links to interaction in the network. Last, the ‚closeness centrality‘ measures the degree of centrality in a social network through focusing on how close an actor is to all other actors (Lienert et al. 2013)(Rombach et al. 2012).

From **Figure 4.3**, it can be seen that node B and D are connected with three bonds with nodes and have the highest degree. Next, the ‚betweenness of centrality‘ is calculated by summing all the shortest paths containing the nodes. Betweenness centrality shows how often a node is passed through by another node to go to a particular node on the network. This value serves to determine the role of actors who become bridges or links to interaction in the network.
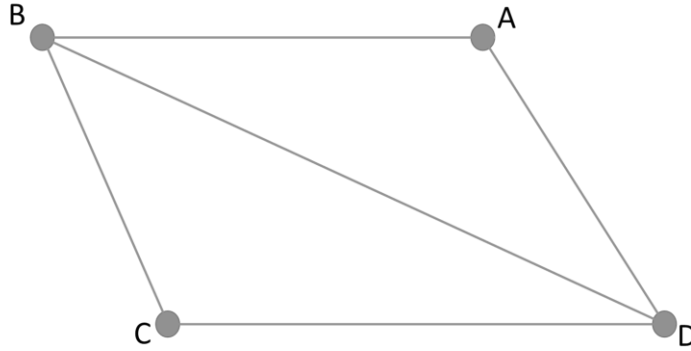
Figure 4. 3 Example network to explain the concept of centrality

To calculate the value of ‚betweenness centrality' for each node can use the equation (1):

$$C'_B(i) = \frac{2\sum_{j<k}\frac{p_{jk}(i)}{p_{jk}}}{(n-1)(n-2)} \quad ....(1)$$

$C'_B(i)$ is the value of betweenness centrality for node i, P_{jk} (i) is the number of the shortest paths between nodes j and k that pass through i, whereas P_{jk} is the number of the shortest paths between j and k. Based on **Figure 1**, we can calculate the ‚betweenness centrality' for node B is C'_B (B) = (2×0.5) / (3×2) = 1/6. Last, the ‚closeness centrality' measures the degree of centrality in a social network by focusing on how close an actor is to all other actors (Lienert et al. 2013)(Rombach et al. 2012). To calculate the value of ‚closeness of centrality' for each node can use the following equation:

$$C_c(i) = \frac{n-1}{\sum_{j=1}^{n} d(i,j)} \quad ....(2)$$

From the equation (2), $C_C(i)$ is the value of closeness centrality for node i, d (i, j) is the distance between nodes i and j, while n is the total number of nodes contained in the network. From the

Figure 1, then we can calculate the value of closeness centrality for node A is C_C (A) = 3 / (1 + 2 + 1) = 0.75.

4.3 Regulation

4.3.1 The overview of regulation shift after decentralization

The DML, enacted in 2007, sets out the responsibilities and expectations of central and local government, community preparedness, and emergency assistance during a disaster (BNPB 2013). It also regulates the obligations and responsibilities of the community and donor agencies, as well as the private sector. Previously, the community had always been viewed as victims and had limited participation in disaster management, especially in the pre-disaster phase. The DML provided space for the community to participate actively in disaster management. Moreover, the DML addressed disaster financing, which is now the responsibility of both central and local governments. In other words, this legislation obliged all parties to view and develop disaster management systems more seriously to ensure these systems become an integral part of the state administration system (BNPB 2011).
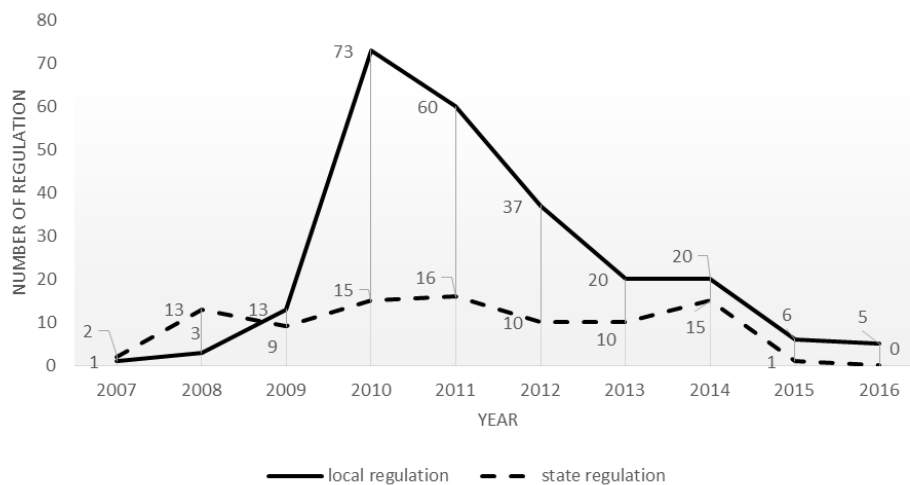
Figure 4. 4 The number of state regulations and local regulations developed from 2007 to 2016

This delegation of authority has encouraged local governments to develop disaster management systems in respect of their specific natural hazard characteristics and conditions of vulnerability. Local government is also required to promote its governance capacity as part of balancing the level

of risk. The DML has become a foundation for local governments to develop regulations for implementing disaster management at the local level (BNPB n.d.). Based on data from the Law Bureau Ministry of Home Affairs (MOHA) (see **Figure 4.4**), there was a significant escalation in developing state and local regulations related to disaster management in the period from 2010 to 2012. Based on our in-depth interviews with central government officials, this enhancement can be considered as due to financial support from central government and donor agencies to assist local governments (provinces and municipalities) to establish local regulations.

4.3.2 Challenges and opportunities on regulation of disaster management

However, the increasing number of disaster management regulations at the local level has not been followed by a proper synchronization with other regulations. The development of local regulations on disaster management requires reference to two guidelines issued by two different agencies, namely, the MOHA and the National Disaster Management Agency (BNPB). As the Regional Disaster Management Agency (BPBD) is a local government agency, it is under the responsibility of the MOHA (interview with a MOHA official, 2016). Regulation from the BNPB is also necessary for providing technical guidance for disaster management (see **Figure 4.5**). The general structure of disaster management regulation at the local level has to follow MOHA regulations, as the MOHA is the ministry authorized to approve regulations.
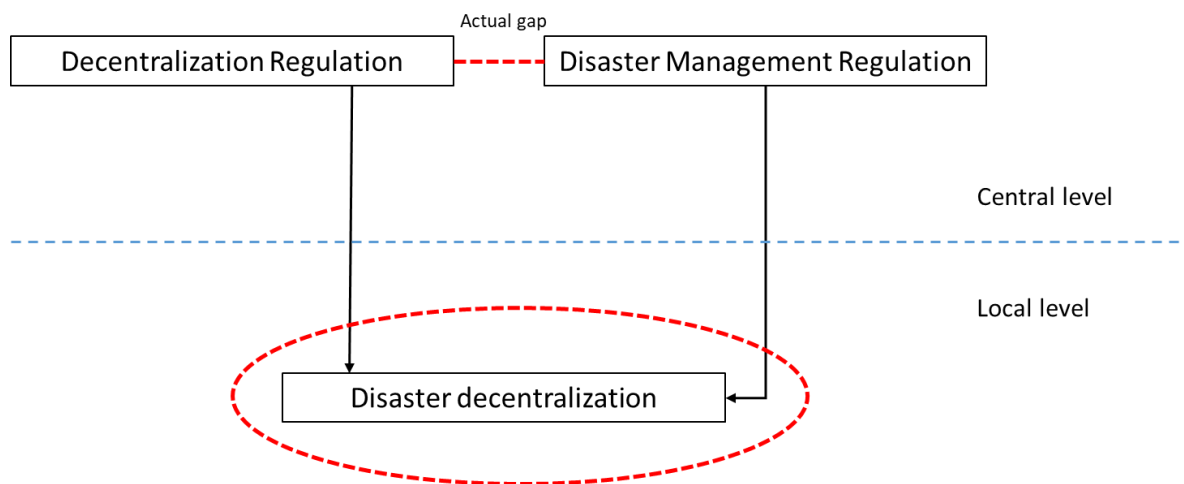
Figure 4. 5 Regulatory framework of decentralized disaster management in Indonesia

At the same time, to a substantial extent, local regulations concerning disaster management structures must also follow BNPB guidelines. Resulting differences in approach often lead to inconsistencies in disaster management policies (interview with a Bogor official, 2016). For example, in the establishment of a BPBD, the BNPB regulations clearly state that all local governments, both provincial and the municipal, must set up BPBDs. However, MOHA regulations state that the obligation to establish BPBDs only applies at the provincial level, and is not mandatory at the municipality level were creating a BPBD depends on a higher level of vulnerability and greater financial capacity. Most of the respondents from local authorities state that this inconsistency between these two guidelines are often an obstacle for local governments to develop disaster management institutions.

4.4 Institutional establishment

4.4.1 The overview of the institutional establishment

Before 2007, the Government of Indonesia had disaster management institutions as stated in Presidential Decree No. 3 of 2001 on the National Coordinating Agency for Disaster Management and Refugees (BAKORNAS-PB). BAKORNAS-PB was a non-permanent organization (ad-hoc) for disaster management operating under and responsible to the President and led by the Vice President. The establishment of BAKORNAS-PB at the national level was followed by the establishment of the disaster management Coordinator Unit (SATKORLAK) at the provincial level, led by the governor, and the formation of the Implementing Unit (SATLAK) at the municipality level, led by the mayor. SATLAK constituted a task force formed by the relevant institutions, such as the health service agency, search and rescue agency (SAR), the army, the police department, the Indonesian Red Cross (PMI), social services agency, public works agency, and non-governmental organizations (NGOs). As shown in **Figure 4.6**, BAKORNAS-PB acted as the coordinator and formulator of strategy and policy in the mitigation activities. The disaster governance activities were carried out by each ministry by their respective roles. During a disaster emergency, rescue and aid delivery are handled by SATLAK at the district level, SATKORLAK at the provincial level, and BAKORNAS-PB at the national level. The post-disaster phase was the responsibility of BAKORNAS PB, in coordination with the relevant ministries. In the coordination mentioned above system, all the standard operating procedures, hazard maps, risk assessments, and early warning systems were handled by each ministry in connection with their duties (see **Table 4.3**).

Before the enactment of the Disaster Management Act

After the enactment of the Disaster Management Act
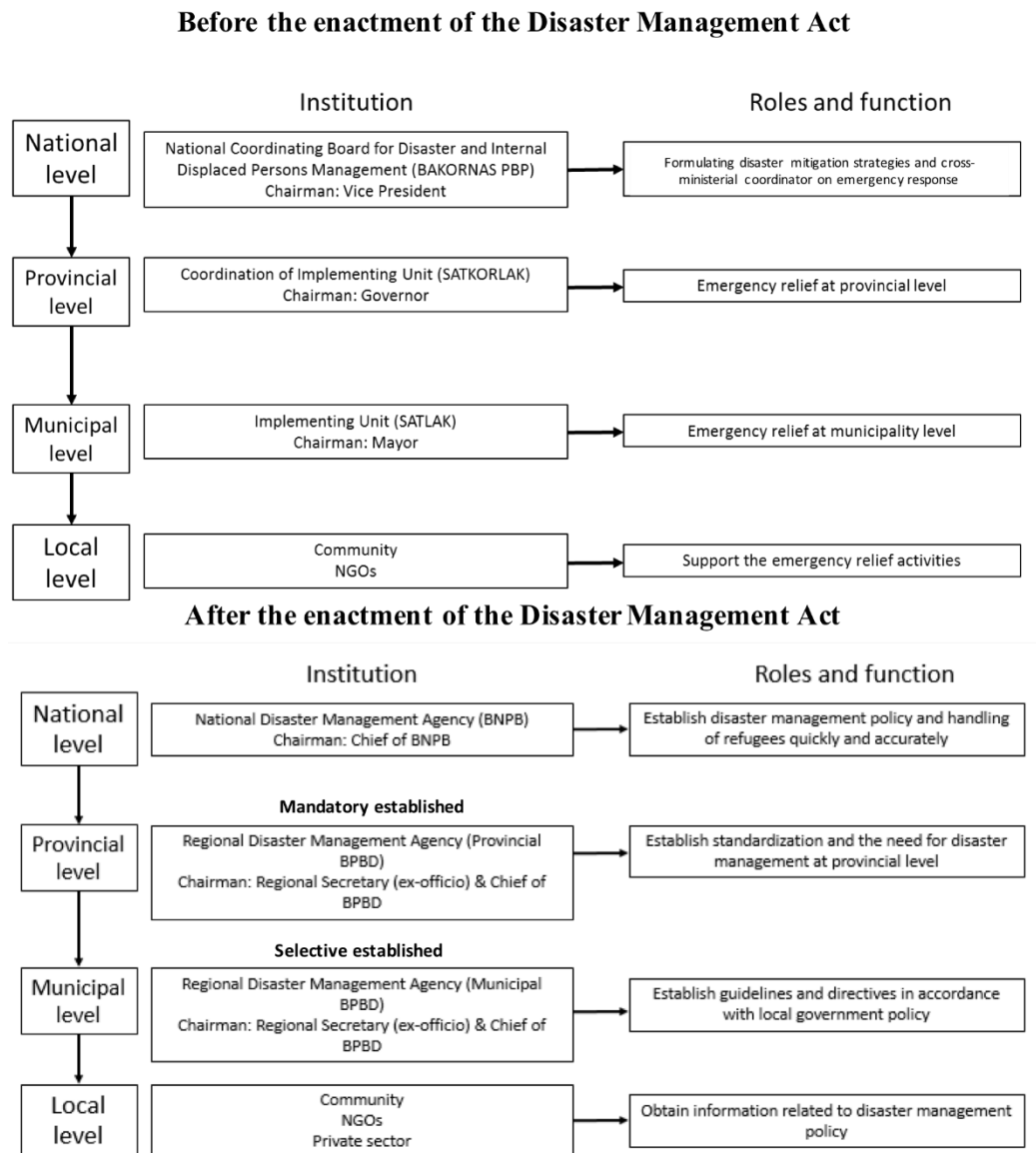
Figure 4. 6 The evolution of institutional arrangements on disaster governance in Indonesia

The series of recent disasters experienced by Indonesia, primarily since the Indian Ocean earthquake and tsunami (2004) motivated the government to improve the legislation through Government Regulation No. 83 of 2005 on National Coordinating Agency for Disaster Management (BAKORNAS-PBP). However, the increasing intensity of disasters, along with the

resulting economic losses, motivated Indonesia's government and parliament (the DPR) to develop disaster management institutions further by issuing Law No. 24 of 2007 on Disaster Management. This law mandated the establishment of a new agency, the National Disaster Management Agency (BNPB), to replaces the BAKORNAS-PB, and the Regional Disaster Management Agency (BPBD), to replace SATKORLAK at the provincial level and SATLAK at the municipal level (see **Figure 4.7**).
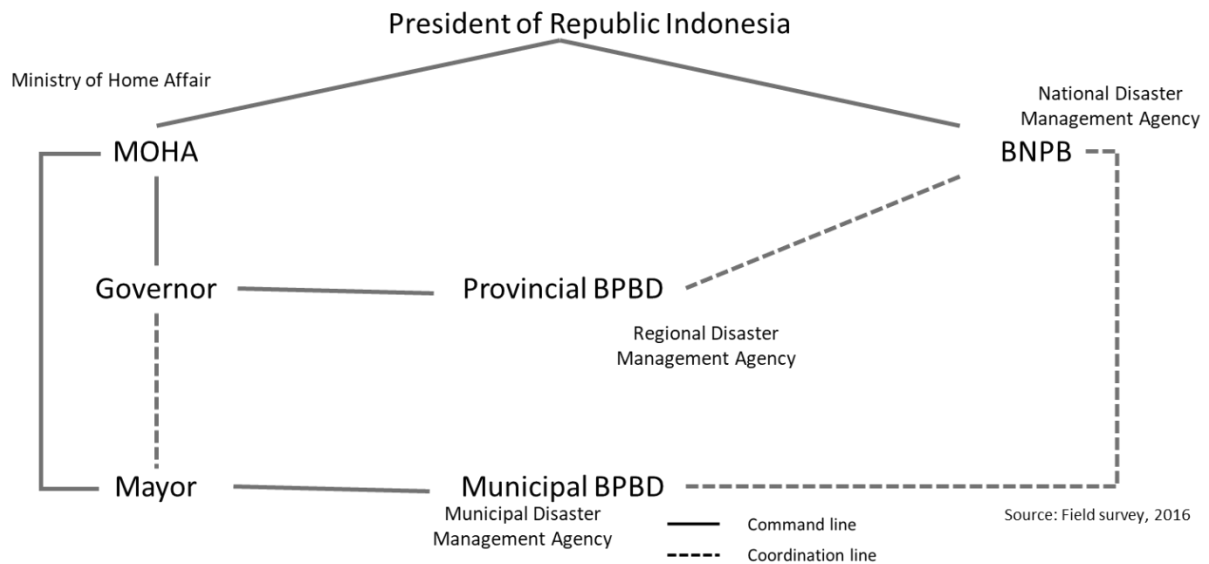
Figure 4. 7 Institutional framework of decentralized disaster management

The establishment of BPBDs requires reference to two guidelines issued by two different agencies: the Ministry of Home Affairs (MOHA) and the BNPB. These two institutions are essential in the establishment of BPBDs at the provincial and municipal levels. BPBDs' position as a local government agency becomes the responsibility of MOHA. Regulation from the BNPB is also necessary because, based on the mandate of the Law No. 24/2007, the BNPB is responsible for providing technical guidance for local government in shaping BPBDs. Problems arise due to MOHA's rules on BPBDs (Minister Decree No. 46/2008), which stipulate that BPBDs must be established at the provincial level, but do not mandate their establishment at the municipal level: instead, the MOHA offers local government the choice to either develop a BPBD or integrate disaster affairs into the responsibilities of an existing agency. The problem is that MOHA's rules do not define the criteria under which local governments must establish a BPBD; therefore, each local

government interprets that regulation independently. Local governments tend to use the budget factor as the basis for deciding whether to establish BPBDs.

Conversely, the rules of the BNPB also do not provide sufficient guidance regarding the establishment of BPBDs. Moreover, the BNPB's regulations about such institutions also prevent local governments that do not establish BPBDs by incorporating disaster management affairs into other relevant institutions. In the process of the transition to BPBDs, many local governments are integrating disaster management affairs into other related agencies, such as the Social Agency (DINSOS), the National Unity and Community Protection Agency (KESBANGLINMAS), the Fire Department (DAMKAR), and the Agency of the Police Unit of the Civil Service (SATPOL PP). The rationale for integrating of disaster management into other institutions is that, with no institution specialized in this field, disaster management affairs will be handled by other relevant agencies. Therefore, the BNPB should frame technical criteria for local government in shaping BPBDs, akin to disaster risk analysis guidelines. These should be complemented by MOHA's rules explaining the organizational factor criteria for BPBD establishment, such as the workload and financial capabilities.

4.4.2 Challenges and opportunities on the institutional establishment

Regarding the range of its authority, the BNPB has more extensive jurisdiction than the BAKORNAS-PB. However, regarding its capacity to exercise power, the BAKORNAS-PB had its advantages (see **Table 4.3**). In coordinating with other ministries during emergency relief, the BAKORNAS-PB appears to have been more efficient because its chairman, namely, the Vice-President, had held a higher position in the bureaucratic hierarchy than other ministers (interview with a BNPB official, 2016). At the local level, SATKORLAKs and SATLAKs also had similar advantages to the BAKORNAS-PB, since they had been led by governors and mayors who had higher administrative positions than other chiefs of local institutions. In contrast, the chiefs of the BNPB and provincial and municipal BPBDs are bureaucrats; therefore, their capacity to exercise power among other ministries and institutions is weaker. On the other hand, based on the DML, the BNPB and BPBDs can carry out disaster management functions in all phases of a disaster (pre-disaster, emergency, and post-disaster), allowing for a more extensive performance of a disaster

management role. Moreover, regarding budget allocation, they are permanent institutions and receive an annual budget to implement their programs in all phases of a disaster.

Table 4. 3 Comparison of disaster management institutions before and after decentralization

Content	Before decentralization	After decentralization
Organization	- The National Coordinating Agency for Disaster Management and Refugees (BAKORNAS-PB) (national) - The Disaster Management Coordinator Unit (SATKORLAK) (provincial) - Implementing Unit SATLAK (municipal)	The National Disaster Management Agency (BNPB) (national) The Regional Disaster Management Agency (BPBD) (provincial and municipal)
Head of institution	Vice-president (national) Governor (provincial) Mayor (municipal)	Chief of BNPB (national) Chief of BPBD (provincial and municipal)
Institution status	Ad-hoc agency	Permanent agency
Function	Coordination across sectors in the implementation of emergency response	Coordination, command, and implementation of disaster management (pre-disaster, emergency response, and post-disaster).

Based on our interviews with local officials, we identified specific issues with the institutional aspects of disaster management. As a new institution, the BPBD has been given a broad responsibility to lead other institutions in the disaster management system at the local level. However, based on the statement from the local officials from Bogor and Sidoarjo, a lack of human and financial resources has inhibited the effective functioning of the BPBD. Additionally, the BPBD has been unable to create productive relationships between government and non-government actors within disaster management. Moreover, according to local officials from Sleman, Non-government actors, such as NGOs, donor agency, and academia have indicated a willingness to be involved, but the absence of opportunities provided by the BPBD means their potential has been ignored.

4.5 Planning

4.5.1 Overview of the planning process

Before the enactment of the Disaster Management Act, disaster was not categorized among the decentralized government affairs. At that time, disaster management essentially considered only the emergency relief phase, with just limited attention given to the pre-disaster stage. Therefore, during the period before decentralization, the concerned institutions, both at the national level (BAKORNAS-PBP) and local level (SATKORLAK and SATLAK), were non-structural agencies. Budgeting for disaster management was only sourced from the central government budget, with local governments not required to allocate specific funds to tackle disasters. Before the Disaster Management Act, the system of planning and financing disaster management was implemented through the budget of each ministry (national level) (see **Figure 4.8**). If there were shortcomings in the implementation, especially in the emergency relief and post-disaster periods, the central government, through the chairman of the BAKORNAS-PBP, could increase budgets and mobilize a funds proposal to Ministry of Finance. In this mechanism, the role of the community and donor agencies was not integrated adequately.

Before the enactment of the Disaster Management Act

- Global level
- National Development Plan → Ministerial budget
- National level
- Regional Development Plan → Local agency budget
- Local level

After the enactment of the Disaster Management Act

- Hyogo Framework for Action
- Donor Agencies — Global level
- Disaster Management Act → National Development Plan → National DM budget — National level
- Regional Development Plan → Regional DM budget — Local level
- Private sectors — Community level

Legend:
- Disaster management document
- Development planning document
- Financing document
- Transfer
- Integrate

Figure 4. 8 The evolution of the planning and financing mechanism on disaster governance in Indonesia

Following the enactment of the Disaster Management Act, the pattern of financing within disaster management decentralization is conducted under the three principles of local autonomy: decentralization, deconcentration, and co-administration [24]. This third principle aims to ensure the successful implementation of disaster management and mutual support between the central and local governments. Following up on HFA in 2007, the Government of Indonesia developed an integrated system of disaster management, marked with the enactment of Law No. 24 of 2007. This law changed disaster management from its previous emergency-orientation to disaster risk reduction (DRR).

4.5.2 Challenges and opportunities for planning

Before decentralization, disaster management in Indonesia did not have any planning document because disaster management was still regarded as an event that could not be prepared or planned. At that time, disaster management activities were always oriented towards emergency response activities, such as logistics distribution and refugee handling. Pre-decentralization, disaster management activities coordinated by the BAKORNAS-PB at the national level focused only on emergency response activities (see **Table 4.4**). The implementation of disaster management was not based on disaster risk assessments but rather on the magnitude of the impact of the disaster (interview with a MOHA official, 2016). Next, at the local level, local governments were to follow up the policies formulated at the central level in the implementation of emergency operations.

Initially, in the post-decentralization period, disaster governance tended to focus only on emergencies without considering appropriate emergency response activities before a disaster. Therefore, the DML has required every level of government to prepare disaster management plans – a National Disaster management plan (RENAS-PB) at the national level and Provincial and Municipal Disaster Management Plans (RPBs) at the local level. These plans are comprehensive, detailing physical and social conditions, natural hazards, and local capacity regarding disaster governance. More importantly, these plans describe the role of the actors at every stage of a disaster. However, these plans cannot stand alone. National/provincial/municipal disaster management plans need to be integrated with other more strategic plans, such as national/provincial/municipal development plans and spatial plans. This integration provides several benefits such as ensuring the implementation of a multi-year government program in disaster management and ensuring that land use planning considers hazardous and vulnerable conditions. However, based on our interviews with local government officials, most local governments have still not integrated the RPBs with development plans or spatial plans.

Table 4. 4 Comparison of the disaster management planning process before and after the Disaster Management Law

Content	Before DML	After DML
Plan	No plan	National Disaster management plan (RENAS-PB) Provincial disaster management plan, Municipal disaster management plan (RPB)
Planning coordinator agency	BAKORNAS-PB (national)	BNPB (national) and BPBD (provincial and municipal)
Content plan	Emergency activities	Pre-disaster, emergency response, post-disaster planning
Integrated with another plan	No	Yes (integrated with development and spatial plans)

Various obstacles, such as lack of guidance on how to integrate the plans and lack of technical advice, mean that RPBs have tended to remain as stand-alone documents. The RENAS-PB and RPBs provide comprehensive plans that serve as references for disaster management at all levels of government (interview with a BAPPENAS official, 2016). However, based on our interviews with the National Development Planning Agency (BAPPENAS) and MOHA officials, we could identify certain practical inefficiencies. At the national level, the RENAS-PB is still an internal BNPB document and not yet a standard practice document that can be adopted by other ministries, which leads to a lack of involvement by other ministries. This situation has led to programs being frequently implemented at the ministry level that are not in line with the national roadmap of disaster management as formulated by the BNPB through the RENAS-PB. At the local level, the lack of involvement of non-governmental actors, especially within academia, means that most RPBs still lack academic foundations (interview with a Sidoarjo official, 2016). This situation is due to lack of funding and academic institutions in or near many municipalities. To develop plans effectively, assessments of threats and vulnerabilities based on scientific analysis by experts is essential. However, in the absence of scientific evaluation, the provincial/municipal RPBs cannot

accurately describe the real conditions of the region and the types of hazards likely to be encountered.

4.6 Budgeting

4.6.1 Overview the budgeting system on the pre-disaster phase

The disaster management system in Indonesia was dramatically affected by decentralization. Historically, spending on disaster risk reduction has been low in Indonesia, especially for pre-disaster activities – preparedness and early warning system. In 2007, the budget for disaster risk reduction expenditures were about 0.08% of GDP from all public and private source (Herry Darwanto 2012). In 2012, the budget allocation for DRR increased to 0.12% of GDP, but they were still low. Government spending in 2014 still accounted for only about 0.75% of total budget expenditure and majority allocated to the central government budget. In other words, central government spending for disaster risk reduction constituted the majority of disaster spending (see **Table 4.5**). Analysis of disaster risk reduction pattern revealed the following: First, the dependence of local governments on the central government in the financing of disaster. Second, the lack of political will of the elite at the local level to see the DRR as a priority. Third, the other public service providers – for example, the private sector also has not seen the importance of disaster management.

Table 4. 5 Budget allocation for Disaster Risk Reduction (2007 – 2014)

	2007	2008	2009	2010	2011	2012	2013	2014
Budget for DRR (IDR billion)	3,588	4,386	3,807	5,158	8,977	9,876	12,511	13,831
DRR on total budget (%)	0.71	0.63	0.61	0.74	0.99	1.02	0.74	0.75

National Development Planning Agency (BAPPENAS) and Ministry of Finance (MOF) are responsible for the formulation of the national budget with the goal of attaining the national development objectives. Both Agency is responsible for providing guidelines addressed to the

Ministry/ inline Agency in determining the Annual Work Plan. In a disaster management framework, BNPB responsibility to formulate the National Disaster Management Plan will then be integrated into the National Development Plan.

The pattern of funding for disaster decentralization in the pre-disaster carried out by the three principles of local autonomy: decentralization, de-concentration, and co-administration (Matsui 2003). This third principle aims to ensure the implementation of disaster management can work well and mutual support between the central and local governments. The lack of funding for the local government to make DRR monetary support from the central government is essential. Average budget DRR in local governments around 0.38% of the total amount, under ideal DRR allocations, are minimum 1.00% of the total amount (BNPB, 2014). Therefore the support of central government funding is essential to improve the functioning of DRR as obligatory functions related to basic services (see **Table 4.6**).

Table 4. 6 Budget source on pre-disaster period

Sources	Principle	Type of funds
Local budget (APBD)	Decentralization	• Program from local budget • Special allocation fund (DAK) on fire infrastructure system
Central government budget (APBN)	De-concentration	• Disaster risk reduction • Institutional and zoonosis • Fire management
	Co-administration	• Office • Logistic • Warehouse • Command Center

To support disaster management at the local level - especially firefighter infrastructure, Central Government allocated Special Allocation Fund (DAK) addressed to the local government (see **Table 4.6**). DAK used to finance the activities of local government which is a related national priority. Selection of the region and the number of funds determined by the calculation of the DAK index - based on general, specific and technical criteria. Fire management DAK aims to provide sustainable financing schemes for building firefighter management system by the Minimum Service

Standards (SPM). DAK fire management started budgeted from 2015 with a budget of 155 Billion IDR and decrease by more than 48% in 2016 to 74 Billion IDR. DAK is crucial to support the infrastructure system fires at the local level due to limited budget allocation in the local budget for disaster risk reduction activities cause the local government difficulties in establishing adequate fire management system (see **Table 4.7**).

Related to this, officials from MOHA shared an opinion:

More than 60% of the local administration budgets are used to finance the regular budget - salaries and other operating needs. Therefore it most of the local government needs the support of the Central Government in providing financial help to build the administrative, human resources, and infrastructure in fire management.

The problem of human resources at the local level must also be given special attention. Some local governments are having problems due to difficulties in planning and are reporting for the DAK funds. Thus in some cases, the central government takes over the function of planning.

Table 4. 7 Budget allocation in pre-disaster period

Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Decentralization Fund	-	-	-	-	-	-	-	-	-	155,000	74,216
De-concentration Fund	-	2,400	3,900	3,600	4,572	3,000	2,700	15,000	20,000	16,000	15,000
Co-Administration Fund	4,000	4,000	22,700	14,850	13,500	22,490	26,150	45,140	20,000	38,500	26,500

The second type of funding is de-concentration fund. De-concentration fund is a fund for the delegation of authority from the central government to the local government that is in line with the hierarchy of the Central level. These funds are transferred the central government to the provincial government as the representative of the central government at the local level. Activities funded by the de-concentration fund is earmarked for activities that are non-physical, e.g., inter-agency

coordination and strengthening the role of the province with the municipality. De-concentration fund established by the Central Government for three activities: disaster risk reduction, institutional strengthening and zoonosis, and the enhancement of firefighting apparatus. In 2007, the de-concentration fund was intended only for eight provinces. In 2015 and 2016 due to increasing budget, de-concentration fund allocated to 32 (2015) and 30 (2016) of the total 34 provinces in Indonesia. De-concentration fund is essential to increase the access of local government (municipal level) to the central government. Also, the role of the provincial government as the representative of the central government also increased.

One local government official stated:

Activities are financed de-concentration fund is one of the official's access at the local level to get the latest information related to the national disaster management. Because not all local governments have sufficient resources to consult directly to Jakarta (the state capital) to meet central government officials.

The third type of fund in the pre-disaster period is co-administration funds. Co-administration funds are funds transferred from central government to local government for the physical development purposes, such as the development of office buildings, logistics warehouse, and command center. Unlike the de-concentration fund is managed only by the provincial government, co-administration fund can be administered both the provincial and municipality government. This fund was initially earmarked funds for the rehabilitation of government buildings after the disaster. After the enactment of Law No. 24 of 2007 on Disaster Management which mandates local governments to form BPBD as a special institution to deal with a disaster at the local level. Co-administration of funds earmarked to assist local governments in building office buildings for BPBDs

The budget allocation in 2016 was 26,500 Million IDR for 20 local government. Decreased 32% from the previous year that set for 38 projects. When comparing the number BPBDs that has been formed with a budget allocation will require a very long time to be able to assist all local governments. From the years 2006-2016 was built 170 office buildings, while the total number BPBDs until 2016 is 463. So with an average of 20 projects per fiscal year, the central government takes 15 years to build all BPBDs office. Therefore, it is necessary for addition supported by

funding co-administration, the central government needs the support of other funding sources so that the target of construction of the building can be implemented in the shorter period.

4.6.2 Overview the budgeting system on emergency phase

Indonesia government allocated budget for the fiscal year 2016 included 4.5 trillion IDR included on-call Fund, a special purpose fund intended for disaster relief to areas affected by natural/human-made disasters. Releases of this fund shall be made by BNPB directly to the implementing agencies by the approval of the Minister of Finance (MOF) as a state treasurer. The amounts appropriated herein provided for the eight emergency relief activities: search and rescue, emergency aid, evacuation, sanitation, food supply, clothing, health service, and building an emergency shelter. The amount of the on-call fund released based on an assessment of the proposal from the BPBD or the appropriate agency for disaster management.

The National Disaster Management Agency (BNPB) is responsible for the formula and implementation of disaster relief aftermath the disasters. Linked with the disaster emergency fund, BNPB must obtain approval from the Ministry of Finance (MOF) as Treasurer - responsible for the management of state finances. State funds must be managed effectively and based on the principle useful by national development objectives. In decentralized disaster upon disaster emergency there are two types of funds: first, on-call fund - allocated at national budget. Second, unexpected fund - assigned at the regional budget. Functionally, these two types of funds have the same function, as a reserve fund to finance the activities of emergency response in case of disaster) of natural or human-made disasters).

The analysis of the data shows that in the past decade, from 2007 to 2016, the allocation for the on-call fund has increased by 60% or 1,800 Billion IDR (see **Figure 4.9**). The increasing trend proves that the Indonesia Government has shifted the fiscal priority in disaster response to the disaster events brought by natural and human-made disasters that hit the country. Based on interviews with officials from the central government, one of the principal reasons why the increase in the number of on-call funds because Indonesia has the experience of a variety of major natural disaster. For example, Earthquake and Tsunami (2004), Jogja and Central Java earthquake (2006) and Merapi volcano eruption (2010). Moreover, based on the experience of all these disasters requires substantial funds for disaster relief activities. The government should allocate on-call funds each

fiscal year to ensure the availability of funds in the event of a major disaster. Besides the availability of funding also aims to assist local governments who have financial constraints at the time of emergency.

Using the year 2011 as a baseline can be observed that there has been 97.5% decrease in on-call fund release for the following year, from 4,000 Billion IDR in 2011 to only 100 Billion IDR in 2012. In 2013, there had been a significant 92.5% increase amounting to 2183.70 billion IDR but then decreased again to 1,211 Billion in 2014 and 500 Billion IDR in 2015. The exciting thing is the level of disbursement on-call which has a downward trend since 2012 (except in 2013 which is still high). There are two reasons for this: first, since 2012 the Central Government put the on-call Fund as a reserve fund for a major disaster. This policy aims to raise awareness of local government to allocate emergency funds. Within the framework of disaster management, this is to reduce the dependence of local authorities to the central government and improve the functioning of local authorities as the main responsible for disaster management at the local level. Secondly, regarding local government also considers proposing the on-call requires a longer process, while at the time of emergency, local governments need the funds as soon as possible.

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Budget allocation (IDR Billion)	2,700	3,000	3,000	3,000	4,000	4,000	2,300	3,300	4,000	4,500
Disbursement	2,700.00	2,900.00	2,500.00	2,681.00	4,000.00	100.00	2,183.70	1,211.40	500.00	-
number of disasters	714	1,049	1,578	1,923	1,863	1,965	1,398	1,426	1,348	1,892
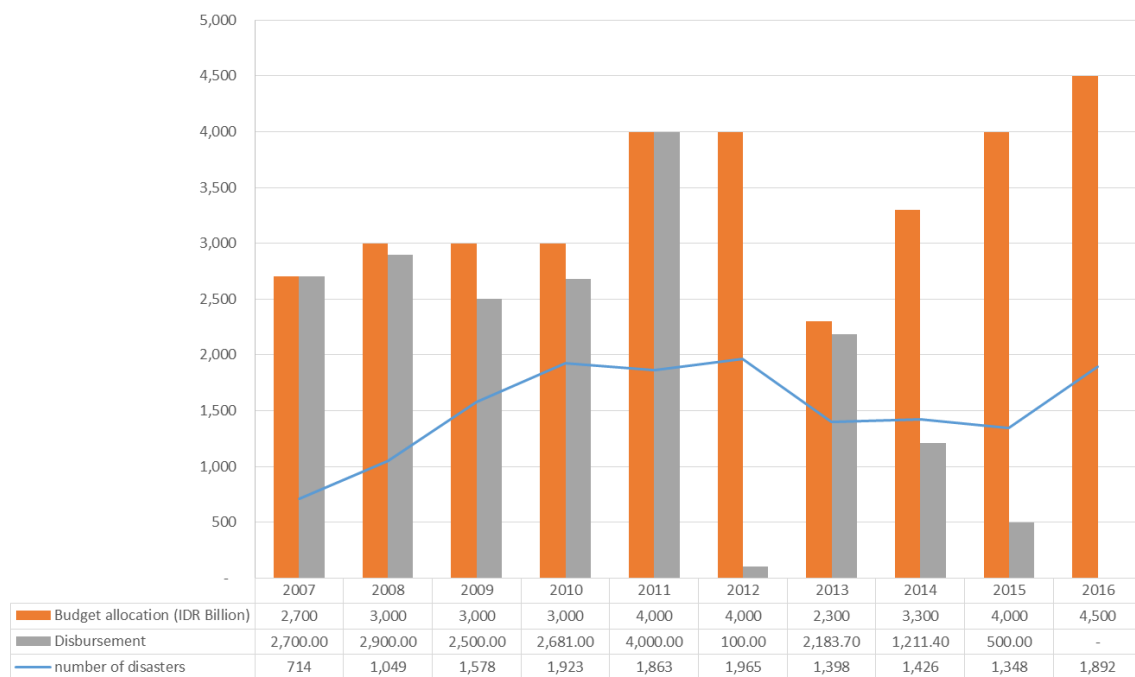
Figure 4. 9 Budget allocation for emergency response

During the emergency response, there is budget allocation from the national budget (APBN). This budget managed by the Ministry of Finance (MOF) with the National Disaster Management Agency (BNPB). At the local level, the government can allocate emergency funds using unexpected Funds. Aside from the on-call fund from the national budget, the local government also allocated unexpected fund which is defined in Article 28 paragraph 4 Law No 17/2003 on State Finances:

In an emergency, the regional government may make expenditures that are not yet available, which is further proposed in the draft budget changes.

These funds are not only used for emergency response needs but also be used for other expenses that are urgent and have not previously estimated. To analyze the utilization of these funds, the authors do a case study in three regencies: Bogor - West Java, Sleman - Yogyakarta Special Region Province, and Sidoarjo - East Java Province. Selection of the three regions is based on two reasons: first, the three municipalities have different natural hazards. Moreover, secondly, they are located in various provinces that are considered to have different characteristics.

Responding to the enactment of Law no 24 the year 2007 on Disaster Management, which decentralized disaster affair to the local government, the local government of Bogor, Sleman, and Sidoarjo formed Regional Disaster Management Agency (BPBD) as a specialized institution for disaster management. After the disaster, BPBDs should provide rapid assessment related to the significant impact of the disaster on its territory. This report should at least include the time and place of the disaster, the number of victims (dead/wounded), and damage to essential infrastructure. BPBDs should also report the estimated funding needs for emergency response. Upon receiving the report, the Mayor will decide whether or not to establish a disaster emergency in the form of a declaration of emergency. If the mayor chose to declare an emergency situation, then BPKAD (general treasurer) will disburse funds for emergency response activities led by BPBD. The Unexpected fund allocation is lodged under the budgets of local governments enumerated below:

Table 4. 8 Budget allocation for unexpected funds (2008 – 2016)

	2008	2009	2010	2011	2012	2013	2014	2015	2016
Bogor						20,000	40,000	20,000	10,000
Sleman	3,000	1,034	4,700	4,404	5,000	12,395	28,291	15,600	-
Sidoarjo	5,000	1,000	8,715	5,000	3,000	3,000	3,4S53	3,000	3,000

Table 4.8 shows that for years 2008-2016, three local governments have almost the same trend. Budget allocation relative increase after 2011, but then declined after 2014. The local government is giving priority budgetary allocation to areas that are considered more stimulate the local economy, such as infrastructure or services - education and health. However, based on interviews allocation of budget funds unexpected considered being sufficient for the needs of emergency response disaster events that are not extraordinary.

Related to the issue, officials from BNPB give a statement:

"The allocation of funds unexpected in Sleman is sufficient for the needs of emergency response to natural disasters had an enormous impact, such as floods, landslides, and residential fires. Particularly for the anticipation of the eruption of Merapi is usually repeated four/five years, the local government has prepared a special budget to anticipate. "
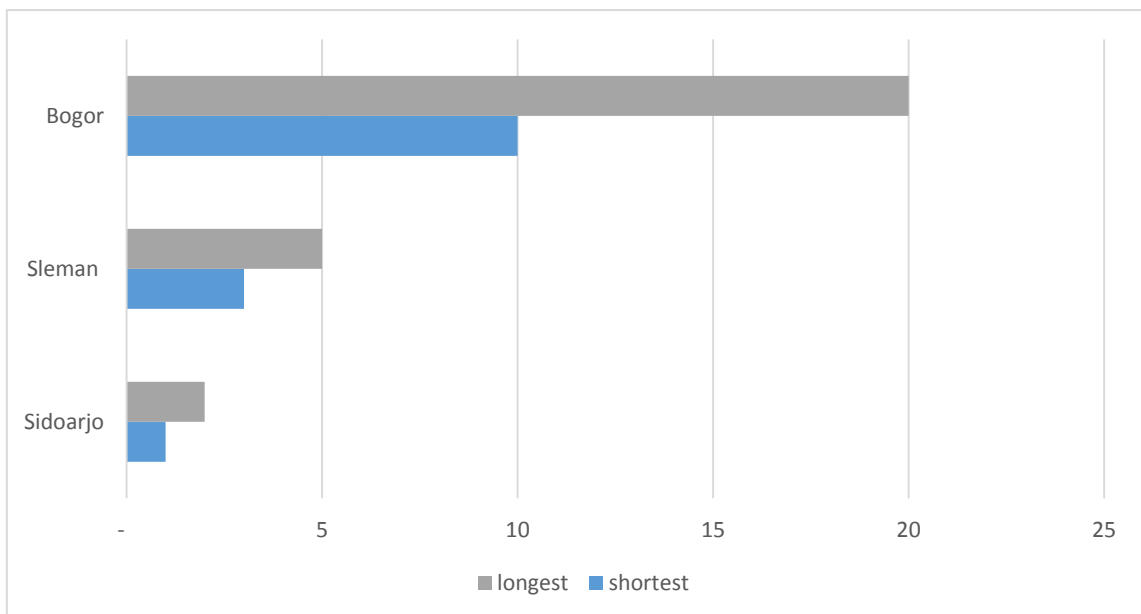
Figure 4. 10 Time for releasing the Unexpected Funds

We also noted that unexpected budget allocation is not the only source of funding for emergency response from the local budget (APBD). If the unexpected budget is insufficient, local governments can take a budget allocation of budget items that have not been implemented for emergency response activities. In addition to the distribution of funds, the time required for release of funds is also very essential. Activities during emergency response require government action is fast and efficient, must therefore also be supported funding rapidly available.

Table 4. 9 Analysis of implementation of unexpected funds in Bogor, Sidoarjo, and Sleman

	Bogor	Sleman	Sidoarjo
Time needed (days)	10-20	3-5	1-2
Regulation for the release mechanism	No	Yes	Yes
Problem	The mayor needs 3 – 5 days for an issued declaration of emergency disaster response	The mayor has a strong commitment for emergency disaster response	The mayor has a strong commitment for emergency disaster response
	Financial agencies ask legal documents for releasing the budget for emergency response	Issued an agreement with related agencies for the emergency disaster fund	1. Granted a deal with another agency associated with unexpected funds

Based on **Figure 4.10**, compared to the two other regions, Bogor needs the longest time to release unexpected funds (10-20 days). Sidoarjo requires the shortest possible date for the disbursement of the unexpected funds (1-2 days). The primary factor underlying the time of expenditure of funds is the political will of Mayor as decision maker's peaks and incident commander during emergency response. In the case of Bogor Mayor takes about one week after the disaster to decide whether or not to issue a declaration of emergency. Compared with the major of Sleman and Sidoarjo, they only take less than two days to make a decision. Leadership and courage of risk-taking are crucial in situations like this. The absence of local regulations related disbursement mechanism is also the reason for the length of the thawing process in the absence of a technical rule that is causing the

local government uses the central government regulations that are more general and not technical (see **Table 4.9**).

4.6.3 Overview the budgeting system on the recovery phase

After the end of the emergency, disaster period shifts to the next stage of the post-disaster phase. The post-disaster period is divided into two main activities: rehabilitation and reconstruction. Rehabilitation is the recovery of all public service and social economy activity while reconstruction is rebuilding infrastructure and public facility. Both of these activities in post-disaster is closely related and complementary. To restore the livelihood of the people as it was before the disaster, the government must do both of these activities simultaneously to prevent even more significant losses. In the post-disaster period, the government should calculate the total loss due to the disaster. Catastrophe losses due to natural disasters based on data UNISDR (2015) annually to reach $ 250-300 Billion with an approximate loss can be increased to reach USD 315 billion annually. According to UNISDR (2012), catastrophic losses are divided into two types: direct and indirect loss. Direct loss is physical or structural damages due to a disaster. Indirect losses refer to losses continuation of direct loss. After conducting a post-disaster needs assessment, local governments must draw up a plan detailing post-disaster rehabilitation and reconstruction activities. Formulation of the post-disaster plan based on three factors: the post-disaster needs, priority sectors, and community participation.

Rehabilitation and reconstruction activities can be funded with disaster management sourced from the local budget in the budget allocation of each local agencies (SKPD). If the Disaster Relief Fund of the budget is insufficient, the local governments can propose post-disaster financing of the central government. There are two types of transfer funds in the period after the disaster: Rehabilitation and Reconstruction (RR) fund and Calamity fund (see **Table 4.10**). Both of these funds come from the budgets of the central government and will be allocated to local governments affected by natural disasters. Both of these funds have almost the same objective but is managed by different ministries (See Figure 4.9).

Table 4. 10 Post-Disaster financing forms a national budget

	RR funds	Calamity funds
Purpose	For physical and non-physical reconstruction	Rebuild the public facility
Administrator	BNPB	MOHA
Guidelines	Chief of BNPB decree	Minister of Home Affair decree

Historically, calamity fund was established through the Local Governance Law in 2004. The function of the calamity fund, in the beginning, was a reserve fund in the post-disaster. These funds are given within the framework of the financial relationship between the central-local government and managed by local mechanisms budget. The primary requirement of the provision of calamity funds to local governments in the area affected by national disasters or other extraordinary events that cannot be addressed by funding only from the local budget. Classification of national disaster or other extraordinary events, as well as rehabilitation and reconstruction time limit, must be established by the president.
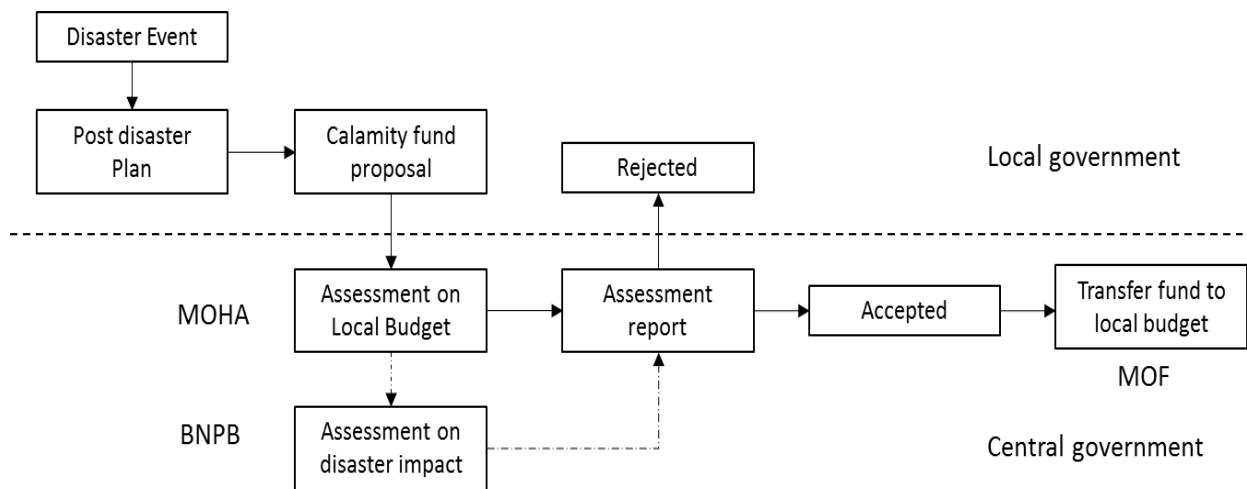
Figure 4. 11 Procedure for calamity fund allocation

The provision of emergency funds is recognized as the expenditure of the central government transfers to local government and implemented with through the mechanism of the Local budget as

a local government revenue on the part of other revenues. The use calamity fund is to finance the rehabilitation and reconstruction activities under the authority of local authorities, and must not overlap with the activities that have been financed by the state budget. Local Government proposes calamity funds to the MOHA as the Ministry responsible for local government (See **Figure 4.11**). MOHA will then coordinate with BNPB to assess the proposal in two aspects: local financial capacity and the total losses from the disaster. Based on the assessment of the central government will decide to accept or reject the submission of such funds. If the proposal is accepted, MOHA will ask the MOF to transfer the calamity fund to the regions by the amounts of funds approved.

With the requirement of calamity funds disbursed only in the event of a national disaster makes it tough to use. Throughout history, just the earthquake and tsunami in Aceh in 2004 which included a national disaster category defined by a presidential decree. Based on interviews with officials of the Ministry of Finance (MOF) said that many local governments that submit proposals request emergency funds, but by the regulations that the release of calamity funds should be a qualified national disaster. Also, no mechanism involves BNPB to be responsible for disaster management in Indonesia in the disbursement of calamity funds.

Ministry of Home Affair (MOHA) officials also expressed their opinions regarding calamity fund:

Amendments to the Local Government Act in 2014 opened up opportunities use of calamity funds as a source of financing in the post-disaster. However, the use of calamity funds still needed technical manual planning, implementation, and accountability. Other important issues include the mechanisms that govern the relationship between central and local government and affairs division between calamity fund with a fund RR that managed by BNPB.

The second types of funds: funds for rehabilitation and reconstruction (RR). These funds are funds managed by BNPB for post-disaster recovery. Rehabilitation and reconstruction funds are used by social assistance mechanism patterned grant implementation and management through mechanisms that apply in the state budget.

To obtain assistance, local governments submit a written application to the Government through the BNPB at the ministerial level in charge of disaster management (See figure **4.10**). Based on the

application, BNPB evaluates and coordinate with related institutions. The results of the evaluation and verification prescribed by the Chief of BNPB and submitted to the Minister of Finance to further introduced to the Parliament for approval patterned use of social aid grants. Rehabilitation and reconstruction fund management refers to the guidelines drawn up by BNPB.
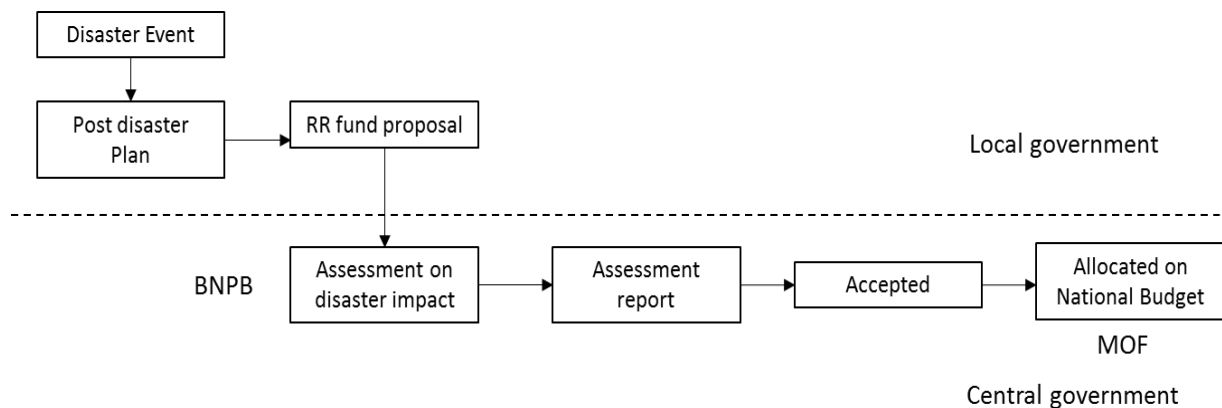
Figure 4. 12 Procedure for RR fund allocation

Local government as the beneficiary shall report on its appropriate use procedures for the management of state budget with some adjustments. RR unused funds at the end of the period must be deposited back into the state treasury. If after collecting the funds back to the state treasury no unpaid work, then the work shall be financed from the local budget or other sources.

Accountability is a severe problem in the management of RR funds. The concept of the use of RR funds relatively new and has never been applied before. According to one local government officials, the financial mechanism remains unclear therefore need to be made special rules. RR fund is different because it is in charge of the central government (BNPB) and implementation in local government (BPBD). Also, in practice, this is often overlapping with post-disaster funds sourced from the local budget, resulting in inefficient use of the budget (see **Figure 4.12**).

On post-disaster activities according to applicable regulations allow the use of funds from local and national budget simultaneously. However, the proposal must still refer to the mechanisms of each type of fund. Mount Merapi eruption in late 2010, causing a variety of significant losses. Total

damage and loss impact of the eruption of Merapi in the Special Province of Yogyakarta and Central Java reached IDR 3.56 trillion. This includes losses in five sectors, namely housing, infrastructure, economic, social and another sector. Total damage and losses in each sector respectively are as follows: residential (IDR 626.65 billion), infrastructure (IDR 707.47 billion), economy (IDR 1.69 trillion), Social (IDR 122.47 billion), and another sector (IDR 408.76 billion).
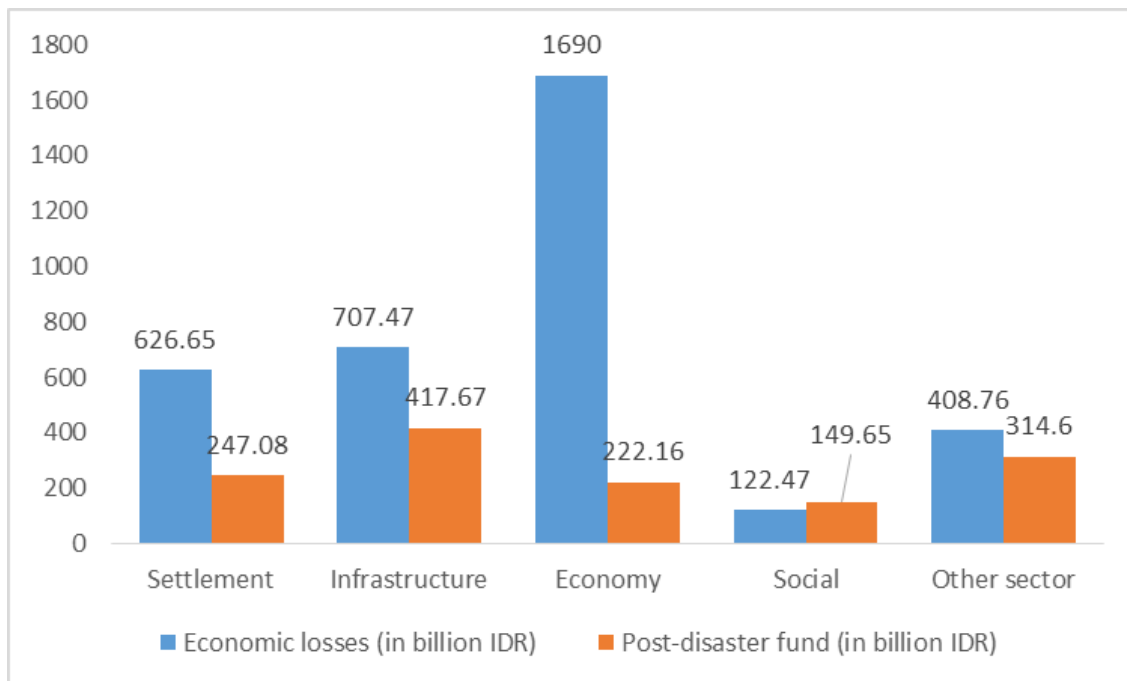
Figure 4. 13 Budget allocation for Merapi rehabilitation and reconstruction

To rebuild the areas affected by the disaster through the rehabilitation and reconstruction program necessary to fund approximately IDR 1.35 trillion. Rehabilitation and reconstruction need to cover five sectors as well as in the calculation of damages and losses; that is a settlement (IDR 247.08 billion), infrastructure (IDR 417.67 billion), economic (IDR 222.16 billion), social (IDR 149.25 billion) and other sectors (IDR 314.60 billion) (see **Figure 4.13**). Total recovery needs to be earmarked for three years (2011-2013). From the total funding requirement: IDR 1.23 trillion (91%)

funded by RR funds (National budget), IDR 70.29 billion (5%) funded by provincial budget, and IDR 53.59 billion (4%) funded by municipality budget.

4.6.4 Challenges and opportunities for budgeting

Before decentralization, budget allocation for disaster management came from the central government budget only and was limited to emergency response activities. The amount of budget finance allocated was based on how significant the impact of a disaster was and subsequent losses. At that time, the government did not budget for the risk of a disaster. Given the absence of standard procedures about funding for disaster management, the BAKORNAS-PB's function was merely to calculate the magnitude of the impact of events and then submit a budget plan to the Ministry of Finance (MOF) for approval. Notably, this budget was only to be used for emergency response needs (see **Table 4.11**).

Table 4. 11 Comparison of the disaster governance budgeting process before and after the Disaster Management Law

Content	Before DML	After DML
Financing priority	Emergency phase	Pre-disaster phase
Source of budget finance	National budget	National budget, local budget, donor agencies, community, private sector
Regulation of disaster budget	No regulation	Government regulation on disaster management funding (PP No. 22 (2008))
Coordinator agency	BAKORNAS-PB	BNPB
Type of budget	-Emergency fund	-Pre-disaster fund -Emergency fund -Post-disaster fund

Table 4. 12 The budget for disaster management as a percentage of the total budget in the case study areas (2014 – 2016)

City	Year		
	2014	**2015**	**2016**
Bogor	0.726%	0.583%	0.380%
Sleman	0.348%	0.648%	0.467%
Sidoarjo	0.048%	0.023%	0.029%

Following up on the DML, in 2008 central government issued a government regulation governing the funding system of disaster management, ‗Government Regulation (PP) No. 22 (2008)'. Based on this regulation, funding for disaster management is not only sourced from the national budget, but local governments are also required to allocate budgets at every stage of a disaster. The regulation also allows for opportunities to obtain sources of funding from non-government actors, such as donor agencies, the private sector, and within communities (interview with a BNPB official, 2016). The mechanism and amount of funding depend on the role and function of each institution. With more potential funding sources, opportunities have been created for central and local governments to increase the budget for disaster management, especially concerning risk reduction activities.

However, in addition to opportunities to increase budget allocations for disaster management, the disaster budgeting system also confronts certain issues. We found that, in the three areas of our case study, all the municipalities had allocated less than one percent of their total budget allocation in the fiscal years 2014 to 2016 to disaster management, and that there was an unstable but generally declining trend (see **Table 4.12**). Based on interviews with BNPB and local officials, we found that local governments had a high level of dependence on central government for the disaster management budget. A low budget allocation at the local level ensures that a transfer of funds from central government remains a significant source of funding, especially in the provision of infrastructure and early warning systems (interview with a BNPB official, 2016). Our study also found that a lack of high-quality human resources has meant that BPBDs have not engaged in creating innovative programs to respond to the natural hazards in their territory. BPBD agencies are

often trapped in routine activities that do not provide clear outputs (interview with a MOHA official, 2016). This situation results in no increases in the budget allocation from the local budget.
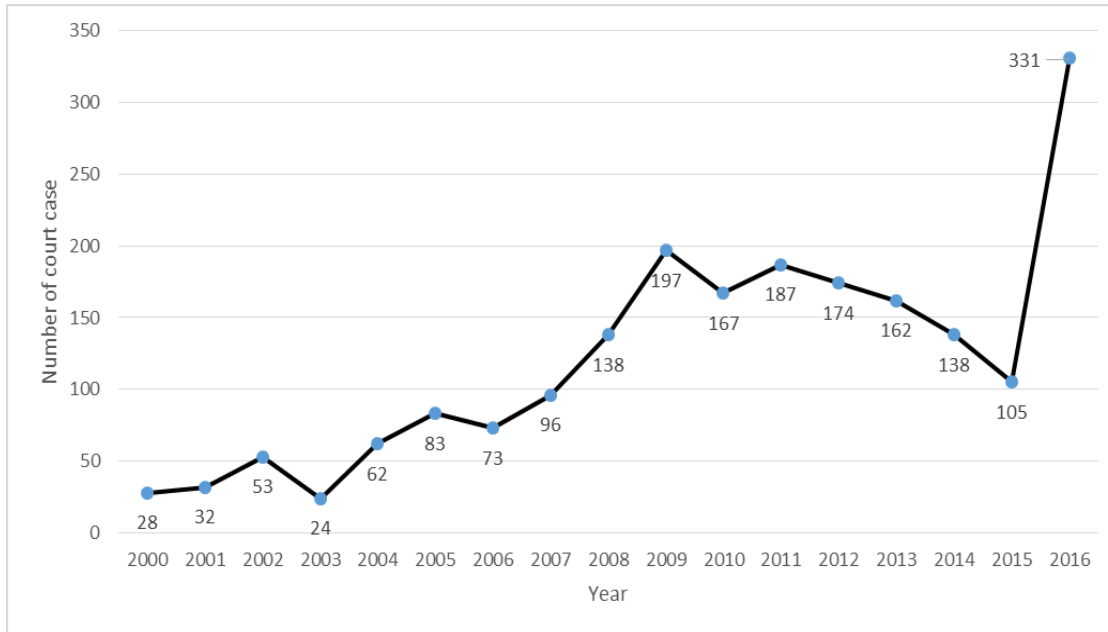
Figure 4. 14 Number of court case-related to disaster issue

Another issue related to budgeting is an increase in corruption cases. According to data from the Republic of Indonesia's Supreme Court, the number of disaster-related corruption cases increased significantly after the enactment of the DML in 2007 (see **Figure 4.14**). Based on our interviews with MOHA and local government officials, it appears that this increase is due to two factors. First, there is a lack of guidance in administering disaster management funds, especially at the emergency stage. Second, an increase in the allocation of disaster management funds, especially at the local level, has not been balanced with a rise in the employment of appropriately qualified people to manage those funds.

4.7 Inter-governmental network on disaster management

To determine how decentralization affected the disaster management network in Indonesia, we analyze the network using data obtained from interviews and a review of government officials' documents on decentralization and disaster management by SNA. In SNA, a network is defined as a

set of actors/nodes linked by ties/links [34]. In our interviews, we identified actors in the governance network operating within the government sector at both the national and local level. In this study, an actor is defined as one of the agencies involved in the network, and ties/links are relationships and interactions that occur in a network. To determine how decentralization has affected the disaster management network in Indonesia, we analyzed the network using data obtained from interviews and a review of official government documents concerning decentralization and disaster management, using SNA. The results of the interviews and literature studies will be included in the dataset. The dataset contains relationships between actors related to disaster management systems in Indonesia. We will give the code "1" if the actor has a relationship and "0" if he has no relationship. Sample datasets can be seen in **Table 4.13**. Next, we will use UCINET software to show a comparison of network visualizations, based on the interactions that occurred in disaster management in Indonesia before and after the DML took effect, involving four indicators, namely, regulation, institutional establishment, planning, and budgeting.

Table 4. 13 Example dataset for social network analysis

	MOHA	MOF	BNPB	BAPPENAS	BPBD	…
MOHA	-	0	1	1	1	
MOF	1	-	0	0	0	
BNPB	1	1	-	1	1	
BAPPENAS	1	0	0	-	1	
BPBD	1	0	1	0	-	
…						-

4.7.1 Inter-governmental network on disaster management before decentralization

Figure 4.15 and **Figure 4.16** show a comparison of network visualizations, based on the interactions that occurred in disaster management in Indonesia before and after the DML took effect, involving four indicators, namely: regulation, institutional establishment, planning, and budgeting. **Figure 4.15** and **Figure 4.16** show the entire network of actors involved in the disaster management system in Indonesia. The disaster management network after decentralization has 31 actors, shown in **Figure 4.16**, an increase on the previous 22 actors, as shown in **Figure 4.15**. The number of ties also increased, from 234 to 290. Density measurement revealed that the network after decentralization was more cohesive at 0.442 than before decentralization, which measured 0.226. This increase in density values indicates the increasing number of relationships that arise between actors in the post-decentralization network.

Before decentralization, according to centrality analysis (see **Table 4.13**), the network appeared to be highly centralized around two institutions at the national level, namely, the MOHA and the MOF, with degrees of centrality of 19 and 18, respectively. This network structure shows that, before decentralization, the MOHA and the MOF shared the role of central actors in the disaster management network. These actors had both the most connections with other actors and also the most significant influence on the network. From the measurement of betweenness centrality, the MOHA played a vital role in linking other actors (43.98) before decentralization (see Table **4.13**). The MOHA's significance was due to institutional organization before decentralization being ad hoc, with all governmental decision-making related to regulation, planning, and budgeting based on MOHA's authority. At the local level, the role of municipal Development Planning Agencies (BAPPEDAs) as technical agencies involved with research and planning of regional development was the most critical, measuring a betweenness centrality of 40.644.
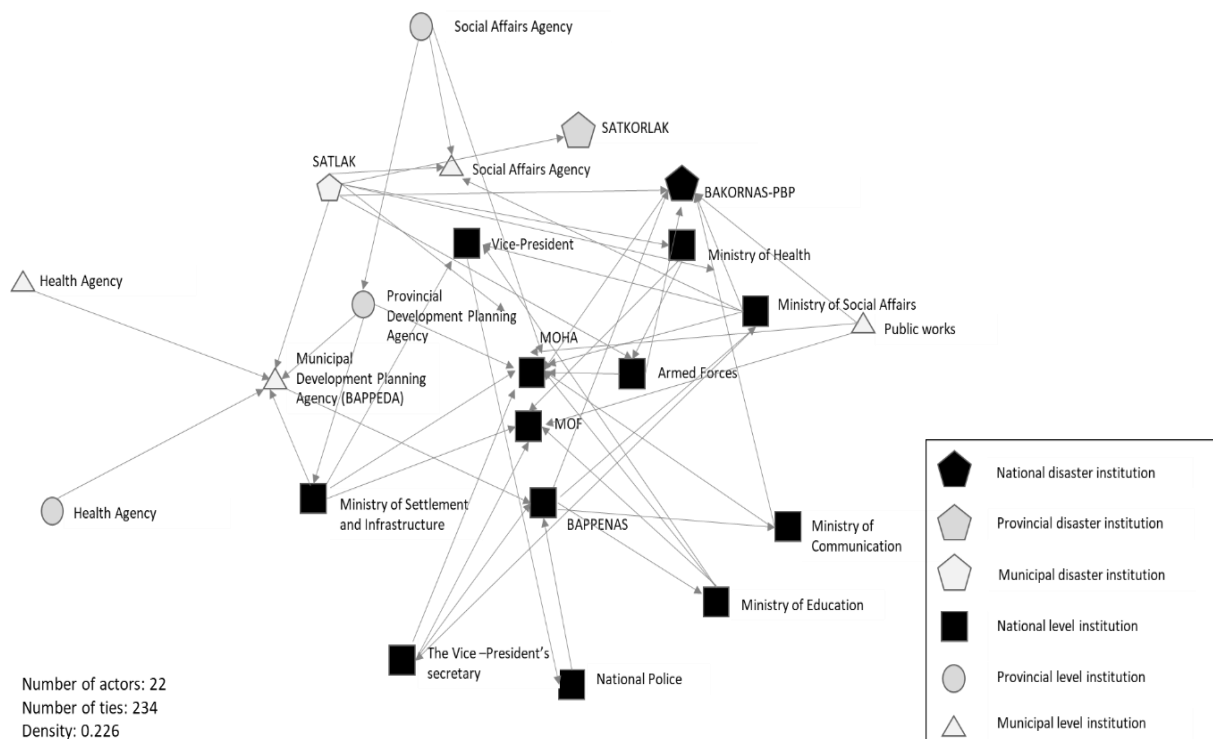
Figure 4. 15 Inter-governmental relationships concerning disaster management before decentralization

Table 4. 14 Centrality testing on the disaster management network

	Actor/Institution	Before			After		
		Degree	Betweenness	Closeness	Degree	Betweenness	Closeness
National	Vice-President	10	4.895	32	-	-	-
	Vice President's secretary	-	-	-	2	0	95
	BAKORNAS PB*	8	2.468	36	x	x	x
	Coordinating Ministry for Peoples Welfare	-	-	-	10	33.999	66
	National Disaster Management Agency (BNPB)*	x	x	x	17	214.948	55
	Ministry of Home Affair (MOHA)	19	43.980	23	16	150.076	58
	Ministry of Finance (MOF)	18	33.480	24	15	86.394	61
	Ministry of Social Affairs	6	0.601	38	7	68.111	75
	Ministry of Health	7	0.601	37	7	52.635	75
	Ministry of Public Works	3	0	41	6	32.100	78
	National Development Planning Agency (BAPPENAS)	13	15.174	29	11	32.099	65
	Ministry of Settlement and Infrastructure	6	0.125	36	4	20.278	80
	Ministry of Communications	4	0	40	5	0.111	79
	Ministry of Transportation	-	-	-	1	0	90
	Ministry of Energy and Mineral Resources	-	-	-	1	0	90
	Ministry of Law	-	-	-	2	0	84
	Meteorological, Climatological and Geophysics Agency (BMKG)	x	x	x	1	0	90
	National Police	3	0	41	6	69.111	78
	Armed Forces	12	9.229	30	4	0.111	82
Provincial	SATKORLAK*	7	0.476	37	x	x	x
	Provincial Regional Disaster Management Agency (Provincial BPBD) *	x	x	x	7	84.643	72
	Provincial Development Planning Agency (Provincial BAPPEDA)	11	6.775	31	7	12.017	77
	Provincial Health Agency	1	0	51	2	2	99
	Provincial Public Works Agency	3	0	41	2	0.333	108
	Provincial Police	-	-	-	1	0	113
	Provincial Social Affair Agency	3	0	41	2	0	109
	Provincial Finance and Asset Management Agency	-	-	-	3	0	84
	Provincial Law Bureau	-	-	-	2	0	92
Municipal	SATLAK*	8	1.357	34	x	x	x
	Municipal Regional Disaster Management Agency (Municipal BPBD) *	x	x	x	7	82.900	72
	Municipal Development Planning Agency (Municipal BAPPEDA)	11	40.644	31	6	9.100	78
	Municipal Public Works Agency	3	0	41	3	4.033	97
	Municipal Police	-	-	-	1	0	113
	Municipal Social Affair Agency	10	7.195	32	2	0	109
	Municipal Health Agency	1	0	51	1	0	110
	Municipal Law Bureau	-	-	-	2	0	92
	Municipal Finance and Asset Management Agency	-	-	-	3	0	88

*: a special agency for disaster management
x: the institution has not been established or no longer exists

The closeness of centrality analysis showed that the MOHA was also the closest institution to the other actors, with the smallest value, 23, before decentralization. Therefore, based on these calculations, the MOHA had the closest connections with the other actors in the network. Most of this study's interviewees reported that, before decentralization, coordination and decision-making of disaster management at the local level were conducted through the MOHA. As there was no specific regulation concerning disaster management at the local level, the rules were set by the MOHA as the ministry responsible for local government. The MOF had a similar closeness value of 24 to the MOHA. Interestingly, as an ad hoc institution concerned with an emergency response at the local level, the BAKORNAS-PB was not especially prominent in the disaster management network before decentralization. The BAKORNAS-PB was only fully functional when involved in emergency relief for natural disasters.

The MOHA's significance was due to the institutional organization before decentralization being ad hoc, with all governmental decision-making related to regulation, planning, and budgeting based on MOHA's authority (see **Table 4.15**). MOHA also has a role in developing guidelines for disaster management and refugee handling. Before decentralization, MOHA also had a role in coordinating with the local government in the implementation of emergency activities and post-disaster recovery. The MOF had a similar closeness value of 24 to the MOHA. Before decentralization, MOF collaborated with MOHA in allocating disaster management budgets at the local level. In the national level, MOF has a role in allocating special funds reserved for emergency and disaster recovery purposes. For the use of this special fund, the MOF will assess the proposed funds from BAKORNAS PB and other institutions at the central level following the impact of the disaster. Also, MOF also has a role in receiving aid funds for disaster needs from national and international.

4.7.2 Inter-governmental network on disaster management after decentralization

After decentralization, the establishment of the BNPB had a significant effect on the disaster management network. The degree of centrality analysis shows that the MOHA (degree of centrality: 16) and the MOF (degree of centrality: 15) were no longer the only principal actors in the network and that the BNPB had the highest degree of centrality at 17. The BNPB had the highest value of betweenness (214.948), and this was exceptionally high compared to the second highest value

attained by the MOHA of 150.076. This finding shows that, in post- decentralization, the role of the BNPB has become essential in linking different actors in the disaster management system.

Number of actors: 31
Number of ties: 290
Density: 0.442
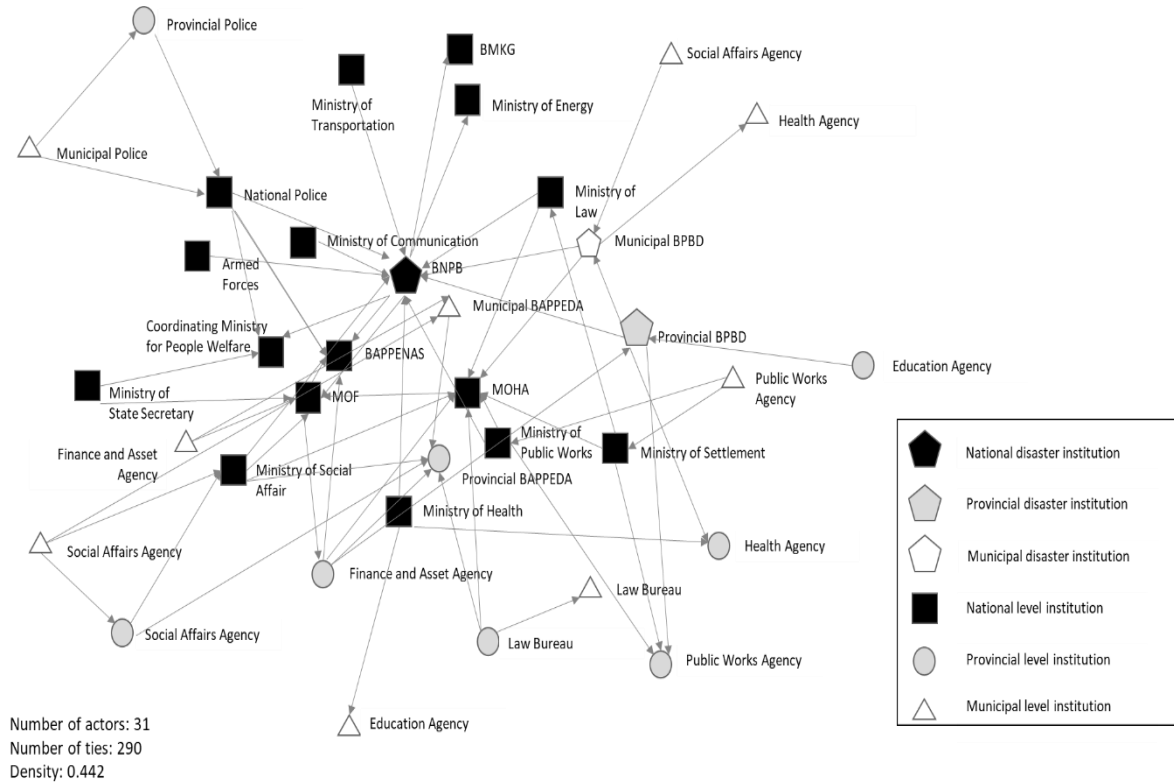
Figure 4. 16 Inter-governmental relationships concerning disaster management after decentralization

Based on **Table 4.14**, it is apparent that the BNPB had a closeness value of 55, which shows that the BNPB provided the most efficient route to access other nodes and appeared to have high visibility regarding ascertaining what was happening in the disaster management network. Although the BNPB has become the most critical actor in the network after the enactment of the DML, the role of the MOHA and the MOF remains essential. After the establishment of the BNPB, the MOHA transferred most of its authority (e.g., concerning standard operating procedures for refugee handling and management assistance during emergencies) to the BNPB. However, following decentralization, the MOHA continues to play a valuable administrative role within provincial/municipal government, while the MOF retains a function as state treasurer.

BNPB receives the authority from MOHA in preparing guidelines for national disaster management and refugee handling. Besides, BNPB also needs developing guidelines regarding the division of tasks between the central and local governments; and coordinating the implementation of disaster governance at in the emergency and recovery stages. BNPB also received transfer of authority from MOF to assess funding proposals from other agencies and receive disaster relief funds from national and international levels. While the new BNPB authority post-decentralization is coordinating the implementation of prevention, preparedness and mitigation and acquainting the disaster information to the public (see **Table 4.15**).

In interviews with representatives from central government, a MOHA official drew the following analogy regarding the distribution of authority: ―MOHA's role in decentralized disaster management is like building a house, while the BNPB is expected to fill it with a broad range of furniture" (Jakarta, March 2016). This analogy shows that the decentralized authority of the BNPB has not superseded the influence of the MOHA. The broader the scope of the decentralization of disaster management, the greater the necessary cooperation and coordination across ministries, since it is no longer possible for disaster management to be handled by only one agency. At the provincial and municipal levels, the positions of disaster management agencies before and after decentralization were compared using centralized analysis. Regarding the degree of centrality, there was little difference in value between institutions before decentralization (SATKORLAKs: 7, and SATLAKs: 8) and after decentralization (provincial BPBDs: 7, and municipal BPBDs: 7) (see **Figure 4.13** and **Figure 4.14**). However, there was an increase in value regarding betweenness of centrality, both at the provincial (SATKORLAKs: 0.476 to provincial BPBDs: 84.643) and municipal (SATLAKs: 1.357 to municipal BPBDs: 82.9) levels. This increase was expected due to

the increase in actors at the local level. These values indicate that disaster management institutions at the local level play a vital role in coordinating the disaster network and, while not yet key actors, they show increased activity in the network. However, when considering **Figure 4.14**, it is apparent that both provincial and municipal BPBDs are not connected with all the other relevant provincial or municipal actors, respectively. For example, at the provincial level, provincial BPBDs are connected with provincial education agencies, health agencies, and finance and asset agencies, but not connected with provincial public works agencies, law bureaus, BAPPEDAs, social affairs agencies, and provincial police. These unconnected institutions are otherwise connected with the relevant central government institutions, for example, provincial public works agencies are connected with the Ministry of Public Works, and provincial social affairs agencies are connected with the Ministry of Social Affairs. At the municipal level, the municipal level, municipal BPBDs are only connected with municipal health agencies and social affairs agencies and not connected with municipal public works agencies, law bureaus, BAPPEDAs, finance and asset agencies, social affairs agencies, and municipal police. These unconnected institutions are of course connected with relevant central government institutions as well.

Table 4. 15 The comparison the authority of the key actors before and after decentralization

Key actor	Before decentralization	After decentralization
MOHA	▪ Formulate the structure of disaster management organization at provincial and municipal levels. ▪ Formulate guidelines for national disaster management and refugee handling. ▪ Develop guidelines for the division of roles in disaster management between provincial and municipal governments. ▪ Coordinate the implementation of disaster emergency response activities at the local government level. ▪ Coordinate the local government in implementing the disaster recovery.	▪ Formulate the structure of disaster management organization at provincial and municipal levels. New authorities ▪ Develop guidelines for the formation of BPBD. ▪ Develop rules for drafting regulations for disaster management at the local government level. ▪ Develop guidelines for development planning integrated with disaster issue. ▪ Develop local budget planning guidelines that integrate disaster issue.
MOF	▪ Coordinate with MOHA in preparing the disaster management in local budget. ▪ Allocate special funds for emergency response activities. ▪ Allocate sufficient budget for recovery activities. ▪ Approve funding requests submitted by BAKORNAS PB for emergency handling ▪ Assess proposals for requests for funds from other ministries related to emergency handling. ▪ Receive and manage disaster funds from international and national.	▪ Coordinate with MOHA in preparing the disaster management in local budget. ▪ Allocate special funds for emergency response activities. ▪ Allocate sufficient budget for recovery activities. ▪ Approve funding requests submitted by BNPB for emergency handling. New authorities ▪ Allocate sufficient budget for prevention, preparedness, and mitigation activities in each ministry.
BNPB		▪ Formulate guidelines for national disaster management and refugee handling. (transferred from MOHA) ▪ Develop guidelines for the division of roles in disaster management between provincial and municipal governments. (transferred from MOHA) ▪ Coordinate the implementation of disaster emergency response activities at the local government level. (transferred from MOHA) ▪ Coordinate the local government in implementing the disaster recovery. (transferred from MOHA) ▪ Assess proposals for requests for funds from other agencies related to emergency handling (transferred from MOF) ▪ Receive and manage disaster funds from international and national. (transferred from MOF) New authorities ▪ Coordinate the implementation of prevention, preparedness, and mitigation activities. ▪ Conveying disaster information to the public.

4.8 Summary

This study has revealed how decentralization has affected the disaster management system in Indonesia. We initially examined how the disaster management system has changed, and the opportunities and challenges are arising following decentralization. We then discussed how vertical and horizontal relationships between relevant government actors have changed. In our analysis of changes in the disaster management system, we found that decentralization had positive effects, such as enabling local authorities to develop local disaster management regulations, the establishment of central- and local-level permanent institutions that specialize in disaster management, a broadening of the scope of disaster management to cover not only emergency responses but also pre-disaster and post-disaster scenarios, the development of disaster management plans at central and local level that facilitate the integration of disaster element considerations into other plans as inputs, a widening of potential budgetary contributors, and an increase in the disaster management budget. However, we also identified several challenges, such as inconsistencies within the regulations that cause difficulties for local governments in building local institutions for disaster management, a lack of funding and capacity for establishing local disaster management institutions (provincial/ municipal BPBDs), a lack of participation of experts in the preparation of disaster management plans, a high dependence of local governments on funding from central government, and an increased corruption rate in disaster management at the local level.

In our analysis concerning the institutional network, we found that, before decentralization, the MOHA played the dominant role and the MOF also played a major role. After decentralization, in addition to the MOHA and the MOF, the BNPB also now plays a leading role in disaster management. The disaster management institutions at the local level, namely, the provincial and municipal BPBDs, remain supporting actors, but they play a vital role in coordinating the disaster network. However, provincial and municipal BPBDs lack many horizontal network links with other key actors at the same level.

In summary, a framework for a decentralized disaster management system has been established, but the capacity of provincial and municipal BPBDs and the overall network remain underdeveloped, with national institutions continuing to play a leading role. This study has revealed several issues in the decentralized disaster management system, with most related to BPBDs. It appears that empowering BPBDs is a key means to enhance the disaster management system in Indonesia.

Although the BNPB, the MOHA, and the MOF continue to occupy significant roles in the disaster management system, the BNPB can be expected to be involved more heavily in the disaster management system because, from SNA, it is clear that the BNPB is directly connected with both provincial and municipal BPBDs. To enhance the horizontal network in respect of BPBDs with other institutions at the same level is also required and, about this point, not only the BNPB but also the MOHA can be expected to be influential because, as our analysis reveals, the MOHA is directly connected with some of the provincial institutions. Horizontal network building also holds possibilities for promoting the participation of experts in local disaster management planning.

As discussed, a decentralized disaster management system is still being developed in Indonesia. As Indonesia is a pioneer country in this area, it is essential to continue to observe how the disaster management system changes and how various issues may be overcome. This study also has some limitations. First, we only conducted in-depth interviews with officials at several central government ministries and with officials from three cities as case studies. Therefore, we were unable to obtain comprehensive information about all actors connected to disaster management at the local level. Secondly, in conducting SNA, we focused only on government actors without considering non-government actors at the central and local levels. Future research should examine more detailed patterns of interaction through examining both government and non-government actors.

CHAPTER 5

STAKEHOLDER AND SOCIAL NETWORK ANALYSIS ON DECENTRALIZED DISASTER MANAGEMENT SYSTEM

5.1 Introduction

Decentralization brought significant changes in the model of governance in developing countries. In disaster management, decentralization was essential to improve the role of local governments and communities to engage actively in disaster management (Ainuddin et al. 2013b). By the global paradigm change, disaster management is not only an exclusive affair of the government but became "everybody business" involving not only all levels of government but also the community and private sectors (Al-Nammari and Alzaghal 2015). All stages of disaster governance show a complex system, due to the many actors involved in it (Misra et al. 2016).

Disaster governance policies are one of the most common challenges in developing countries, where the human resources and financial factors are still relatively low (Rautela 2015)(Rumbach 2015a). The involvement of non-governmental stakeholder is one of the efforts to increase public participation in disaster management. Stakeholders, according to Varvasovszky and Brugha in Sarmento et al., are actors with interests, directly or indirectly affected by the system/policy, or actors whose positions must act as policymakers in the system (dos Muchangos, Tokai, and Hanashima 2017b).Based on the fact that post decentralization each municipality has the authority to manage its disaster management based on different characteristics: natural hazards, financial ability, organizational capacities, and socioeconomic context (Oswar 2014). The effective disaster management system is needed to provide good disaster management services for the people. Disaster management is known as a complex structure. Therefore every decision taken will impact all stakeholders involved (Garschagen 2016). In some cases, the role of key actors is essential to enable the other players to become involved, not just as implementations but also from planning processes.

A study in several countries has shown that coordination among stakeholders will increase the effectiveness of disaster management at the local level. In disaster management, no single stakeholder can solve all the problems alone, in both the pre-disaster and post-disaster phases

(Guzman 2001). Good cooperation between stakeholder groups at both national and local levels, governmental and non-governmental is essential. Moreover, in the context of developing countries, the combination of policies appropriate to the involvement of different stakeholders is key to the effectiveness of disaster management governance (Djalante, Thomalla, Sinapoy, et al. 2012). According to Koresawa, one of the reasons why often the disaster management system does not work effectively especially when the emergency phase is due to the lack of development of stakeholders, especially at the local level (Koresawa 2014). This unpreparedness of stakeholders at the local level will have a further impact by causing a lack of preparedness in some of the sensitive issues of disaster management. Active communication, especially the mutual opinion among stakeholders including the community can significantly reduce the impact of natural disasters in the future (Madan and Routray 2015).

In Indonesia context, Decentralization brought significant changes in the model of governance. Nearly two decades ago Indonesia was revolutionizing the administration by decentralized the public-sector policy with the primary goal was increasing the efficiency and bring government closer to the people (Shah and Thompson 2004). In disaster management, decentralization was essential to improve the role of local governments and communities to engage actively in disaster management (Bae et al. 2016). As a disaster-prone country, Indonesia urgently needs to distribute roles and responsibilities of each level of government in three stages of disaster: pre-disaster, emergency response, and recovery (Government and Team 2009).

Some studies found that local stakeholders in Indonesia are developing very slowly when compared to stakeholders at the national level (Djalante, Thomalla, Sinapoy, et al. 2012). The main problem at the local level is the lack of collaboration between the local government and the community. In the context of knowledge transfer, the stakeholders at the national level have done various forms of empowerment for local stakeholders, especially the government apparatus. The main problem is the transfer of this knowledge only stops at the local government apparatus, not continued to the community. Some studies have identified this condition as related to several local government issues related to capability: institutional, policy, financial, human resources, and leadership (Kusumasari and Alam 2012).

The objective of this study is to identify the roles of stakeholders and to evaluate the inter-organizational relationship representing different sector (government and non-government sectors) at the local level. In this paper, we try to demonstrate stakeholder analysis (SA) to (1) identify the

role, and (2) assess the power, and leadership of the actors. Next, we will demonstrate social network analysis (SNA) to (1) identify the relationship between the actors and (2) examine the key actor on the implementation of disaster management.

Previous studies are addressing actors in disaster management in Indonesia is limited in the relationship between actors in a single stage of disaster only. The study includes, Bisri (2016) discusses the network performance to compare inter-organizational cooperation during earthquake emergency response in two provinces in Indonesia (Bisri and Beniya 2016); Lassa (2010) analyzed the relationship between institutional and regulatory factors to map key actors in disaster management in Indonesia (J. A. Lassa 2010).

5.2 Methodology

In building a good disaster management system requires strong commitment and leadership (Rivera, Tehler, and Wamsler 2015) (Rautela 2015). In some cases, disaster management systems are robust to implement due to lack of strong leadership factors. Especially in an emergency phase, leadership is crucial. In times of emergency, every decision should be taken quickly and appropriately to reduce casualties. In disaster management, the biggest challenge is to bring actors from different sectors and interests to work together in one system (CRED 2015). The sectoral approach in the governance system was found to be barriers in bringing institutions together as one (Corlew et al. 2015). Some research addresses the complexity of stakeholder leadership and power in disaster governance.

The empirical finding by Newnham et al. (2007) show that the government's role has shifted to disaster management (Newnham et al. 2007). The government should provide a more portion for the people to be able to manage its environment. Decentralization also gives communities more significant opportunities to express their opinions. The ideal role of local government is to increase the capacity and knowledge of the community in disaster management. More educated communities will also parallel the government to be more open and transparent in every policy taken. In disaster management, the participation of various actors is proven to support disaster planning and implementation (Koivisto 2014). With proper collaboration expected will reduce the burden of government especially from the financial side. Also, by encouraging the function of other actors, especially the community will be able to build community resilience (Djalante, Thomalla, Sabaruddin, et al. 2012).

5.2.1 Data Source

Our study was conducted in four municipalities: Semarang City, Cilacap Regency, Banyumas Regency, and Purworejo Regency. All municipalities located in Central Java Province of Indonesia (see **Fig. 1**). Central Java Province is one of the most populous provinces in Indonesia. Located in the middle of Java Island – the most populated island in Indonesia and categorized as the third most at risk province in Indonesia. The selection of these sites is based on two critical criteria: First, the study location has a high risk based on the disaster risk index issued by the National Disaster Management Agency (BNPB). Second, the location has the same main natural hazard characteristics (see **Table 2**). Both criteria are essential to be able to conduct comparative studies between study sites.
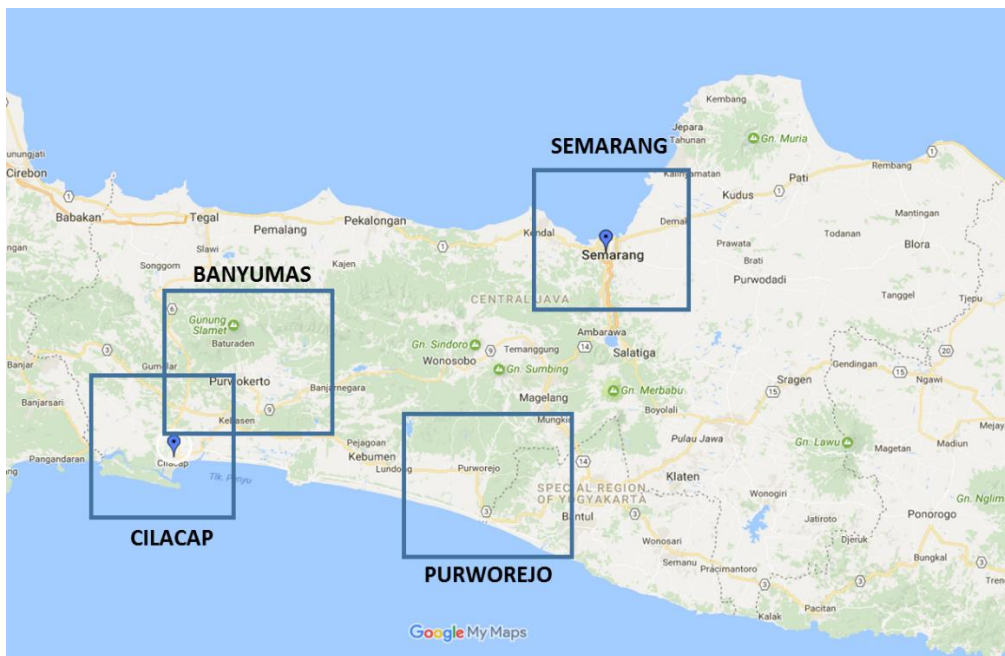
Figure 5. 1 Location of study

Firstly, a literature survey of the actor on disaster management was performed. To categorize the actor using the Disaster Management National Plan issued by BNPB and Local Institution Government Plan published by the Ministry of Home Affair (MOHA). The result, three groups for local government, were selected as respondents of this study: agency related to disaster management, an organization associated with government's administration, and other sectoral

institution. Next, to identify the constituents of each group, a literature review on Disaster Management Act was conducted, and an initial list of 24 actors in each city was selected. Next, the snowballing methods were adopted to expanding the respondent from the non-government organization: academia, civil society (NGOs), community, donor agency, and the private sector.

Table 5. 1 The characteristic of the municipalities

Characteristics	Semarang City	Cilacap Regency	Banyumas Regency	Purworejo Regency
Covers area (km$^{2)}$)	373.78	2,124	1,335	1,834
Population (people)	2.137.801	2.137.801	1,554,527	828,947
Potential natural hazards	Flood, landslide, earthquake, residential fire	earthquake, tsunami, flood	flood, landslide, volcanic eruption	landslide, flood
Disaster risk index	High	High	High	High

In the end, we interviewed 90 actors: 35 actors from Semarang City, 28 actors from Cilacap Regency, 15 actors from Purworejo Regency, and 12 actors from Banyumas Regency (see **Table 5.2**). We used semi-structured interview followed guidelines with the several important questions: 1). What is your institution's role in every stage of disaster? 2). Who is influential and affected by the policy? (Stakeholder analysis part 1). The next questions are 1). How do you assess the power and 2). How you value the leadership of related organizations in disaster management? (Stakeholder analysis part 2). Most of the questions used the Likert scale with three points of choice and often the respondent is asked why they chose that point.

Table 5. 2 List of the stakeholder in disaster management system

Sector	Semarang City	Cilacap Regency	Banyumas Regency	Purworejo Regency
Government	**BPBD, Bappeda, Legal Bureau, Financial Bureau**, **Public works**, **Social affairs, Fire management**, **Satpol PP**, Water management, Energy and mineral agency, **Kesbanglinmas**, Inspektorat, Kecamatan, Kelurahan, DKP, BLH, PSDA, **Education agency**, BMKG, BPMPKB, **Transportation agency**, Bina Marga, Cipta Karya, BPN, BPSDA , Agricultural agency, PDAM, RSUD, SEKDA, DPRD, Sekretariat DPRD, BASARNAS, KODIM, Police	**BPBD, Bappeda, Legal Bureau, Financial Bureau**, **Public works, Social affairs, Fire management**, **Satpol PP, Water management, Energy and mineral agency**, **Kesbanglinmas**, Inspektorat, Kecamatan, Kelurahan, DKP, BLH, PSDA, Education agency, BMKG, BPMPKB, **Transportation agency, Bina Marga, Cipta Karya**, BPN, BPSDA, **Agricultural agency**, PDAM, RSUD, SEKDA, DPRD, Sekretariat DPRD, BASARNAS, KODIM, Police	**BPBD, Bappeda**, Legal Bureau, **Financial Bureau**, **Public works**, Social affairs, Fire management, **Satpol PP**, **Energy and mineral agency,** Kesbanglinmas, Kecamatan, Desa, **Health agency**, Education agency, BMKG, **Transportation agency,** Bina Marga, Cipta Karya, Puskesmas, RSUD Ajibarang, RSUD Banyumas, Agricultural agency, DPRD, SEKDA, BASARNAS, KODIM, Police, Perhutani	**BPBD, Bappeda, Legal Bureau, Financial Bureau, Public works, Social affairs**, Fire management, **Satpol PP**, Energy and mineral agency, **Kesbanglinmas**, Kecamatan, Desa, **Health agency**, **Education agency**, BMKG, Transportation agency, Bina Marga, Cipta Karya, Puskesmas, Agricultural agency, RSUD, SEKDA, BASARNAS, KODIM, Police
Civil society (NGOs)	Pramuka, PMI, **Bintari**, **Kalandara**, P5, Tagana	Pramuka, PMI, **Seroja, Tagana**	Pramuka, PMI, **ACT**, Ampel, Tagana	Pramuka, PMI, Kompak, Tagana
Academia	**Diponegoro University**, USM, UNISULLA, UNNES, **POLINES**	-	**ONSOED**	-
Community organization	**PKK**, Karang taruna, **Kelompok siaga bencana**, Dasa wisma, Posyandu	**Karang taruna, Kelompok siaga bencan**a, Dasa wisma, Mosque	**Kampung siaga bencana**	Karang taruna, **Kelompok siaga bencana, Desa siaga bencana**
Donor agency	**Mercy Corps**, Rockefeller	UNDP	-	-
Private sector	Djarum, Phapros, Guna bina kimia, Viva generic, Sido muncul	Pertamina, Pelindo, BRI, Holcim	Semen Bima, Telkom, Holcim	BCA, Pertamina, Taspen, Sinar mas

Note: Written with a bold font indicates that the actor is being interviewed

5.2.2 Analytical method

5.2.2.1 Stakeholder Analysis

First, we conducted a stakeholder analysis. A stakeholder can be identified as people, or groups, or institutions that are likely to be affected by a program or policy activity, whether positive or negative that may have an impact on the outcome of the program/policy (Lin et al. 2017). SA is a systematic process to collect and analyze qualitative data to explain the role and importance of each actor in the implementation of a system or policy (Schmeer 2000). Some stages in the SA include explaining phenomena influenced by a policy/decision, identifying affected actors/institutions, then mapping stakeholders to see the level of importance and role in policy making (Dos Muchangos et al. 2017). SA is an important instrument for understanding the social and institutional context of a program/policy activity. The things revealed by this tool can provide information about: (1) anyone who will be influenced by programs/policies either positive or negative (Mok et al. 2017). (2) anyone who may have a positive or negative impact on the program/project (Reed et al. 2009b); (3) What individuals, groups, and institutions need to be involved in the program/policy and how; And who needs to build capacity to participate actively in it (Bryson 2004).
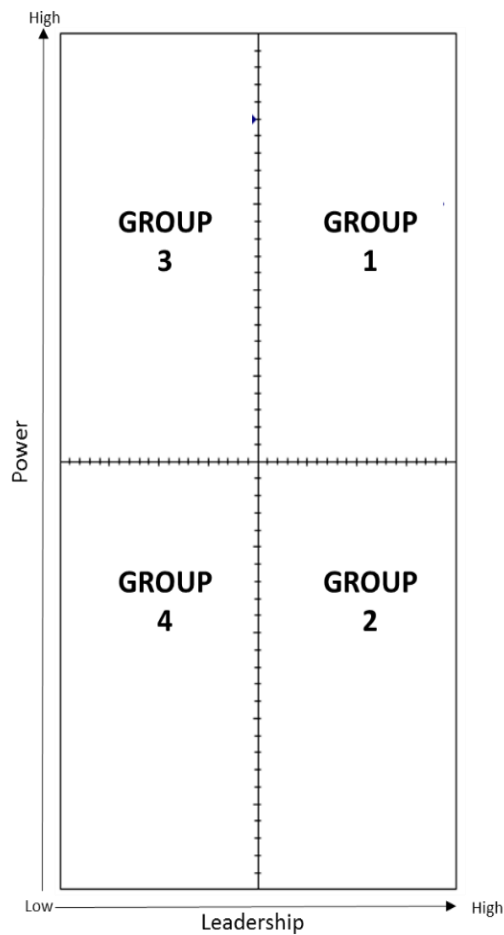
Figure 5. 2 Mapping of the stakeholder based on power and leadership (Schmeer 2000)

Stakeholders in a system can be identified in various approaches. SA is an analysis that does not have a standard form, thus giving researchers the freedom to choose the analytical tool used to categorize stakeholders. One typology used is to analyze the characteristics and roles of stakeholders with five Likert-scale points (Dos Muchangos et al. 2017). In this analysis, the author tries to analyze stakeholders based on the information, knowledge, and satisfaction of each stakeholder in the implementation of the disaster management policy at the local level. Another study on SA focuses on four sectoral analyses in a water infrastructure process using a ten-point Likert scale (Lienert et al. 2013).

To analyze stakeholders, we asked respondents to 1.) mention all actors relating to disaster management at the local level. 2.) explains the position of each actor in the disaster prevention activities using binary scale types 0 and 1 (0: "the actor has no role in the activity"; 1: "the actor has a role in the activity"). They are also asked about the level of stakeholder interest based on the ability of each stakeholder to impact on disaster management policies. Each respondent points to the "power" and "leadership" factor of each stakeholder based on a three-point Likert scale (1: "actor has low power or leadership"; 2: "actor has medium power or leadership"; and 3: "actor has high power or leadership. ").

Table 5. 3 Definition of power and leadership factor

Power	Leadership
Ability of the stakeholder to affect the implementation of the disaster management policy due to the strength or force he or she possesses	The process of influencing the activities of an organized group **toward goal achievement** (Rauch & Behling)
These resources could be: monetary, human, political, or scientific, amongst others	Willingness to initiate, assemble, or lead an action for or against the disaster management policy

Next, the diagram built to represent the distribution of power and leadership in four locations of the study as the outputs of SA. This study analyzed the stakeholder importance based on power and leadership aspects in four phases of disaster (prevention and mitigation, preparedness, response, and recovery). Referring to Schmeer (2000), the level of importance of stakeholders is a description of the ability of each actor to influence the system or policy (Schmeer 2000). To determine the level of interest on a policy, the characteristics of each actor are defined by the power and leadership factor. This study will divide actors into four categories: Group 1, actors with high leadership and high power. Group 2, actors with high leadership and medium/low power. Group 3, players with low/medium leadership but has high power; Group 4, those actors with low/medium leadership and low/medium power. The diagram of the analysis shown in the **Figure 5.2** and **Table 5.3.**

In this study, we divided the stakeholders in two study area into four stakeholder groups. Based on some research we proposed the name of the groups and their characteristics (see **Table 5.4**).

Table 5. 4 Stakeholder's group and the characteristics

Group	Name	Characteristics
Group 1	Advocate stakeholder	• High power • High leadership • The one that can make differences • Ability impact the system (Schmeer 1999) • The key actor (Eden & Eckerman, 1998)
Group 2	Antagonistic stakeholder	• Low power • High leadership • The irresponsible (DFID, 2003)
Group 3	Low priority stakeholder	• High power • Low leadership • Ability impact the system if given opportunity • The —victims" (Petit, 2011)
Group 4	Problematic stakeholder	• Low power • Low leadership • The bystanders • The —crowd" (Eden & Eckerman, 1998)

5.2.2.2 Social network analysis

With SA, the qualitative data based on the respondent's opinion can be used to map the stakeholders in a system based on the importance and influence of each actor. But based on some studies, SA has several disadvantages. First, in the SA only focuses on the character and behavior of each stakeholder, but does not discuss how the level of influence of stakeholders in a system (Lienert et al. 2013). Second, stakeholder identification is often based on the subjective assessment of the respondents (Dos Muchangos et al. 2017). Third, in a system required analysis of the network structure so that it can be known the relationship between stakeholders in the system (dos Muchangos et al. 2017b). SNA is a logical approach to covering weaknesses in SA. SNA is a quantitative approach to analyze the strength of relationships among stakeholders in the system (Dos Muchangos et al. 2017). The SNA approach can be applied in policy analysis to analyze structural network patterns among stakeholders. Social networks are relationships created between many individuals in a group or between groups with other groups. The relationships can be both formal and informal. Social relations is a reflection or reflection of cooperation and coordination among citizens based on active and reciprocally social ties.

The approach of combining SA with SA is not a new approach. This method has been applied to various fields, such as public policy, regulation, water resources, institutional, environmental, and

development planning (Lienert et al. 2013) (Dos Muchangos et al. 2017) (Prell et al. 2009) (Yu et al. 2017). The main purpose of SNA is to know the relationship between stakeholders in a system which previously had to be identified first. Therefore, some scholars do not strictly divide between SA and SNA. In our case, a combination of SA and SNA allows us to identify inter-organizational patterns of disaster management at the local level and analyze fragmentation and key role of particular actors. SNA can answer some questions that cannot be explained by using the SA approach. To answer questions such as who is the key actor in the system, what is the relationship between the leading actor and the supporting actor, and how the relationship between the government and non-government sectors. Some of the examples above show that SA and SNA are mutually supportive and complementary approaches to one another. In disaster management context, the combination of SA and SNA is relatively new. Most of the scholar using SNA to analyze the pattern of the network related to the institutional and regulation of disaster governance. A few examples include, a study conducted by Mojtahedi, used this to analyze stakeholder attributes of disaster recovery project (Mojtahedi and Oo 2017b).

5.3 Identification group of stakeholders and their role

The Law Number 24 of 2007 of Disaster Management establishes the basis for the disaster management legal framework in Indonesia. The law is hailed as the first comprehensive disaster management law which delineates national and local government responsibilities, community rights and obligations, roles of private sector and international organizations, the disaster management stages, and requirements, and disaster aid finance and management.

Article 5 of Law No. 24 of 2007 on Disaster Management mentioned that the central government and local governments become primary responsibility in disaster management (CFE-DMHA 2015). The issuance of Law no. 24/2007 then there is one legal certainty for disaster management system in Indonesia. All sectors understand the roles and functions and have the confidence to take action related to disaster management in all phases of disaster (Bappenas 2014).

Based on interviews and literature studies in four research areas, can be identified six sectors of actors related to disaster management at the local level: government, civil society, community organization, academia, donor agency, and private sector (see **Table 5.5**). The number of each institution varies from one municipality to the other. But in general, each group has a representative

in each study location. The government is the main responsibility of disaster management. The government has a role to plan and implement disaster management activities. Also, the government is also obliged to allocate sufficient funds for activities in the four stages of the disaster. Regional Disaster Management Agency (BPBD), Regional Development Planning Agency (BAPPEDA), and Financial Bureau are the three leading institutions with responsibilities concerning disaster management planning and financing at the local level.

Table 5. 5 Group of stakeholder and their role

No	Sector	Role
1.	Government	- Responsible for planning and implementing the policy on disaster management - Allocating enough budget, personnel, and other resources
2.	Civil society (NGOs)	- Bridging the gaps between government and the people - Empowering the community
3.	Academia	- Supporting the government in research and developing tools for disaster management
4.	Community organization	- Participate in preparing a disaster risk analysis - Work with the government in developing mitigation plans
5.	Donor agency	- Supporting funding and human resources in developing regulations and other technical rules.
6.	Private sector	- Supporting the government's role in disaster management in its area of expertise

The other important actor is a civil society (NGOs). Civil society is mainly composed of non-profit and non-government organizations and volunteer organizations in disaster management. Some organizations mentioned in the interviews are: Justice Enforcement Command (KOMPAK),

Institute for Women and Children Empowerment Edge (SEROJA), Quick Response Action (ACT), Caring Community Alliance (AMPEL), Sustainable Works Development (BINTARI), Social and Humanity Foundation (KALANDARA), and Public Service Delivery Center (P5). Most civil society institutions work with the government to build community resilience. Some agencies also receive funding support from donor agencies as their primary source of funding.

Educational institutions are also actively involved in disaster management activities. Some local universities are partners for the local government in conducting research and academic manuscripts of disaster management technical regulations. Some universities are also active in the process of community empowerment and mitigation through the Community Development Program (KKN). Post-decentralization, the Disaster Management Act provides opportunities for a community organization to be directly involved in disaster management. The Disaster Risk Reduction Forum (Forum-PRB), for example, is a regional-based community organization that serves as a disaster management forum for coordination through consultative and participatory processes. This forum presents an opportunity for the citizen to be actively involved in disaster management's activities.

In the last decade, the role of donor agencies is critical in building disaster management system at national and local level. United Nation Development Planning (UNDP), for example, with the Safer Community through Disaster Risk Reduction (SCDRR) program simultaneously implemented programs to develop regulatory frameworks, databases, and community empowerment at the national and local level. Several other donor agencies are also involved in climate change adaptation and mitigation at the local level. Since 2009, Mercy Corps and Rockefeller Foundation developed Semarang City becoming one of the 100 resilient city networks. The private sector also becomes an active agency involved post-decentralization. Disasters are no longer seen as business as usual; community resilience is key to economic resilience (UNISDR 2015). With an active role in disaster management, the private sector can build ties with the community as part of achieving the target of national resilience.

5.4 Stakeholder analysis
5.4.1 SA part 1: mapping of stakeholder's role
In this study, we map stakeholders based on their role in any disaster management activities. Based on the results of the interviews, we formulated a dataset that prepared each stage of disaster management with the number of stakeholders involved in each case study location. Disaster is the

result of the emergence of extraordinary events (hazards) in vulnerable communities so that people cannot overcome the implications of these exceptional events (Lindell 2013). Disaster management primarily seeks to prevent people from disasters by reducing the likelihood of hazards or overcoming vulnerabilities (Tarhan, Aydin, and Tecim 2016). Disaster management cycle consists of two major activities. The first is the disaster (pre-event) and secondly is after the disaster (post-event). In this study, we used a four-stage disaster approach: prevention-mitigation and preparedness for pre-event phase; response and recovery for post-event period (see **Table. 5.6**). In this analysis, we assume that every disaster management policy established by the local government will affect the number of stakeholders at each stage of the disaster. In other words, the more policy focus at one stage of the disaster will open up opportunities for wider stakeholders to be involved in it (see **Table 5.7**). The purpose of this analysis is to identify the distribution of stakeholders in each disaster management activity. Each of the disaster stages has three activities, so there is a total of 12 activities to be mapped in this analysis.

Table 5. 6 List of activities in every phase of disaster

Prevention and mitigation	Preparedness	Response	Recovery
Establish objectives	Emergency access and evacuation	Rescue and relief	Detailed damage assessment
Risk assessment	Emergency drill	Damage assessment	Treatments
Risk prevention and mitigation	Emergency response equipment	Protection of the heritage	Recovery and rehabilitation

 Source: Mojtahedi & Oo (2017)

Based analysis on stakeholder's role in disaster management, the characteristics of stakeholder mapping in the location of study can be divided into three groups. Group 1, is the municipality with stakeholder features that focus on preparedness and response activities. The municipalities that belong to this group is Semarang City and Purworejo Regency (see **Figure 5.3** and **Figure 5.4**). Group 2, is the municipality with stakeholder characteristics that focus on response and recovery. The municipality that belongs to this group is Banyumas Regency (see **Figure 5.6**). Group 3, is the municipality with stakeholder characteristics that focus on prevention and mitigation, preparedness, and recovery phase. The city that goes into this criterion is Cilacap Regency (see **Figure 5.5**).

Table 5. 7 List of disaster activities and the number of stakeholders

Phase of disaster	Activities	Semarang	Purworejo	Cilacap	Banyumas
Prevention and mitigation	Establish objectives	16	17	27	16
	Risk assessment	13	10	24	9
	Risk prevention and mitigation	28	21	23	23
Preparedness	Emergency access and evacuation	20	19	22	13
	Emergency drill	25	26	27	23
	Emergency response equipment	28	18	27	23
Disaster response	Rescue and relief	33	36	34	25
	Damage assessment	19	12	31	19
	Protection of the heritage	6	10	17	18
Recovery	Detailed damage assessment	7	15	23	12
	Treatments	9	18	19	11
	Recovery and rehabilitation	13	18	29	32
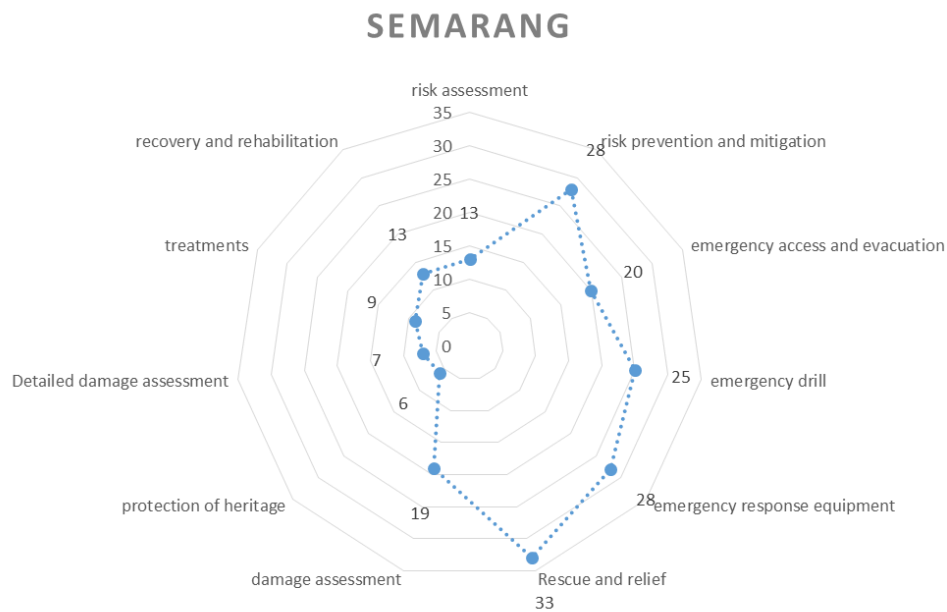
SEMARANG

Figure 5. 3 Mapping of stakeholder on disaster management in Semarang
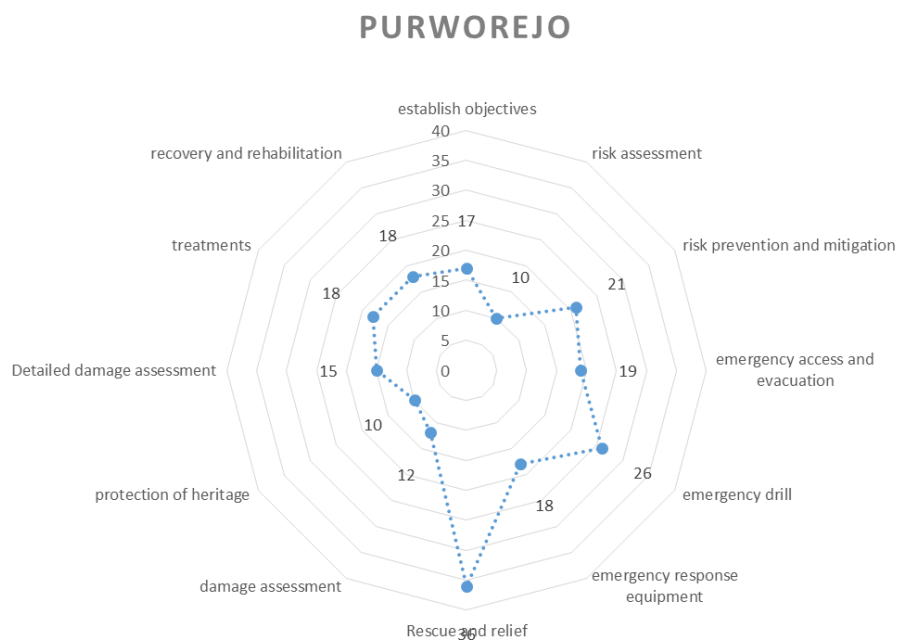
PURWOREJO

Figure 5. 4 Mapping of stakeholder on disaster management in Purworejo
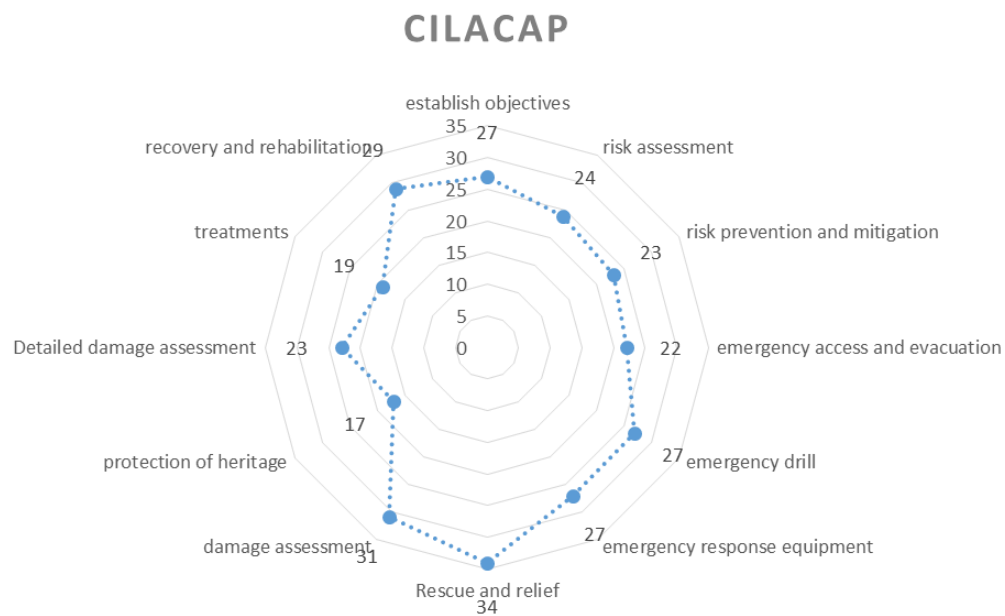
Figure 5. 5 Mapping of stakeholder on disaster management in Cilacap
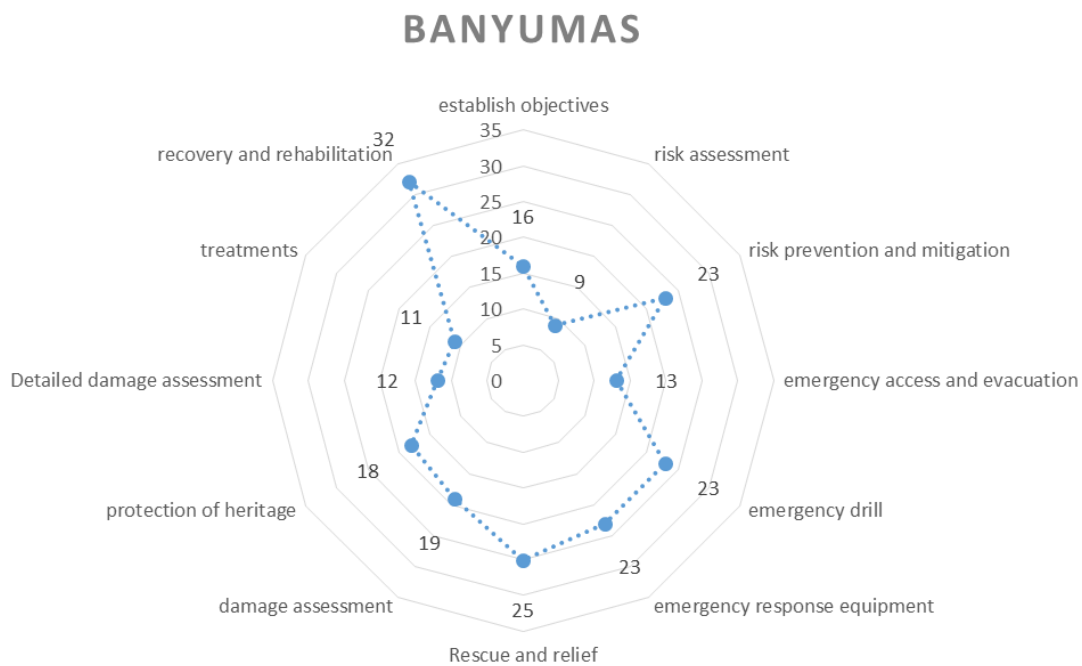
Figure 5. 6 Mapping of stakeholder on disaster management in Banyumas

Several factors cause different characteristics of maps of stakeholder between one municipality with others. First, local government development priorities factor. Based on interviews with respondents, it is known that disaster management affairs are not always becoming a priority in regional development. In a municipality with major disaster experiences such as Cilacap Regency with experienced an earthquake and tsunami (2006), disaster risk reduction (DRR) continues to be pushed into development priorities with sufficient budget allocation commitments in local funds. Second, the existence of an actor who plays a role in the formulation of objectives and plans in disaster management. Third, the role of government to encourage non-governmental organizations is involved in every stage of the disaster. It should be admitted that local government resources are insufficient in handling all disaster management activities. Therefore, the local government needs a strategy to engage non-governmental organizations to support the government's policy to achieve its objectives in disaster management.

5.4.2 Analysis power and leadership

Next, we will use SA based on two aspects, namely power, and leadership. Power and leadership are characteristics to determine the importance of stakeholders from SA (dos Muchangos et al. 2017b) (dos Muchangos et al. 2017a). In this analysis, we will try to map the level of stakeholder interest in the four stages of the disaster, namely: prevention and mitigation, preparedness, response, and recovery. We assume that by mapping the characteristics in each study area in the four stages of the disaster, we can understand the characteristics of the disaster management system in each municipality. Besides, we assume that the four stages of the disaster have been able to capture most of the actors involved in it.

Stakeholder mapping based on an assessment of the significance of stakeholder importance to the disaster management system in the prevention phase can be categorized into four groups as shown in the **Figure 5.7**. Total of 179 stakeholders from four municipalities were mentioned as playing a role in local disaster management. From the figure, all stakeholder in the first group is occupied by actors from government sector. No actors were identified from civil society, academia, community, donor agency, and the private sector. In Indonesia's disaster management system, the government has a responsibility in determining the policy from the planning to the implementation. In the second group, the role of non-government actors began to emerge, especially from the community sector.
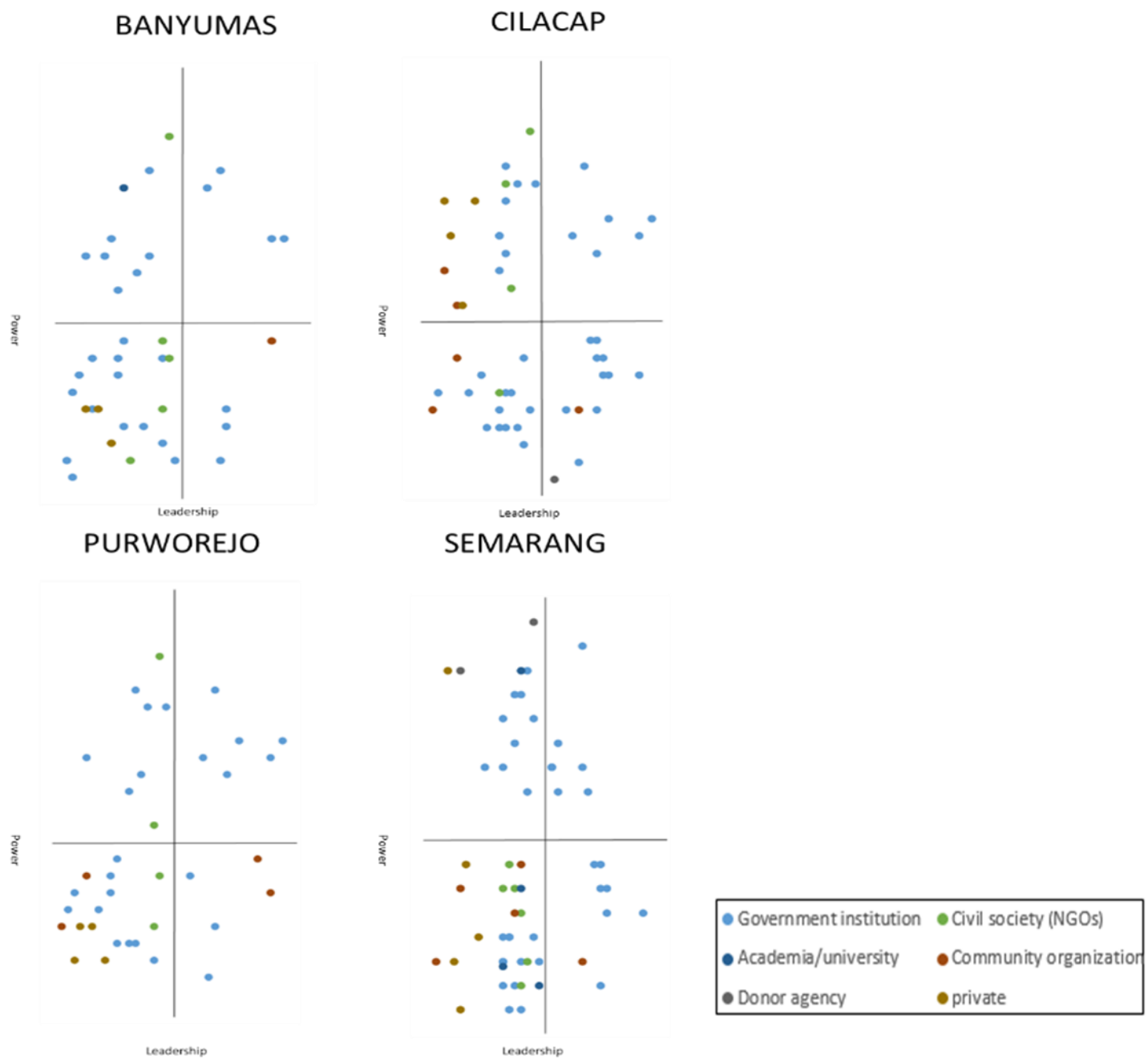
Figure 5. 7 The mapping of stakeholder on prevention and mitigation phase
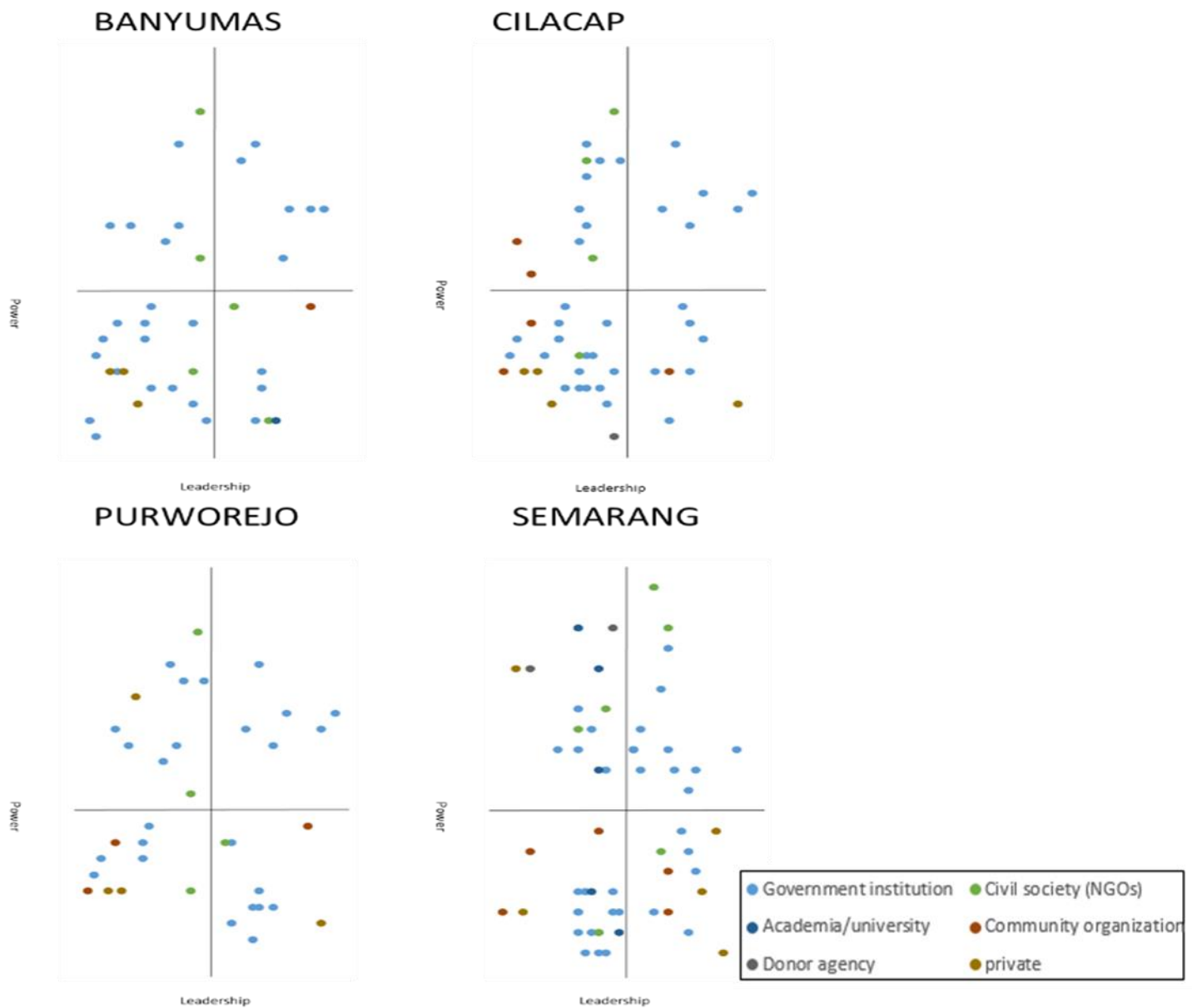
Figure 5. 8 The mapping of stakeholder on preparedness phase

In the preparedness phase, group one are still dominated by actors from the government sector (see **Figure 5.8**). Interestingly in Semarang City, Group 1 also involves actors from civil society who

have high leadership and high power. Actors who are directly involved so have power and leadership as equal as internal stakeholders become part of the *crowd* (dos Muchangos et al. 2017a). In this phase stakeholders of civil society in Semarang City, for example, had long experience in disaster preparedness. Their role is crucial in the policy-making process. In this phase, the spread of the actor on each group becomes more heterogeneous. One of the underlying aspects is in this phase the government opens wider opportunities for other actors to be involved in the decision-making process. In contrast to the prevention and mitigation phases that can be planned gradually, this phase requires a relatively large resource in a short time. So, the contribution of external resources from other stakeholders is needed.

In the response phase, almost all stakeholders will give all their resources to reduce the impact of disasters. Group 3, those who have medium or low leadership but high power become very heterogeneous groups (see **Figure 5.9**). This group consists of many government agencies, the private sector, and civil society. In a heterogeneous group like this, often some actors work independently without waiting for command or coordination from key stakeholders. Because some actors, especially from the private sector and civil society who get support from donor agency have reliable resources to be able to perform their role. Non-governmental organizations tend to move quickly in the emergency response phase. The condition happens because sometimes aid from the government is considered slow while people need help as soon as possible. The impact often occurs overlap in the implementation of the role between stakeholders.

Therefore, building an effective communication network is one way to strengthen the system, and each actor can perform its function without any overlap. During the recovery phase, the first group, most the actor are re-filled by the actor from the government. Non-government sectors do not have many roles in the recovery phase because this phase has become the obligation and authority of the government (see **Figure 5.10**). But it does not rule out if the non-government agencies to assist the government in the implementation of the recovery phase, of course with the mechanism and fund channeling that has been agreed. The third group is the most heterogeneous group compared to the other groups. In this group, the role of government is also supported by other non-government actors: private sector, civil society, community, and academia.
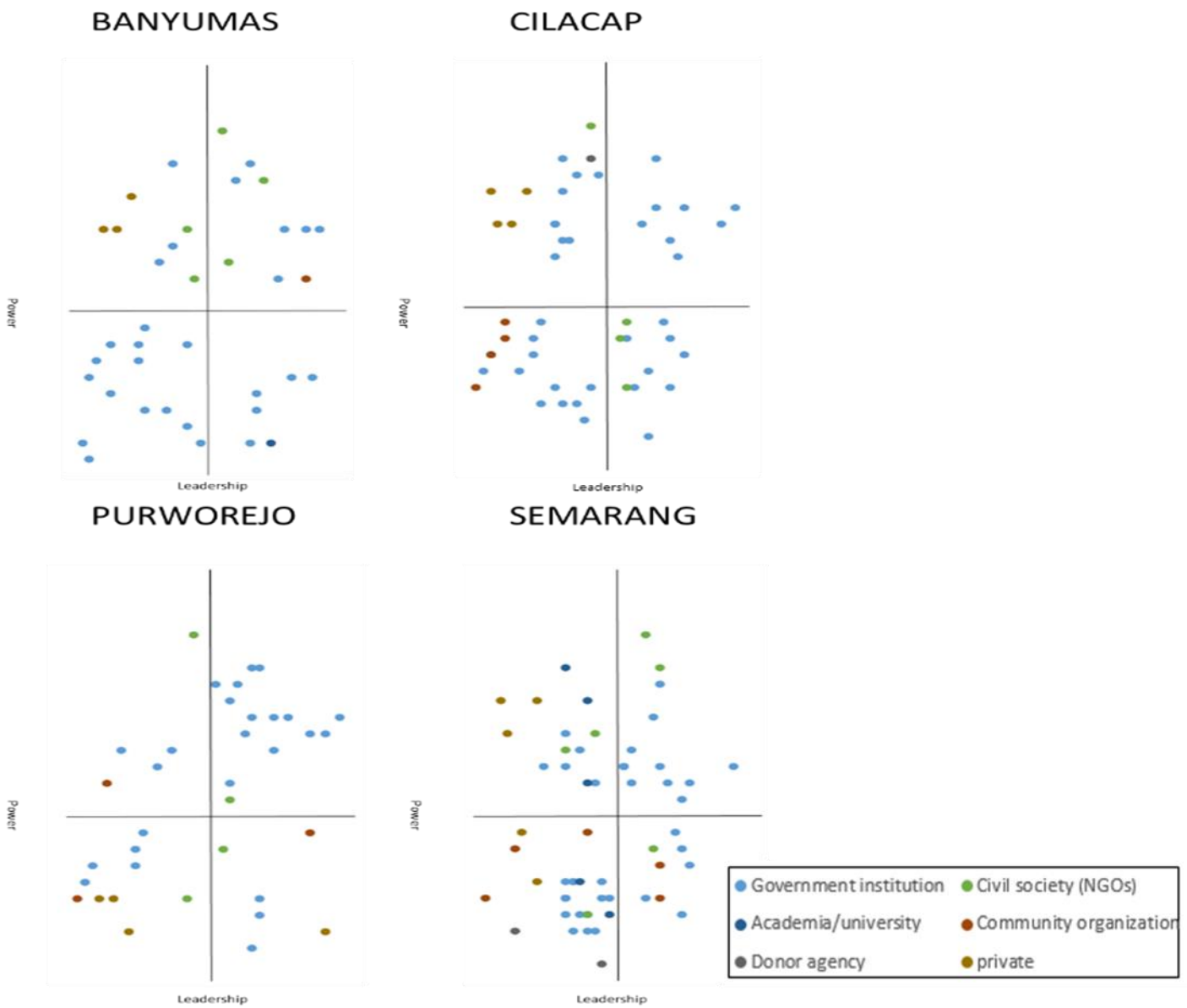
Figure 5. 9 The mapping of stakeholder on response phase
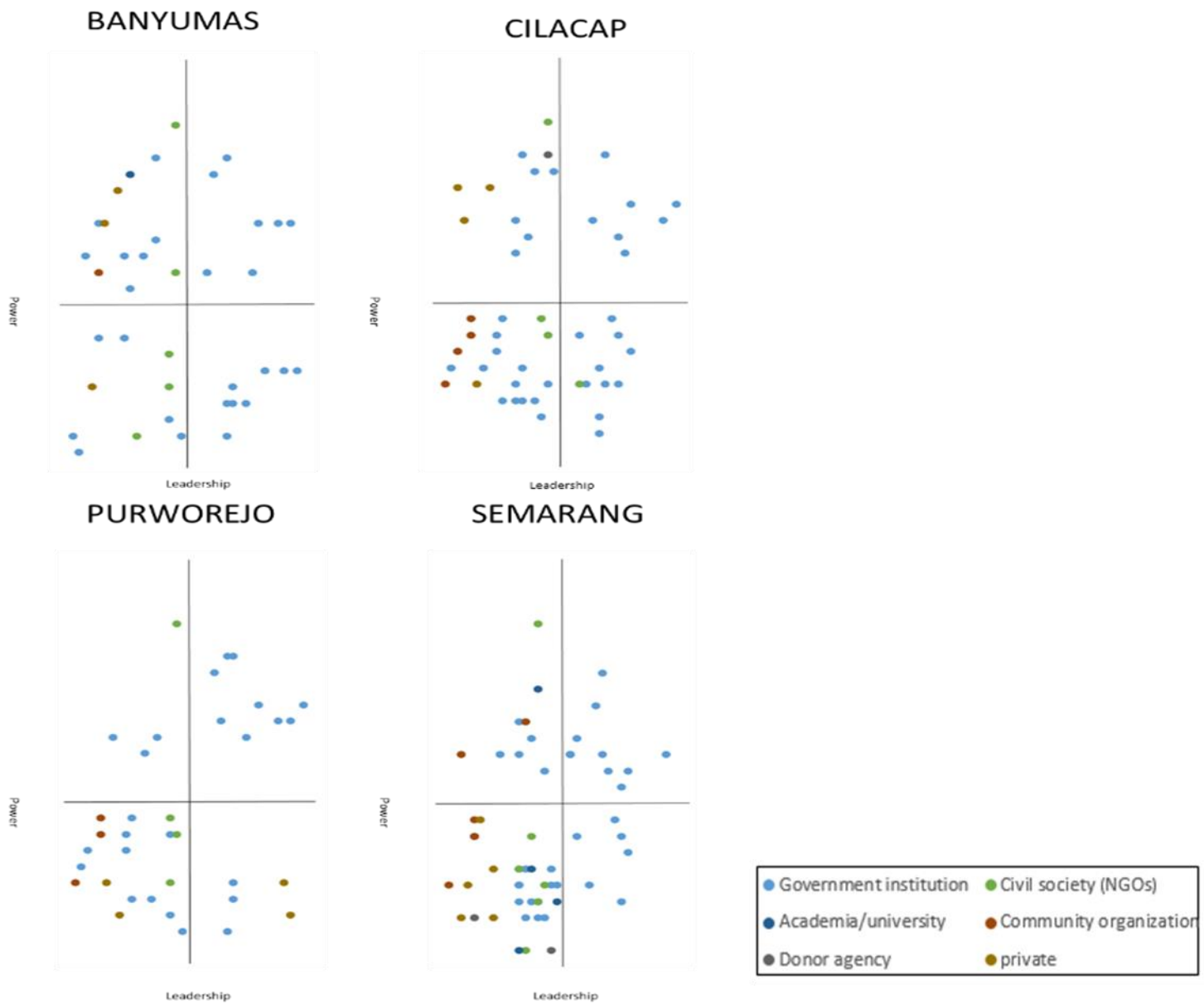
Figure 5. 10 The mapping of stakeholder on recovery phase

5.4.3 Discussion

In the prevention, mitigation and preparedness phase, the role of actors from the government sector is taking control in the decision making the process of disaster management at the local level (Djalante, Thomalla, Sabaruddin, et al. 2012). In the Indonesian context, the part of local government becomes more dominant after decentralization where most authorities are transferred from the central government to lower level of governments (Leer 2016). But to be fully functional implementation, the local government should be dynamic encourage communities to be more involved and have more initiatives in implementing disaster management functions in their region (Guarnacci 2016). This research has revealed that the role of the community has not been enough participated in the decision-making process (see **Table 5.8**). Based on the interviews it was found that the lack of socialization, capacity building, and financial factor became one of the reasons for the low role of community in the disaster management process in case study area.

In addition to the vital role of the community, the role of academia and other research institutions is essential in supporting activities in the pre-disaster phase (Barnes 2014). The position of academia is dominant in risk assessment, early warning development, capacity building, and risk management. This study found that the purpose of academia in Semarang City has been well developed, mainly related to its relationship with the local government. Several types of research institute have been conducted some study primarily related to flood risk assessment and climate change. In Cilacap Regency, the role of academia is still not involved. The absence of a local university that has a substantial capacity in research causes the local government not to engage in too intensive cooperation with actors from academia.

Table 5. 8 The comparison between theory and actual situation on prevention and preparedness

Theory	Actual situation	action needed
• An effective disaster management requires participation of all stakeholders especially communities and that local government has authority and responsibility for disaster management (Djalante, 2012)	• Local government becomes the critical actor of disaster management in two study areas. • No actor from community becomes the key actors	• Government agencies with a technical role in prevention and preparedness phase (Energy and mineral agency, BMKG, Agricultural agency, public works, SATPOL PP) should further enhance the role. • Other agencies from government sector with a ―coordination‖ role should involve more role in planning and regulate activities (Bappeda and Legal bureau). • Representatives of communities which has a significant influence should improve their role Semarang (Kelompok siaga bencana, karang taruna) Cilacap (PMI, tagana)
• Academia, scientific and research entities and networks to focus on the disaster risk factors and scenarios, including emerging disaster risks (UNISDR, ITC, and UNDP 2010)	• Semarang City is better able to participate academia in becoming a partner in studies related to risk analysis and community resilience. • For cooperation with private sector, Cilacap regency is more active in opening opportunity.	• Essential to improving the role of academia in prevention and preparedness activities Semarang (Diponegoro University, UNISSULA)
• Promote community participation in disaster risk reduction through the adoption of specific policies, the promotion of networking, the strategic management of volunteer resources (UNISDR, 2005) • The role of the community is essential to support the implementation of an effective disaster management system at the local level (Artiningsih, Setyono, & Yuniartanti, 2016) (UNDP, 2015).	• Cilacap Regency and Semarang City actively involve the community to have a significant role in decision-making in the prevention and mitigation phase.	• The role of the community organization still needs some improvements. • Increasing the role of grass root level community to support the role of local government (PKK, dasa wisma). • Increasing the role of low-level administrative level of government (district and village). The main role of these actors is representative of local government at the community level (kecamatan, desa/kelurahan)
• International funding institutions, development agencies, and humanitarian organizations should play more an important role in mainstreaming DRR in their overseas development assistance. (O'Brien, 2008).	• In both regions, the role of the donor agency has not been significant.	• Open the opportunity for donor agency to involve in pre-disaster activities (UNDP, Mercycorps, Rockefeller))

Disasters are often not considered when they have not occurred (Kusumasari and Alam 2012). In the event of a disaster, especially major disaster, almost all actors will focus on how the government acts in activities related to rescue and logistics. The role of local government will be very dominant because disaster events are always effects locally and local government is the closest level of government to the community (Rautela 2015) (see **Table 5.9**). Group 3, those who have low leadership but high power become very heterogeneous groups. This group consists of many government agencies, the private sector, and civil society. In a varied group like this, often some actors work independently without waiting for command or coordination from critical stakeholders. Because some actors, especially from the private sector and civil society who get support from donor agency have reliable resources to be able to perform their role. Non-governmental organizations tend to move quickly in the emergency response phase. From our study, we found that this condition happens because sometimes aid from the government is considered slow while people need help as soon as possible. The impact often occurs overlap in the implementation of the role between stakeholders.

During the recovery phase, the first group, most the actor are re-filled by the actor from the government sector. Actor from non-government sectors does not have many roles in the recovery phase because this phase has become the obligation and authority of the government. Based on Disaster Management act, the leading role of the government after the disaster is to formulate a recovery plan that includes rehabilitation and reconstruction. This strategy aims to restore the activities of affected communities as before the disaster happen. In both study areas, the role of local government has been dominant in the implementation of recovery activities (see **Table 5.10**). If compared to prevention, preparedness, and response phase, in this stage we can see there is a significant gap between the actors from the government sector and another actor from the nongovernment sector. It also found that the role of communities in the two study areas decreased when compared with the response phase in which the position of the community was quite dominant. Particularly in Cilacap regency, the role of private sector is dominantly involved in the activity in the recovery phase. The different condition in Semarang City, where private sectors are not meant as seen in other non-government actors.

Table 5. 9 The comparison between theory and actual situation on response phase

Theory	Actual situation	Action needed
• When disaster strikes citizens typically look to local government for capabilities that do not synchronize with pre-existing norms and resources (Blackburn et al. 2014)	• The role of the government sector in both study areas is still dominant with the majority of key actors coming from the government sector	• Encourage other actors from the government sector to involve actively in emergency response (Bappeda, Bina marga, transportation agency, satpol pp, and financial bureau). • Mainstreaming disaster management becomes the best solution to increase the other government actors in disaster management.
• Individuals, private and nonprofit organizations become resources for this collective response operation (Kapucu 2012).	• The role of private sector is critical to support response phase activities • Local Government has successfully exploited the potential of private sector and community resources to be able to support emergency activities	• Stimulate the role of nongovernment sectors to involve in decision making especially the actors with high power but low leadership. (BLH, bintari, kelompok siaga bencana, karang taruna) (tagana) • Promote the leadership of private sector to equip their high power. (Tagana, pertamina, pelindo, holcim)

Table 5. 10 The comparison between theory and actual situation on recovery

Theory	Actual situation	Action needed
• Local government leaders—particularly those who have been through a major community disaster—recognize that preparing for long-term disaster recovery demands as much attention as developing a short-term response (Becker, 2009).	• Government actors in both study areas took over the role of principal actors in both areas of study.	• Encourage other actors from the government sector to involve actively in the recovery phase. (transportation agency, kecamantan, kelurahan/desa, agricultural agency) • Increasing the leadership is essential for this action.
• The role of the community should be crucial in the aftermath of disasters especially in the setting of rehabilitation plans (Amin Hosseini, de la Fuente, and Pons 2016)	• The role of the community declined in the decision-making process • The role of private sector in Cilacap is always important in helping the local government in recovery activities. • In Semarang city, the role of private sector is not so important in the process of policymaking.	• Promote community as a partner for recovery activity with increasing their power and leadership. (kelompok siaga bencana, karang taruna, bintari, seroja) • Encourage private sector with leadership so they can involve actively in the recovery phase. (Pertamina, holcim, pelindo, BRI)
• An increasing trend in the involvement of international nongovernmental actors and international organizations (INGOs/IOs) in post-disaster interventions (J. A. Lassa 2010)	• The role of donor agency is also not dominant in this phase.	• Promote the leadership factor of donor agency to support the recovery activities (UNDP, Rockefeller)

5.4.3 Strategy to improve the network

Based on our findings from SA, we will use two study areas, Semarang and Cilacap as a case study for formulating strategies to improve the networks on disaster management. The selection of these two locations is based on two considerations: first, each city represents the type of city in Indonesia, Semarang represents metropolitan, and big urban, and Cilacap represents medium and small urban. The second weld, based on the SA, is known that these two cities have different disaster management characteristics. Semarang municipality focuses on post-disaster activities, while Cilacap Municipality focuses on pre-disaster activities.

Based on the comparison of the number of stakeholders in each group in the three phases of the disaster, the two study areas have almost identical characteristics (see **Figure 5.11**). In the prevention and preparedness phase, the number of stakeholder advocates (group 1) in both study areas has the same amount. However, the number of problematic stakeholders - who act only as supporters in the system, Semarang city has a broader distribution than the Cilacap regency. In the response phase, there is an increase in the number of actors in Group 1. The addition of the actor mainly comes from the actor of Group-3 who has high power and low leadership. In this phase, the number of actors in group 4 also decreased, where some actors migrated to Group 2 and 3. In the recovery phase, the number of actors in groups 1,2 and 3 in both study areas decreased with most actors returning to their original group in the prevention and preparedness phases. In line with the trend, the number of actors in Group 4 also increased when compared with the response phase.
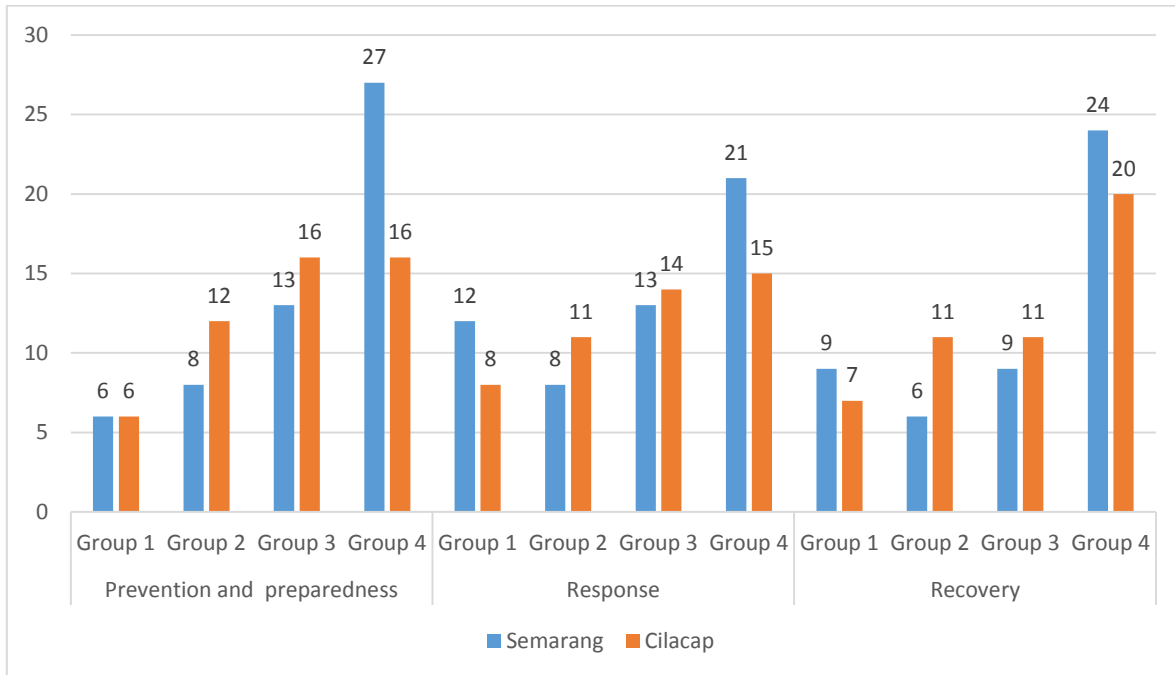
Figure 5. 11 Summary mapping of the stakeholder on the two study area

Some research on stakeholder analysis recommends that the role of each stakeholder can be enhanced to upgrade the overall system. In this study, we restricted the strengthening of stakeholder roles to include only power and leadership factors. Also, we limit that not all stakeholders can be enhanced by their power and leadership. We only recommend stakeholders who are tied to the system at every stage of disaster management. So in this study, we combine the output of SA analysis with secondary data in the form of government documents from local government and government regulations. In this study, we divide three strategies to enhance stakeholder roles: increasing power, increasing leadership, and growing power and leadership (see **Figure 5.12**). Furthermore for our strategy split into both approaches. The first approach is specific to stakeholders from the government. The second approach is particular to non-government actors (see **Table 5.11**).
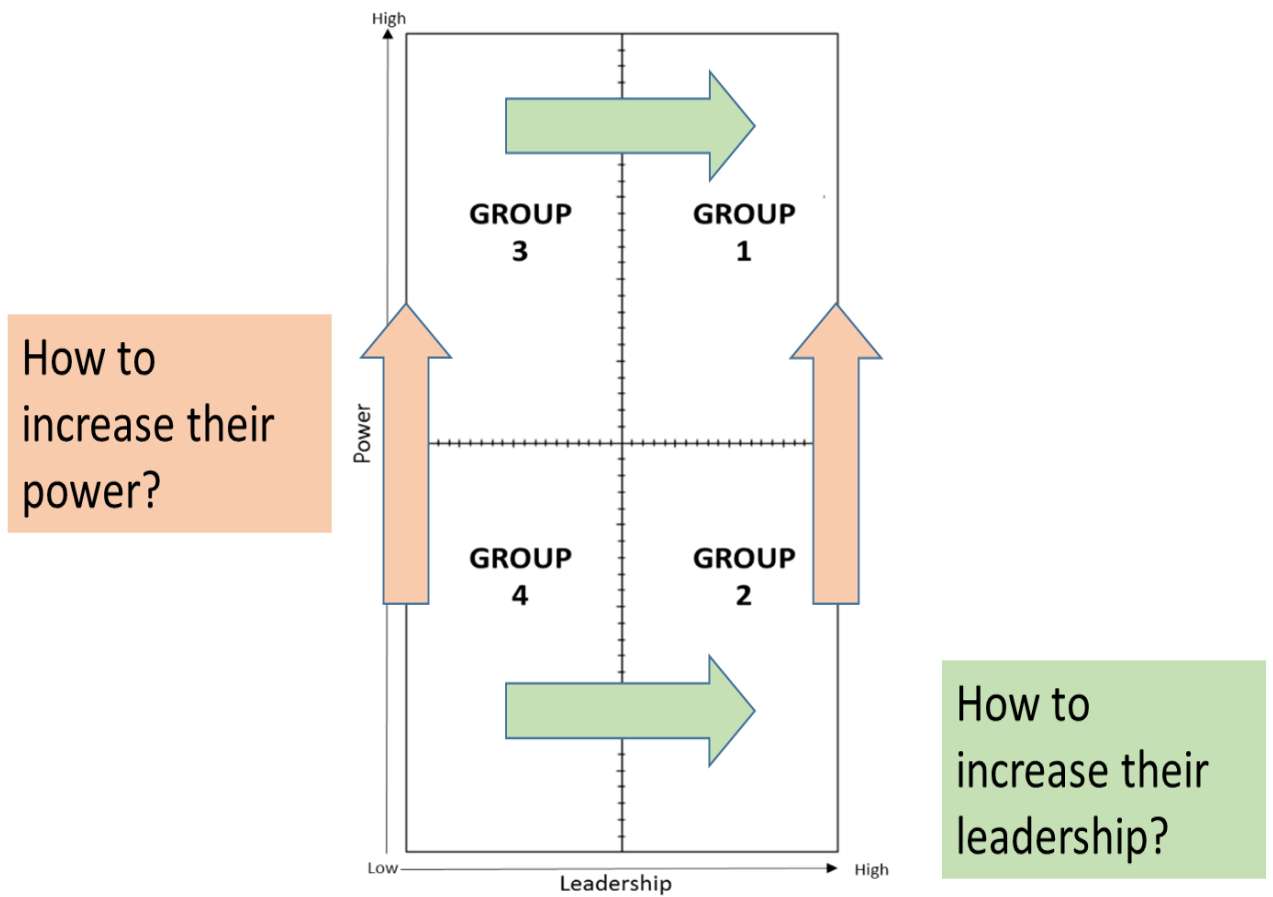
Figure 5. 12 Strategy to improve the network

Table 5. 11 Strategy to improve the role of the stakeholder

	Increase the power	Increase the leadership
Government actor	• Transfer of power (political authority) → money follow function	• Develop regulation for mainstreaming disaster context on other sector program/activity
Non-government actor	• Empowerment • Participation • Ownership	• Partnership

In the prevention, mitigation, and preparedness phase, **Figure 5.13** shows that the majority of actors in both study locations require increased the leadership factor. The number of actors that do not expect improvement in both areas of study is relatively balanced. The finding shows that in the two study areas, the principal actors in the government sector are almost identical. Then for the power aspect, Semarang City has much more actor than Cilacap Regency. Our analysis found that in the prevention and preparedness phase, most actors from the government sector need to enhance their power with an authority transfer strategy (see **Figure 5.14**). This transfer of authority among government agencies has two benefits. First, as a form of distribution of resources, mainly financial and human. Second, to enhance the role of the organization in the policy-making process. Transfer of authority, especially to the lower level government, such as district and village, is a wise choice to bring public services in the disaster management to the people.
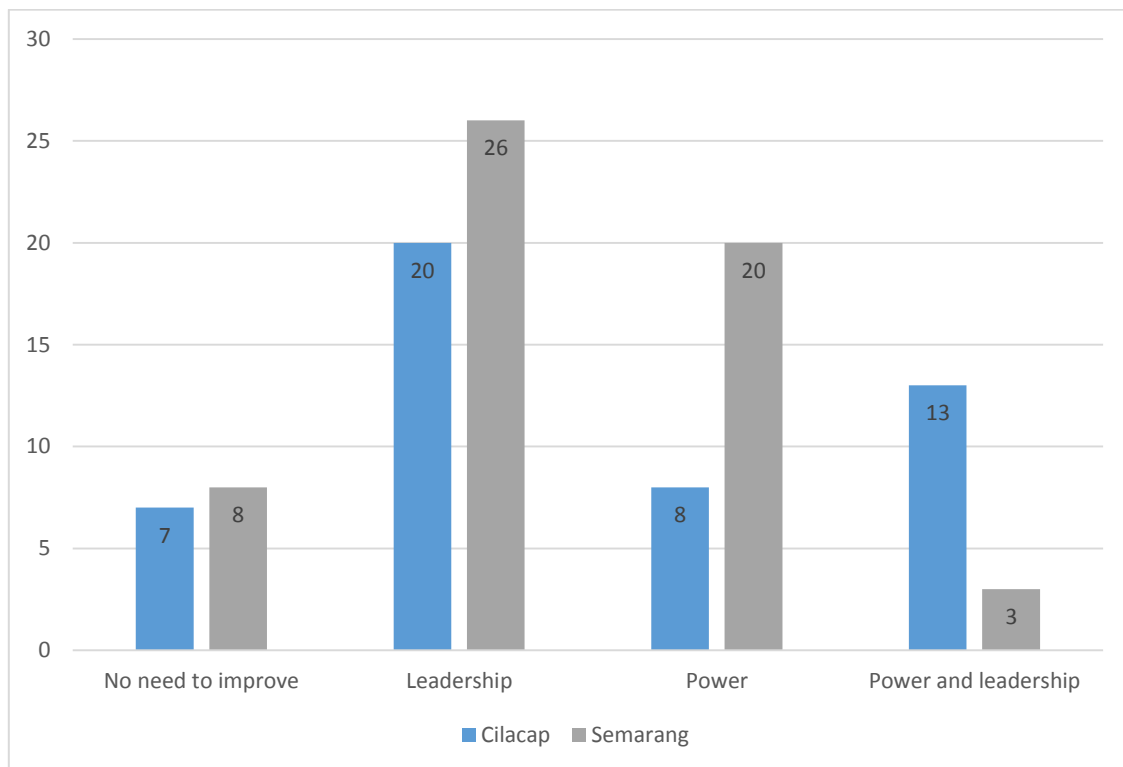
Figure 5. 13 Number of actors that need to develop the system of prevention,mitigation and preparedness
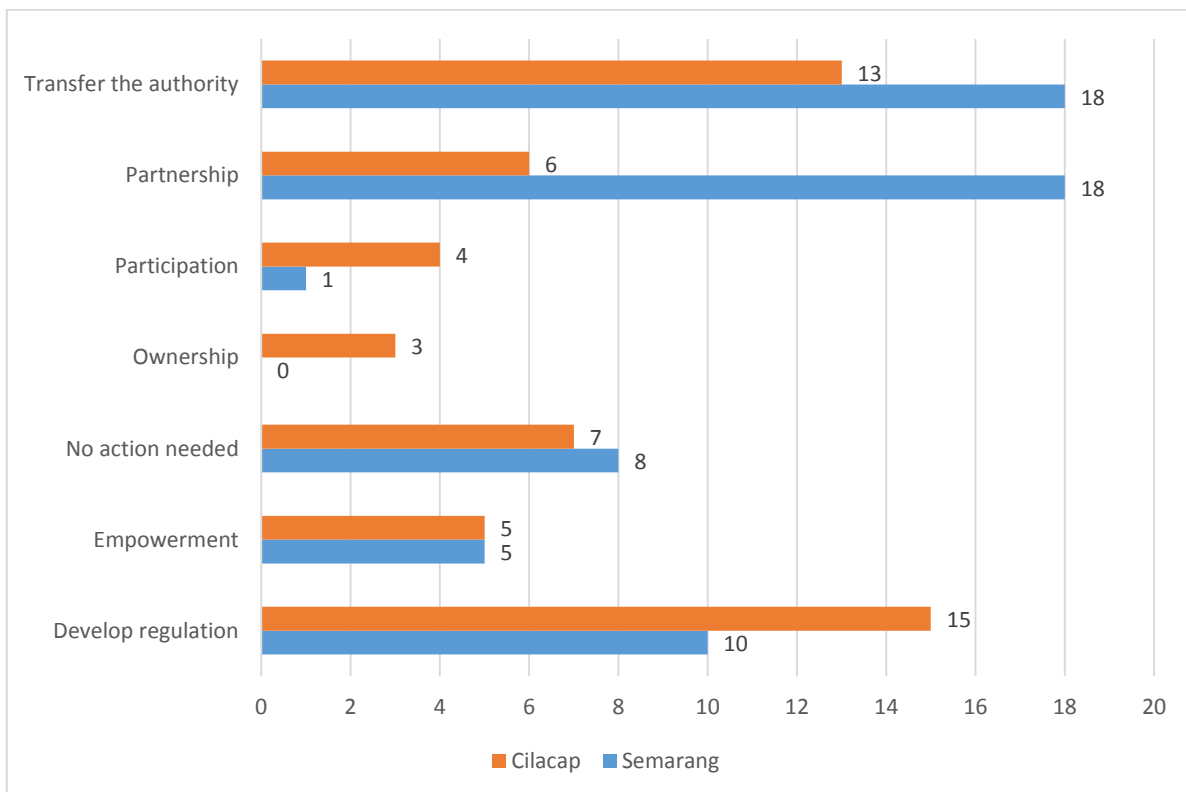
Figure 5. 14 Action needed to improve the role of the actors in prevention, mitigation and preparedness

In the response phase, the two study areas have different actor characteristics. Most of the actors in Cilacap Regency need an increase in leadership, while most of the actors in Semarang City require an increase in power (see **Figure 5.15**). Different approaches to the disaster governance in the two study areas led to these differences. Cilacap regency has potential resources from non-government actors, so most actors need increased initiative in disaster response activities. While Semarang city most of the resources are in the government sector so that the increase of power, especially for nongovernment actors is essential as a form of equity of resources. In both study areas, government actors requiring the transfer of authority as measures of increasing power during a disaster emergency have the same amount (see **Figure 5.16**). For the non-government sector. The majority of actors in Semarang city need participation and partnership to expand their role in disaster management system. While in Cilacap regency, the majority of the actors requires collaboration and empowerment.
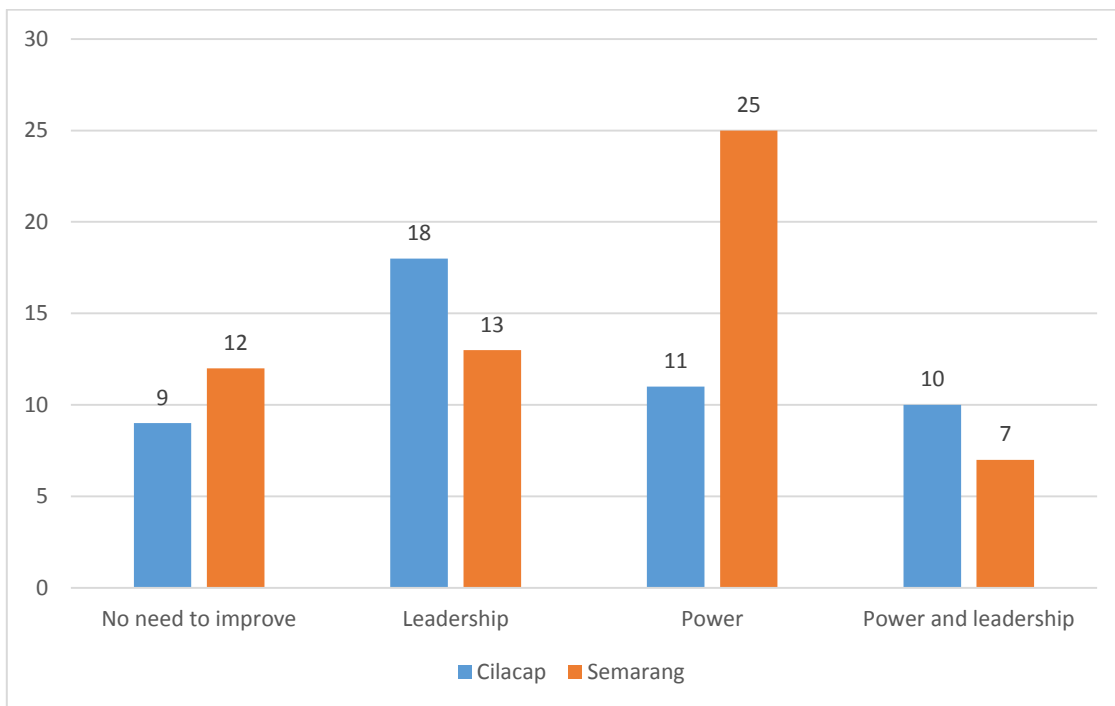
Figure 5. 15 Number of actors that need to improve the system in response
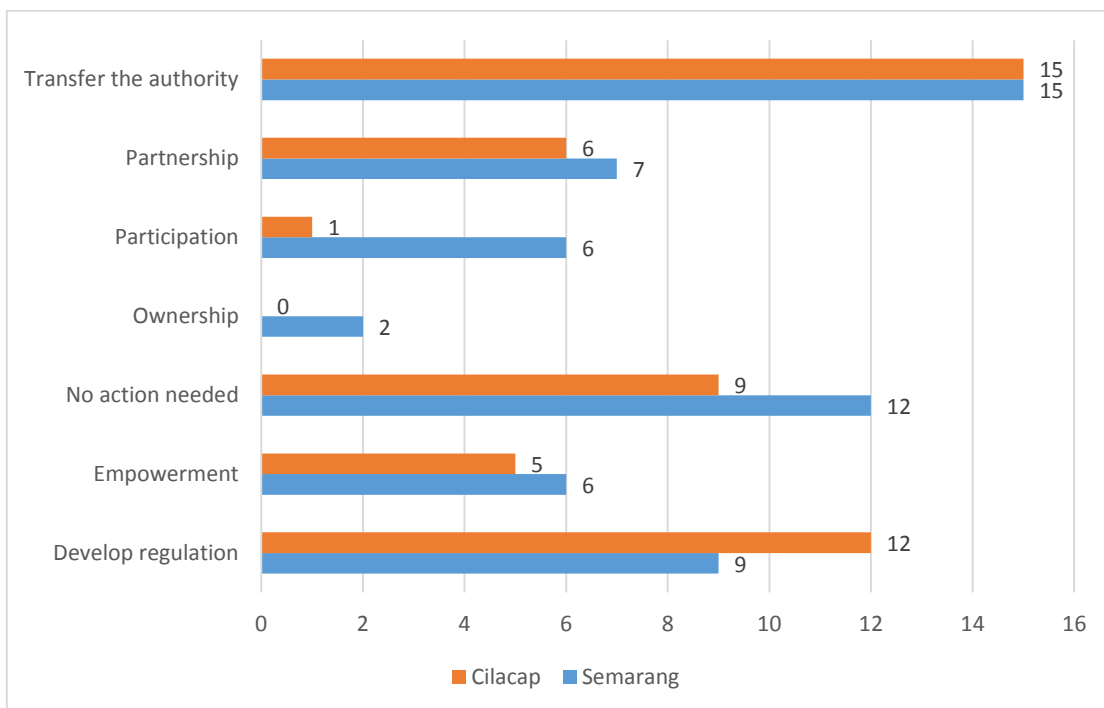
Figure 5. 16 Action needed to improve the role of the actors in response

During the recovery phase, the number of actors needs to improve the leadership in both study area increased significantly. In the government sector, the transfer of the authority and developmental regulation in both locations have almost the same amount (see **Figure 5.17**). In the non-government sector, the partnership becomes the dominant action in Semarang city. While in Cilacap partnership and empowerment becomes the most crucial action to increase the role of non-government actors in disaster management system. For effort needed to improve the system on recovery phase, both activities in the government sector – transfer the authority to enhance the power and develop regulation to enhance the leadership becomes dominant (see **Figure 5.18**). In the non-government sector, the partnership becomes the required action in this phase. Cooperation with actors, especially private sector and donor agencies is vital because these actors have a great resource in supporting recovery activities. Factors required by the actors are opportunities from the local government to be involved in recovery activities.
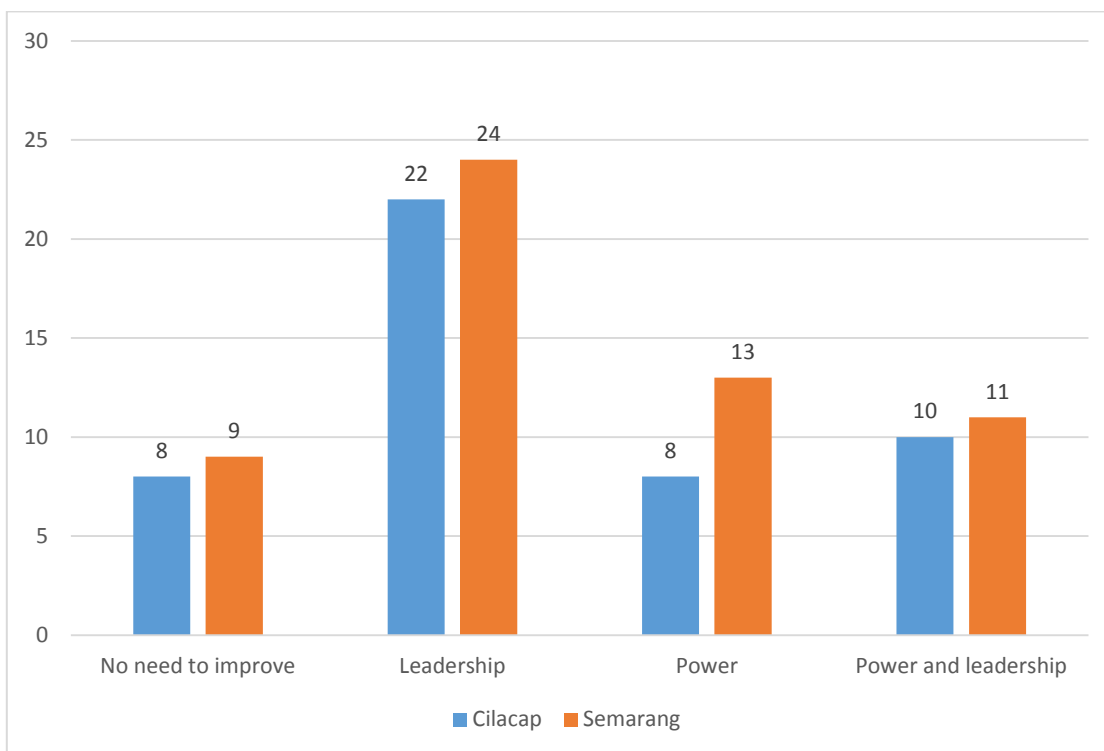
Figure 5. 17 Number of actors that need to improve the system on recovery
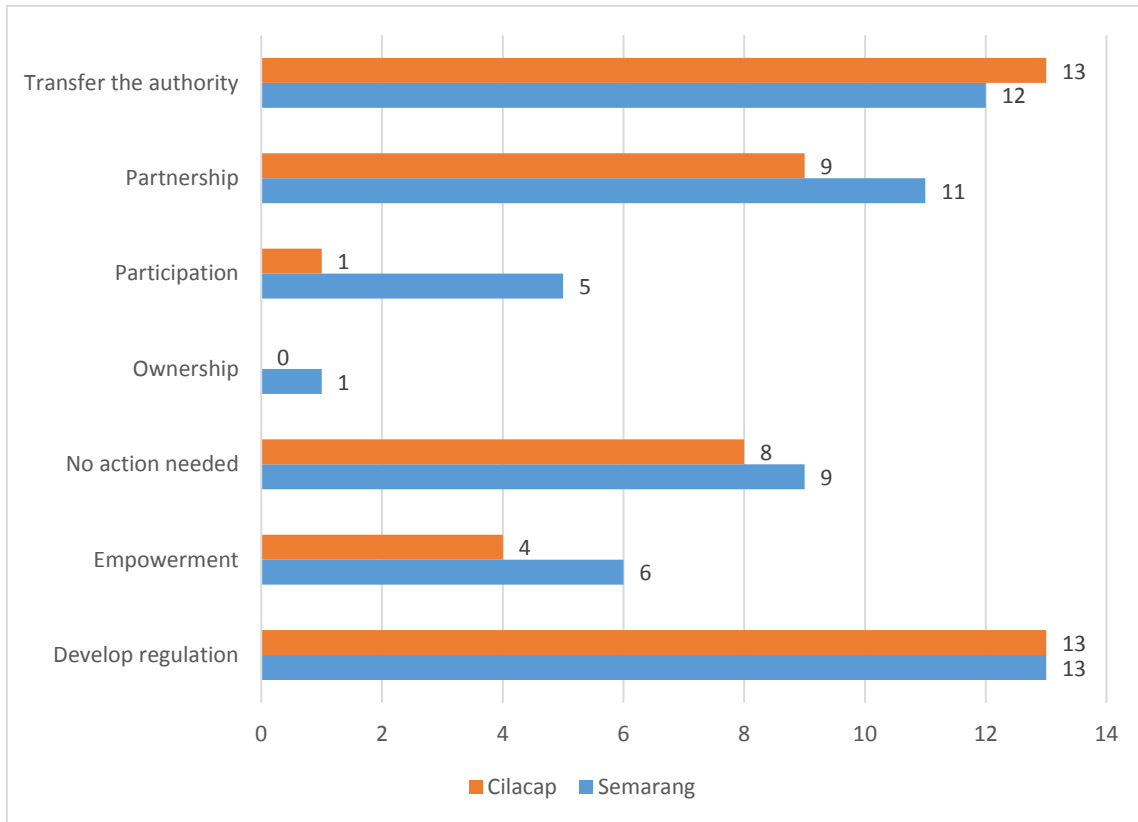
Figure 5. 18 Action needed to improve the role of the actors in recovery

5.5 Social Network Analysis

We use social network analysis (SNA) to determine the pattern of relationships that occur between stakeholders in building a disaster management system in each case study area. We will map relationships between stakeholders at each stage of the disaster, namely prevention and mitigation, preparedness, response, and recovery. Also, our primary objective in analyzing the pattern of this relationship is to know the key actors in every stage of the disaster in each study area. In this study, we will use UCINET version 6.0 to analyze the SNA.

Based on our analysis we can identify a total of 179 actors involved in disaster management in four study areas (57 actors in Semarang City, 36 actors in Purworejo Regency, 48 actors in Cilacap

Regency, and 38 actors in Banyumas Regency). Most are actors from the local government sector (121). There are also 19 civil societies and 14 community organizations identified. Also, there were 16 private sectors involved; most are companies located in the study area. Also, six universities and three donor agencies also contribute to being a partner of the local government in strengthening disaster management capacity. Based on the above data, we developed a social network analysis.

5.5.1 Case study: Purworejo municipality

It can be seen in **Figure 5.19**, based on the results of interviews and literature studies, we built a pattern of interaction between stakeholders in Purworejo municipality in the prevention and mitigation stages (see **Table 5.12**). In the interaction pattern above, the size of the stain in each actor indicates the degree of centrality or the number of direct connections that each actor has. This argument means that the larger the size of the stain shows that the actor also has a more significant amount of links. In other words, it also says that the actor also plays a vital role in the system. At this stage, based on the analysis it is known that Regional Disaster Management Agency (BPBD) becomes the actor with the highest degree of centrality (21.0). In addition, BPBD also has the highest betweenness of centrality among other actors (244.9). It means that BPBD plays an essential role as a liaison between actors in the disaster management system in the prevention and mitigation stages. Then based on density analysis also known that the density value of this network is 15.6%, which means this network has a low density.

Table 5. 12 List of the actor involved in disaster management network in Purworejo

Sector	Actor	
Government	BPBD, Bappeda, Legal Bureau, Financial Bureau, Public works, Social affairs, Fire management, Satpol PP, Energy and mineral agency, Kesbanglinmas, Kecamatan, Desa, Health agency, Education agency, BMKG, Transportation agency, Bina Marga, Cipta Karya, Puskesmas, Agricultural agency, RSUD, SEKDA, BASARNAS, KODIM, Police	
Non-government	Civil society (NGOs)	Pramuka, PMI, Kompak, Tagana
	Academia	-
	Community organization	Karang taruna, Kelompok siaga bencana, Desa siaga bencana
	Donor agency	-
	Private sector	BCA, Pertamina, Taspen, Sinar mas
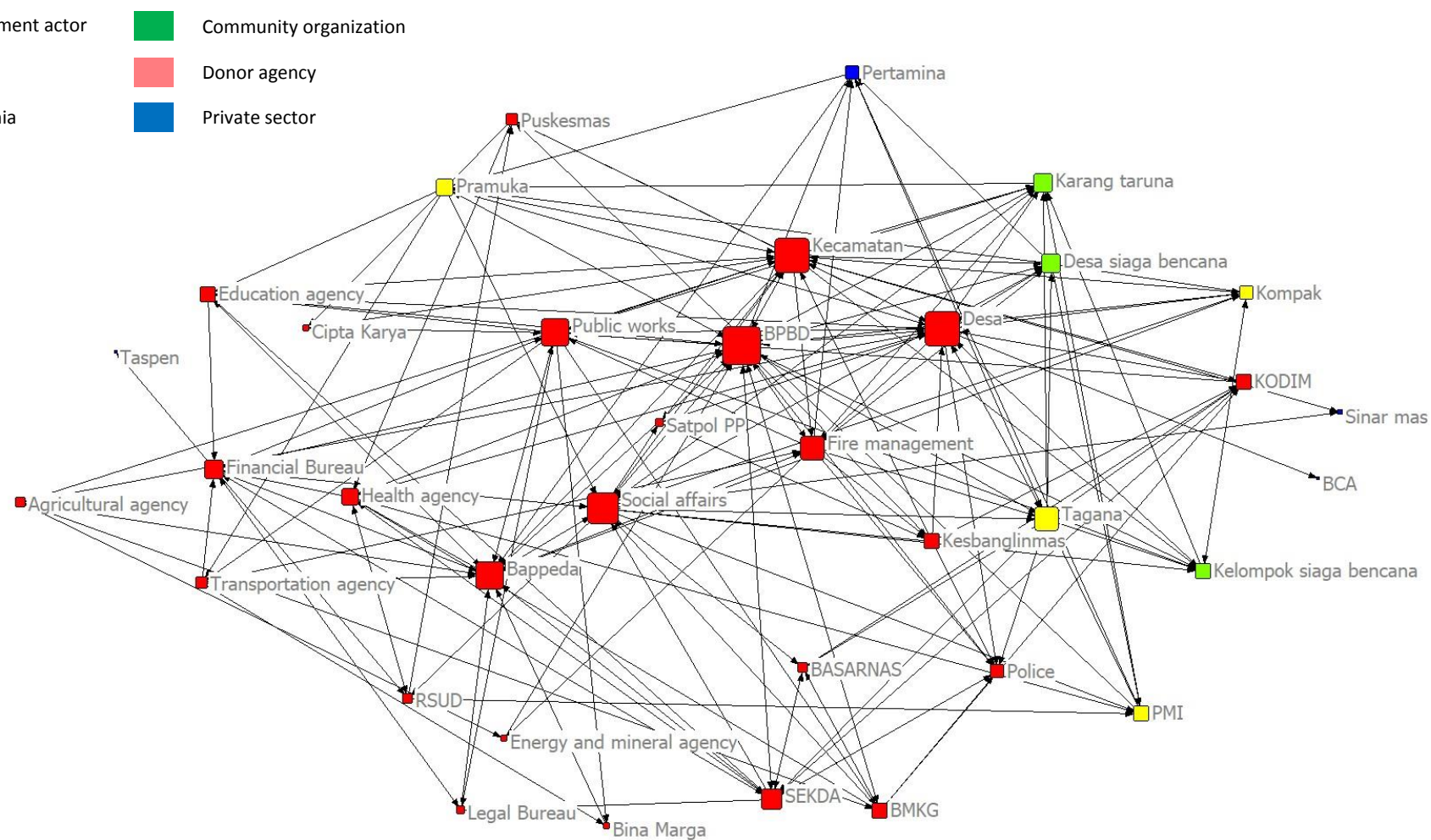
Figure 5. 19 The social network on prevention and mitigation phase in Purworejo Municipality
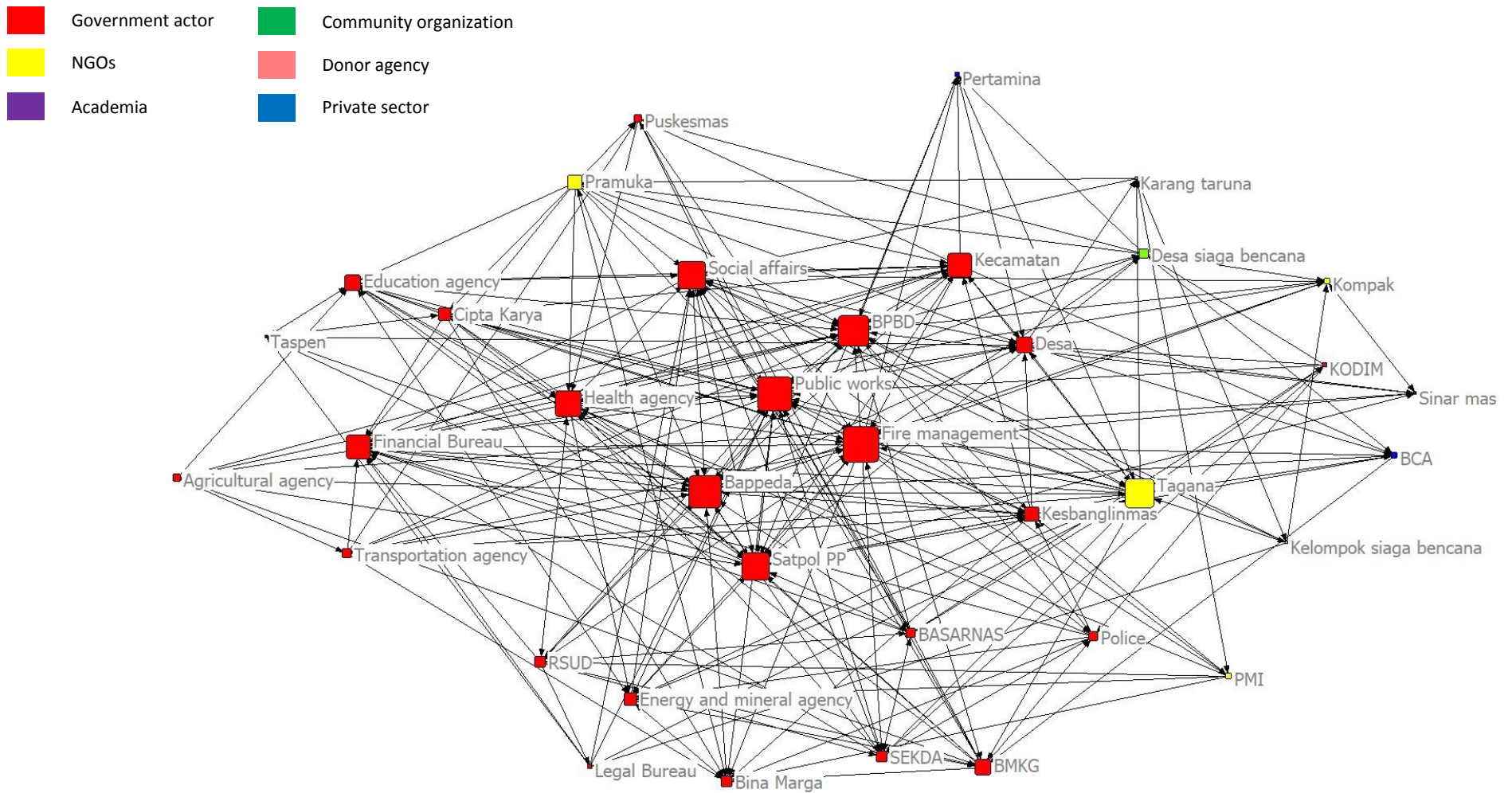
Figure 5. 20 The social network on preparedness phase in Purworejo Municipality
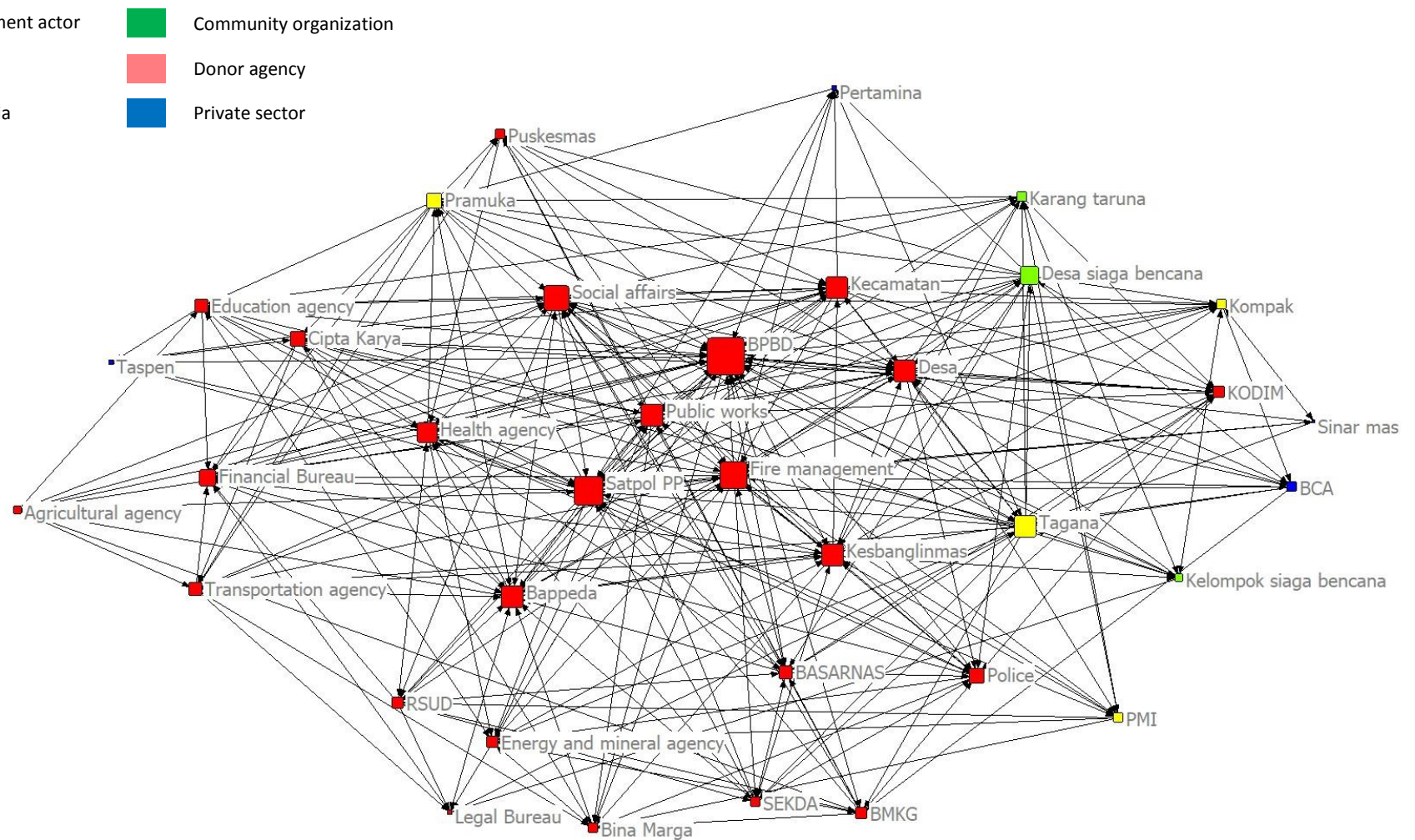
Figure 5. 21 The social network on response phase in Purworejo Municipality
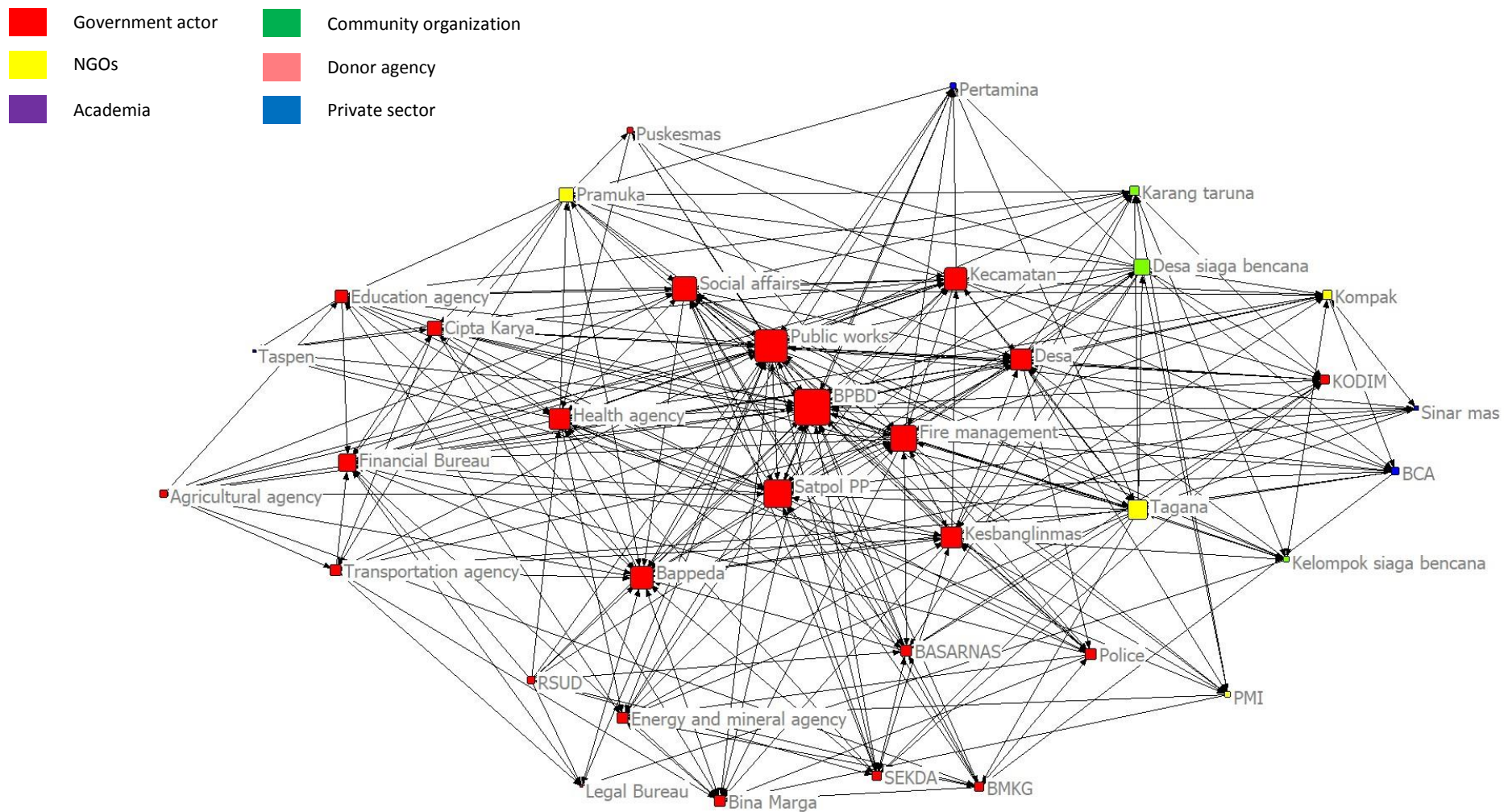
Figure 5. 22 The social network on recovery phase in Purworejo Municipality

In the preparedness phase, the network density value increases if compared to the prevention and mitigation stages, to 22.8% (see **Figure 5.20**). This increasing means that in this phase the more actors or, the more relationships between actors occur in the system. Besides, based on the degree of centrality, the Regional Development Planning Agency (BAPPEDA) became the actor with the most connections (18.0). Also, BAPPEDA is also an actor that has the highest betweenness of centrality (166.2).

In the response phase (see **Figure 5.21**), this network becomes the densest network compared to the network in other stages with a value of 26.8%. In this phase, BPBD returns to being an actor with the highest degree of centrality (27.0) and betweenness of centrality (252.1). The role of BPBD as a command makes it the most influential actor in the system in the response phase network. At the recovery stage (see **Figure 5.22**), BPBD is also still an actor with the highest degree of centrality (21.0) and betweenness of centrality (194.2). The density level in this phase is slightly reduced compared to the response phase (194.2).

After identifying each pattern of every phase of the disaster, we combine all profile of the network to understand the general pattern of disaster management in Purworejo Municipality. The result of the mixed network can be seen in **Figure 5.23**. From the figure, it can be identified that BPBD becomes the critical actor in disaster management at the Purworejo municipality. According to centrality analysis (see **Table 5.12**), the network appeared to be highly centralized to BPBD as the new organization formed as a coordinator and implementer of disaster management at the local level (degree of centrality: 33 and betweenness of centrality: 57.613). Though not becoming key player at the network, other local agency also play a significant role to support the duty of BPBD, such as Public Work Agency (degree of centrality: 29 and betweenness of centrality: 38.212), Satpol PP (degree of centrality: 26 and betweenness of centrality: 27.36), and Fire Management Agency (degree of centrality: 25 and betweenness of centrality: 23.585).

Interestingly, some non-government sector also plays a significant role in the disaster management network in Purworejo Agency. The most important actor is Tagana (degree of centrality: 20 and betweenness of centrality: 20.654) and Desa Siaga Bencana (degree of centrality: 17 and betweenness of centrality: 8.704). This finding revealed that though remain the supporting actor, the role of some non-government actors also essential to support the local government for the implementation of disaster management at the local level.

Legend:
- Government actor (red)
- Community organization (green)
- NGOs (yellow)
- Donor agency (pink)
- Academia (purple)
- Private sector (blue)
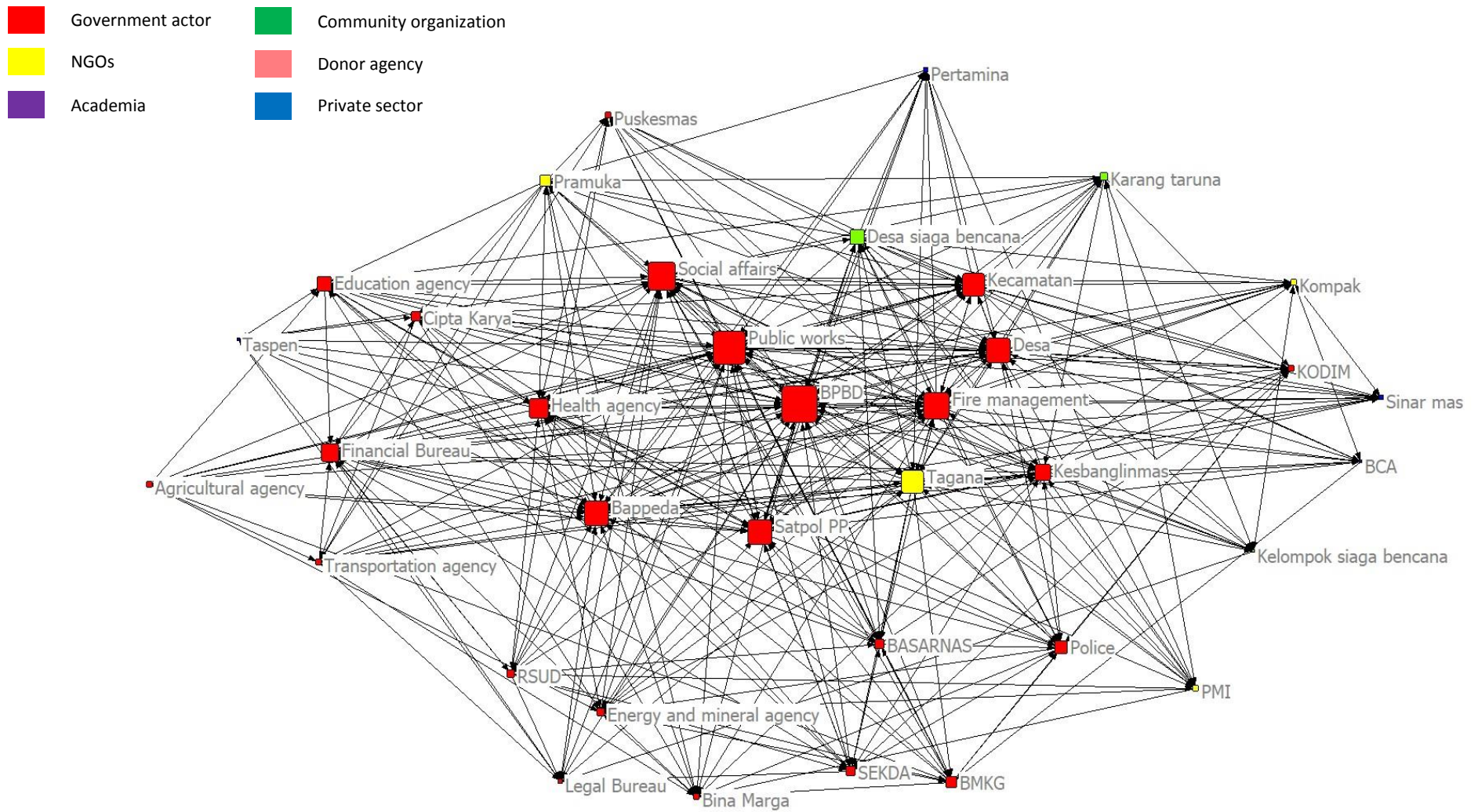
Figure   5.   23   The   pattern   of   disaster   management   network   in   Purworejo   Municipality

Table 5. 13 Centrality testing on the disaster management network in Purworejo Municipality

Actor/Institution		Degree value		
		Degree	Betweenness	Closeness
Government actor	BPBD	33	57.613	37
	Bappeda	23	19.737	47
	Legal Bureau	8	1.331	62
	Financial Bureau	18	7.184	52
	Public works	29	38.212	41
	Social affairs	24	23.821	46
	Fire management	25	23.585	45
	Satpol PP	26	27.36	44
	Energy and mineral agency	12	3.263	58
	Kesbanglinmas	20	13.426	50
	Kecamatan	21	11.636	49
	Desa	21	14.714	49
	Health agency	20	14.602	50
	Education agency	14	4.606	56
	BMKG	12	5.438	58
	Transportation agency	13	4.402	57
	Bina Marga	12	3.591	58
	Cipta Karya	15	6.829	55
	Puskesmas	11	2.405	59
	Agricultural agency	10	1.538	60
	RSUD	12	4.479	58
	SEKDA	12	1.846	58
	BASARNAS	14	3.219	56
	KODIM	12	2.749	58
	Police	16	5.161	54
Non-government actor	Pramuka	15	4.817	55
	PMI	10	3.222	60
	ompak	11	3.022	59
	Tagana	20	20.654	50
	Karang taruna	11	3.34	59
	Kelompok siaga bencana	9	2.003	61
	Desa siaga bencana	17	8.704	53
	BCA	10	1.445	60
	Pertamina	9	0.406	61
	Taspen	6	0.091	64
	Sinar mas	7	0.549	63

5.5.2 Semarang municipality

We were able to identify 57 actors involved in the disaster management system in Semarang municipality in all four stages of the disaster (see **Table 5.17**). These actors consist of government and non-government sectors. Based on interviews and literature studies, we were able to identify relationships between actors and build patterns of the network in four stages of the disaster. In the prevention and mitigation phases, based on **Figure 5.23**, it can be seen that BPBD has the highest degree of centrality (34.0) and betweenness of centrality (769.6) compared to other actors. The network density value shows a value of 13.1%, which means that the network is classified as a network that is not dense. In the preparedness phase (see **Figure 5.24**), BPBD is still a principal actor in the network, with the value of the degree of centrality (26.0) and betweenness of centrality (1041.3). But at this stage, the network density value has decreased to 10.4%, which means the number of actors involved or the relationship between actors has reduced.

In the disaster response phase, BPBD is still consistently the critical actor in the network with the value of the degree of centrality (46.0) and betweenness of centrality (1332.4) (see **Figure 5.25**). In this phase, the network density also increased to 14.7%. Furthermore, in the recovery phase, BPBD still becomes the leading actor in the network with a value of the degree of centrality (25.0) and betweenness of centrality (796.8) (see **Figure 5.26**). The SNA reveals the vital role of BPBD in disaster management in Semarang Municipality. In addition, this also indicates that BPBD has been able to play a positive role as a leader in organizing other actors involved, both from the government and non-government sectors.

Table 5. 14 List of the actor involved in disaster management network in Semarang

Sector	Actor	
Government	BPBD, Bappeda, Legal Bureau, Financial Bureau, Public works, Social affairs, Fire management, Satpol PP, Water management, Energy and mineral agency, Kesbanglinmas, Inspektorat, Kecamatan, Kelurahan, DKP, BLH, PSDA, Education agency, BMKG, BPMPKB, Transportation agency, Bina Marga, Cipta Karya, BPN, BPSDA , Agricultural agency, PDAM, RSUD, SEKDA, DPRD, Sekretariat DPRD, BASARNAS, KODIM, Police	
Non-government	Civil society (NGOs)	Pramuka, PMI, Bintari, Kalandara, P5, Tagana
	Academia	Diponegoro University, USM, UNISULLA, UNNES, POLINES
	Community organization	PKK, Karang taruna, Kelompok siaga bencana, Dasa wisma, Posyandu
	Donor agency	Mercy Corps, Rockefeller
	Private sector	Djarum, Phapros, Guna bina kimia, Viva generic, Sido muncul
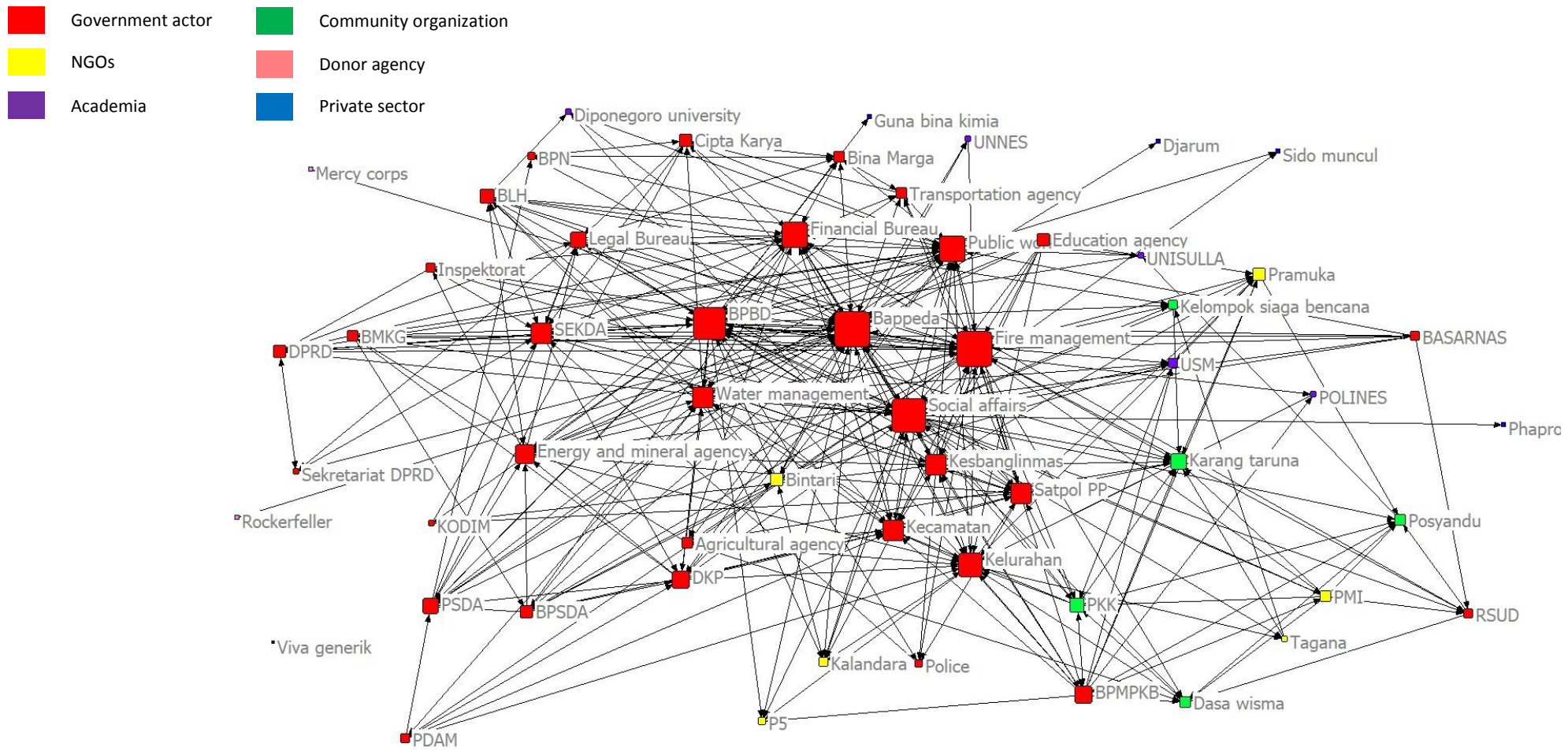
Figure 5. 24 The social network on prevention and mitigation phase in Semarang Municipality
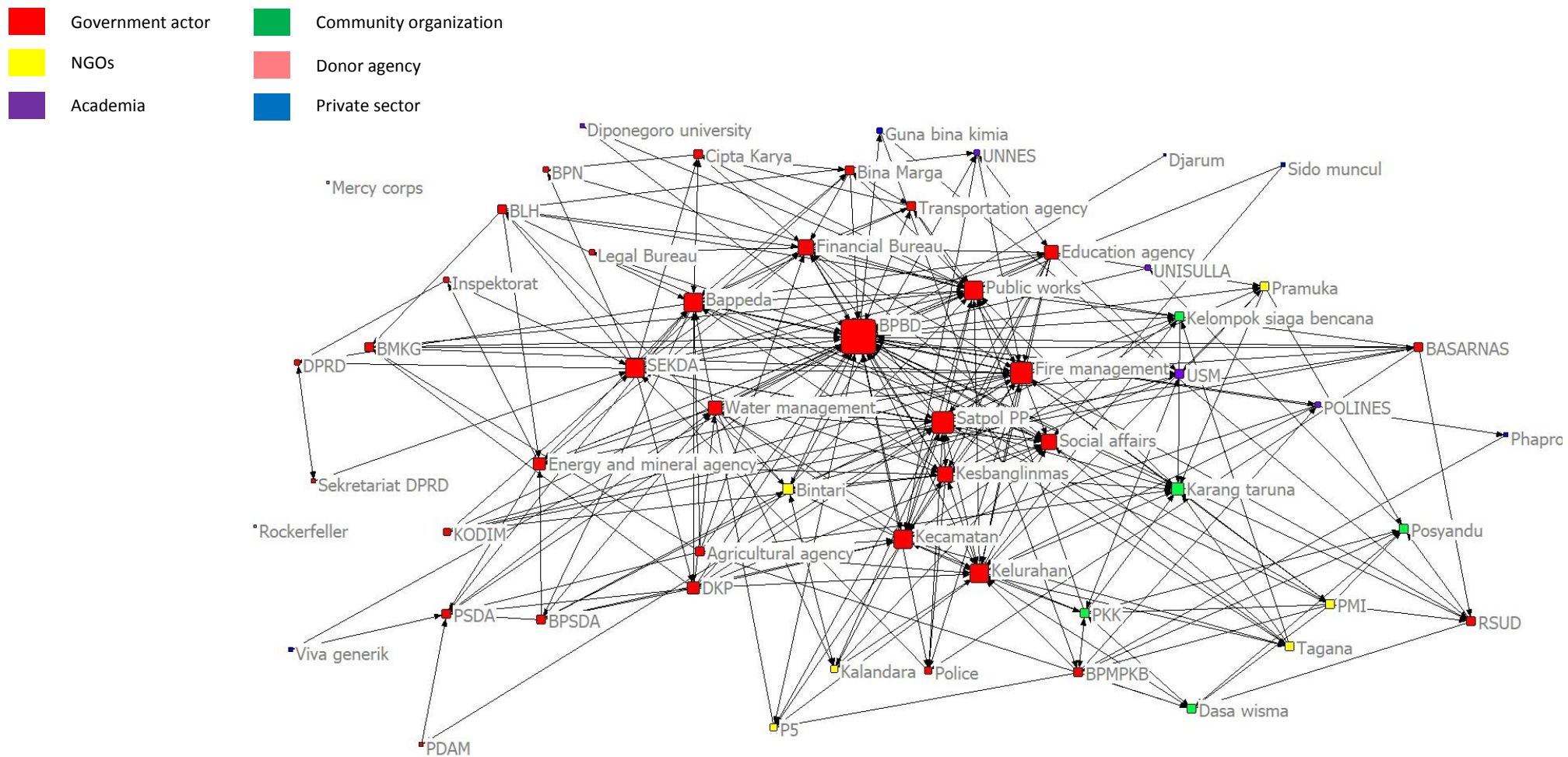
Figure 5. 25 The social network on preparedness phase in Semarang Municipality

Figure 5. 26 The social network on response phase in Semarang Municipality
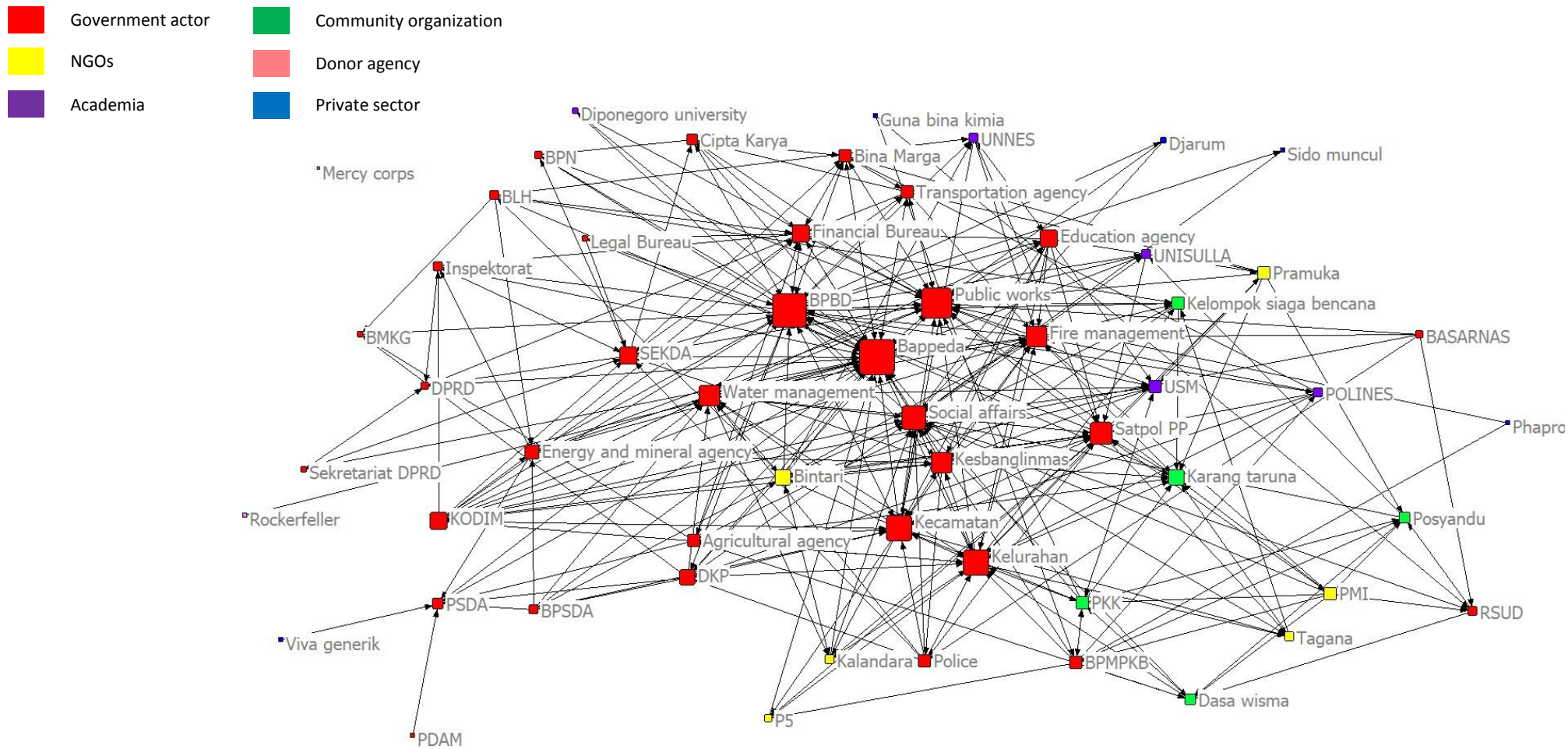
Figure 5. 27 The social network on recovery phase in Semarang Municipality
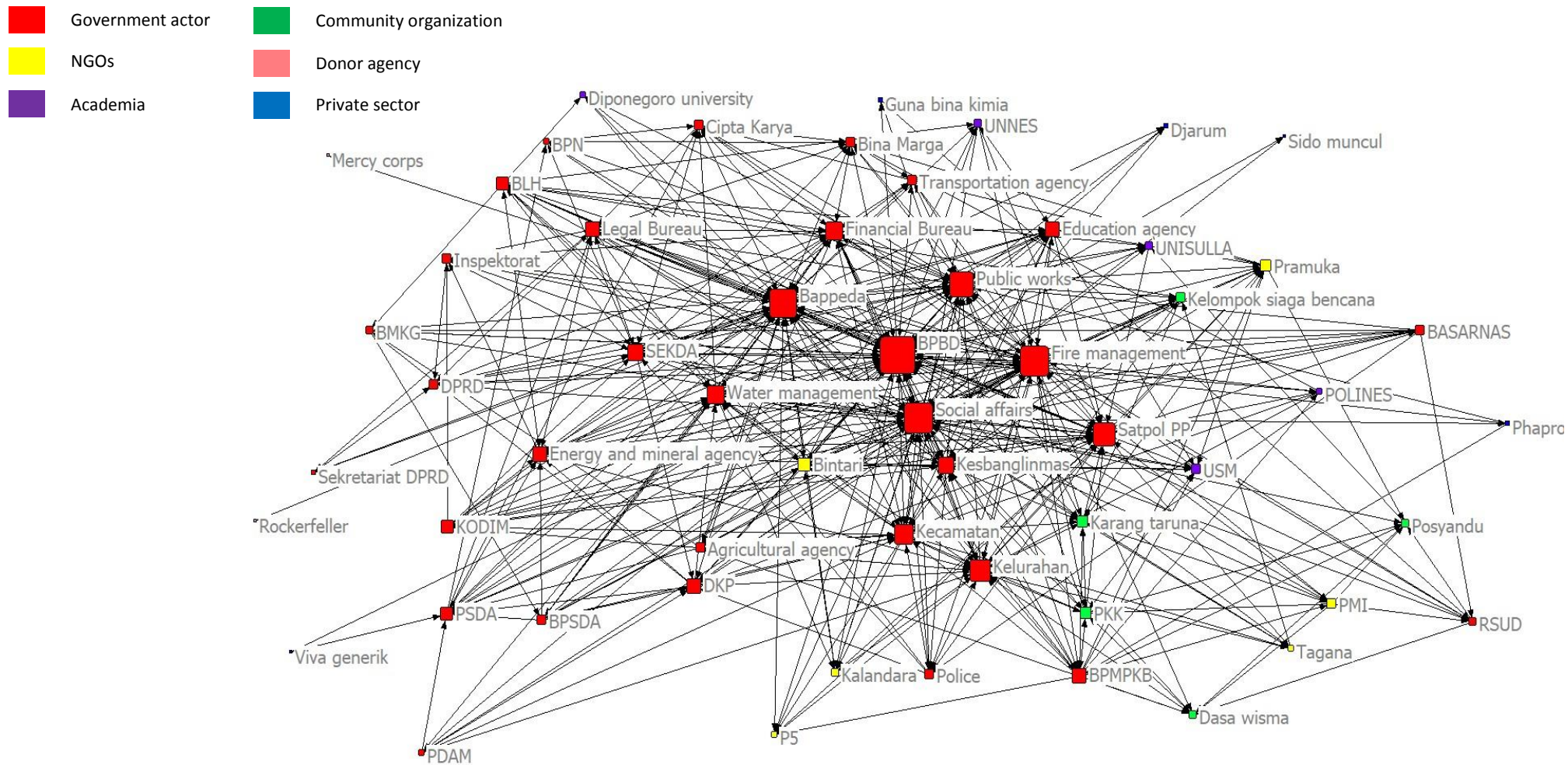
Figure 5. 28 The pattern of disaster management network in Semarang Municipality

Figure 5.28 shows the network visualizations of disaster management implementation in Semarang municipality involving in four phases of the disaster: prevention and mitigation, preparedness, response, and recovery. The disaster management network was identifying all actors in the entire process, both from government and non-government actors. Form this network, the government actor still plays a significant role, with BPBD become the critical actor in the system. From the centrality analysis, it shows that BPBD as the most linked with other actors (degree of centrality: 48). BPBD also becomes the most significant actor in the network, with the value of betweenness 393.597 (see **Table 5.13**. This finding revealed the fact that despite BPBD formed as the new institution in Semarang Municipality, it already plays an essential role to control other agency and make a good connection to another actor on the implementation of disaster management.

Centrality analysis also shows that other local institution, such as BAPPEDA (degree of centrality: 34 and betweenness of centrality: 199.089), Social affairs agency (degree of centrality: 32 and betweenness of centrality: 135.903), and Fire management agency (degree of centrality: 31 and betweenness of centrality: 87.098) plays significant impact in the network. We found that this three local institution has a different role in supporting the BPBD. BAPPPEDA as the coordinator of government plan plays a significant role during pre-disaster activities, and Social affairs agency and Fire management agency become the partner of BPBD on the implementation of post-disaster activities, especially during emergency response.

From the non-government actor, there are two actors becomes the most crucial player in the network. They are Bintari (degree of centrality: 13 and betweenness of centrality: 5.88), Karang taruna (degree of centrality: 12 and betweenness of centrality: 6.626) and PKK (degree of centrality: 10 and betweenness of centrality: 9.884). Bintari is non-government organization (NGO) with focus on empowering the community while two other actors are grassroots actors and usually formed independently by the community for some various purposes. This finding shows that in community level, people have their mechanism to increase their capacity to reduce the impact of the disaster. With two actors from the community level becomes the most influenced actor in the network, the community participation on disaster management policy is the necessity to improve the disaster management system.

Table 5. 15 Centrality testing on the disaster management network in Purworejo Municipality

	Actor/Institution	Degree value		
		Degree	Betweenness	Closeness
Government actor	BPBD	48	393.597	119
	Bappeda	34	199.089	133
	Legal Bureau	11	1.157	158
	Financial Bureau	17	13.56	152
	Public works	29	86.5	140
	Social affairs	32	135.903	135
	Fire management	31	87.098	137
	Satpol PP	26	42.923	143
	Water management	18	12.577	150
	Energy and mineral agency	14	7.362	154
	Kesbanglinmas	17	10.191	152
	Inspektorat	9	1.346	160
	Kecamatan	22	27.745	147
	Kelurahan	24	44.743	144
	DKP	14	6.65	154
	BLH	10	5.567	159
	PSDA	10	58.685	158
	Education agency	15	7.709	155
	BMKG	8	2.458	163
	BPMPKB	11	42.775	157
	Transportation agency	9	1.816	161
	Bina Marga	10	3.567	160
	Cipta Karya	9	0.975	162
	BPN	5	0	166
	BPSDA	9	1.422	161
	Agricultural agency	10	11.428	158
	PDAM	3	0.25	170
	RSUD	8	29.38	162
	SEKDA	20	33.194	149
	DPRD	6	2.651	165
	Sekretariat DPRD	3	0	183
	BASARNAS	8	2.805	162
	KODIM	15	7.175	154
	Police	11	1.718	159
	Pramuka	10	7.769	161
	PMI	10	7.095	160

Actor/Institution	Degree value		
	Degree	Betweenness	Closeness
Bintari	13	5.88	156
Kalandara	8	0.111	161
P5	6	0.535	162
Tagana	7	0.705	164
Diponegoro university	3	0	168
USM	9	2.984	162
UNISULLA	7	3.008	162
UNNES	7	0.792	166
POLINES	7	1.858	163
PKK	10	9.884	160
Karang taruna	12	6.26	159
Kelompok siaga bencana	9	2.726	163
Dasa wisma	8	4.284	171
Posyandu	8	5.579	170
Mercy corps	0	0	3192
Rockerfeller	1	0	187
Djarum	3	0	168
Phapros	3	0.311	167
Guna bina kimia	2	0.2	206
Viva generik	1	0	212
Sido muncul	2	0	170

5.5.3 Case study: Banyumas Municipality

We identified 38 actors involved in the disaster management system in Banyumas Municipality (see **Table 5.16**). Based on this information we build patterns of relationships between actors using SNA. Based on our analysis, it reveals that in the prevention and mitigation phase (see **Figure 5.27**), the network density value is 24.6% and BPBD becomes the central actor in the network with the value of the degree of centrality (27.0) and betweenness of centrality (48.4). Furthermore, in the preparedness phase (see **Figure 5.28**), the network density value increases to 25.5% with BPBD still being the principal actor in the network with the value of the degree of centrality (88.0) and betweenness of centrality (47.5). This finding shows that BPBD plays a very vital role in building relationships between actors in the disaster management system in the pre-disaster stage.

In the response phase (see **Figure 5.29**), the network density value slightly increased to 25.6%. BPBD still plays the critical actor with a degree of centrality (31.0) and betweenness of centrality (60.48). Furthermore, the recovery phase (see **Figure 5.30**), the value of network density is 25.5% with BPBD still functions as a central actor on the network with the value of the degree of centrality (32.0) and betweenness of centrality (67.13). This analysis explains that in Banyumas Municipality, BPBD has been able to carry out the role of leader in the disaster management system. Additionally, although based on interviews, we also found some obstacles and problems in the implementation of disaster management at the local level, BPBD has been able to utilize the available resources in building networks that involve almost all actors at the local level.

Table 5. 16 List of the actor involved in disaster management network in Banyumas

Sector	Actor	
Government	BPBD, Bappeda, Legal Bureau, Financial Bureau, Public works, Social affairs, Fire management, Satpol PP, Energy and mineral agency, Kesbanglinmas, Kecamatan, Desa, Health agency, Education agency, BMKG, Transportation agency, Bina Marga, Cipta Karya, Puskesmas, RSUD Ajibarang, RSUD Banyumas, Agricultural agency, DPRD, SEKDA, BASARNAS, KODIM, Police, Perhutani	
Non-government	Civil society (NGOs)	Pramuka, PMI, ACT, Ampel, Tagana
	Academia	ONSOED
	Community organization	Kampung siaga bencana
	Donor agency	-
	Private sector	Semen Bima, Telkom, Holcim
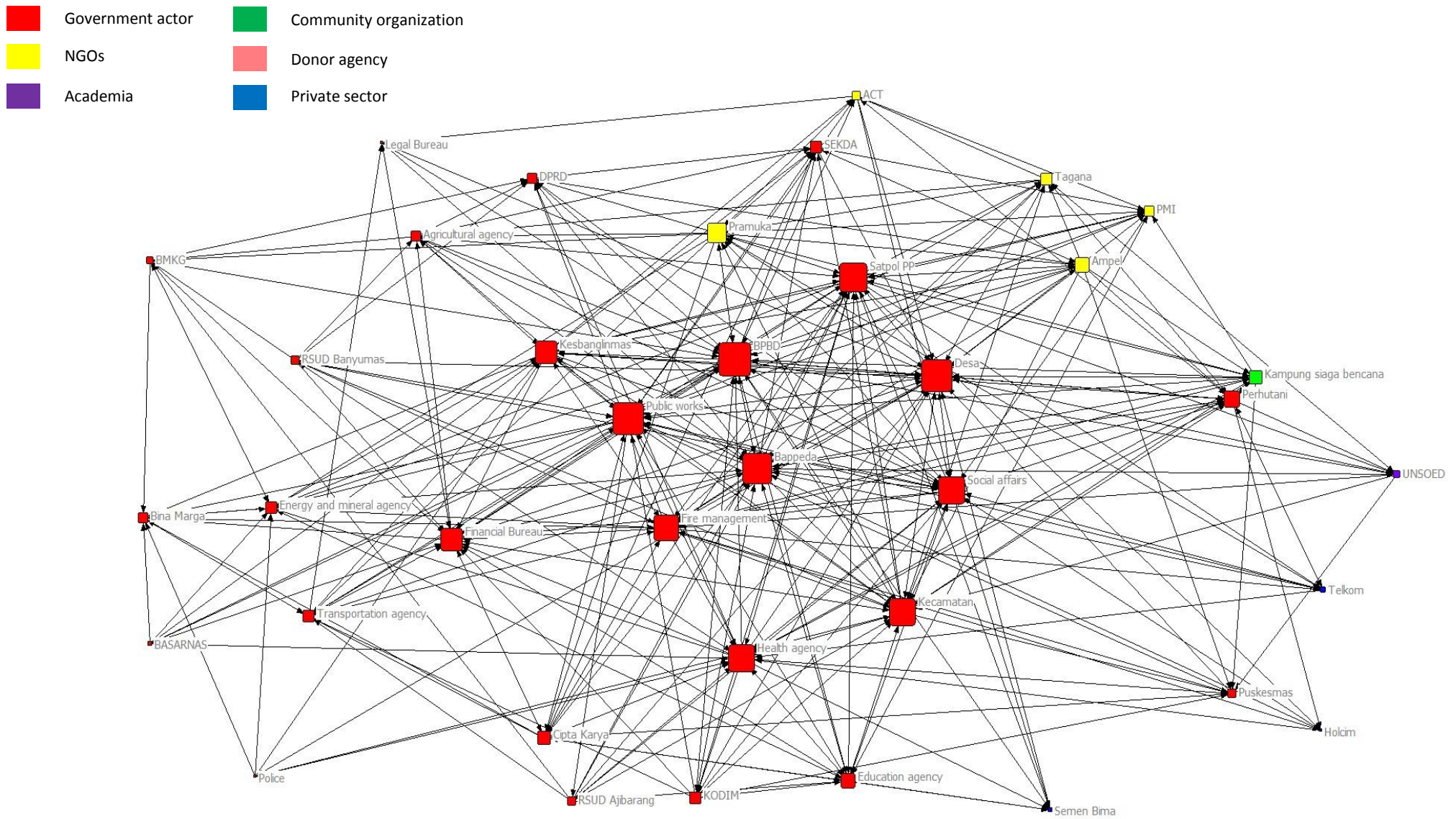
Figure 5. 29 The social network on prevention and mitigation phase in Banyumas Municipality
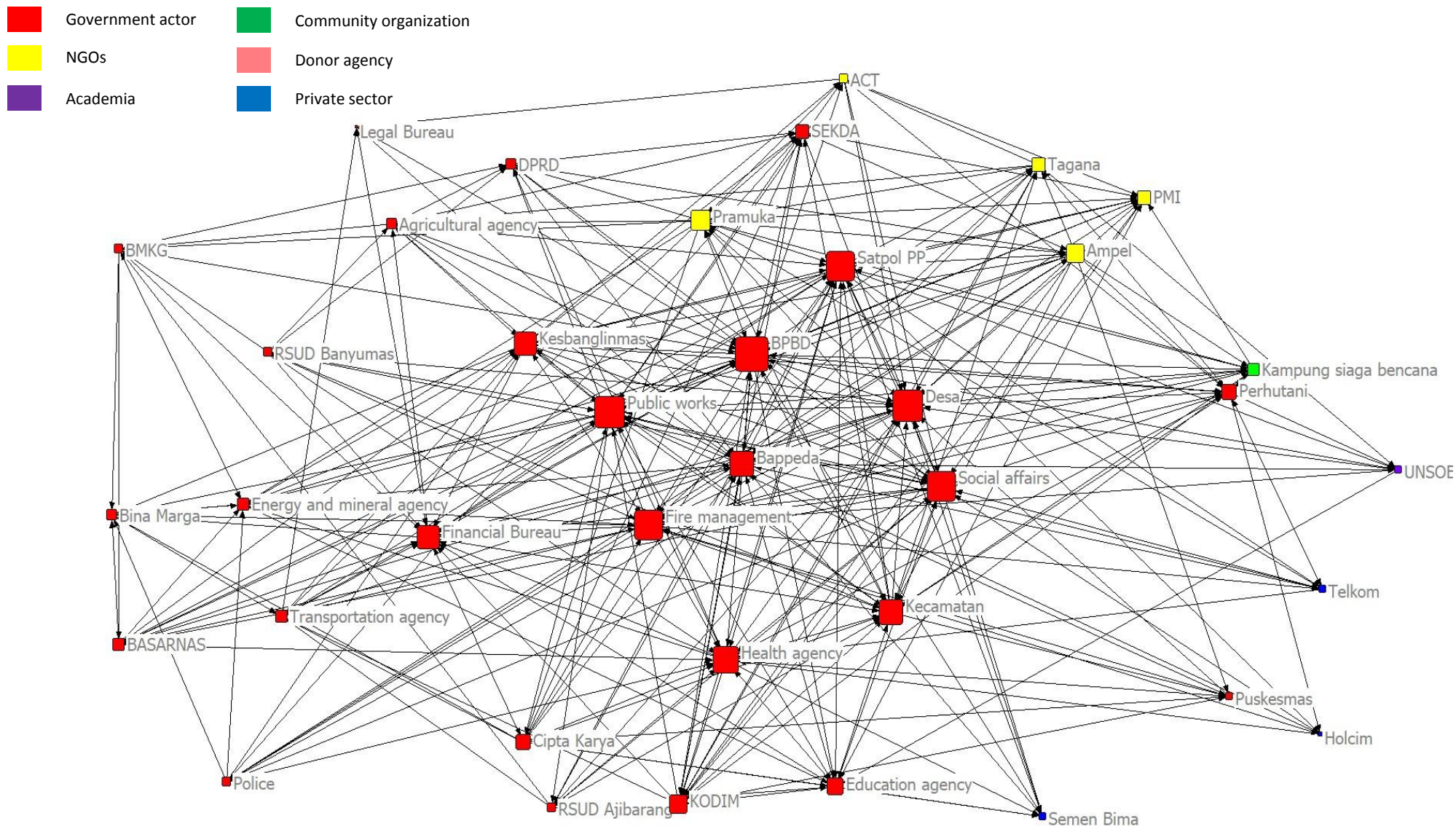
Figure 5. 30 The social network on preparedness phase in Banyumas Municipality
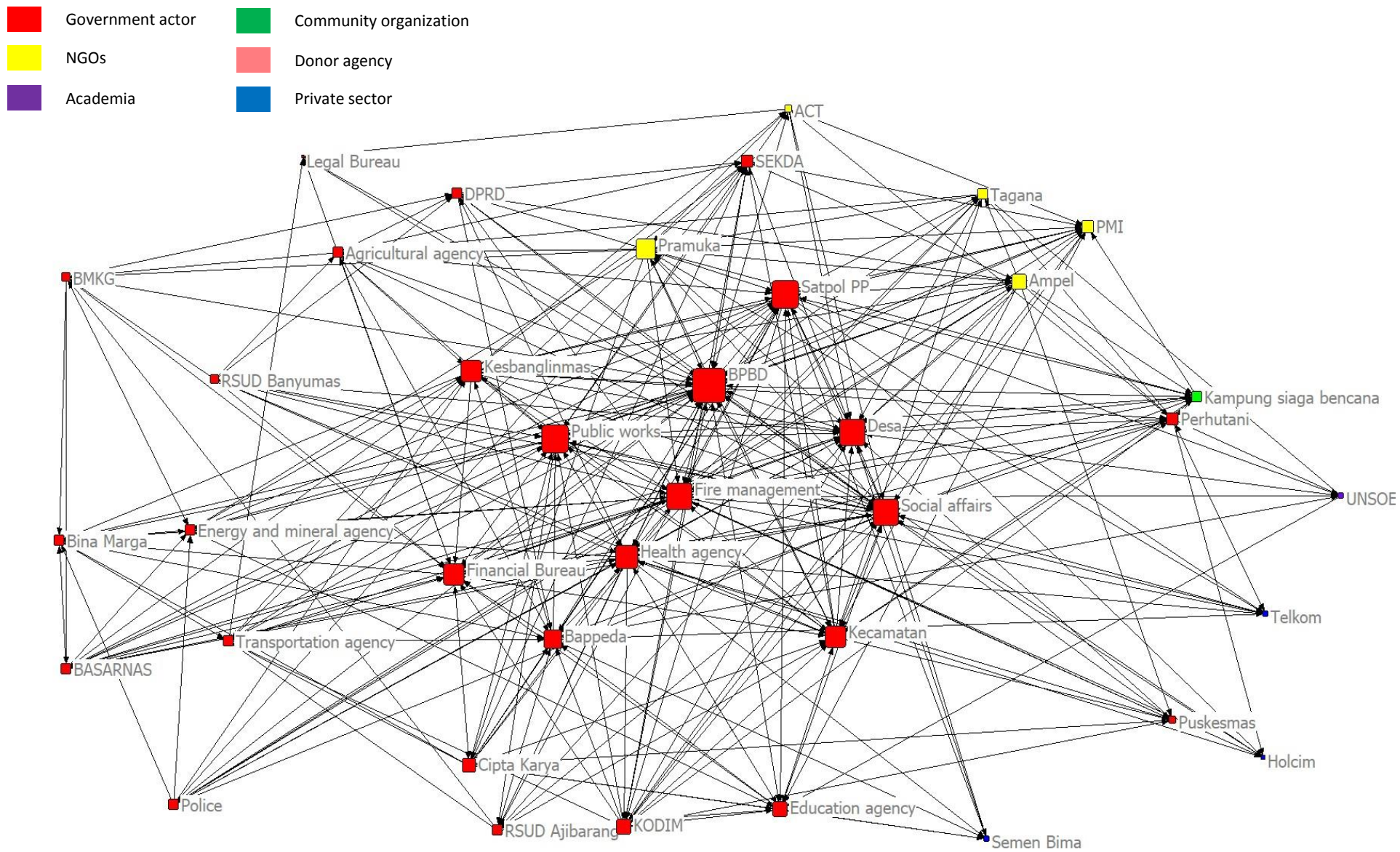
Figure 5. 31 The social network on response phase in Banyumas Municipality
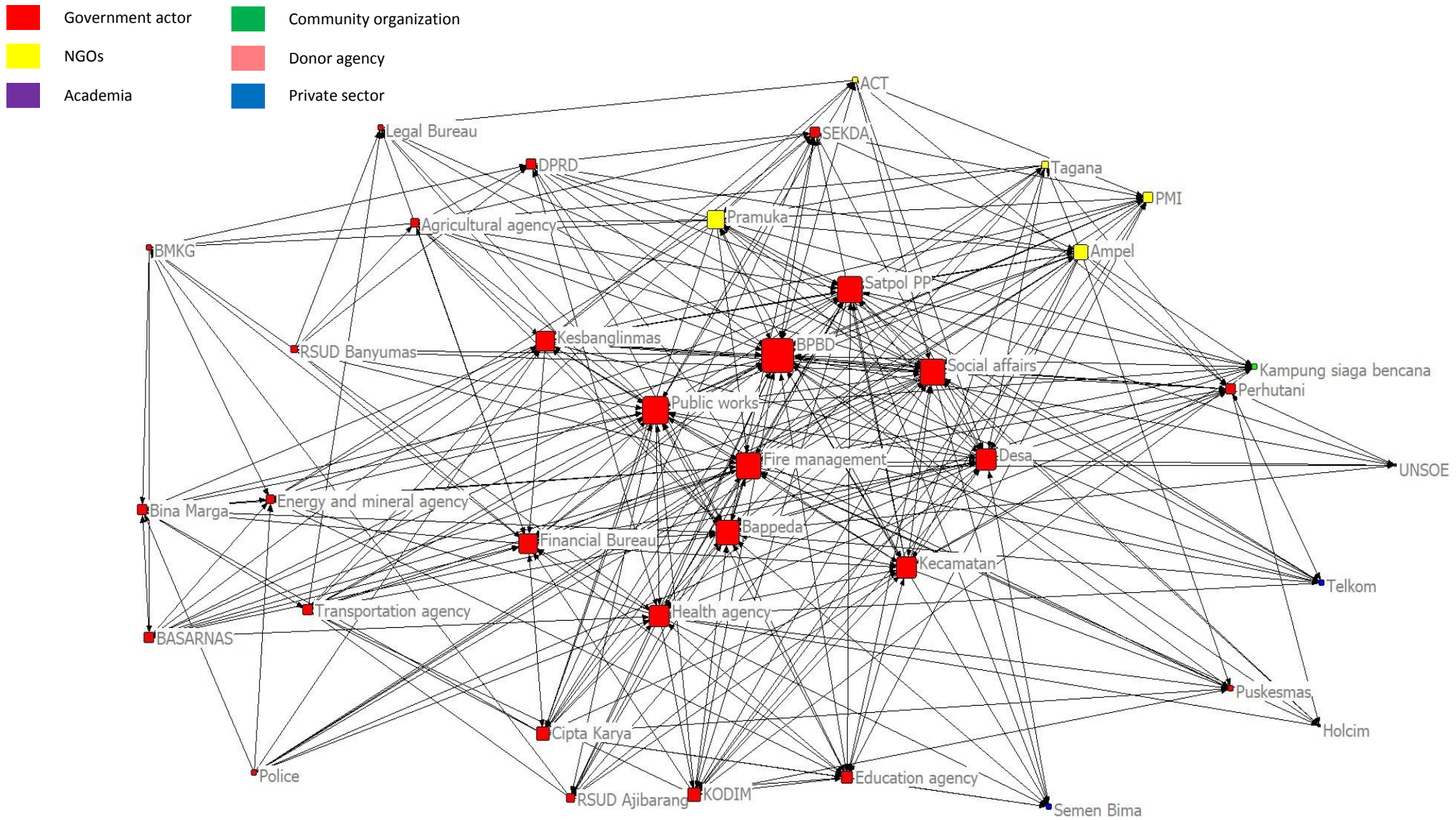
Figure 5. 32 The social network on recovery phase in Banyumas Municipality
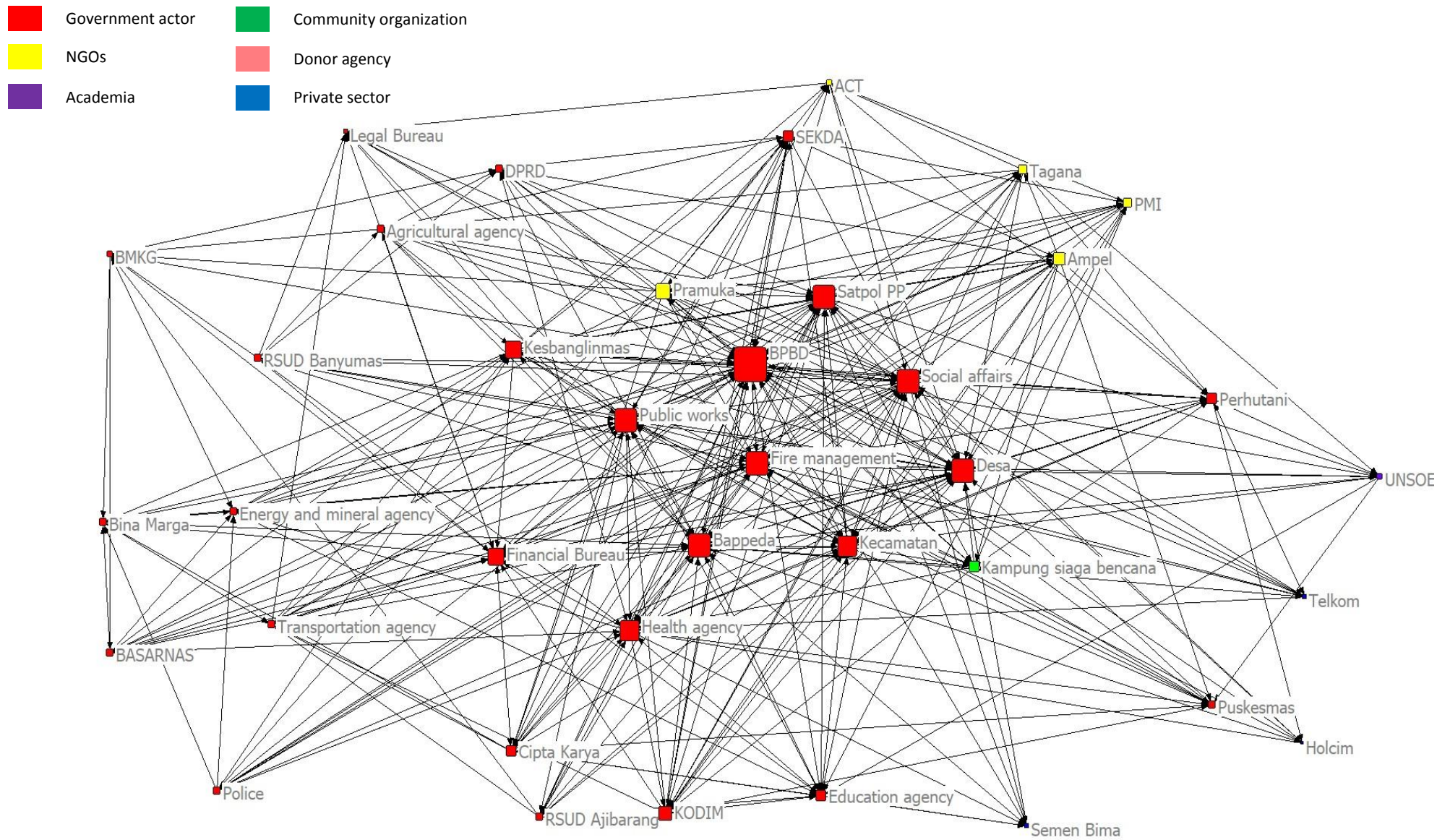
Figure 5. 33 The pattern of disaster management network in Banyumas Municipality

Our next analysis is to identify the pattern of disaster management network at Banyumas Municipality. We used similar ways to develop the system of disaster management by combining the previous network in the four phases of disaster in Banyumas Municipality: prevention and mitigation, preparedness, response, and recovery. **Figure 5.33** shows that the actor from the governments' sector still represents a significant role in disaster management in Banyumas municipality. From the centrality analysis (**Table 5.14**), we found that BPBD is the most central actor in the network (degree of centrality: 37 and betweenness of centrality: 82.117). Almost similar with our finding from previous cases study, in Banyumas municipality, the role of BPBD is essential in the activities of pre-disaster and post-disaster. Table of centrality analysis shows that other local institutions in crucial, namely: Public works agency (degree of centrality: 27 and betweenness of centrality: 31.921), Satpol pp (degree of centrality: 27 and betweenness of centrality: 29.28), Social affairs (degree of centrality: 26 and betweenness of centrality: 29.374), and Fire management agency (degree of centrality: 26 and betweenness of centrality: 30.577. We found that Desa or village as a local institution also performs an essential role with (degree of centrality: 26 and betweenness of centrality: 26.702). This finding revealed that the local government already distributed the disaster management affair to the lower level of government (Desa) to improve the effectiveness and efficiency. This argument also supported from the role of non-government actors. Our analysis found that the most influenced actor from the non-government sector is kampung siaga bencana (KSB). KSB formed in the community level besides to encourage people to face the disaster, also to absorb the community voice in disaster issue. KSB under the coordination of Desa as the closest local institution to the community. The other non-government actor that have essential role in the network are: Pramuka (degree of centrality: 19 and betweenness of centrality: 16.574), Ampel (degree of centrality: 16 and betweenness of centrality: 6.206), and PMI (degree of centrality: 13 and betweenness of centrality: 3.441).

Table 5. 17 Centrality testing on the disaster management network in Banyumas Municipality

	Actor/Institution	Degree value		
		Degree	Betweenness	Closeness
Government actor	BPBD	37	82.117	37
	Public works	27	31.921	47
	Satpol PP	27	29.28	47
	Social affairs	26	29.374	48
	Fire management	26	30.507	48
	Desa	26	26.702	48
	Bappeda	25	25.866	49
	Health agency	23	20.24	51
	Kecamatan	22	12.206	52
	Financial Bureau	20	11.399	54
	Kesbanglinmas	20	12.871	54
	Pramuka	19	16.574	55
	KODIM	16	5.068	58
	Education agency	15	5.545	59
	Cipta Karya	15	5.823	59
	SEKDA	14	4.266	60
	Perhutani	14	6.669	60
	Energy and mineral agency	12	3.535	62
	Transportation agency	12	3.427	62
	Bina Marga	12	3.426	62

	Actor/Institution	Degree value		
		Degree	Betweenness	Closeness
	RSUD Banyumas	12	3.353	62
	DPRD	12	3.3	62
	BASARNAS	12	1.92	62
	RSUD Ajibarang	11	2.236	63
	Agricultural agency	11	1.541	63
	Police	11	2.57	63
	Legal Bureau	8	1.124	66
	BMKG	10	4.209	64
	Puskesmas	9	0.526	65
Non-Government actor	Kampung siaga bencana	22	18.551	52
	ACT	9	1.629	65
	Telkom	9	0.659	65
	Tagana	11	2.877	63
	Semen Bima	8	0.251	66
	UNSOED	8	0.745	66
	Holcim	6	0.077	68
	PMI	13	3.441	61
	Ampel	16	6.206	58
	Pramuka	19	16.574	55

5.5.4 Case study: Cilacap Municipality

Our last case study location is Cilacap Municipality. From this study area, we have identified 48 government and non-government actors involved in disaster management systems in Cilacap Municipality (see **Table 5.18**). The majority of actors are actors from the government sector. By using SNA, we build a pattern of disaster management based on the relationships between these actors. Based on the SNA (see **Figure 5.31**), we affirmed that the network density in the prevention and mitigation phase was 17.2%. At this stage, the fire management agency (DAMKAR) becomes the central actor in the network with a degree of centrality (34.0) and betweenness of centrality (140.4). Based on interviews we found that historically before the establishment of BPBD, DAMKAR was an institution that handled disasters not only in the emergency phase but also in the pre-disaster phase. After decentralization, the role of DAMKAR is also still significant in disaster management, especially the prevention and mitigation phase. In the preparedness phase (see **Figure 5.24**), the value of network density decreases to 14.8%. The principal actor in this phase shifts to BPBD with the value of the degree of centrality (35.0) and betweenness of centrality (257.9).

In the response phase (see **Figure 5.33**), the network density increases to 17.6% and BPBD is still a central actor with a degree of centrality (45.0) and betweenness of centrality (293.5). These findings indicate that BPBD can play a role in coordinating activities in the emergency phase, such as the rescue of disaster victims and distribution of logistics. Then in the recovery phase (see **Figure 5.34**), the network density decreases to 14.8%. In this phase, the central actor is BAPPEDA with a degree of centrality (31.0) and betweenness of centrality (191.3). Based on our analysis, in this phase the role of BAPPEDA is more critical because the recovery phase is related to the development planning system, so the role of BAPPEDA is the key to be able to integrate recovery plans with the development system at local and regional levels.

Table 5. 18 List of the actor involved in disaster management network in Cilacap

Sector	Actor	
Government	BPBD, Bappeda, Legal Bureau, Financial Bureau, Public works, Social affairs, Fire management, Satpol PP, Water management, Energy and mineral agency, Kesbanglinmas, Inspektorat, Kecamatan, Kelurahan, DKP, BLH, PSDA, Education agency, BMKG, BPMPKB, Transportation agency, Bina Marga, Cipta Karya, BPN, BPSDA, Agricultural agency, PDAM, RSUD, SEKDA, DPRD, Sekretariat DPRD, BASARNAS, KODIM, Police	
Non-government	Civil society (NGOs)	Pramuka, PMI, Seroja, Tagana
	Academia	-
	Community organization	Karang taruna, Kelompok siaga bencana, Dasa wisma, Mosque
	Donor agency	UNDP
	Private sector	Pertamina, Pelindo, BRI, Holcim
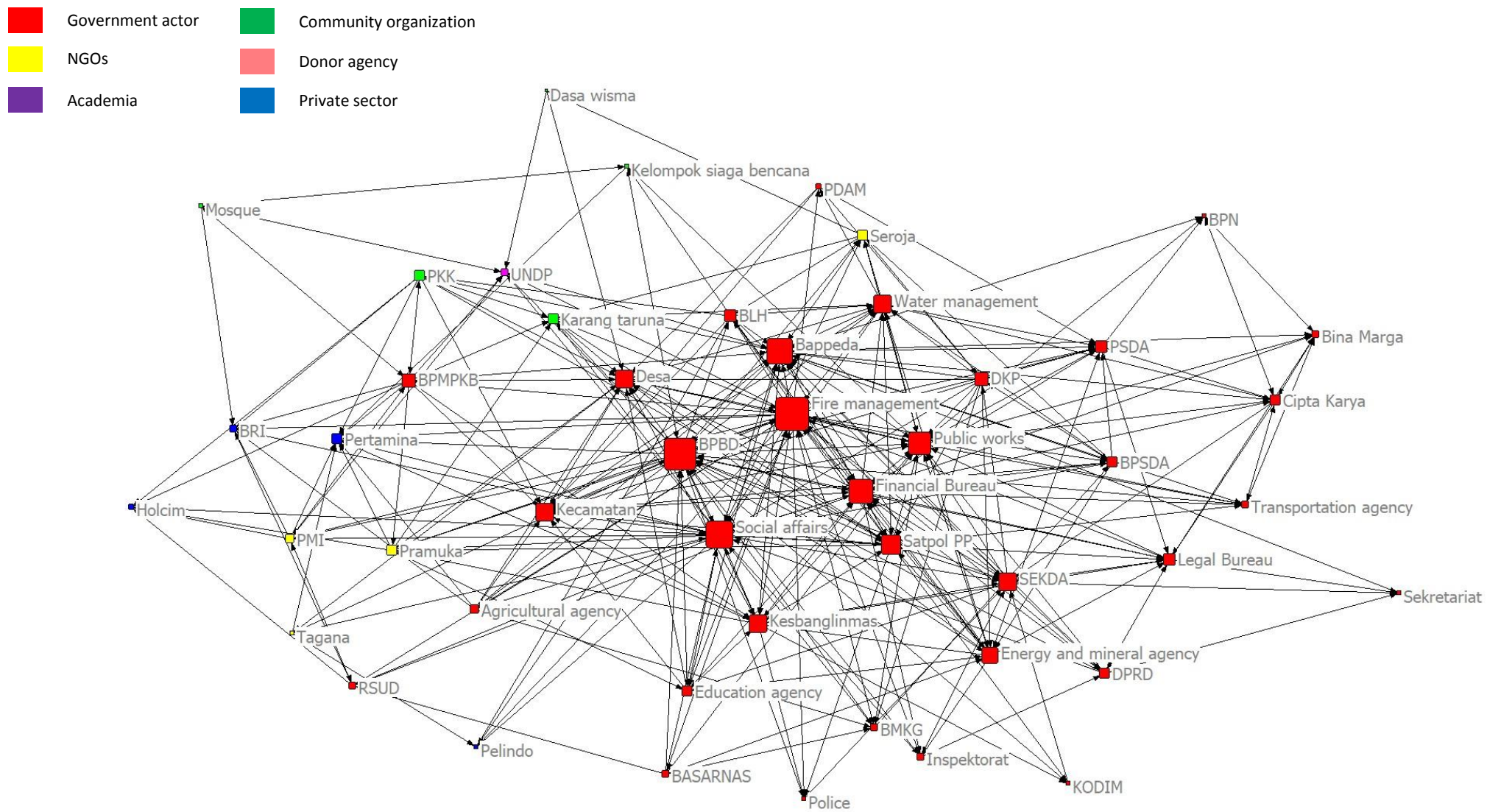
Figure 5. 34 The social network on prevention and mitigation phase in Cilacap Municipality
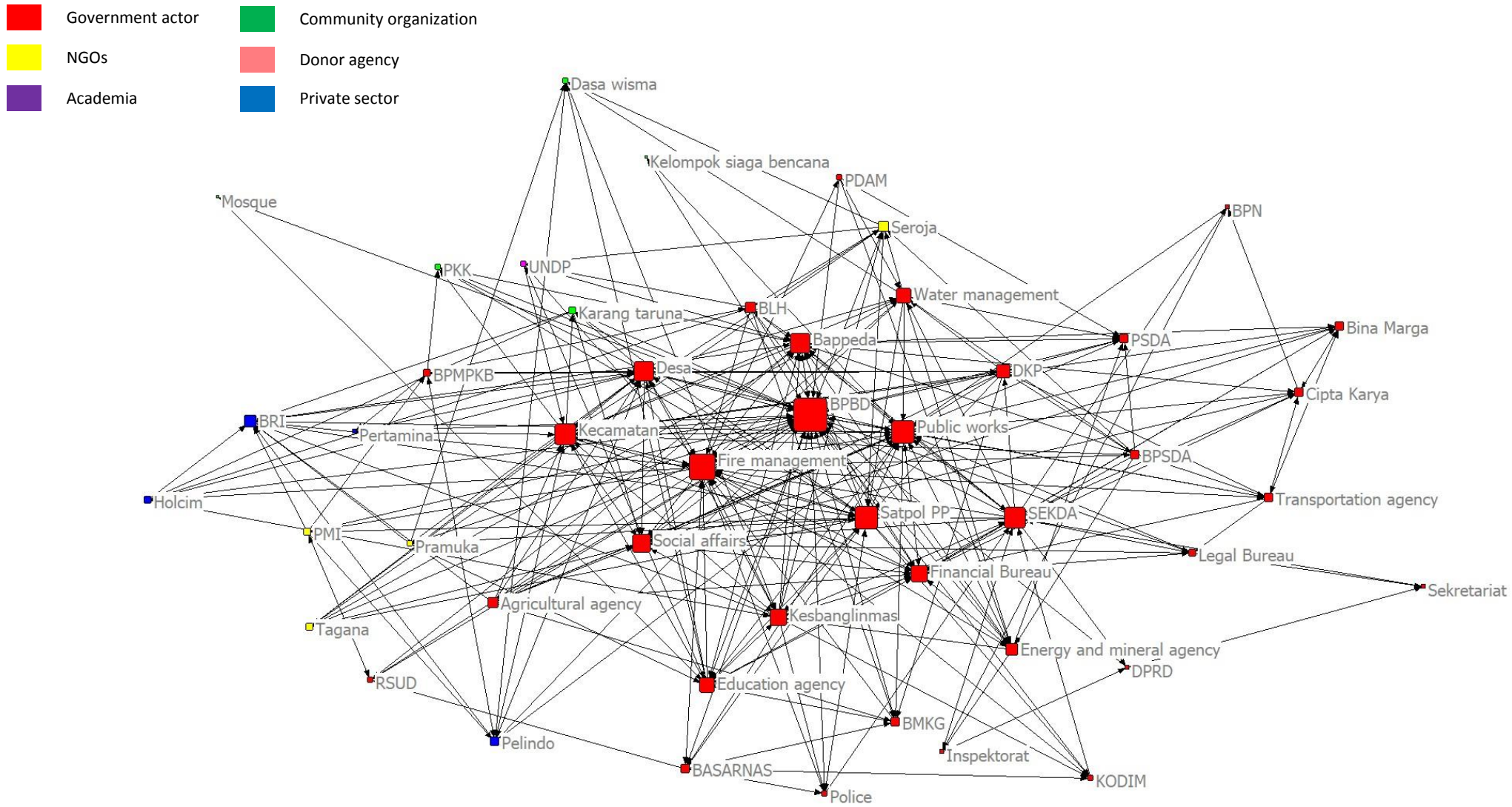
Figure 5. 35 The social network on preparedness phase in Cilacap Municipality

Figure 5. 36 The social network on response phase in Cilacap Municipality
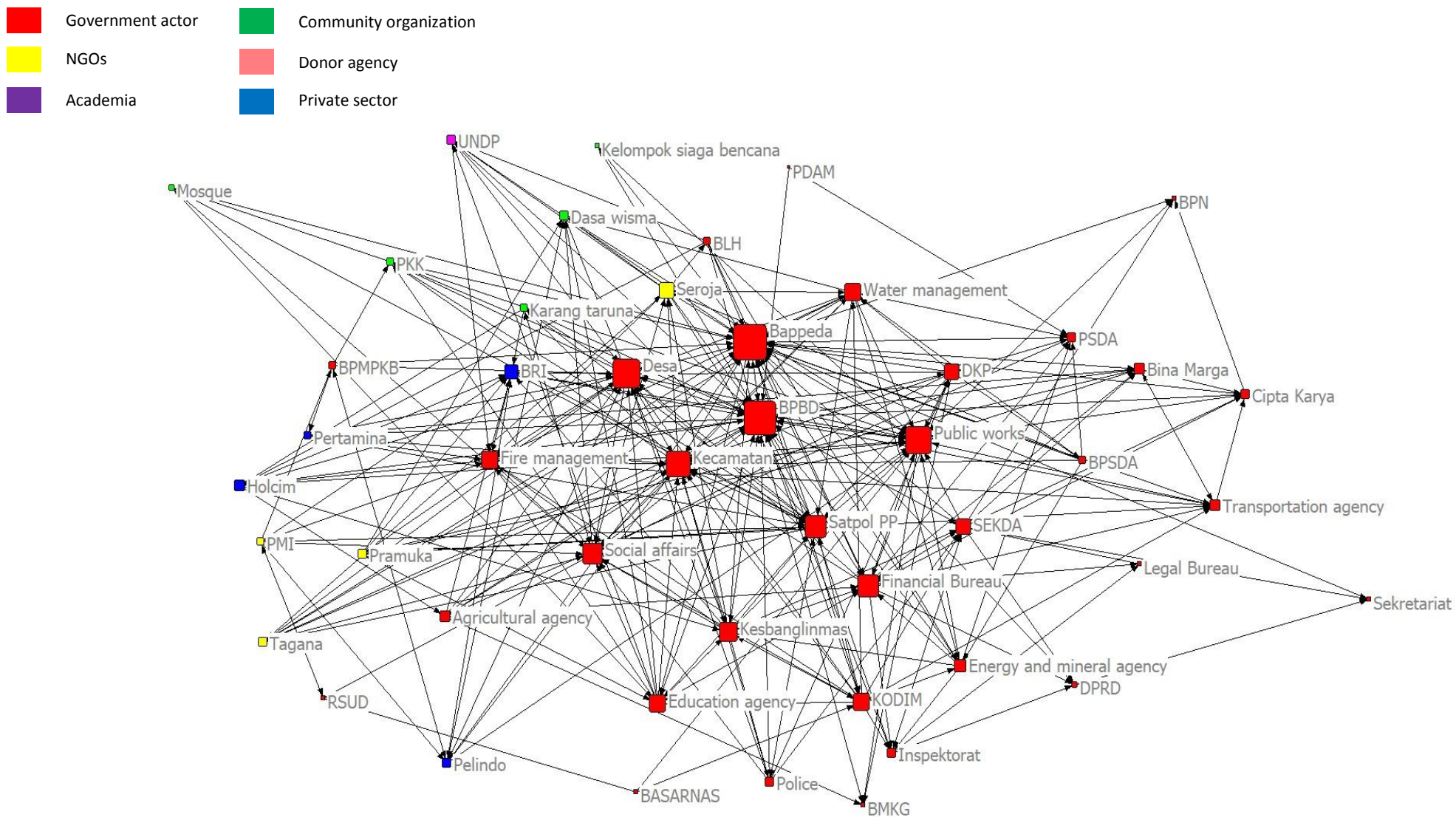
Figure 5. 37 The social network on recovery phase in Cilacap Municipality
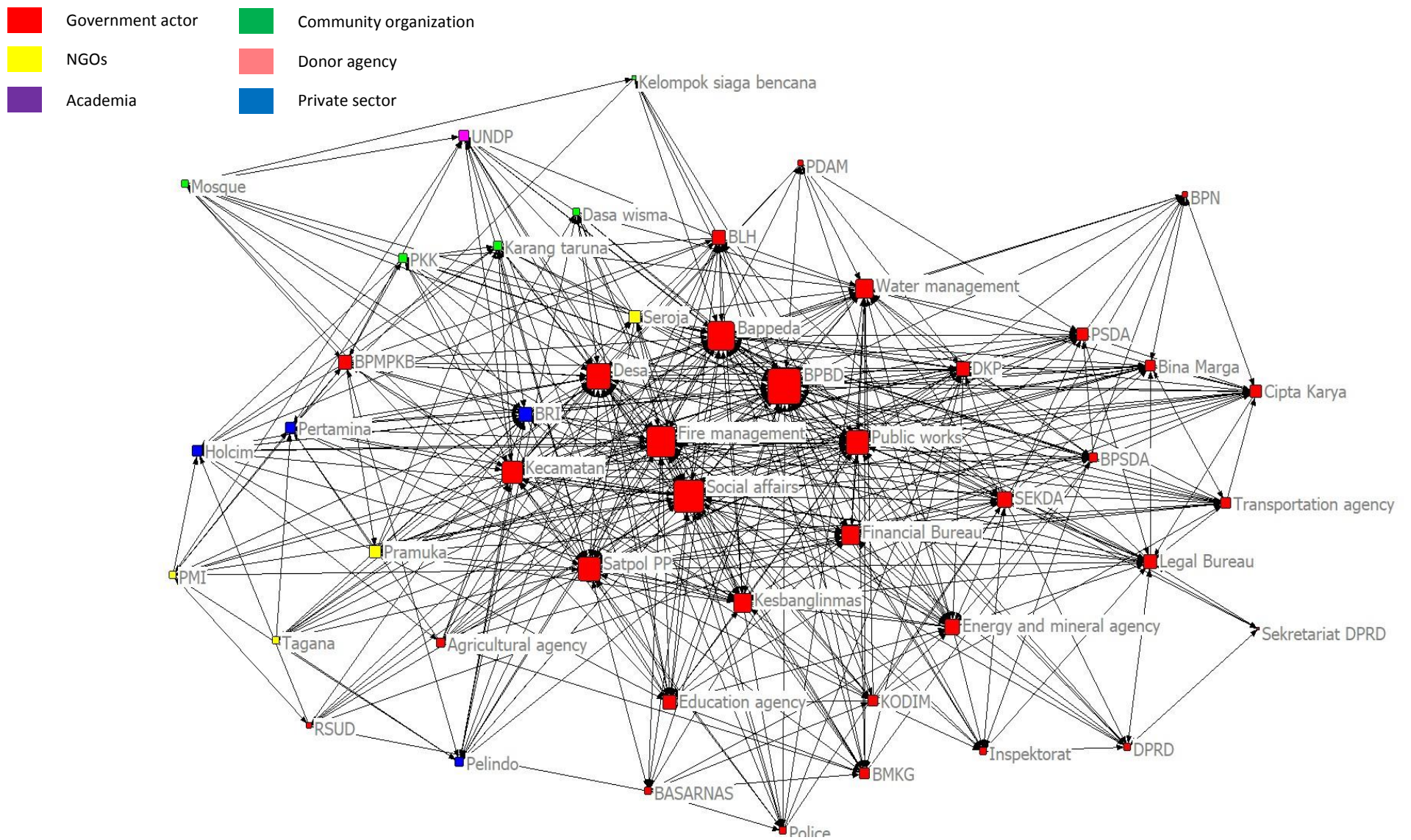
Figure 5. 38 The pattern of disaster management network in Cilacap Municipality

Our SNA pattern (**Figure 5.38**) on disaster management network in Cilacap municipality revealed that BPBD becomes the central actor in the network. Even though our previous finding shows that in pre-disaster, the role of fire management agency is the most essential, but in general disaster phase, BPBD is the most vital actor in disaster management network in Cilacap municipality. This finding also supported from our evidence of centrality analysis (see **Table 5.15**). According to centrality analysis, BPBD is the central actor in the network (degree of centrality: 46 and betweenness of centrality: 239.462). The other local institutions that present essential role namely: Bappeda (degree of centrality: 33 and betweenness of centrality: 107.224), Desa (degree of centrality: 31 and betweenness of centrality: 60.669), and fire management agency (degree of centrality: 30 and betweenness of centrality: 63.396). The role of Desa in the disaster management network is essential in Cilacap municipality. First, the part of Desa is as the representative of local government in the community level. The as the largest region in central Java province, Cilacap needs to distribute some authority to Desa, as the lowest level of government, to overcome every problem related to governance issue immediately. And, secondly, the role of Desa also essential to improve other community organization related to disaster management.

Compared to other case study area, Cilacap has more variety of non-government organization. This potential made local government has many options to involve which actor in every phase of the disaster. From the value of centrality, Seroja, as local NGOs become the essential actor (degree of centrality: 13 and betweenness of centrality: 4.675) and followed by BRI with (degree of centrality: 12 and betweenness of centrality: 5.84).

Table 5. 19 Centrality testing on the disaster management network in Cilacap Municipality

	Actor/Institution	Degree value		
		Degree	Betweenness	Closeness
Government actor	BPBD	46	239.462	48
	Bappeda	33	107.224	61
	Legal Bureau	12	1.535	82
	Financial Bureau	21	17.405	73
	Public works	27	47.264	67
	Social affairs	28	50.103	66
	Fire management	30	63.396	64
	Satpol PP	27	42.974	67
	Water management	20	13.208	74
	Energy and mineral agency	14	4.736	80
	Kesbanglinmas	19	12.411	75
	Inspektorat	9	1.272	85
	Kecamatan	28	41.312	66
	Desa	31	60.699	63
	DKP	14	3.937	80
	BLH	11	3.914	83
	PSDA	11	5.243	83
	Education agency	16	6.894	78
	BMKG	12	4.166	83
	BPMPKB	8	2.078	86

	Actor/Institution	Degree value		
		Degree	Betweenness	Closeness
	Transportation agency	11	1.465	83
	Bina Marga	12	2.975	82
	Cipta Karya	13	2.375	81
	BPN	6	0.067	88
	BPSDA	9	0.983	85
	Agricultural agency	9	2.611	85
	PDAM	3	0.111	92
	RSUD	5	0.375	90
	SEKDA	20	28.93	74
	DPRD	6	2.139	88
	Sekretariat DPRD	3	0	102
	BASARNAS	8	1.713	87
	KODIM	15	5.935	79
	Police	11	1.68	83
Non-government actor	Pramuka	9	2.118	86
	PMI	8	2.918	87
	Seroja	13	4.675	81
	Tagana	8	0.203	86
	PKK	7	0.47	87
	Karang taruna	7	0.665	88
	Kelompok siaga bencana	3	0	91

Actor/Institution	Degree value		
	Degree	Betweenness	Closeness
Dasa wisma	9	2.463	86
Mosque	6	0.103	88
UNDP	9	0.911	85
Pertamina	7	0.644	88
Pelindo	9	3.121	85
BRI	12	5.84	83
Holcim	9	2.278	86

5.6 Summary

The disaster management system requires integrated and sustainable cooperation between actors. Each actor must have an active role from the planning stage to implementation. Disaster management in Indonesia post-decentralization creates opportunities for government and non-government actors to be involved in the decision-making process. Decentralized disaster management has an approach for all the players to take on the role and benefit from the process. In this study, we combine SA with SNA to be able to fully present who and how actors collaborate in disaster management systems at the local level. Also, in this study is also expected to get a strategy that can be used to improve disaster management system at the local level.

In SA (part 1), we analyze stakeholder distribution based on their role in every activity in four phases of a disaster. The result of this analysis we can understand how the policy priority of disaster management in each research location. Then in SA (part 2), we analyze based on "power" and "leadership" to understand the distribution of stakeholders based on their importance level. Next, the SNA helps us to explain the relationships between actors in communicating and collaborating that result in disaster management networks at the local level.

There are amounted to 179 actors in the four cities (57 actors, Semarang City; 36 actors, Purworejo Regency; 48 actors, Cilacap Regency; and 38 actors, Banyumas Regency). Actors are grouped into six sectors: government, civil society, academia, community, donor agency, and the private sector. SA 1 showed that the allocation of the actor in disaster management system in Indonesia is reflected fragmentation in each phase of a disaster. Each phase has their pattern. Based on the analysis, the study area can be divided into three different patterns: municipality focusing on preparedness and response activity; municipality focusing on response and recovery; and municipality focusing on prevention and mitigation, preparedness and response activity. This characteristic is not a general description of the disaster management system at the local level because every municipality must have different priorities and features in disaster management. From this pattern, it is also found that local governments still prioritize post-disaster activities (response and recovery) rather than prevention-mitigation and preparedness activities. Though the disaster governance has shifted from disaster response to disaster risk management, most of the local government still prioritize the post-disaster activities as the primary disaster governance.

Table 5. 20 The comprehensive result from SA and SNA in four study area

Municipality	Stakeholder analysis (SA)	Social Network Analysis (SNA)
Purworejo	• During prevention and mitigation phase, only actor from government sector that has high power and high leadership. • In preparedness phases, only actor from government sector that has high power and high leadership. • During response phases, BPBD is the principal actor. There are 3 actors from the non-government sector with high power and high leadership: Tagana, Desa Siaga Bencana, and Pramuka. • In the recovery phase, only actor from government sector that has high power and high leadership.	• Local government actor played a dominant role in the network. • BPBD becomes the critical actor in disaster management network (degree of centrality: 33 and betweenness of centrality: 57.613). • Local institutions that play a significant role in the network, namely: Public Work Agency (degree of centrality: 29 and betweenness of centrality: 38.212), Satpol PP (degree of centrality: 26 and betweenness of centrality: 27.36), and Fire Management Agency (degree of centrality: 25 and betweenness of centrality: 23.585). • Some non-government sector also plays a significant role in the disaster management network. • The essential non-government actor in the network is Tagana (degree of centrality: 20 and betweenness of centrality: 20.654) and Desa Siaga Bencana (degree of centrality: 17 and betweenness of centrality: 8.704).

Municipality	Stakeholder analysis (SA)	Social Network Analysis (SNA)
Semarang	• During prevention and mitigation phase, only actor from government sector that has high power and high leadership. • In Semarang municipality, a group of stakeholder with high power and high leadership also involved one actor from the non-government sector (Bintari). • In the response phase, besides actor from the government sector, there are two non-government actors with high power and high leadership: Bintari and Karang Taruna. • In the recovery phase, only actor from government sector that has high power and high leadership.	• The government actors become the center of the network. • BPBD as the most linked with other actors (degree of centrality: 48). BPBD also becomes the most significant actor in the network, with the value of betweenness 393.597. • Centrality analysis also shows that other local institution, such as BAPPEDA (degree of centrality: 34 and betweenness of centrality: 199.089), Social affairs agency (degree of centrality: 32 and betweenness of centrality: 135.903), and Fire management agency (degree of centrality: 31 and betweenness of centrality: 87.098) plays significant impact in the network. • From the non-government actor, there are three actors becomes the most crucial player in the network. They are Bintari (degree of centrality: 13 and betweenness of centrality: 5.88), Karang taruna (degree of centrality: 12 and betweenness of centrality: 6.626) and PKK (degree of centrality: 10 and betweenness of centrality: 9.884).

Municipality	Stakeholder analysis (SA)	Social Network Analysis (SNA)
Banyumas	• During prevention and mitigation phase, only actor from government sector that has high power and high leadership. • During preparedness phases, only actor from government sector that has high power and high leadership. • In the response phase, besides actor from the government sector, there is four non-government actors with high power and high leadership: KSB, Pramuka, Ampel, and PMI. • In the recovery phase, only actor from government sector that has high power and high leadership.	• Actor from the governments' sector still represents a significant role in disaster management in Banyumas municipality. • BPBD is the most central actor in the network (degree of centrality: 37 and betweenness of centrality: 82.117). • Other local institutions is crucial, namely: Public works agency (degree of centrality: 27 and betweenness of centrality: 31.921), Satpol pp (degree of centrality: 27 and betweenness of centrality: 29.28), Social affairs (degree of centrality: 26 and betweenness of centrality: 29.374), and Fire management agency (degree of centrality: 26 and betweenness of centrality: 30.577. • Desa or village as a local institution also performs an essential role with (degree of centrality: 26 and betweenness of centrality: 26.702). • Kampung Siaga Bencana (KSB) become the essential actor form the non-government sector (degree of centrality: 12 and betweenness of centrality: 1.551).

Municipality	Stakeholder analysis (SA)	Social Network Analysis (SNA)
Cilacap	• During prevention and mitigation phase, only actor from government sector that has high power and high leadership. • During preparedness phases, only actor from government sector that has high power and high leadership. • In the response phase, only actor from government sector that has high power and high leadership. • In the recovery phase, only actor from government sector that has high power and high leadership.	• Local government institutions become the central actor in the network. • BPBD is the vital actor in the network (degree of centrality: 46 and betweenness of centrality: 239.462). • The local institutions that present essential role namely: Bappeda (degree of centrality: 33 and betweenness of centrality: 107.224), Desa (degree of centrality: 31 and betweenness of centrality: 60.669), and fire management agency (degree of centrality: 30 and betweenness of centrality: 63.396). • From the value of centrality, Seroja, as local NGOs become the essential actor (degree of centrality: 13 and betweenness of centrality: 4.675) and followed by BRI with (degree of centrality: 12 and betweenness of centrality: 5.84).

Table 5.16 revealed the complete result of SA and SNA in four study area, namely: Purworejo, Semarang, Banyumas, and Cilacap. We examined how the disaster management system has a different pattern, and identify the critical actor in each study area. In our analysis with SA, we found that the involvement of non-government actor only in the disaster response phase. There are two exceptions in this case: first, in Semarang municipality, in the preparedness phase; also one actor from the non-government sector has high power and high leadership. The name of this actor is Bintari, one of the local NGO that focuses on empowering the community, especially in disaster capacity. Second, in the case of Cilacap Municipality, in every phase of disaster (prevention and mitigation, preparedness, response, and recovery) all actor with high power and leadership are coming from the government sector. There is no actor from the non-government sector has high power and high leadership.

SA 2 showed that the government sector still has strong power and leadership in all stages of disaster management. The role of the non-government sector is also significant, especially in the response phase. The role of non-governmental actors in response phase's activities is crucial to fill the gaps left by the government, especially in the event of a major disaster. However, SA also demonstrated a significant impact in the role of non-government actors, especially from civil society and private sector, to take a strategic role in the system. This role is supported by the adequate resources of each actor so that with high power impact has an impact in the decision-making process.

From SNA (see **Table 5.16)**, we found that BPBD, as a new institution formed as coordinator in disaster issue, already become the center actor in the disaster management network in four study area. Besides BPBD, there are some government actor also played a significant role. There are Public works agency, Satpol PP, Fire Management Agency (Purworejo), Bappeda and Fire management agency (Semarang), Public works agency and Satpol PP (Banyumas), and Bappeda and Desa (Cilacap). The principal government actors in disaster management network that differ in each study area are an interesting finding in this study. Our hypothesis for this finding is because the role of each actor is related to their primary duty and function (TUPOKSI) of each institution that state in local regulation. Future research should examine more detailed this finding through literature review and interview with a local official.

The other finding from this analysis is about the role of Desa, as the lowest level of government in Indonesia. SNA revealed that the performance of Desa is essential in disaster management network in two study area, namely Banyumas (degree of centrality: 26 and betweenness of centrality: 26.702) and Cilacap (degree of centrality: 31 and betweenness of centrality: 60.669). From this finding, we can conclude two essential points: first, these two municipalities already distribute some of the disaster authority to the village to increase the effectiveness and efficiency of disaster governance. Second, with the well-established role of Desa, it will affect non-government actor to perform more in disaster management network, namely: KSB (Banyumas) and Seroja (Cilacap).

From **Table 5.16**, we can identify some non-government actor that plays a vital role in disaster management network. They are Tagana and Desa Siaga Bencana (Purworejo), Bintari and Karang Taruna (Semarang), Kampung Siaga Bencana and Pramuka (Banyumas), Seroja and BRI (Cilacap). The role of the non-government actor is four study area mostly as supporting actor of local government in the response phase of the disaster. Some of the actors also perform a role during prevention and mitigation, preparedness, and recovery although it is not a significant role. To improve the part of the non-government actor, the local government should open the opportunity of the involvement of non-government actor in disaster management through local regulation. With the formal and legal regulation, the non-government actor has a fundamental responsibility to involve disaster governance in every phase.

Through SNA analysis we found that all study areas have similar approaches that determine the characteristics of networks in disaster management systems. In the government sector, the similarity of characteristics can be seen from the similarity of the main actors as the center of the disaster management network in the pre-disaster and post-disaster phase. However, there are different approaches in the approach to providing an opportunity for actors from the non-government sector to play a larger role in the network. Based on our analysis, only one study area makes non-government actors a part of the central actor in the network.

This study allowed us to give a general description of disaster management system at local level. On the one hand, we find that the role of local government has increased and can act as coordinator for disaster management. We can see that the function of the community still cannot be fully accommodated in the system. The findings suggest that cooperation is required and continuous empowerment of actors who have strong power and high leadership to achieve common goals.

Local governments also need to open more opportunities to non-governmental organizations to participate in any disaster management activities.

In our analysis concerning the disaster management network in four study area, we found that the dominant player in the network, especially from the government sector, are different from one study area to the others. Based on our interview and concerning official documents issued by local authorities, we found that this finding based on two main reasons. First, the primary player on each municipality related to the primary duty and function (TUPOKSI) of each local agency. This TUPOKSI state in the local regulation or other decree issued by a local leader. Based on this rule, each local agencies has their responsibilities and limitation to perform their activity on Government Issue, including disaster issue. The main reason for this strict rules is to avoid overlap function of each local agencies. Second, related to the role of BPBD in each municipality. If BPBD can well be performed, mainly described as a coordinator of disaster management, it will involve as many as an actor, both government and non-government in disaster management.

From Due to the larger area, municipality requires different concepts of disaster management to enable all communities to be well served. One solution is to delegate some of the authority of disaster management to the lower level of the government, such as ―kecamatan‖ (district) and ―desa‖ (village). By delegating some of these powers can have two significant impacts: 1.) Increasing the range of services to the community and 2.) Strengthening the role of kecamatan/desa in the DM system.

Although the SA and SNA proved useful to analyze the distribution and relationship of the actors. But there are still some points that become limitations in the study. First, although this research is considered to have enough respondents from each study site, the difficulty of conducting interviews with the principal respondents is becoming a challenge. For a broader analysis, the data collection method needs to be done by combining several methods such as semi-structured interview, questionnaire survey, focus group discussion, and public hearing, expected to understand the role of each actor in the system. Second, the location selected for this study are only municipalities which include high risk based on Disaster Risk Index (BNPB 2013). Furthermore, for the future research SA should be analyzed for a municipality that has medium and low disaster risk to know the differences characteristic and pattern of the stakeholder.

CHAPTER 6

LOCAL GOVERNMENT CAPABILITY IN MANAGING THE DISASTER

6.1 Introduction

Disaster is the result of the emergence of extraordinary events in vulnerable communities so that people cannot overcome the implications of these extraordinary events (Lindell 2013). Based on data from United Nation Office for Disaster Risk Reduction (UNISDR), in period 2004 to 2014, natural disasters around the world caused 0.7 million people killed, 1.7 billion people affected and the economic losses around USD 1.4 trillion (Songwathana 2018). The highest number of natural disasters was caused by climate-related disasters, amounting to 87% of the total events throughout the ten years. Awareness of the importance of disaster risk reduction efforts began to emerge in the decade 1990-1999 which was proclaimed as the Decade of International Disaster Risk Reduction (DRR). The United Nations Economic and Social Council (UN) in Resolution No. 63 of 1999 calls on Governments in each country to formulate an Action Plan for National Disaster Risk Reduction to support and ensure the achievement of sustainable development goals. However, the paradigm of disaster management has changed after the establishment of the Hyogo Framework for Action (HFA) which encourages all countries in the world to develop integrated mechanisms for disaster management that are supported by strong institutional and human resource capacity (Meerpoël 2015).

Disaster management primarily seeks to prevent people from disasters by reducing the likelihood of hazards or overcoming vulnerabilities (Tarhan et al. 2016). The effective disaster management system is needed to provide good disaster management services for the people. Disaster management is known as a complex structure. Therefore every decision taken will impact all stakeholders involved (Garschagen 2016). However, disaster management policies are one of the most common challenges in developing countries, where human resources and financial factors are still relatively low (Rautela 2015)(Rumbach 2015a).

A paradigm shift in disaster management makes the principal actors also shift from the central administrator to the local administrator. The role of the local administrator is essential to enable the

other players to become involved, not just as the supporting actor during an emergency but also as an actor who plays a significant role during pre-disaster and post-disaster activities. In Indonesia context, in 2007 the government issued the Disaster Management Law (DML) as flow up of HFA as the national foundation of disaster management system. The primary objectives of this regulation are to transfer for the disaster management authority from central to local government (Government and Team 2009). In disaster management, the transfer of power was essential to improve the role of local governments and communities to engage actively in disaster management (Bae et al. 2016). As a disaster-prone country, Indonesia urgently needs to distribute roles and responsibilities to the local government in three stages of disaster: pre-disaster, emergency response, and recovery (Government and Team 2009). The development of the DML has contributed to the establishment of regulation and institution at the local level. In the period 2007 - 2016, the total regulations issued related to disaster management were 329 regulations consisting of 238 local regulations and 91 central government regulations. Recent data show that the total number of Regional Disaster Management Agency (BPBD) that were formed during this period were 436 or around 80% of the total number of the municipality in Indonesia (BNPB 2010c).

However, some studies found that local government in Indonesia are developing very slowly when compared to the national level (Djalante, Thomalla, Sinapoy, et al. 2012). Few of problems related to lack financial capacity, lack of human resources, lack of collaboration and coordination become the obstacle to increasing the role of local government as a leading actor in disaster management (Djalante, Thomalla, Sinapoy, et al. 2012). Some literature has identified this condition as related to several local government issues related to local government capability (Kusumasari and Alam 2012). Regarding the role of local government as a principal actor in disaster management, analysis of this local capability in managing disaster is fundamental. By understanding the character of the capability of the local government, we can understand the opportunities and problems of disaster governance at the local level. Several studies on capability in disaster management provide a general overview of the conditions of local government capability. The previous study from Anantasari (2016) has focused on the competence of local government capability and identify the problem and opportunity (Anantasari et al. 2017). Other studies related to capability, for instance, Kusumasari et al. (2010) revealed that the capability requirements for local governments in handling disasters in the pre-disaster, emergency response and post-disaster phases (Kusumasari et al. 2010). In this study, the author also explained some local government problems in managing disasters. Then, Bussell and Clogan (2010) formulated a model of linkages between government

capability and disaster outcomes with study locations in several countries in Africa (Bussell et al. 2014). However, there is no study analyzes how the interrelationships between variables in capability and what factors influenced.

Our research addresses the above gaps by assessing the local government capability using quantitative and qualitative data to identify the factor that influenced the local capability. It provides empirical evidence on the local government capability in managing disasters in Indonesia. The first objective of this study is to develop the structural model based on SEM technique to provide the relationship between a variable of local capability and some observed variables, namely: ‗number of disaster,' budget allocation, ‗relationship with parliament,' and ‗relationship with the non-government actor.' Second, we will test the model fit to assess how well the SEM model represents the data. Third, the model proved with typical characteristics of case study to understand how the model describes the actual situation.

6.2 Definition of capability

In the international context, the term of the capability in managing disaster refers to an ability to use and access the resources needed above and beyond the availability of existing resources (Termeer and Dewulf 2014) (Ikeda and Nagasaka 2011). Besides that Kusumasari also defines capability as the ability of an individual, institution or community to perform functions, solve problems and regulate and achieve the goals of a sustainable disaster management system (Kusumasari et al. 2010). HFA, which was then followed by the Sendai Framework for Action (SFA), highlighted the importance of developing capability in disaster management. However, for developing countries, this capability development requires a relatively large investment compared to their financial capacity (Crawford, Langston, and Bajracharya 2012). Besides that, the problem related to limited access to information technology, low education levels, a high level of vulnerability and natural threats make improving capability in managing disaster is more complicated. Parsons assumes that capability is one of the factors that build disaster resilience at the local level (Parsons et al. 2016). This opinion is based on the idea that no matter how broad the impact of the disaster is, operations for handling and responding will always be local. But then if the resources owned by the local authority are inadequate, it is crucial to increase the scale of responses to provincial or national

levels. In this case, Alexander underlined the importance of local authorities to measure the level of their capability in managing disasters (Alexander 2015).

In Indonesia context, most of the previous study on capability focus on the local government level. A consensus that the local government is the primary actor responsible for disaster management. Their unique position as a connection between the central government and the community makes the role of the local government is vital for the effectiveness of disaster management performance (Kusumasari et al. 2010) (Ainuddin and Routray 2012). However, with great responsibility in managing disaster management, it was realized that the local government still had limitations. Djalante (2012) suggested that strengthening capability at the central and local government levels was very important for the effectiveness of disaster governance (Djalante, Thomalla, Sabaruddin, et al. 2012). But she also stressed that increasing capability at the local level is a priority, due to several obstacles, such as financial and human resources. Capability cannot be seen as a single resource concept. So that capability cannot only be measured by how much is the allocation of funds, financial assets, or human resources (Kusumasari et al. 2010). But capability must also be seen from the ability to carry out a function, such as the ability to allocate resources, provide public services, and complete its tasks (Anantasari et al. 2017). Anantasari et al. (2017) argued the local government's level capability in handling disasters, especially leadership, is still relatively weak (Anantasari et al. 2017). Local decision makers even did not consider disaster management as an essential government affair. This matter is affected by the allocation of disaster management funds that are still insufficient in the local government budget. Moynihan in Kusumasari et al. argued that the local government must be aware and rational in managing disaster risk (Kusumasari, Alam, and Dibben 2005). This statement means that the local authorities must know their strengths and weaknesses compared to the natural hazard. With a better understanding of capability, the local government can predict when they can manage the disaster themselves or ask for help from higher levels of government.

Table 6. 1 Description of the variables

The six dimensions of capability (Kusumasari et al. 2010).		The indicators of capability in this study	
Institutional	Having a clear structure, role, responsibilities, and relationship between all levels of government	Structure	The effectivity of organizational structure of BPBD to manage the disaster.
		Role	Role of BPBD to manage the disaster in pre-disaster, emergency response, and post-disaster.
		Responsibility	The active response of BPBD to face the disasters.
		Communication	The system to exchange the information on the disaster.
Human resource	Having sufficient personnel, proper task delegation, and division of labor	Task limitation	The scope of the duty of each official of BPBD.
		Duty division	The division of the task/duty in BPBD.
Policy	Availability of appropriate policies, rules and effective implementation regulations for making a decision, mobilizing resources and engaging relevant public/ private organizations	Local regulation	The availability and effectivity of local regulation on disaster management.
		Disaster plan	The availability and effectivity of the disaster plan.
		Assessment	The availability and effectivity of assessment on policy and rules on disaster management.
Financial	Having sufficient financial resources to support activities in all stages of disaster management	Allocation	The availability and sufficiency of disaster management budget.
		Financial resources	Various source of finance for disaster management activity.
Technical	Having an effective logistic management system, sufficient technology information system and communication network between organizations, communities and media representatives	Logistics	The availability and effectivity of logistics system during the emergency
		(Sufficient technology for) Early Warning System	The availability and effectivity of the early warning system.
		System information	The availability and effectivity of the system to deliver information on the disaster to the people.
Leadership	Building local level leadership to make a quick and appropriate decision if and when needed	Decision making	The ability or process of making important decisions on disaster management.

In this study, we assume that each variable capability effects each other. Additionally, we also expect some external factors affect the level of capability at the local government level. We consider two factors in developing this research. First, we base our analysis on previous research; we use theories and variables that build capability in disaster management. We also based the theory on the direction of connection between variables in developing a capability model. Recently several studies have focused on how to measure capability levels in disaster management. And there is no consensus among researchers to be able to formulate a standard method for determining indicators on capability. Anantasari et al. (2017) suggested that measuring capability indicators could not only be analyzed quantitatively, but capability must also be analyzed qualitatively to get an accurate situation. In Kusumasari's model, the capability is formed by variables built in the pre-disaster, emergency response, and post-disaster (Kusumasari and Alam 2012). In this study, we use fifteen variables to develop a capability model in disaster management, namely institution role, clear structure, early warning system, disaster plan, duty division, institution responsibility, task limitation, financial sources, budget allocation, communication, system information, logistic, assessment, decision making, and local regulation (see **Table 6.1**).

Second, based on the theory we identify external factors that can affect capability (see **Fig. 1**). We refer to research from Bussell et al. (2014), where they identify several external factors that affect capability, namely: disaster experience, economic conditions, political condition, and external capacity and aid (Bussell et al. 2014). It is also assumed that there is a positive relationship between these external variables and the capability-forming variable. The external factors can often be seen in the experience of disasters that occurred in the past. This can be seen from several previous studies, where the researchers assume that there is a direct relationship between the disasters of past events and the level of local government capability (Bussell et al. 2014) (Ahmed 2009). This also refers to the literature as a reference model. According to Bussell and Clogan, the experience of recent events is one of the factors influencing institutional capability. But in the study also explained that disaster experience is not the only variable forming capability (Bussell et al. 2014).
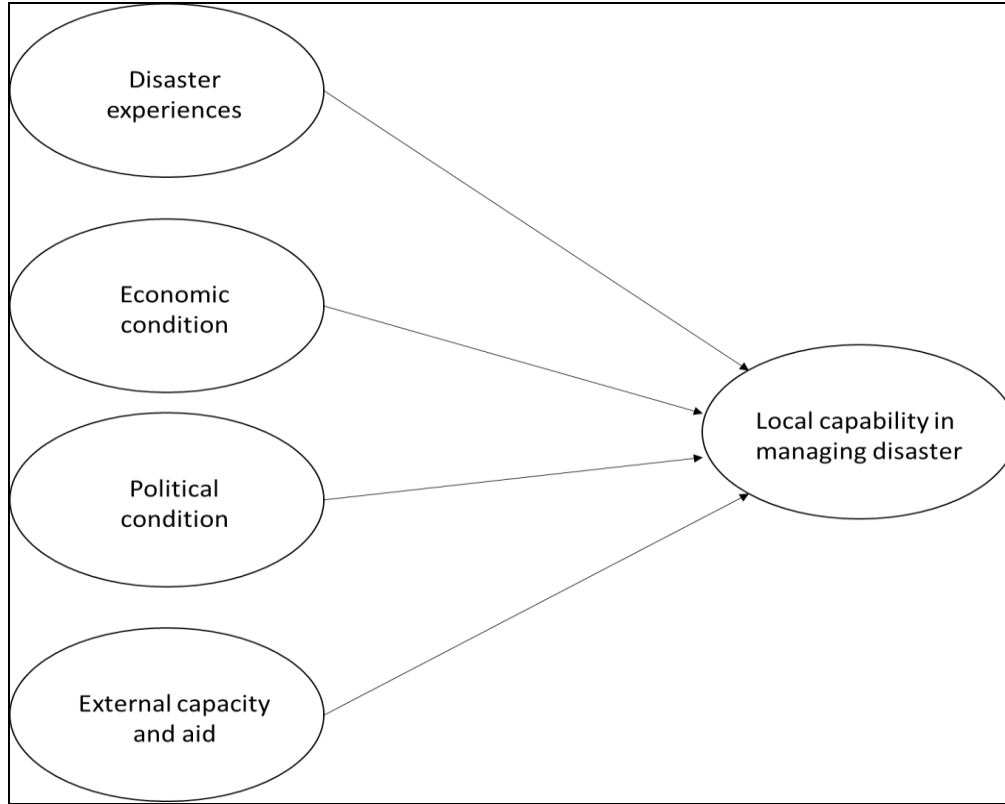
Figure 6. 1 The theoretical framework of the relationship between capability and external factors

Economic conditions are also seen as one of the external factors that affect capability. Raschky (2008) noted that directly and indirectly, the government's economic conditions have a significant impact on disasters (Raschky 2008). Kahn in Raschky (2008) also found that a country that has higher per capita income will have a smaller disaster impact than other countries that have lower per capita income (Raschky 2008). In addition, economic development with the effects of disasters also has a significant relationship. Where a massive catastrophe can also hinder the economic growth of a country/region that does not have a substantial financial capacity. Next, political conditions and external capacity and aid are seen as external factors that affect capability. For political conditions, from the beginning, UNISDR tried to place disaster management as part of the political agenda at the national and local levels (UNISDR 2014). By gaining a strategic position in the political structure, it is expected that disaster management will get sufficient funding allocations and leadership at the highest level of government. But this is also not easy where changes in political leadership often make the priorities of political leaders different (Hagelsteen and Burke 2016b)

(Hagelsteen and Becker 2013). External capacity also has a strategic role in building capability at the local level. External capacity such as other countries, donor agencies, international NGOs, local NGOs, and private sectors are actors who influence capability levels (Levie, Burke, and Lannon 2017) (Islam and Walkerden 2017). This external assistance is often used to cover up problems, both financial and human resources to be able to bridge the capability development at the local level (Bisri and Beniya 2016).

6.3 Methodology

6.3.1 Data source

The questionnaire was generated based on previous research that discusses the capability of disaster management (Kusumasari and Alam 2012) (Anantasari et al. 2017) (Combaz 2013). The questionnaire is separated into two sections. The first section of the questionnaire consists of descriptive topics, namely: the respondent's name, position, agency, task details, and stakeholder list of respondents' organizational partners. Position, agency and task details are necessary to provide the respondent's background on disaster management experience. The second section of the questionnaire consists of types of objective questions where respondents were asked to give weight to these attributes on a 5-point Likert scale. The "1" score shows the unreliability of capability at the local level, while the "5" score indicates that the organization is very reliable in the capability attribute. Likert scale is a measure used by researchers to capture the opinions of respondents. Likert scale assumes the interval between each item is the same (Gupta, Kapur, and Kumar 2017).

The web questionnaire method with simple random sampling we have used in this study. This procedure provides extensive opportunities for all municipalities to participate in this study. The data source used to test the model were gathered from a sample of local government employees from Indonesia. The Republic of Indonesia was organized into 542 municipalities and grouped into 34 provinces. Thus, to improve the generalization of results, the questionnaire will be distributed to 34 provinces in Indonesia. We base our selection on the availability of an official email address for each local government. The focus is on local representatives who have a better understanding of disaster management - in the pre-disaster phase, emergency, and recovery. Municipality Regional Disaster Management Agency (BPBD) is selected as respondents because their role as disaster

management coordinators at the local level, and it is assumed that they have the capacity and good understanding of local capability levels in disaster management. Because of the characteristics of the specific information contained in the questionnaire, senior representatives, both Chief of BPBD (KALAK), chief of division (KABAG), chief of sub-division (KASI), or senior representatives in each division, are asked to participate in the survey. These personnel categories are supposed to be in an excellent status to present information about the questions posed in the questionnaire.

A total of 220 questionnaires were distributed via web questionnaire from December 2017 to January 2018, and 111 municipality BPBD responded. But the five questionnaires that were filled incompletely were therefore dismissed. The final questionnaire is 106 municipality or about 23% of the total population. **Table 6.2** summarizes the general characteristics of the respondents. Around 47.2% of respondents are municipalities from Java, as the most densely populated island in Indonesia, then 23.6% of respondents from the municipality on Sumatra Island and 14.2% from Sulawesi Island. Only 4.7% of respondents came from the eastern part of Indonesia. Limited access and technology are assumed to be the main reason for the low response from that region. Distribution of respondents by position is 34% of respondents identified as chief of division (KABAG), Chief of BPBD (KALAK) 27.4%, senior officer 17.9%, chief of sub-division (KASI) 11.3%, and secretary 9.4%. Then based on the type of city, we can group respondents into four groups, namely: respondents from urban medium 49 respondents (46.2%), metropolitan 30 respondents (28.3%), big urban 21 respondents (19.8%), and small urban six respondents (5.7%). Next, we asked the respondents about the three main natural threats in the area. As many as 93.4% of respondents mentioned flood as one of the main natural threats in the region. Then landslide 82.1%, drought 61.3%, and flash flood 52.8%. The most natural geological hazard mentioned by respondents is an earthquake by 50.9% of respondents and then volcano eruption by 31.1% of respondent. This condition shows that hydro-meteorological hazards are more dominant in the respondent's area.

Table 6. 2 The characteristics of the respondent

Characteristics	Number	Percentage (%)
Area		
Java island	50	47.2
Borneo island	7	6.6
Sumatera island	25	23.6
Sulawesi island	15	14.2
Bali and Nusa Tenggara	4	3.8
Papua and Moluccas	5	4.7
Position		
Chief of BPBD (KALAK)	29	27.4
Secretary	10	9.4
Chief of division (KABAG)	36	34
Chief of sub-division (KASI)	12	11.3
Senior office	19	17.9
Type of the city (population)		
Metropolitan (more than 1 million)	30	28.3
Big urban (500,000 – 1 million)	21	19.8
Medium urban (100,000 – 500,000)	49	46.2
Small urban (less than 100,000)	6	5.7
Natural hazard characteristics		
flood	99	93.4
landslide	87	82.1
flash flood	56	52.8
storm	12	11.3
earthquake	54	50.9
tsunami	15	14.2
volcano eruption	33	31.1
drought	65	61.3
others	29	27.4

Table 6. 3 Description of the variables

	Variables	Question/ Description	The way of answer/data source
	Structure	How do you evaluate the organizational structure of the local government to manage the disaster?	1=not reliable at all; 2=somewhat not reliable; 3=either reliable or not reliable; 4=somewhat reliable; 5= greatly reliable.
	Role	How do you evaluate the role of local government in all stages of disaster?	1=not reliable at all; 2=somewhat not reliable; 3=either reliable or not reliable; 4=somewhat reliable; 5= greatly reliable.
	Responsibility	How do you evaluate the response of local government to manage the disaster?	1=not reliable at all; 2=somewhat not reliable; 3=either reliable or not reliable; 4=somewhat reliable; 5= greatly reliable.
	Communication	How do you evaluate the way of exchanging the information in local government?	1=not reliable at all; 2=somewhat not reliable; 3=either reliable or not reliable; 4=somewhat reliable; 5= greatly reliable.
	Task limitation	How do you evaluate the scope of duty in the local government?	1=not reliable at all; 2=somewhat not reliable; 3=either reliable or not reliable; 4=somewhat reliable; 5= greatly reliable.
	Duty division	How do you evaluate the division of the task/duty the local government to manage the disaster?	1=not reliable at all; 2=somewhat not reliable; 3=either reliable or not reliable; 4=somewhat reliable; 5= greatly reliable.
	Local regulation	How do you evaluate the reliability of local regulation on disaster management?	1=not reliable at all; 2=somewhat not reliable; 3=either reliable or not reliable; 4=somewhat reliable; 5= greatly reliable.
	Disaster plan	How do you evaluate the disaster plan that developed by the local government?	1=not reliable at all; 2=somewhat not reliable; 3=either reliable or not reliable; 4=somewhat reliable; 5= greatly reliable.
	Assessment	How do you evaluate the approach of the local government to evaluating the disaster risk based on existing conditions of exposure and vulnerability?	1=not reliable at all; 2=somewhat not reliable; 3=either reliable or not reliable; 4=somewhat reliable; 5= greatly reliable.
	Allocation	How do you evaluate the availability of disaster management budget?	1=not reliable at all; 2=somewhat not reliable; 3=either reliable or not reliable; 4=somewhat reliable; 5= greatly reliable.
	Financial sources	How do you evaluate the various source of finance for disaster management activity?	1=not reliable at all; 2=somewhat not reliable; 3=either reliable or not reliable; 4=somewhat reliable; 5= greatly reliable.
	Logistic	How do you evaluate the system of the local government to flow of goods during the emergency?	1=not reliable at all; 2=somewhat not reliable; 3=either reliable or not reliable; 4=somewhat reliable; 5= greatly reliable.
	Early warning system	How do you evaluate the reliability of an early warning system that developed by the local government?	1=not reliable at all; 2=somewhat not reliable; 3=either reliable or not reliable; 4=somewhat reliable; 5= greatly reliable.

	Variables	Question/ Description	The way of answer/data source
	System information	How do you evaluate how the local government organized a system to provide information about disaster for the community?	1=not reliable at all; 2=somewhat not reliable; 3=either reliable or not reliable; 4=somewhat reliable; 5= greatly reliable.
	Decision making	How do you evaluate the ability or process of making important decisions on disaster management?	1=not reliable at all; 2=somewhat not reliable; 3=either reliable or not reliable; 4=somewhat reliable; 5= greatly reliable.
External variables	Relationship with parliament	Do the local government has a good relationship with the parliament to develop the disaster management system?	0=No; 1=Yes
	Relationship with non-government actor	Do the local government has a good relationship with a non-government actor (e.g., NGOs, donor agency, and academia) in disaster management?	0=No; 1=Yes
	Number of disasters	The total number of disasters was happening in a municipality. (Bussell et al. 2014)	Indonesian Disaster Data and Information (DIBI)
	Percentage of own source revenue	The proportion of own income funds compared to total income. (Herry Darwanto 2012)	The proportion of local government budget 2017
	Percentage of disaster allocation	Estimated proportion of disaster management funds compared to the total budget. (Nurhidayat 2017)	

6.3.2 Variables

Based on the literature study, we formulated variables that are assumed to have an impact on the level of capability in managing disaster at the local level. Based on several theories, we identified four aspects that might affect the level of capability, namely: disaster experience, economic conditions, political conditions, and external capacity and aid. In determining the variables in each aspect, we are guided by two main ideas: first, we are guided by prior research on capability. And second, we consider the availability of data. Based on these two considerations, the variables and data we use can be seen in **Table 6.3.** For aspects of disaster experience, we are referred to data released by BNPB on Indonesian Disaster Data and Information (DIBI)[1]. DIBI is data that can be accessed free of charge by the public which records the event of disasters that occurred in Indonesia from 1815 to the today. Through DIBI, we can identify data on disaster events in all municipalities in Indonesia and categorize them into two types of disasters: geological and hydro-meteorological. The second aspect is economic conditions; we refer to the data issued by the Ministry of Home Affairs (MOHA) about the composition of the local government budget. In this analysis, we use four variables, namely: percentage of own source revenue, the percentage of transfer fund, and

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[1] Available: http://dibi.bnpb.go.id/dibi/ accessed on 20/06/2018

percentage of disaster allocation. Furthermore, for aspects of political conditions and external capacity and aid, we use data through questionnaires. The political condition aspects, we use variables about the 'relationship with the parliament,' while regarding 'external capacity and aid' aspects, we use variables relationships with non-government actors.

6.3.3 Statistical procedure

This study adopted a procedure formulated by Mafimisebi et al. (2012) that combine the factor analysis with SEM (Mafimisebi et al. 2018). First, we will use factor analysis both explanatory factor analysis (EFA) and confirmatory factor analysis (CFA), and then we will use SEM to construct model-fit constructs and assessments. Exploratory factor analysis (EFA) is done to examine the relationship between variables. EFA will help to identify the factors used to represent the relationship between variables. In principle, exploratory factor analysis in which the formation of new latent factors or variables is random, which can then be interpreted according to the factors or components or constructs formed. EFA is a technique to reduce data from the original variable to a new variable or a factor that is smaller than the original variable. The analysis process tries to find relationships between new variables and eliminate the variable that is free or uncorrelated. To run the EFA, we use IBM SPSS statistics version 23. Next, CFA aims to evaluate the patterns of relationships between variables. To do CFA, we use AMOS software version 23. The confirmatory analysis model is usually not assumed to be the direction of the relationship between variables, but only a correlative relationship between them. So, CFA is a factor analysis that is used with the aim to test or confirm the measurement model empirically. Measurement model or also called a descriptive model (Hou et al. 2014). The operationalization of latent variables or constructs into one or several indicators or some manifest variables that are formulated according to a particular theoretical study. Thus, the CFA is not intended to produce models, but rather to test measurement models developed by specific theoretical studies.

To develop the model-fit assessment, we use SEM to measure the mutual relationship between capability variable in disaster management. SEM is a statistical technique used to construct and test statistical models that are usually in the form of causal models (Adedeji et al. 2016). SEM then develops and has a function similar to multiple regression, though it seems that SEM is a stronger analysis technique because it considers interaction modeling, nonlinearity, correlated independent

variables, measurement errors, correlated errors, some latent independent variables where each is measured using many indicators, and one or two latent variables which are also measured by several indicators (Li, Liu, and Peng 2018) (Gupta et al. 2017). In this study, we will develop a model with SEM based on two stages. The first stage-measurement model aims to examine observed variables that have been obtained from the results of the questionnaire. This test aims to reduce the number of variables and classify these variables into latent variables to minimize bias in the SEM model (Adedeji et al. 2016). The next stage, we do a structural model, which aims to determine the relationship between latent variables and also between latent variables and exogenous variables. To do SEM, we use AMOS software version 23 in the measurement and structural model stages. In approaching statistically especially Structural Equation Modeling (SEM), the sample size is critical. Some experts argue that the minimum sample for SEM is to use a comparison ratio between the number of variables and the number of respondents, but in some cases, this creates a biased (Adedeji et al. 2016). Some experts also argue that the minimum sample for SEM analysis is 200 samples (Lee 2016) (Adedeji et al. 2016). In this study, we use an online calculator algorithm developed by Daniel Soper for measuring the size of the sample. Based on the total of four latent variables and 23 observed variables that we have, we get the minimum sample results for SEM analysis is 91 samples[2]. Therefore 106 sample size from the questionnaire we have is acceptable to be used for the analysis.

6.3.4 Case study area

Case studies are a method for understanding the complexity and uniqueness of real-life phenomena. Also, case studies are also seen as an appropriate method for testing a model. Case studies will try to answer a phenomenon from the context of 'why' and 'how' (Mok et al. 2017). Because this study is a study that tries to answer 'how,' the case study method is supposed suitable. There are various case study approaches. One theory from Yin (2003) divides case studies into single-case and multiple-cases (Mok et al. 2017). This study conducts a multiple-case case study because this study has two main objectives. First, to get an overview of the relationship between the variable of local capability and to find out the external factors that influence it qualitatively. Then, try to validate the

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[2] Available: https://www.danielsoper.com/statcalc/calculator.aspx?id=89 accessed on 18/08/2018

model obtained from SEM analysis. An exact understanding of the phenomenon requires several cases as a comparison, due to the different characteristics of one municipality to another.

Figure 6. 2 Location of selected areas

The selected location of the case studies in this study was not chosen randomly but by information-oriented sampling (Flyvbjerg, Garbuio, and Lovallo n.d.). Two criteria are set for case selection: (1) each municipality is selected based on the characteristics of different natural hazards. We assume that the aspects of the natural hazards will affect the interaction between the variable of local capability. (2) The municipality is also chosen based on the type of city in Indonesia, which is based on the population. In this case, we assume that the population is one of the external factors that can play a role in affecting capability levels at the local level. The selected case study locations meet these two criteria. For this reason, we chose three municipalities as the location of the case study, namely Sidoarjo, Bogor, and Sleman (see **Figure 6.2**). Sidoarjo is a metropolitan city located in East Java and has a vulnerability to flooding, then Bogor is a big urban type municipality located in West Java and is vulnerable to landslides. And Sleman is a medium urban type municipality, located in a Special Region of Yogyakarta, has experience of being affected by volcanic eruptions.

Table 6. 4 List of the respondents

Study area	Institution	Number of respondents
Bogor	- Regional disaster management agency (BPBD) - Regional development planning agency (BAPPEDA) - Social affair agency (DINSOS) - Fire management agency (DAMKAR)	7
Sidoarjo	- Regional disaster management agency (BPBD) - Regional development planning agency (BAPPEDA) - Public works agency (PU) - Legal bureau - Financial and asset agency (DPKAD)	9
Sleman	- Regional disaster management agency (BPBD) - Financial and asset agency (DPKAD) - Social affair agency (DINSOS) - Fire management agency (DAMKAR) - Public works agency (PU)	11
TOTAL		**27**

Initially, we conducted desktop studies to understand the characteristics of threats and background of local disaster management organizations. Documents evaluated include two main kinds. The first type is official government documents that can be accessed by the public, such as disaster management plans, action plans, strategic plans, development plans, and technical plans prepared by the local government in collaboration with universities, etc. The second type is non-government documents, such as disaster profiles compiled by donor agencies, articles on institutional capacity, and discussion papers by non-governmental institutions on disaster management systems, etc. These documents are investigated under two critical contexts: relationships between variables that form capability and identify external factors that may influence capability. Next, we conducted a field survey in January 2018. We administered in-depth interviews and focus group discussions with local officials in the three municipalities. In this study, a total of 27 people became respondents, including nine people from Sidoarjo, seven people from Bogor, and 11 people from Sleman (see **Table 6.4**). The majority of respondents are local officials from BPBD, but there are also government officials from other agencies, such as the Regional Development Planning Agency (BAPPEDA), the Public Works Agency (PU), the Social Affairs Agency (DINSOS), etc. We also

noted that five respondents were chiefs of a local agency (KADIN) and others were officials structurally subordinate KADIN, such as the chief of division (KABAG) or chief of sub-division (KASI), as well as senior officers. The purpose of the interview is to understand perception and public opinion among a group of individuals that we assume to have a similar background (Li et al. 2017). Interviewees were asked the following questions: 1) How do capability factors such as institution, human resources, policy, and leadership influence each other in the disaster management system?; 2) Which capability factors have a strong influence ?; 3) What external factors affect capability?; and 4) How do these external factors affect capability?

6.4 Characteristics of respondents

To find out the characteristics of respondents, we use cluster analysis. Cluster analysis is a statistical analysis that aims to separate objects into several groups that have different properties between groups (Santos, Tavares, and Zêzere 2014). In this study, we assume that each municipality in a group is homogeneous or a variety of purposes in groups that are as small as possible.

Table 6.5 shows the results of cluster testing use k-means clusters to form three clusters with varying scores based on local government capability in managing disaster namely role, structure, early warning system, disaster plan, duty division, responsibility, task limitation, financial sources, allocation, communication, system information, logistics, assessment, decision making and local regulation. From the results of the cluster analysis, it can be seen that the municipality included in cluster one is 17 municipality, while in cluster two there are 67 municipalities and there are 22 municipalities in cluster three. The score indicates the dominant value of each cluster, the higher the score of a variable, the more dominant or reflects the characteristics of the cluster. By using the average value (z-score), it can be seen that Cluster 1 generally has a high variable capability; only the variable local regulation value is relatively low (-). Cluster 2 has all variables of capability that are below the average (-), we named this cluster with low capability. Next cluster 3 has a high capability value (+) except for variables related to the policy: disaster plan and assessment (-) as a cluster with medium capability.

Table 6. 5 Segmentation of the sample based on final cluster center value

Capability variable	Cluster		
	1 (n=17)	2 (n=67)	3 (n=22)
Role	.52535	-.27986	.44636
Structure	.96950	-.38094	.41098
Early warning system	.16124	-.38340	1.04303
Disaster plan	.88369	-.15307	-.21667
Duty division	.63069	-.28798	.38967
Responsibility	1.21138	-.47538	.51167
task limitation	1.08915	-.31896	.12976
Financial sources	.53434	-.15960	.07315
Allocation	.35901	-.48327	1.19436
Communication	1.19087	-.47587	.52902
System information	.52950	-.46869	1.01823
Logistic	.89372	-.42259	.59638
Assessment	.67919	-.15628	-.04890
Decision making	.35802	-.14186	.15537
Local regulation	-.07260	-.01996	.11688

Table 6. 6 Characteristics of the sample

Variable	Cluster 1 High capability		Cluster 2 Low capability		Cluster 3 Medium capability		Total	
	N	%	N	%	N	%	N	%
Population								
Metropolitan (> 1 Million)	8	**47.1%**	17	25.4%	5	22.7%	30	28.3%
Big urban (500,000 - 1M)	2	11.8%	16	23.9%	3	13.6%	21	19.8%
Medium urban (100,000 - 500,000)	7	41.2%	31	**46.3%**	11	**50.0%**	49	46.2%
Small urban (20,000 - 100,000)	0	0.0%	3	4.5%	3	13.6%	6	5.7%
Number of disasters (events in last ten years)								
0-20	2	11.8%	24	**35.8%**	9	**40.9%**	35	**33.0%**
20-50	2	11.8%	20	29.9%	5	22.7%	27	25.5%
50-100	7	**41.2%**	12	17.9%	4	18.2%	23	21.7%
>100	6	35.3%	11	16.4%	4	18.2%	21	19.8%
Own Source Revenue (% of the total budget)								
0-5	5	29.4%	22	32.8%	10	**45.5%**	37	34.9%
5-10	7	**41.2%**	26	**38.8%**	6	27.3%	39	**36.8%**
10-20	3	17.6%	16	23.9%	5	22.7%	24	22.6%
>20	2	11.8%	3	4.5%	1	4.5%	6	5.7%
Expenditure for personnel (% of the total budget)								
10-30	0	0.0%	3	4.5%	1	4.5%	4	3.8%
30-50	2	11.8%	10	14.9%	6	27.3%	18	17.0%
50-70	13	**76.5%**	45	**67.2%**	12	**54.5%**	70	66.0%
>70	2	11.8%	9	13.4%	3	13.6%	14	13.2%

Table 6.6 presents the characteristics of the cluster regarding population, number of disasters, and economic condition. Based on the number of population, it is known that cluster 1 (high capability) is dominated by the municipality with metropolitan type (47.1%) and medium urban (41.2%). Whereas cluster number 2 (low capability) is dominated by municipalities with urban medium type (46.3%). Cluster number 3 is also dominated by municipalities with the kind of medium urban (50%). Then based on the _number of disaster' events, We divided into four categories. It is known that cluster 1 is dominated by the municipality with the _number of disaster' occurring between 50-100 events in the last ten years. Whereas cluster 2 and cluster 3 are dominated by the municipality with the _number of disaster' from 0 - 20 events. Finally, based on general economic conditions namely the percentage of own revenue and percentage of expenditure of personnel, it is known that the characteristics of the three clusters have almost the same economic conditions. The majority of the municipality in clusters 1 and 2 have own percentage revenue in the range of 5-10% of total revenue. While cluster 3 is at the level of 0-5%. This condition shows that the majority of municipalities are still dependent on funds transfers from the central government. Then for the variable percentage of expenditure of personnel, the three clusters were in the range of 50-70% of total spending.
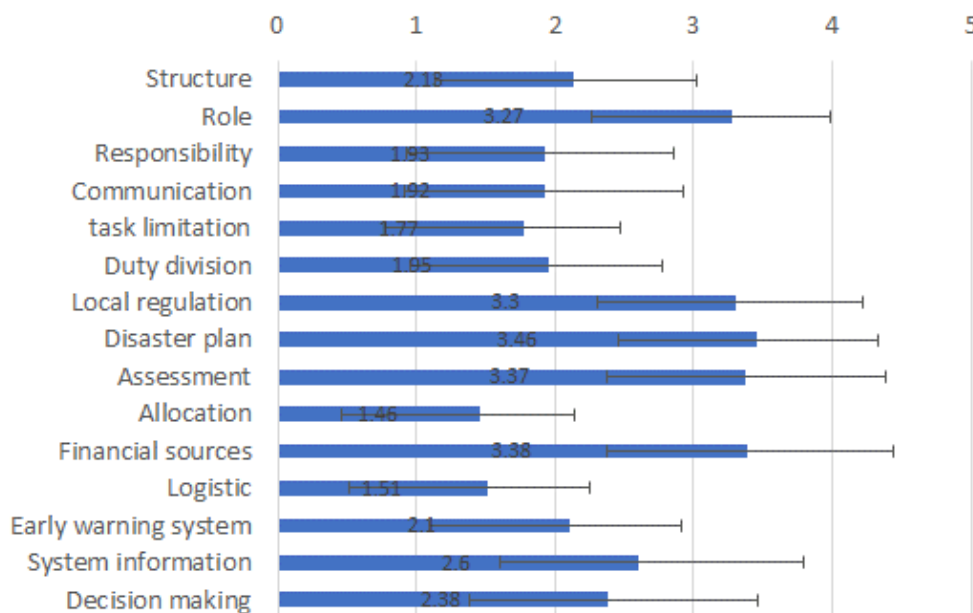
Figure 6. 3 Mean and SD of capability variables

Figure 6.3 shows the mean and standard deviation (SD) of the capability indicator of respondents. ‚Role,‛ ‚financial sources,‛ ‚local regulation,‛ ‚disaster plan,‛ and ‚assessment‛ have higher scores. After decentralization, the enactment of DML gave local government great ‚role‛ in coordinating disaster management systems in pre-disaster, emergency, and post-disaster. One of the main reason is the continuous supervision and assistance from the national level make the majority of local governments have the good ability to play their ‚role‛ in managing disasters (Djalante, Thomalla, Sabaruddin, et al. 2012). Also, DML also provides opportunities for local governments to increase budget allocation in disaster management from various ‚financial sources‛ (BNPB 2013). Apart from the local budget, DML also offers opportunities for the municipality to receive transfer funds from central government, and grants from donor agencies, private sectors, and communities (BNPB 2010c). The other essential variables in the analysis are ‚local regulation‛ for disaster management. As explained in several studies and national reports, ‚local regulation‛ has a necessary role as a foundation for local disaster management (Carter 1991) (Messages 2014).

Based on data from BNPB, most municipalities have built ‚local regulations‛ based on DML. Only a small number of municipalities have not compiled due to financial problems (BNPB 2010c). To establish an effective disaster management system, the municipality must develop a ‚disaster plan‛ that includes local hazard, vulnerability, and capacity. BNPB declares that almost 60% of municipalities in Indonesia have developed disaster plans in the period 2011 to 2017 (BNPB 2010c) (Bappenas 2014). The ‚disaster plan‛ has a vital role to be able to integrate disaster issues into regional development plans (RPJMD). ‚Assessment‛ is also a variable of capability that is important as a tool for reviewing and assessing the performance of disaster management policies within a specified period (Syiko, Rachmawati, and Rachmansyah 2014). It also functions as a mechanism to adjust existing systems to accommodate the actual conditions of vulnerability and hazards (Pollard et al. 2002).

On the other hand, ‚allocation,‛ ‚logistics‛ and ‚task limitation‛ have the lowest score. Some studies reveal that the availability of a sufficient budget ‚allocation‛ for disaster management is a common problem for most municipalities in Indonesia (Herry Darwanto 2012) (BNPB 2009). Although DML has opened up opportunities, regulatory issue and the incompetence to optimize existing resources have made funding allocations relatively stagnant and declined (Djalante, Thomalla, Sinapoy, et al. 2012). ‚Logistics‛ distribution was also highlighted by several reports due to infrastructure constraints and lack of stock in the prevention and preparedness phase (BNPB 2010b).

Besides, most local governments do not have ‗task limitation' as the scope of duties among their agency in managing the disaster. This issue makes overlapping tasks and roles between local agencies in carrying out duties to accomplish the activities in before and after the disaster (BNPB 2011).

Figure 6.3 shows that the value of ‗Allocation,' ‗task limitation' and ‗role' has the lowest standard deviation. This value shows in 106 municipalities as a sample of this study are relatively have the same characteristics in the variable 'allocation,' 'task limitation' and 'role.' From some reports, it can be seen that 'task limitation' and 'role' are given variables of regulation derived by DML (Bappenas 2014). This is the main reason most municipalities have the same way of adopting it. Some of the studies also found that limited allocation of disaster funding is also a common problem in most municipalities in Indonesia (Djalante, Thomalla, Sabaruddin, et al. 2012) (BNPB 2009). On the other hand, ‗assessment,' ‗system information' and ‗decision making' has the highest standard deviation. 'Assessment', 'system information' and 'decision making' are indicators that have varied diversity in the 106 municipalities as the sample of this study. Some studies recognized that this is influenced by the original characteristics of the development of a local disaster management system. Several reports and studies explain that the features of natural hazards, vulnerabilities and capacities of local government are some of the factors that influence this variable (Guna et al. 2013) (Nasional and Bencana 2008a) (Djalante, Thomalla, Sabaruddin, et al. 2012).

6.5 Radar diagram trends of capability

To determine the capability pattern from the questionnaire data, we use radar diagrams. Radar diagram uses the average value of each variable capability from total 106 samples. First, we measure the total capability value of all variables without considering the type of city from the study location. Next, we will consider the type of city to divide the sample, so that it can determine the pattern and character of the capability of each type of city. In this study, radar diagrams do not replace data charts and tables that can produce a description. However, radar diagrams only serve as a visual tool that is useful for providing information about a phenomenon. Information in radar diagrams can be further analyzed to produce an average score for each different type of city.
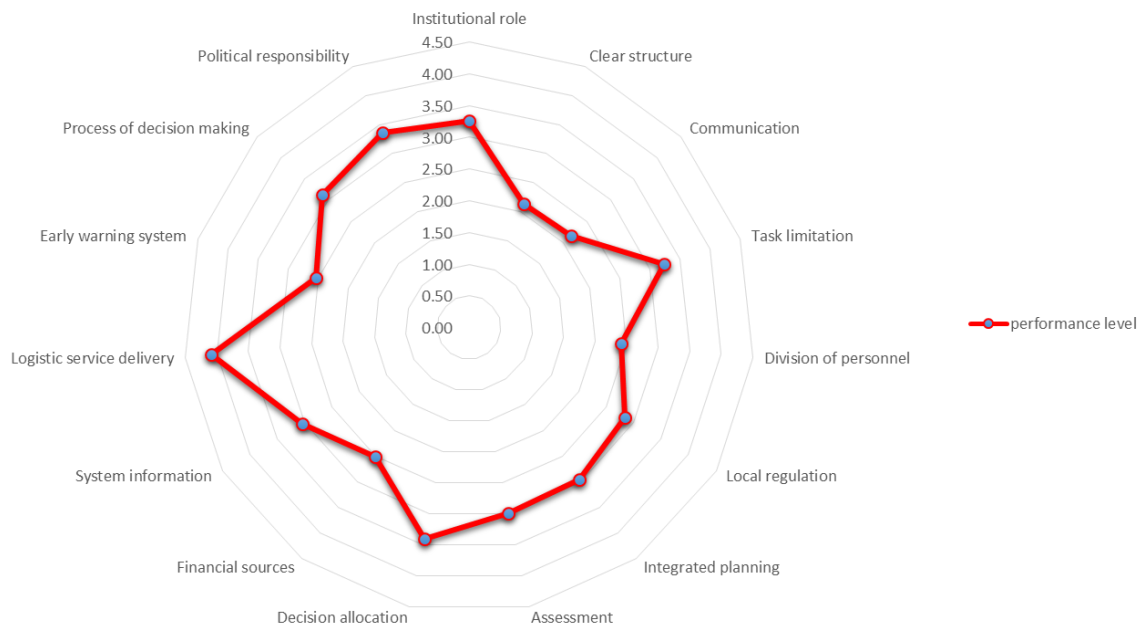
Figure 6. 4 Local government pattern of capability

Figure 6.4 shows the pattern of capability obtained from the results of the questionnaire. This pattern indicates that of all study locations there are three dominant variable capabilities, namely decision allocation, logistic service delivery, and political responsibility. When considering the context of the disaster stage, this indicates that the orientation of disaster management is in the sample location, the majority are still oriented to emergencies. The main reason is that these three variable capabilities are very dominant to support the implementation of local government in disaster emergency response.

Then to find out the level of performance, we used the method from Panya et al. (2017). In this study, the author analyzes local government performance in Thailand using a simple statistical method (calculating the percentage and mean values). The author also tried to adopt this study because it has similarities in using the five Likert scale to obtain the data. In this study, we divide the performance level of local government capability into five levels: lowest (average score 1.00-1.80); low (1.81-2.60); moderate (2.61-3.40); high (3.41-4.20); and highest (4.21-5.00) (Panya et al. 2017).

Table 6. 7 Performance level of capability

No	Variable	greatly reliable (5)	Somewhat reliable (4)	Neither reliable or not reliable (3)	Somewhat not reliable (2)	Not reliable at all (1)	n = 106 mean	Performance level
1	**Institutional**							
	Institutional role	2.83%	33.96%	50.94%	11.32%	0.94%	3.26	moderate
	Clear structure	2.83%	3.77%	18.87%	52.83%	21.70%	2.13	low
	Communication	2.83%	5.66%	18.87%	50.00%	22.64%	2.16	low
2	**Human resources**							
	Task limitation	14.15%	10.38%	61.32%	13.21%	0.94%	3.24	moderate
	Division of personnel	14.15%	6.60%	16.98%	31.13%	31.13%	2.42	low
3	**Policy and planning**							
	Local regulation	10.38%	12.26%	43.40%	18.87%	15.09%	2.84	moderate
	Integrated planning	13.21%	15.09%	38.68%	20.75%	12.26%	2.96	moderate
	Assessment	10.38%	25.47%	27.36%	26.42%	10.38%	2.99	moderate
4	**Financial**							
	Decision allocation	23.58%	13.21%	46.23%	14.15%	2.83%	3.41	high
	Financial sources	10.38%	13.21%	14.15%	42.45%	19.81%	2.52	low
5	**Technical**							
	System information	5.66%	22.64%	45.28%	22.64%	3.77%	3.04	moderate
	Logistic service delivery	42.45%	28.30%	26.42%	1.89%	0.94%	4.09	high
	Early warning system	6.60%	11.32%	25.47%	42.45%	14.15%	2.54	low
6	**Leadership**							
	Process of decision making	17.92%	16.04%	34.91%	22.64%	8.49%	3.12	moderate
	Political responsibility	19.81%	22.64%	33.02%	22.64%	1.89%	3.36	high
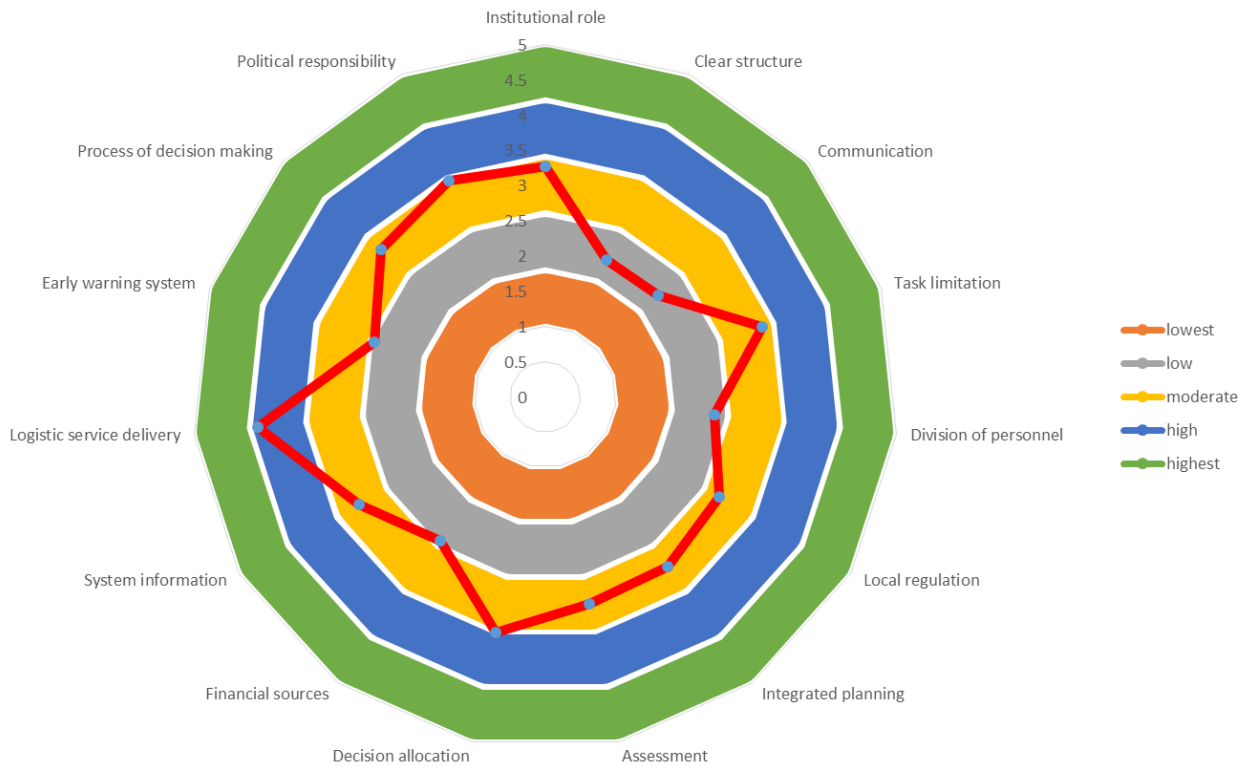
Figure 6. 5 Local capability level of performance

Based on **Table 6.7** and **Figure 6.5** is known among the 15 variables of capability only three variables that have a high level of performance; namely: decision allocation, logistic service delivery, and political responsibility. The majority of the variable of capability has moderate performance, namely: Institutional roles, task limitation, local regulation, integrated planning, assessment, information systems, and decision making. Meanwhile, five variables are categorized as low performance, namely clear structure, communication, the division of personnel, financial sources, and early warning system.
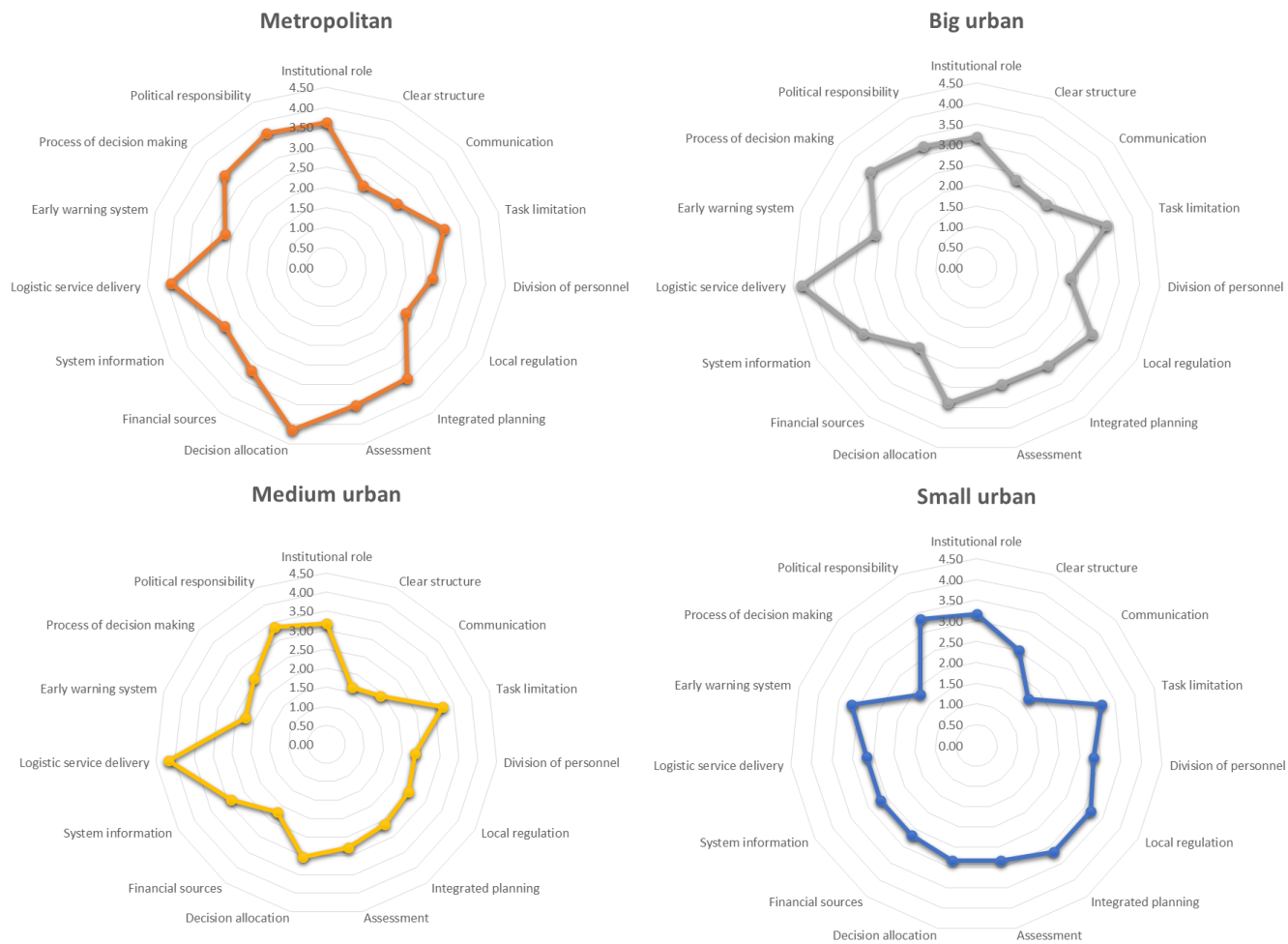
Figure 6. 6 Radar plots of performance for the four type of the city

Figure 6.6 shows that in the metropolitan city, six variables of capability categorized with high-performance level, namely: institution role, planning, decision allocation, logistics, decision making, and political responsibility. And seven variables classify as moderate level and two variable as low-level performance. In the big urban area, one variable of capability organized with highest, namely logistic. And two variables classify with high-level performance: decision allocation and decision making, eight variables as moderate, and four variables with low-performance level. **Figure 6.5** also reveals in medium urban there is only one variable categorized

as high-performance level: logistic; six variables as moderate level, six variables even with low performance, and one variable classify with lowest performance level, namely structure. In small urban, there is no variable categorized with the high level of performance; 12 variables with moderate performance, two variables as low performance and one variable classify as lowest performance: communication.

6.6 Measurement model assessment

Table 6. 8 Structure matrix of the conceptual model on local capability in managing disaster

Variable	Component			
	1	2	3	4
System information	.791			
Allocation	.699			
Early warning system	.693			
Role	.621			
Logistic	.603			
Financial sources		.769		
Assessment		.630		
Local regulation		.607		
Disaster plan		.545		
Responsibility			-.758	
Decision making			-.672	
Communication	.		-.600	
Duty division				-.698
task limitation				-.613
Structure				-.585

Before developing a model using SEM, we conducted a factor analysis. The main purpose of this analysis is to explain the relationship pattern between many variables in the form of latent variables. The first step is exploratory factor analysis (EFA). EFA is used to reduce a large number of original variables and grouping into some new factors or latent variable (Tatsuki 2008). Based on the matrix structure, we formulated 15 variables from the questionnaire. Those 15 variables are information

system, budget allocation, early warning system, role, logistics, financial sources, assessment, local regulation, disaster plan, responsibility, decision making, communication, duty division, task limitation, and structure. The final results of the EFA is a structure matrix shown in **Table 6.8**.

At first, we conducted a factor analysis. The primary purpose of this analysis is to explain the relationship pattern between many variables in the form of latent variables. We input 15 capability variables in Table 2 into the factor analysis. The final results of the factor analysis is a structure matrix shown in Table 4. Based on the sample measurements showed the KMO value was 0.818 which showed significant results. We can name the first latent variable as "performance," the second latent variable as "governance," the third latent variable as "authority," and the fourth latent variable as "bureaucracy." (See **Table 6.9**)

Table 6. 9 List of latent variables

No	Latent variable	Item description
1	Delivery	System information Budget allocation Early warning system Role Logistic
2	Planning	Financial sources Assessment Local regulation Disaster plan
3	Institution	Responsibility Decision making Communication
4	Organization	Duty division Task limitation Structure

Next, we conducted a Confirmatory Factor Analysis (CFA) to confirm the measurement model identified in the explanatory factor analysis fit the data well (Tatsuki 2008). CFA statically removed insignificant variables: allocation, assessment, decision making, and task limitation. The final CFA model consists of 11 observed variables onto four latent variables (see **Figure 6.7**). Some values in the measurement of the model are used as a measure to assess the goodness of fit model. However, by consensus, there are no specific criteria for values that can determine the index.
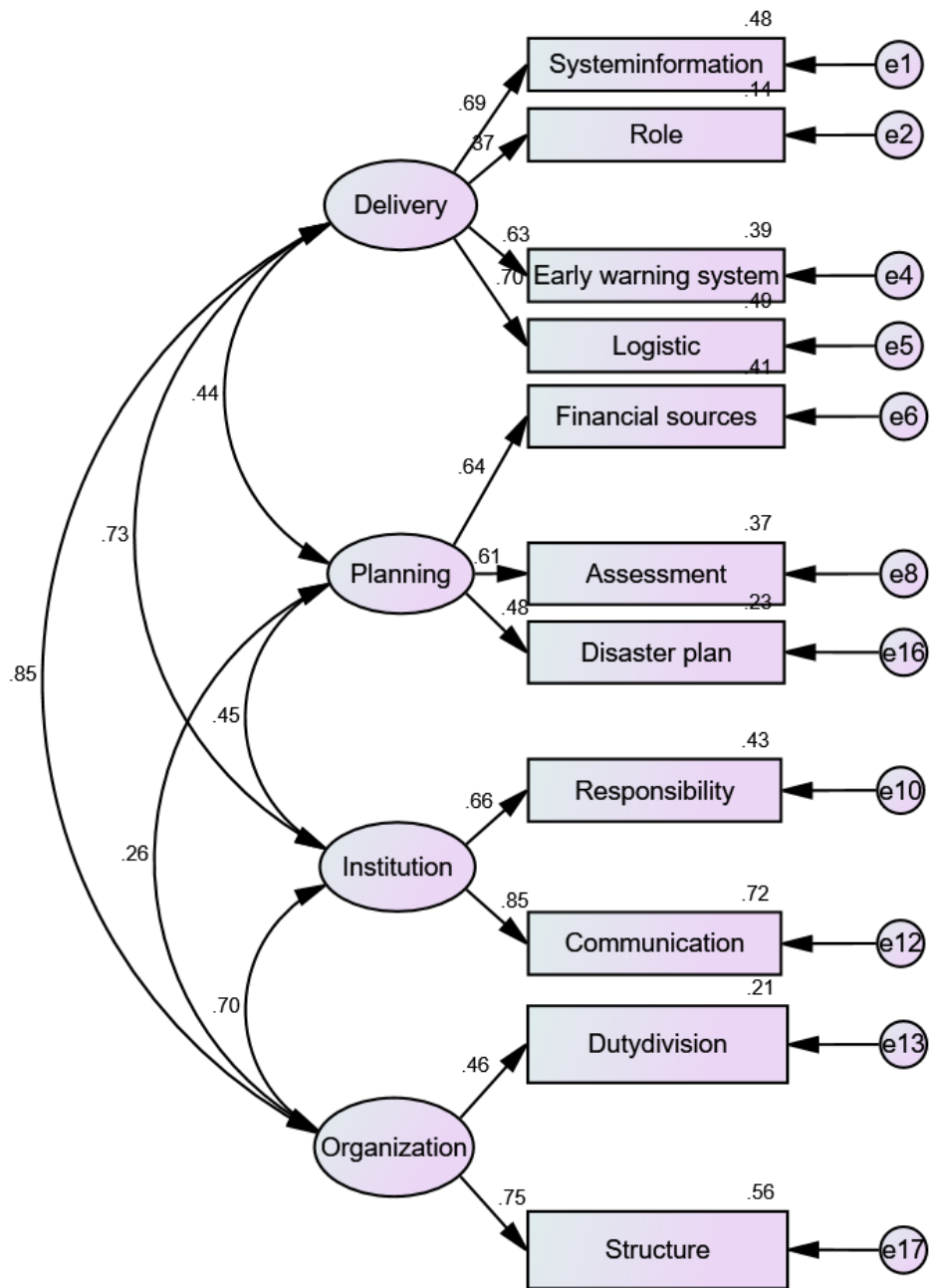
Figure 6. 7 Confirmatory factor model

Some of the literature explains that the chi-square value, goodness of fit index (GFI), comparative fit index (CFI), and the root mean square error of approximation (RMSEA) are the values used as a model for the goodness of fit model (Adedeji et al. 2016) (Maryono et al. 2016). We applied the values above in the measurement model in this study (see **Table 6.9**). The chi-square value is 35.179 and probability level is 0.601. However, the goodness of fit indicator shows that CFI values equal to 1.000 which greater than 0.900 shows the model has a good fitting model. The GFI value is 0.954, and RMSEA value is 0.000.

Table 6.9 Measurement model fit index

Goodness fit measure	Index	Cut-off criteria
R^2/df	0.601	≤ 2
GFI	0.954	≥ 0.95
CFI	1.000	≥ 0.95
RMSEA	0.000	< 0.06

6.7 Structural model assessment

Following factor analysis to measure the validity and reliability of latent variables, we input the 15 capability variables the five external variables and conduct SEM to develop a model to explain causal relationships between variables. We named the four latent variables, ‗delivery, ‗planning, ‗institution,' and ‗organization' respectively (see **Figure 6.8**). ‗Delivery' is composed of two observed variables, ‗logistic' and ‗system information' and it means the capability to deliver required resources and information to the community in case of emergency. Next ‗planning' is composed of ‗disaster plan,' ‗assessment' and ‗financial sources' and it expresses the capability to develop and implement and revise a disaster plan. Then, ‗institution' is composed of two observed variables, ‗responsibility' and ‗communication' and it is local authorities' capability to respond quickly and communicate within the communities smoothly. The last latent variable, ‗organization' is composed with ‗structure' and ‗duty division' and it is the capability to have a good organizational structure in a local authority and good inter-relationship with other agencies for disaster management.
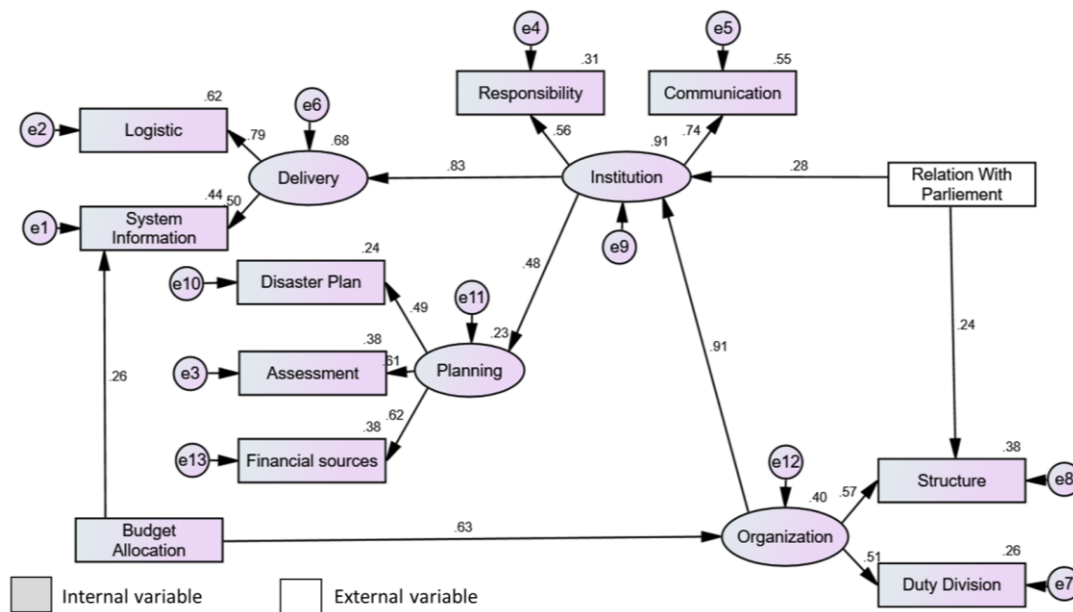
Figure 6. 8 An estimated model of local capability in managing disaster

The established path analysis model is shown in **Figure 6.8**. Latent variables are drawn as circles. Observed variables are shown as squares. All of the standardized coefficients are significant at 1% level. GFI (goodness of fit index in which higher than 0.90 indicates a perfect fit) is 0.931, and AGFI (goodness of fit index in which higher than 0.90 indicates a perfect fit) is 0.889. RMSEA (root mean square error of approximation in which value less than 0.1 indicates the good fit model) is 0.047. Consequently, the model is proved to be a good integral fit model.

In the established model, we find that the four latent variables are interrelated positively. The latent variable 'organization' effects on the latent variable 'institution' strongly (standardized coefficients=0.91). The latent variable 'institution' is also affected by observed variable 'relationship with parliament' (standardized coefficients=0.28). This observed variable 'relationship with parliament' affects an observed variable 'structure,' which is one of the components of the latent variable 'organization.' The latent variable 'institution' affects two other latent variables 'delivery' (standardized coefficients=0.83) and 'planning' (standardized coefficients=0.48)

respectively. The latent variable 'organization' and an observed variable 'system information,' which is one of the components of the latent variable 'delivery' are affected by an observed variable 'budget allocation' respectively (standardized coefficients=0.63, 0.26).

From the above model, we can understand that the local capability of disaster management is developed step by step. The first step is 'budget allocation.' When the number of budget increases, municipalities can improve the particular 'organization' system on disaster. When 'organization' is developed, then municipalities can develop the 'institution' on disaster management system. In this cycle, two variable plays an important role. The first one 'budget allocation' and it is the first step to improve capability. The second is 'relation with parliament,' as an external variable, which affects 'institution' and 'structure,' one component of 'organization.' If a local authority is connected with a local parliament closely, it can improve its 'organization' and 'institution.' We pointed out the 'budget allocation' has the lowest score, that means it prevents local authorities to improve other capabilities. Also, 'responsibility' and 'communication,' which are components of latent variable 'institution' also have a low score, 1.92 and 1.93 respectively. This 'institution' is another bottleneck in the development of capabilities.

In the established model, some capability variables are not employed, such as 'early warning system,' 'role,' 'local regulation,' 'decision making' and 'task delegation.' The reasons for unemployment are expected that they are not related to other variables or multicollinearity. 'Local regulation' has a positive correlative relation with 'disaster plan' (correlation coefficient=0.420**) and 'budget allocation'(correlation coefficient=0.472**). As 'budget allocation' and 'disaster plan' are in the developed path model when municipalities improve those capabilities, 'local regulation' are expected to improve as well. Other non-employed capability factors, 'early warning system,' 'role,' 'decision making' and 'task delegation' do not have a correlative relationship with other capability variables (correlation coefficient is less than 0.4), so in this analysis how to improve those factors is still unclear.

6.8 Qualitative Result from the Case Study

Next, we try to verify the model built through SEM. The results of the case study found that besides influencing each other, local capability in managing disaster has complex interactions with several external factors. Based on the interview with some experts in the case study area, we found that the

relationship between capability variables and external variables is a more complicated relationship than we expected.

Our SEM model found that the 'budget allocation' has a significant impact on ‗organization' (standardized coefficients = 0.63). This finding is supported by the results of our interviews with several experts. The Chief of BAPPEDA Sleman explained that improving ‗organization' at the local level in disaster management requires a substantial 'budget allocation' (Sleman, January 16, 2018). One main reason why ‗organization' at the local level is still lacking is that before decentralization of disaster management, all resources, including human capital, were managed and controlled by the central government. ‗Organization' development has a strategic role in improving the quality of local government (Shakerian, Dehnavi, and Ghanad 2016). The availability of sufficient funds for disaster management performs the local government has more option to build great ‗organization' at each stage of the disaster. Our case study discovered that the concept of budget allocation is not only about the percentage of disaster management funds that allocated at the local budget, but also how is the ability of the local government to obtain funding sources other than the local budget and manage it well (interview with Head of subdivision BAPPEDA Sleman, January 16, 2018). Funding sources from the central government, donor agencies, and private sectors have financial potential to be able to support sufficient disaster management funds.

Another significant relationship that we found in our SEM model is the relationship between ‗organization' and ‗institution' (standardized coefficients = 0.91). Our interviews also confirm our findings from SEM models on the importance of ‗organization' to build adequate ‗institution' on disaster management system. In a disaster management system, ‗organization' perform as drivers or managers of other resources in pre-disaster and post-disaster activities, including strengthening authority within the internal government as well as with non-government actors. Secretary of BPBD Bogor stated that active bureaucracy would make the local government able to manage the natural hazard (Bogor, January 15, 2018). Although natural disasters are generally unpredictable, a reliable bureaucratic capacity can reduce the impact of risks that might be formed. With a proper understanding of the characteristics of hazards and vulnerabilities determines that the local government knows their roles and responsibilities associated with disasters. Additionally, the Head of the BPBD Division of Sleman revealed that the authority in disaster management was also shown by how the local government built good communication with actors from the government and non-

government sectors (Sleman, January 16, 2018). Making a good disaster management network is one effective way of distributing roles in disaster management.

Our SEM model also found a significant relationship between ‗institution' with ‗delivery' (standardized coefficients = 0.83) and ‗institution' with ‗planning' (standardized coefficients = 0.48). This finding supported by our case study that discovered that effective ‗institution' will affect the performance of local government to deliver public service to the community in the context of disaster management. The adequate ‗institution' on disaster management will understand the hazards and vulnerabilities, and provide the public services to improve community resilience. In line with this statement, the Chief of BPBD Bogor explains that the role of local government is as a joint to absorb community inspiration following the threat of disaster (Bogor, January 15, 2018). After that, local government needs to formulating activities to reduce the impact of risk caused by the threat. Furthermore, the good 'institution ' will also influence the planning of disaster management. Head of sub-division of BAPPEDA Sleman stated that the preparation of proper local disaster plan is not simple and must progress through several stages involving government and non-government actors (Sleman, January 16, 2018). This finding illustrates that 'institution' is significant in this regard. Inadequate ‗institution' in disaster management will not be able to deliver public service and plans good policy to reduce the disaster risks.

From the SEM model, we also found a link between the 'relationship with parliament' (standardized coefficients = 0.28) and ‗institution' and observed variable 'structure' (standardized coefficients = 0.24) as components of variable ‗organization.' Based on the interviews, we know that the role of local parliament is vital as a partner of local government in formulating local policies, among others: local development priorities, the composition of local budgets, and local organizational ‗structures' (interview with Head of subdivision BAPPEDA Sidoarjo, January 17, 2018). Political decentralization in Indonesia creates a system of checks and balances in carrying out local governance by giving authority to local parliaments. A good relationship between the local government and the local parliament will create good feedback in building a contributory bureaucratic system particularly in disaster management (interview with Chief of BPBD Sleman, January 16, 2018).

Based on the case study, we also identified some external indicators that affect local government capability but not employed in the statistical analysis. The first indicator is 'disaster scale magnitude.' According to some local officials, the major disaster directly develops local

‗bureaucracy' to be more aware of disaster management issues at the local level. Chief of BPBD Sidoarjo states that in the beginning period of decentralization of disaster management, the municipalities that first formed a particular ‗bureaucracy' to manages disasters were municipalities affected by large-scale disasters, such as earthquakes or volcanic eruptions (Sidoarjo, January 17, 2018). In line with this statement, the Chief of BPBD Sleman also affirmed that the `bureaucracy` shift on disaster management of Sleman municipality in 2011 was triggered by experience from the great eruption of Mount Merapi in 2010 (Sleman, January 16, 2018). This eruption was affected Sleman and some areas in Central Java and Special Region of Yogyakarta Province. The absent of `bureaucracy` of disaster management has made the local government overwhelmed to manage the impact of the large scale of disasters. This finding is one of the evidence that 'disaster scale magnitude' is an external indicator that provokes the ‗bureaucracy' reform of disaster management at the local level.

The second affecting factor is ‗local wisdom.' 'Local wisdom' is known as principles and ways that are embraced, understood, and applied by local people in interacting with their local environment (Satria and Matsuda 2004). In the context of disaster management in Indonesia, local wisdom is the knowledge that is practiced from generation to generation and assists to understand natural phenomena and reduce the impact caused by natural disasters (Teguh 2011) (BNPB 2011). Our study found that the local government adopted this local wisdom approach for the implementation of disaster management. The Chief of BPBD Bogor considers that this 'local wisdom' approach is essential because these beliefs are locally oriented, wise, and followed by members of the community (Bogor, January 15, 2018). In line with that statement, we can conclude that besides being influenced by local culture, in the disaster management context, 'local wisdom' varies between regions depending on the natural hazards.

6.9 Summary

This research attempts to score local capabilities in disaster management and identify the mechanism of interrelationship with the capabilities and relationship with external factors. Descriptive statistics revealing that are indicator roles, financial sources, ‗role,' ‗local regulations,' 'disaster plan,' ‗financial plan' and ‗assessment' have high means values because the improvement

of most of these indicators is regulated by DML. Our analysis also identified ‗budget allocation" and logistics' have the lowest means value.

The SEM model confirms that local capability in disaster management is a continuous process. 'Budget allocation‗ has a fundamental role in the sequence of capability in managing the disaster. With the correlation with ‗organization,‗ it can assume that the increase in the ‗budget allocation‗ for disaster management will enhance the local ‗organization‗ in managing disasters. We found that ‗organization‗ will affect the local ‗institution‗ in managing the disaster. Next, the enhancement local ‗institution‗ will influence the preparation of ‗planning‗ activities of disaster management and the ‗delivery‗ of public services to the society. This statement is in line with the opinion of several experts who explain that structured disaster management arrangements at the local level will significantly affect overall disaster management performance (CFE-DMHA 2015) (Hagelsteen and Burke 2016). Through SEM models, we also found that the only external variable 'relationship with parliament' influences the local capability, especially through the variable ‗institution‗ and ‗organization.‗ In the context of disaster management, this can mean that good cooperation and relations between local authority and the local politician has a positive influence on improving capability through ‗institution‗ and ‗organization.‗

Next, as our third objective, we will formulate recommendations to improve local capability. First, our study found that the increase in the 'budget allocation' is the primary point for strengthening local capability in managing the disaster. As the score of ‗budget allocation‗ is the lowest, this is the bottleneck of the improvement of local capability in Indonesia obviously, and increasing budget allocation for disaster management at the local level is the first and essential step to improve the local capability.

With limited funds from the government budget (central and local), the involvement of non-government actors - donor agencies, international and national NGOs, and the private sector - is a solution to fill the financial gap in disaster management at the local level. In the context of the local budget, the improvement of good ‗relationship with the parliament‗ is also crucial. After decentralization, the local authority must get approval from the parliament to determine the local budget. This condition reveals that understanding about disaster issues aimed at not only the government side but also the parliament side as part of local budget policymakers. And this parliament‗s good understanding of disaster management will improve other capabilities such as ‗structure‗ and ‗institution.‗

Second, strengthening the local ‗organization' in managing disasters. Based on the analysis, it is noticed that ‗organization' is the essential capability-forming variable and represents as one of the bottlenecks in the SEM model. Enhancement of ‗organization' will have a domino effect on strengthening other capability variables (‗institution,' ‗planning,' and ‗delivery'). Strengthening the organizational structure of disaster management by involving non-government actors is one of the recommendations based on our analysis. Also, a clear division of roles between actors is also needed to avoid overlapping functions between institutions that cause inefficiencies disaster management system at the local level.

In our SEM model, some capability variables are not employed, such as ‗early warning system,' ‗role,' ‗local regulation,' ‗decision making' and ‗task delegation,' and some of them do not have correlation relationship with other capabilities. We cannot reveal how to improve these capabilities, so further research is necessary to find a way to improve them.

Moreover, from our interview with local officials, we find some variables which may affect capabilities, are not employed as variables in our study. One of them is ‗magnitude of the disaster.' ‗Number of disasters' was input when we develop SEM model but ‗magnitude of the disaster' was not considered. However, according to some local officials, the major disaster directly encourage local ‗institution' to have more responsibility for disaster management issues. Chief of BPBD Sidoarjo states that in the beginning period of decentralization of disaster management, the municipalities that first formed a particular disaster ‗institution' were municipalities affected by large-scale disasters (Sidoarjo, January 17, 2018). In line with this statement, the Chief of BPBD Sleman also affirmed that the institutional shift on disaster management of Sleman municipality in 2011 was triggered by experience from the great eruption of Mount Merapi in 2010 (Sleman, January 16, 2018). The absent of special institution of disaster management has made the local authority overwhelmed to manage the impact of the large scale of disasters. This finding is one of the evidence that 'disaster scale magnitude' is an external indicator that provokes the ‗institution' reform of disaster management at the local level. In further research, the impact of ‗magnitude of the disaster' should be considered.

CHAPTER 7

CONCLUSION AND RECOMMENDATION

In this study, two main concepts that have just been introduced in this dissertation are explained. The first is disaster management under the decentralization system (**Chapter 4 and 5**) and the second is an assessment of local government capability in managing disasters (**Chapter 6**). The overall goal of this dissertation was to identify how the disaster management system has changed following the decentralization in Indonesia, and to determine the local capability in managing the disaster. Conclusion regarding the main findings of this study are summarized as follows:

7.1. Conclusion

7.1.1 Disaster management system following decentralization in Indonesia

The research objective of this chapter was to identify how disaster management systems have been developed and the opportunities and challenges arising following the decentralization system. In this study, disaster management was defined as ―dynamic process about the operation of management functions to prevent the community from disasters by reducing the possibility of the emergence of hazards and overcoming vulnerabilities." And we also defined decentralization as ―transfer of government authority by the central government to the local government, or commonly called delegation of authority". In this study, we have the assumption that the implementation of the decentralization system in Indonesia, which began with the "big bang of decentralization" at 1999, will have an impact on disaster governance. First, this study examines how disaster management systems have changed after decentralization in four aspects, namely regulation, institutions, planning, and budgeting. Next, we analyze opportunities and challenges arising in the implementation of decentralized disaster management. Furthermore, this study discusses how vertical and horizontal relations between the government actors at before and after decentralization of disaster management in Indonesia.

In our analysis of comparisons between disaster management systems before and after decentralization, we find that decentralization systems have a positive impact on disaster

management in Indonesia. From the regulatory aspect, decentralization of disaster management systems providing an excellent opportunity for local governments to develop local disaster management regulations following the characteristics of the region. From an institutional aspect, the establishment of permanent institutions at the central and local levels that specialize in disaster management provides a certainty that there is a government institution that manages explicitly disasters. Besides, the establishment of this permanent institution also offers an extension of the scope of disaster management to include not only emergency responses but also pre-disaster and post-disaster scenarios. From the aspect of planning, the development of disaster management plans at the central and regional levels is instrumental in facilitating the integration of disaster component considerations into development plans and spatial plans as inputs. In the aspect of budgeting, this system change provides an opportunity for the government to increase the disaster management budget in the government budget.

However, in this dissertation, we also identified several challenges in decentralized disaster management system in Indonesia, such as inconsistencies in regulations issued by various institutions at the central level which caused difficulties for local governments in building local institutions for disaster management. In addition, this study also revealed some limitations that are typical conditions in developing countries in managing disasters, such as lack of funds and human resources to establish local disaster management institutions (provincial/municipal BPBDs) and lack of participation of experts in the preparation of disaster management plans. Furthermore, in the context of funding, our study also found a high dependence on local governments on the financing from the central government. Also, the increased level of corruption in managing the disaster management budget at the local level is also an obstacle in providing adequate public services in the disaster management sector to the community.

The social network pattern shows that before decentralization, there were two institutions at the central level of the Ministry of Home Affairs (MOHA) and the Ministry of Finance (MOF) which played a dominant and significant role in disaster management system. Although in the structural organization, the status of the two institutions is not mainly responsible for disaster governance. Concerning linkages and relationships with other institutions, the two institutions have the most links compared to other institutions. After decentralization, in addition to MOHA and MOF, BNPB - as a permanent institution explicitly formed to deal with disasters, also played a significant role in the disaster management network. The paradigm shift of disaster management forced MOHA and

MOF to transfer some of the authority and functions to BNPB. Besides, some new roles and responsibilities are also held by BNPB as the consequence of the more extensive governance on disaster management system after decentralization. Unlike at the central level, permanent disaster management institutions at the local level, namely provincial and municipal BPBDs, based on the pattern of national social networks still play a role as supporting actors. But in the local context, they have played an essential role in coordinating the disaster network, although in our analysis we also found that BPBDs do not have many horizontal network relationships with other key actors at the same level.

7.2.1 The role of local actor in decentralized disaster management system

The research objective of this chapter was identify the roles of stakeholders and to evaluate the inter-organizational relationship representing different sector (government and non-government sectors) at the local level. In this study was defined stakeholder as ‒groups, or institutions that are likely to be affected by a program or policy activity, whether positive or negative that may have an impact on the outcome of the program/policy of disaster management." Disaster management in post-decentralization Indonesia creates opportunities for government and non-government actors to be involved in the decision-making process. Decentralized disaster management has an approach for all players to take on the role and benefits of the process. In this study, we adopted a model developed by Prell et al. (2009) which combines Stakeholder Analysis (SA) with Social Network Analysis (SNA) to honestly present who and how actors collaborate in disaster management systems at the local level.

This study shows that the allocation of actors in the disaster management system in Indonesia is reflected in fragmentation in each phase of the disaster. At each location, the case study has different coping patterns in the four stages of disaster management (prevention and mitigation, preparedness, emergency, and recovery). In this study we can divide disaster management patterns into three patterns: municipalities that focus on preparedness and response activities; the municipality focuses on response and recovery; and municipalities that focus on prevention and mitigation activities, preparedness and response. We find that differences in patterns of disaster management are influenced by policy priorities and characteristics of vulnerability and local capacity.

Our analysis revealed that the government sector still has strong strength and leadership at all stages of disaster management. However, despite not being significant, decentralization of disaster management has also increased the role of non-government actors at the local level. The part of the non-government sector is very important, especially in supporting emergency phase activities. The amount of resources needed to carry out activities during an emergency makes these activities unable to be carried out only by the government itself. Resource support from other actors makes the implementation of emergency response more effective and faster.

Our study revealed the complete result of SA and SNA in four study area, namely: Purworejo, Semarang, Banyumas, and Cilacap. We examined how the disaster management system has a different pattern, and identify the critical actor in each study area. In our analysis with SA, we found that the involvement of non-government actor only in the disaster response phase. There are two exceptions in this case: first, in Semarang municipality, in the preparedness phase; also one actor from the non-government sector has high power and high leadership. The name of this actor is Bintari, one of the local NGO that focuses on empowering the community, especially in disaster capacity. Second, in the case of Cilacap Municipality, in every phase of disaster (prevention and mitigation, preparedness, response, and recovery) all actor with high power and leadership are coming from the government sector. There is no actor from the non-government sector has high power and high leadership.

SA 2 showed that the government sector still has strong power and leadership in all stages of disaster management. The role of the non-government sector is also significant, especially in the response phase. The role of non-governmental actors in response phase's activities is crucial to fill the gaps left by the government, especially in the event of a major disaster. However, SA also demonstrated a significant impact in the role of non-government actors, especially from civil society and private sector, to take a strategic role in the system. This role is supported by the adequate resources of each actor so that with high power impact has an impact in the decision-making process.

From SNA, we found that BPBD, as a new institution formed as coordinator in disaster issue, already become the center actor in the disaster management network in four study area. Besides BPBD, there are some government actor also played a significant role. There are Public works agency, Satpol PP, Fire Management Agency (Purworejo), Bappeda and Fire management agency (Semarang), Public works agency and Satpol PP (Banyumas), and Bappeda and Desa (Cilacap). The

principal government actors in disaster management network that differ in each study area are an interesting finding in this study. Our hypothesis for this finding is because the role of each actor is related to their primary duty and function (TUPOKSI) of each institution that state in local regulation. Future research should examine more detailed this finding through literature review and interview with a local official.

The other finding from this analysis is about the role of Desa, as the lowest level of government in Indonesia. SNA revealed that the performance of Desa is essential in disaster management network in two study area, namely Banyumas (degree of centrality: 26 and betweenness of centrality: 26.702) and Cilacap (degree of centrality: 31 and betweenness of centrality: 60.669). From this finding, we can conclude two essential points: first, these two municipalities already distribute some of the disaster authority to the village to increase the effectiveness and efficiency of disaster governance. Second, with the well-established role of Desa, it will affect non-government actor to perform more in disaster management network, namely: KSB (Banyumas) and Seroja (Cilacap).

From the analysis, we can identify some non-government actor that plays a vital role in disaster management network. They are Tagana and Desa Siaga Bencana (Purworejo), Bintari and Karang Taruna (Semarang), Kampung Siaga Bencana and Pramuka (Banyumas), Seroja and BRI (Cilacap). The role of the non-government actor is four study area mostly as supporting actor of local government in the response phase of the disaster. Some of the actors also perform a role during prevention and mitigation, preparedness, and recovery although it is not a significant role. To improve the part of the non-government actor, the local government should open the opportunity of the involvement of non-government actor in disaster management through local regulation. With the formal and legal regulation, the non-government actor has a fundamental responsibility to involve disaster governance in every phase.

Through SNA analysis we found that all study areas have similar approaches that determine the characteristics of networks in disaster management systems. In the government sector, the similarity of characteristics can be seen from the similarity of the main actors as the center of the disaster management network in the pre-disaster and post-disaster phase. However, there are different approaches in the approach to providing an opportunity for actors from the non-government sector to play a larger role in the network. Based on our analysis, only one study area makes non-government actors a part of the central actor in the network.

This study allowed us to give a general description of disaster management system at local level. On the one hand, we find that the role of local government has increased and can act as coordinator for disaster management. We can see that the function of the community still cannot be fully accommodated in the system. The findings suggest that cooperation is required and continuous empowerment of actors who have strong power and high leadership to achieve common goals. Local governments also need to open more opportunities to non-governmental organizations to participate in any disaster management activities.

In our analysis concerning the disaster management network in four study area, we found that the dominant player in the network, especially from the government sector, are different from one study area to the others. Based on our interview and concerning official documents issued by local authorities, we found that this finding based on two main reasons. First, the primary player on each municipality related to the primary duty and function (TUPOKSI) of each local agency. This TUPOKSI state in the local regulation or other decree issued by a local leader. Based on this rule, each local agencies has their responsibilities and limitation to perform their activity on Government Issue, including disaster issue. The main reason for this strict rules is to avoid overlap function of each local agencies. Second, related to the role of BPBD in each municipality. If BPBD can well be performed, mainly described as a coordinator of disaster management, it will involve as many as an actor, both government and non-government in disaster management.

7.3.1 Local government capability in managing disaster

The research objective of this chapter was to examine local capability in managing disaster and identifying the factor that influenced them. This study is expected to provide empirical evidence about the relationship between variables that build local capacity in managing disasters in Indonesia. Based on some literature, we formulate variables that form capability in handling the disaster. In addition, we will also analyze any external factors that can influence the forming variables of the capability. We hypothesize that each variable capability has a relationship but also the link is affected by several external factors. We will examine how the relationship between variables in local capability in managing disasters with several external factors. Then we discuss to validate statistical models with qualitative research from case studies.

The SEM model confirms that local capability in disaster management is a continuous process. 'Budget allocation' has a fundamental role in the sequence of capability in managing the disaster. With the correlation with _organization,' it can assume that the increase in the _budget allocation' for disaster management will enhance the local _organization' in managing disasters. We found that _organization' will affect the local _institution' in managing the disaster. Next, the enhancement local _institution' will influence the preparation of _planning' activities of disaster management and the _delivery' of public services to the society. This statement is in line with the opinion of several experts who explain that structured disaster management arrangements at the local level will significantly affect overall disaster management performance (CFE-DMHA 2015) (Hagelsteen and Burke 2016). Through SEM models, we also found that the only external variable 'relationship with parliament' influences the local capability, especially through the variable _institution' and _organization.' In the context of disaster management, this can mean that good cooperation and relations between local authority and the local politician has a positive influence on improving capability through _institution' and _organization.'

Furthermore, through case studies in three municipalities (Sidoarjo, Bogor, and Sleman) we got evidence that reinforces our SEM model. First, the availability of sufficient 'budget allocation' is a crucial factor for building capability variables in managing disasters at the local level. Second, in our study, some experts confirm that the _organization' is the most fundamental variable on the capability of the disaster management system at the local level. _Organization' also functions as an administrator to manage other capability variables in building effective disaster management systems. Third, adequate _organization' will be able to develop a local _institution' in disaster management that is responsible for reducing the risk caused by disasters. Fourth, a reliable _institution' will influence the establishment of effective planning and good performance in delivery public services of to the community. Additionally, through a case study, we also found two hidden external variables that affect capability. First, 'disaster scale magnitude.' Our study affirmed that a major disaster would stimulate the local municipalities affected to carry out 'bureaucratic' reforms in disaster management. Second, 'local wisdom' is used by the local government in improving disaster management 'performance,' especially in delivering information about the disaster to the local people and improve their community resilience.

In summary, how should a disaster management system under the decentralization system in Indonesia be assessed? Chapter 4 and 5 in this dissertation have demonstrated that decentralization

system shaped disaster management system in Indonesia significantly, particularly in four pillars of disaster management based on DML: regulation, institution establishment, planning, and budgeting. This finding automatically answers our first objective about the outline of disaster management under the decentralization system in Indonesia and also identified the problem and advantage of paradigm change of disaster management system. The limitation of data becomes the challenges of this research. This research focused on qualitative data with in-depth interviews with government officials at the national and local level.

Next chapter demonstrates that the decentralization also significantly affected the implementation of disaster management at the local level. This research adopts the case study approach to show that decentralization of disaster management improved the number of actors in the disaster management in all phase of disaster (pre-disaster, emergency response, and post-disaster) activities. Besides, this research also revealed that the establishment of BPBDs is essential to coordinate the disaster management activities at the municipality level. In all study area, BPBDs becomes the critical actor, though, in our previous study also found that in regional or national level the role of BPBD still becomes a supporting actor. With the national actor yet becomes the key player in the system.

Chapter 6 demonstrates that each local governments' capabilities indicator has different characteristics. Based on descriptive statistics, some indicators have the highest score, and some of them got the lowest score. Our finding reveals that the DML influenced the establishment of each variable of local government capability significantly. Our SEM models also show the importance of budget allocation as the milestone of local government capability. The fair budget allocation, especially from the government budget, will improve the other local government capabilities.

Furthermore, in the concept of theory building, this dissertation has evidence that decentralization of disaster management brought some positive impact on the implementation of disaster management. Although we found some challenges and problem on the application, particularly at the local level, that finding must not reduce the role of local government as the primary actor on the implementation of disaster management in Indonesia. With the geographical characteristics of Indonesia, the decentralization of disaster management still becoming the best option for reducing the impact of natural disasters in the future.

Table 7. 1 Conclusion summary of the dissertation

Objectives	Conclusion
Objective 1	The study found some positive impact on decentralized disaster management: an increasing number of regulation, permanent establishment institution, development disaster management plan, and widening potential of budgetary.
	The study found some challenges: inconsistencies of the regulations, lack of funding and institutional capacity, and increasing of corruption rate.
	A network for a decentralized disaster management system has been established with the central government institutions continuing to play a leading role.
Objective 2	SA found that the actors from the government sector are the leading player in the disaster management system and most of the non-government sector play their essential role only during the emergency response phase.
	From SNA, we found that BPBD (Regional Dissenter Management Agency) performs as a central actor in the network of disaster management in the four study area. But there are variations of another major player from the government sector.
	Through SNA, we can identify eight actors have the highest value of centrality in disaster management network in four study area □ five NGOs, two community organizations, and one private sector; but the role of academia and donor agency remains underdeveloped.
Objective 3	Our study confirmed that local governments' capability in disaster management is a continuous process and develop step by step.
	Our study found that 'budget allocation' has a fundamental role in the sequence of capability in managing the disaster. Besides, the external variable _relationship with parliament' is essential to influence the local capability in managing the disaster.

7.2 Recommendation
7.2.1 Recommendation for Indonesian institutions

Based on the conclusion of the study above, we can formulate recommendations as follows:

First, in the context of decentralized disaster management, the capacity of regional institutions (BPBD) is the key to effective implementation. Strong and capable institutions at the central level will not be useful if BPBD at the local level still does not have sufficient capability in managing disasters. This study found that strengthening BPBD both institutionally and personally as well as key in implementing decentralized disaster management effectively. Socialization, capacity building, and integration between regulations is one effective method for the central government to be able to push the BPBD level to an ideal position in disaster management. Although BNPB, MOHA, and the Ministry of Finance continued to play an essential role in the disaster management system, the requirement for a straight bureaucratic line connecting BNPB and BPBDs was one of the critical points in this study (see **Figure 7.1**). In the context of decentralized disaster management, BNPB can be expected to be involved more intensely in the disaster management system at the local level because, from the SNA, it is clear that BNPB is directly connected with provincial and city BPBDs.
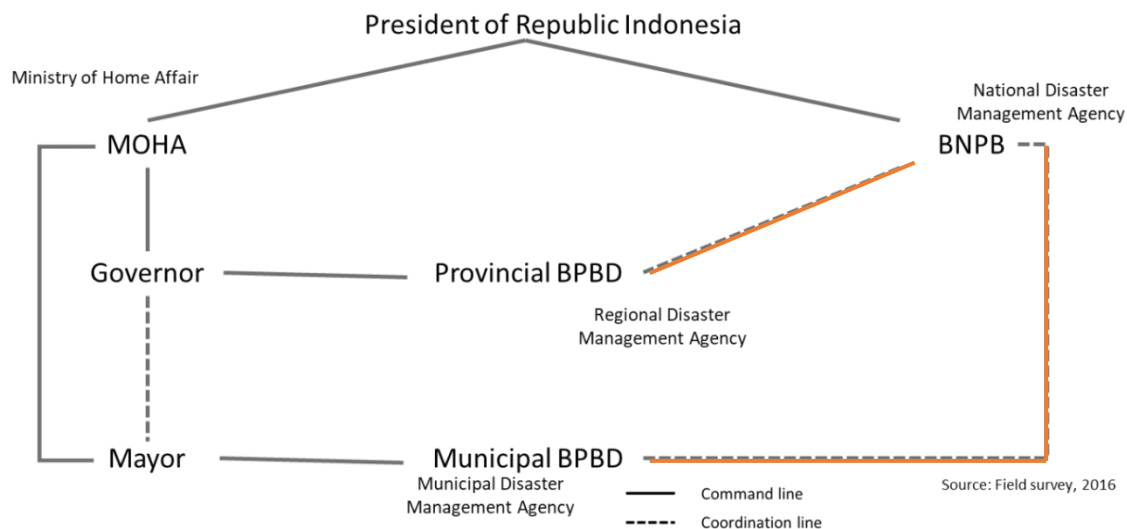
Figure 7. 1 Straight line that connected BNPB and BPBDs

Second, at the local level, to increase horizontal networks concerning BPBD with other institutions at the same level is also needed. In the regulation, it is explained about the role of "coordinator"

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given to BPBD in disaster management at the local level. But the implementation of coordination with other local agencies is very complicated if there is no clear bureaucratic line. Paying attention to different resources, capabilities, and characteristics, there is a need for a rule that is local which regulates this horizontal bureaucratic line. For this context, the role of MOHA can be expected to be influential because, as our analysis reveals, MOHA is directly connected to several provincial institutions. The construction of horizontal networks also can promote the participation of experts in local disaster management planning.

Third, for the implementation of disaster management at the local level, there is require to be a distribution of roles and authorities to ensure equal distribution of power and leadership between actors. But what needs to be noted, before the transfer of authority, BPBD as the organization in charge of disaster management at the local level needs to map the actors and their roles in pre-disaster activities. This framework will be used as a basis for developing the regulations to govern the transfer of these authorities. This transfer of authority between government agencies has two benefits. First, as a form of distribution of resources, primarily financial and human. Second, to increase the role of the organization in the policy-making process. The transfer of authority, especially to lower level governments, such as Kecamatan (districts) and Desa (villages), is a good option to deliver public services in disaster management to the community. Lastly, decentralization to bring government closer to the community, especially in the context of disaster management, will be achieved through this approach.

Fourth, to improve the disaster management network at the local level, empowering non-government actor, especially the community organization is necessary. From SA, we found that some community organization has high power and high leadership in four study area. In line with that, our finding from SNA also found that this community organization played a significant role in the network, as the most important player from the non-government sector. From the SNA we can conclude that to enhance the connection between community organization with another actor (both government and non-government) is required to improve the disaster management network at the local level.

Fifth, to improve the local capability in managing disasters, our study recommend for budget increases on disaster management for strengthening local capability in managing the disaster. This addition must be prioritized especially for activities in the pre-disaster phase. As explained by some experts, sufficient budget allocation in the pre-disaster phase is seen as an investment to reduce the

impact of disasters that might occur in the future. With limited funds from the government budget (central and local), the involvement of non-government actors - donor agencies, international and national NGOs, and the private sector - is a solution to fill the financial gap in disaster management at the local level. In the context of the local budget, the improvement of good relationship with the parliament is also crucial. After decentralization, the local government must get approval from the parliament to determine the local budget. This condition reveals that understanding about disaster issues aimed at not only the government side but also the parliament side as part of local budget policymakers. Strengthening the local ‗organization‘ in managing disasters. Based on the analysis, it is noticed that ‗organization‘ is the essential capability-forming variable and represents as one of the bottlenecks in the SEM model. Enhancement of ‗organization‘ will have a domino effect on strengthening other capability variables (‗institution,‘ ‗planning,‘ and ‗delivery‘). Strengthening the organizational structure of disaster management by involving non-government actors is one of the recommendations based on our analysis. Also, a clear division of roles between actors is also needed to avoid overlapping functions between institutions that cause inefficiencies disaster management system at the local level.

Sixth, our study also found that the relationship with parliament is essential for local government capability. With local parliament position as one of the decision maker at the local level, particularly for budget allocation, it is necessary to improve their knowledge about the disaster. This knowledge is beneficial to increase the priority of disaster issue at the local level. With the limitation of budget, higher priority of government affair will have a more significant percentage of budget allocation from the local budget.

Table 7. 2 Recommendation of the dissertation

Objectives	Recommendation
Objective 1	The government needs to establish a formal straight hierarchical relation between BNPB and provincial/municipal BPBD to increase the inter-governmental relationship.
	The government needs to develop a regulation to enhance the role of provincial and municipal BPBDs in the vertical-horizontal disaster management network.

Objective 2	Local governments need to improve the power and leadership of NGOs and community organizations as leading actors in disaster management at the local level from the non-government sector.
	The Regional Disaster Management Agency (BPBDs) needs to strengthen its role as the coordinator of the implementation of disaster management by bridging relations between actors especially government – non-government relationship.
Objective 3	The local government needs to integrate the disaster issue in the provincial/municipal governance plan to increase the budget allocation on disaster management from the local budget.
	The government needs to promote cooperation with local parliament in disaster management to enhance it as a vital issue on the decision-making process.

7.3.2 Recommendation for future research

[1] In conducting SNA in our first research, we focused only on government actors without considering non-government actors at the central and local levels. Future research should examine more detailed patterns of interaction by examining both government and non-government actors.

[2] SEM model did not employ all governmental capability variables. For instance, this included ―early warning system,‖ ―role,‖ ―local regulation,‖ ―decision making,‖ and ―task delegation‖; some variables have no correlation or relationship with other capabilities. We cannot currently reveal how to improve these capabilities. Thus, further research is necessary.

[3] The interviews we conducted among local officials' also revealed "disaster magnitude" is an important indicator that may provoke institutional reform at the local level. This issue should be more carefully examined in future research.

7.4 Research contribution and originality

The current dissertation aims to examine the implications of the decentralization system on disaster management systems in Indonesia. The current state of knowledge in the fields of decentralization

and disaster management research consists of many dimensions, the most mass of studies coming from governance, sociology, and engineering. The author also provides a series of arguments about how this dissertation contributes to a significantly less explored field in decentralization and disaster management research, namely to: network patterns between stakeholders and local government capabilities. The author also believes why it is essential to support and expand research on decentralization and disaster management in this domain. The combination of decentralization and disaster management as a measure of the impact of these policies on local governments is almost never implemented in the context of all stages of the disaster. This research contains a comparative model between disaster management systems in before and after decentralization in the pre-disaster and post-disaster phases.

The originality of the proposed dissertation also consists of the methodology, including:

[1] This dissertation develops a comprehensive approach in which: regulatory, institutional, planning and budgeting aspects are included together to assess the impact of decentralization on disaster governance in Indonesia. Based on our understanding, the approach with these four aspects in all stages of a disaster has never been carried out. The policy approach has been implemented several times, but rarely few variables are combined to examine the influence of decentralization on the disaster management system.

[2] In the analysis of network patterns, this study utilizes analysis with qualitative data which is then converted into quantitative data. This analysis replaces most of the need to use microdata and survey data. Limitations of microdata related to decentralization and disaster management require some methodological development especially in the data collection in the study area.

[3] Measurement capability includes variables that shape the capability and variables that influence the capability, as external variables. The analysis in the scope of capability in managing disaster mostly uses a qualitative approach that focuses on opportunities and limitations on the implementation. While this study investigates the linkages between capability-forming variables and external variables that influence them. Quantitative analysis in measuring capability in this study is also a challenge because of the complicated bureaucracy in authorizing and limited access to distributing questionnaires.

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ANNEXES

Annex 1: Survey tools

SEMI – STRUCTURED INTERVIEW NATIONAL LEVEL AGENCY	
Identification of the respondent	
Name	
Age	
Email	
Cellphone	
Position	
Institution	

List of Question

1. Administrative decentralization
   a. What roles and responsibilities of your organization in dealing with disaster risk governance?
   b. What is your agency's planning with disaster risk governance?
   c. Does your agency have a relationship with other agencies to manage the disaster?
   d. What do you think the relationship among agencies related to disaster risk governance at the national level?
   e. Could you explain the change of disaster management paradigm and the effect of disaster decentralization?

2. Fiscal decentralization
   a. Does your agency allocate fund for disaster management activities? How much?
   b. What is your agency's priority program for disaster risk governance?
   c. Does your institution support financial aid for local government for disaster management activities?
   d. Do you think that budget allocation for disaster management in national level is enough?
   e. Do you think local government allocate enough budget for disaster risk reduction activity?

3. Political decentralization
   a. What your organization's policies in dealing with disaster management?
   b. Do your agencies dealing with local government for decision making in disaster management?

c. How is your agency mainstreaming the disaster management plan into development planning?
d. How you measure the disaster management priority at the national level?
e. Where is the position of disaster management in national priority program?
f. How your agency monitor the disaster management implementation?
g. Do you think local government has made DRR as a priority in development planning?

Identification of the respondent

Name	
Age	
Email	
Cellphone	
Position	
Institution	

List of Question

1. Administrative decentralization
   a. What roles and responsibilities of local government in dealing with disaster risk governance?
   b. What functions and responsibilities of your organization in the treatment of disaster risk management?
   c. Does your agency have a relationship with other agencies to manage the disaster?
   d. What do you think the relationship among agencies related to disaster risk governance at the national level?
   e. Could you explain the change of disaster management paradigm and the effect of disaster decentralization?

2. Fiscal decentralization
   a. How you plan the disaster management budget in one fiscal year?
   b. Does your agency allocate fund for disaster management activities? How much?
   c. What is your agency's priority program for disaster risk governance?
   d. Does your agency support financial aid for local government for disaster management activities?
   e. Do you think that budget allocation for disaster management is enough?
   f. Do you think local government allocate enough budget for disaster risk reduction activity?

3. Political decentralization
   a. How you integrate the disaster management into political priority?
   b. What your institution's policies for dealing with disaster management?
   c. Do you have intergovernmental cooperation in disaster management with other local government?
   d. How is your agency mainstreaming the disaster management plan into local government development planning?

SEMI – STRUCTURED INTERVIEW
LOCAL LEVEL

Identification of the respondent

Name	
Age	
Email	
Cellphone	
Position	
Institution	

Your opinion

1. Have you heard about decentralization?
2. Have you heard about disaster management?
3. Do you understand the decentralization of disaster management mean?

4. What are the potential benefits to you and your organization of the decentralization of the disaster management?
5. Which of these categorized best describes your opinion on service delivery after the implementation of decentralization on disaster management?
   a. Better
   b. Same
   c. Worse

6. What is the real impact of the decentralization of disaster management for local level?

7. For these aspects of decentralization that you do support
   a. Policy
   b. Institutional
   c. Technical
   d. Leadership
   e. Human resources
   f. Financial
8. Under what conditions would you come to support decentralization on disaster management?

Identification of the respondent

Name	
Age	
Email	
Cellphone	
Position	
Institution	

	Variables	**Question/ Description**	**The way of answer/data source**
	Structure	How do you evaluate the organizational structure of the local government to manage the disaster?	1=not reliable at all; 2=somewhat not reliable; 3=either reliable or not reliable; 4=somewhat reliable; 5= greatly reliable.
	Role	How do you evaluate the role of local government in all stages of disaster?	1=not reliable at all; 2=somewhat not reliable; 3=either reliable or not reliable; 4=somewhat reliable; 5= greatly reliable.
	Responsibility	How do you evaluate the response of local government to manage the disaster?	1=not reliable at all; 2=somewhat not reliable; 3=either reliable or not reliable; 4=somewhat reliable; 5= greatly reliable.
	Communication	How do you evaluate the way of exchanging the information in local	1=not reliable at all; 2=somewhat not reliable; 3=either reliable or not

Variables	Question/ Description	The way of answer/data source
	government?	reliable; 4=somewhat reliable; 5= greatly reliable.
Task limitation	How do you evaluate the scope of duty in the local government?	1=not reliable at all; 2=somewhat not reliable; 3=either reliable or not reliable; 4=somewhat reliable; 5= greatly reliable.
Duty division	How do you evaluate the division of the task/duty the local government to manage the disaster?	1=not reliable at all; 2=somewhat not reliable; 3=either reliable or not reliable; 4=somewhat reliable; 5= greatly reliable.
Local regulation	How do you evaluate the reliability of local regulation on disaster management?	1=not reliable at all; 2=somewhat not reliable; 3=either reliable or not reliable; 4=somewhat reliable; 5= greatly reliable.
Disaster plan	How do you evaluate the disaster plan that developed by the local government?	1=not reliable at all; 2=somewhat not reliable; 3=either reliable or not reliable; 4=somewhat reliable; 5= greatly reliable.
Assessment	How do you evaluate the approach of the local government to evaluating the disaster risk based on existing conditions of	1=not reliable at all; 2=somewhat not reliable; 3=either reliable or not reliable; 4=somewhat reliable; 5= greatly reliable.

Variables	Question/ Description	The way of answer/data source
	exposure and vulnerability?	
Allocation	How do you evaluate the availability of disaster management budget?	1=not reliable at all; 2=somewhat not reliable; 3=either reliable or not reliable; 4=somewhat reliable; 5= greatly reliable.
Financial sources	How do you evaluate the various source of finance for disaster management activity?	1=not reliable at all; 2=somewhat not reliable; 3=either reliable or not reliable; 4=somewhat reliable; 5= greatly reliable.
Logistic	How do you evaluate the system of the local government to flow of goods during the emergency?	1=not reliable at all; 2=somewhat not reliable; 3=either reliable or not reliable; 4=somewhat reliable; 5= greatly reliable.
Early warning system	How do you evaluate the reliability of an early warning system that developed by the local government?	1=not reliable at all; 2=somewhat not reliable; 3=either reliable or not reliable; 4=somewhat reliable; 5= greatly reliable.
System information	How do you evaluate how the local government organized a system to provide information about disaster for the community?	1=not reliable at all; 2=somewhat not reliable; 3=either reliable or not reliable; 4=somewhat reliable; 5= greatly reliable.
Decision	How do you evaluate the	1=not reliable at all;

	Variables	Question/ Description	The way of answer/data source
	making	ability or process of making important decisions on disaster management?	2=somewhat not reliable; 3=either reliable or not reliable; 4=somewhat reliable; 5= greatly reliable.
External variables	Relationship with parliament	Do the local government has a good relationship with the parliament to develop the disaster management system?	0=No; 1=Yes
	Relationship with non-government actor	Do the local government has a good relationship with a non-government actor (e.g., NGOs, donor agency, and academia) in disaster management?	0=No; 1=Yes
	Number of disasters	The total number of disasters was happening in a municipality. (Bussell et al. 2014)	Indonesian Disaster Data and Information (DIBI)
	Percentage of own source revenue	The proportion of own income funds compared to total income. (Herry Darwanto 2012)	The proportion of local government budget 2017
	Percentage of disaster allocation	Estimated proportion of disaster management funds compared to the total budget. (Nurhidayat 2017)	

Annex 2: Example dataset for SNA

No. ID	Institution	Group	Internal/External	establish objectives	Risk assessment	Risk prevention and mitigation	Emergency access and evacuation	Emergency drills	Emergency response equipment	Rescue and relief
1	BPBD	Government	Internal	0	0	1	1	1	1	1
2	Bappeda	Government	Internal	1	1	1	1	0	0	0
3	Legal Bureau	Government	Internal	0	0	1	0	0	1	0
4	Financial Bureau	Government	Internal	0	1	0	0	0	1	0
5	Public works	Government	Internal	1	0	1	1	0	1	1
6	Social affairs	Government	Internal	1	0	0	1	1	1	1
7	Fire management	Government	Internal	0	0	1	1	1	1	1
8	Satpol PP	Government	Internal	0	0	0	1	1	1	1
9	Water management	Government	Internal	1	0	1	0	0	1	1
10	Energy and mineral agency	Government	Internal	1	1	0	0	1	1	1
11	Kesbanglinmas	Government	Internal	0	0	0	0	0	1	1
12	Inspektorat	Government	Internal	0	0	1	0	0	0	0
13	Kecamatan	Government	Internal	0	1	1	1	1	1	1
14	Kelurahan	Government	Internal	0	0	0	1	1	1	1
15	DKP	Government	Internal	1	1	1	0	0	0	0
16	BLH	Government	Internal	1	1	0	0	0	0	0
17	PSDA	Government	Internal	0	0	0	0	0	0	1
18	Education agency	Government	Internal	1	0	1	1	1	1	0
19	BMKG	Government	Internal	1	1	0	1	0	1	0
20	BPMPKB	Government	Internal	0	0	0	1	1	0	1
21	Transportation agency	Government	Internal	1	0	1	1	0	0	1
22	Bina Marga	Government	Internal	1	0	1	1	1	0	1
23	Cipta Karya	Government	Internal	1	0	1	1	1	1	1
24	BPN	Government	Internal	0	0	1	1	0	1	0
25	BPSDA	Government	Internal	0	0	0	0	0	1	1
26	Agricultural agency	Government	Internal	1	0	1	0	0	0	1
27	PDAM	Government	Internal	0	0	0	0	0	1	0
28	RSUD	Government	Internal	0	0	0	0	1	1	1
29	SEKDA	Government	Internal	1	0	0	0	1	0	1
30	DPRD	Government	Internal	1	0	0	0	0	1	0
31	Sekretariat DPRD	Government	Internal	0	0	0	0	0	0	0
32	BASARNAS	Government	Internal	0	0	0	1	1	1	1
33	KODIM	Government	Internal	0	0	0	1	1	1	1
34	Police	Government	Internal	0	0	0	0	1	1	1
35	Pramuka	Civil society	External	0	0	0	0	1	0	1
36	PMI	Civil society	External	0	0	1	0	1	1	1
37	Bintari	Civil society	External	0	1	0	1	1	0	1
38	Kalandara	Civil society	External	0	0	1	0	1	0	1
39	P5	Civil society	External	0	0	0	1	0	0	0
40	Tagana	Civil society	External	0	0	0	0	1	1	1
41	Diponegoro university	Academia	External	1	1	1	0	0	0	0
42	USM	Academia	External	0	0	1	0	0	0	0
43	UNISULLA	Academia	External	0	0	1	0	0	0	0
44	UNNES	Academia	External	0	0	0	0	1	0	0
45	POLINES	Academia	External	0	1	1	0	0	0	0
46	PKK	Community	External	0	0	1	0	1	0	0
47	Karang taruna	Community	External	0	1	0	0	0	0	1
48	Kelompok siaga bencana	Community	Internal/External	0	1	1	0	0	0	0
49	Dasa wisma	Community	External	0	0	1	0	0	0	0
50	Posyandu	Community	External	0	0	0	0	1	0	0
51	Mercy corps	Donor agency	External	0	1	1	0	0	0	0
52	Rockerfeller	Donor agency	External	0	0	1	0	0	0	0
53	Djarum	Private sector	External	0	0	0	1	0	1	1
54	Phapros	Private sector	External	0	0	0	0	0	1	1
55	Guna bina kimia	Private sector	External	0	0	0	0	1	1	1
56	Viva generik	Private sector	External	0	0	0	0	0	0	1
57	Sido muncul	Private sector	External	0	0	0	1	0	0	1

Annex 3: Example dataset for stakeholder analysis

7	Fire management	0	1	1	3	2
15	DKP	1	1	1	3	2
1	BPBD	1	1	1	3	3
2	Bappeda	1	1	1	3	3
5	Public works	1	1	1	3	3
6	Social affairs	1	0	1	3	3
11	Kesbanglinmas	0	0	1	3	3
18	Education agency	1	1	1	3	3
29	SEKDA	1	1	1	3	3
33	KODIM	1	1	1	3	3
21	Transportation agency	1	1	1	3	2
22	Bina Marga	1	1	1	3	2
23	Cipta Karya	1	1	1	3	2
36	PMI	0	0	1	3	2
13	Kecamatan	1	0	1	2	3
10	Energy and mineral agency	1	1	0	3	1
12	Inspektorat	1	0	1	3	1
26	Agricultural agency	1	0	1	3	1
27	PDAM	1	1	0	3	1
38	Tagana	0	0	1	2	2
44	UNDP	1	0	0	3	1
45	Pertamina	0	0	1	2	2
46	Pelindo	0	1	1	2	2
48	Holcim	0	1	1	3	1
4	Financial Bureau	1	0	0	2	2
8	Satpol PP	0	1	1	2	2
9	Water management	1	1	1	2	2
14	Kelurahan	1	0	0	1	3
32	BASARNAS	1	0	0	2	2
34	Police	0	0	1	2	2
3	Legal Bureau	1	0	0	2	1
17	PSDA	0	1	1	2	1
39	PKK	0	0	1	1	2
37	Seroja	0	0	1	2	1
40	Karang taruna	0	0	1	2	1
41	Kelompok siaga bencana	1	1	0	2	1
47	BRI	0	0	1	2	1
30	DPRD	0	0	0	1	1
31	Sekretariat DPRD	0	0	0	1	1
35	Pramuka	0	0	0	1	1
42	Dasa wisma	0	0	0	1	1
43	Mosque	0	0	0	1	1

Annex 4: Example of SNA on centrality output

```
MULTIPLE CENTRALITY MEASURES
--------------------------------------------------------------------------------


Input dataset:                      prep (C:\Users\Danang\Documents\UCINET data\analisis 2\semarang\prep)
Output dataset:                     prep-cent (C:\Users\Danang\Documents\UCINET data\prep-cent)
Treat data as:                      Auto-detect
Type of scores to output:           Raw scores
Undefined dist in closeness:        replace with max dist + 1


Network prep is directed? YES


Value of Beta was:                  0.110342505547587
Centrality Measures
```
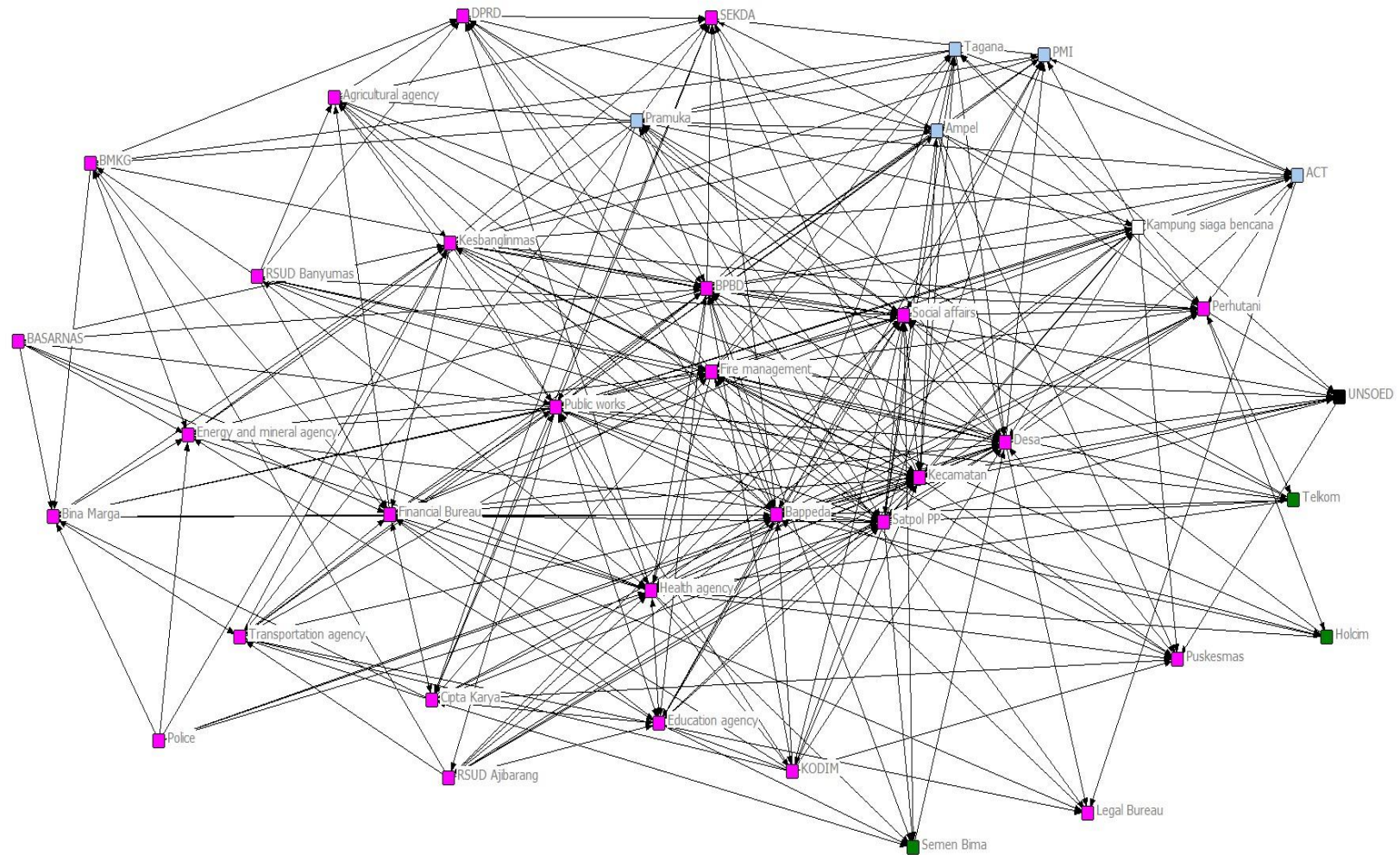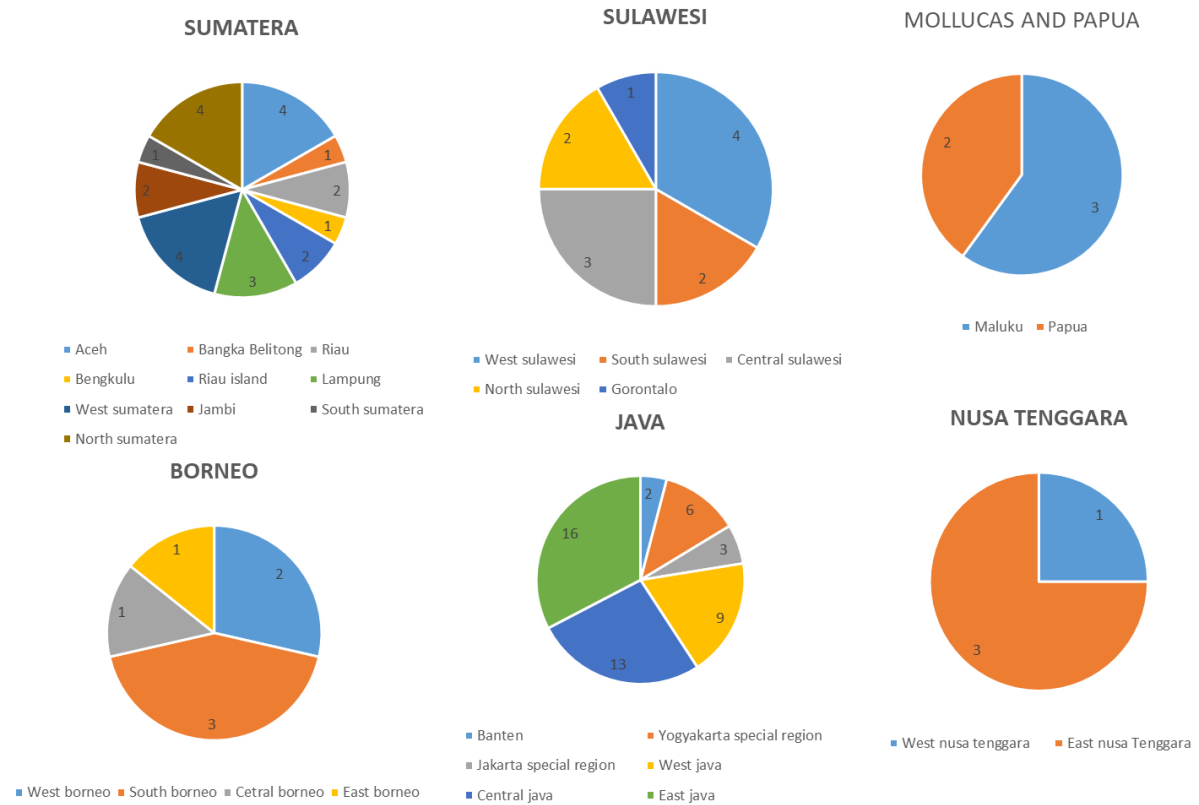
		1	2	3	4	5	6	7	8	9	10	11	12	13	14
		OutDeg	Indeg	Out2loca	In2local	OutBonPw	InBonPwr	Out2Step	In2Step	OutARD	InARD	OutClose	InClose	Between	2StepBet
1	BPBD	26.000	34.000	151.000	245.000	3737.768	5351.435	47.000	51.000	37.500	43.500	119.000	91.000	1041.328	540.239
2	Bappeda	16.000	17.000	145.000	183.000	3263.847	3846.142	45.000	49.000	32.083	34.667	132.000	110.000	392.574	130.692
3	Legal Bureau	2.000	2.000	30.000	50.000	558.464	940.164	27.000	38.000	21.917	25.167	166.000	138.000	0.000	0.000
4	Financial Bureau	6.000	14.000	73.000	152.000	1468.550	3150.860	38.000	46.000	25.917	32.583	149.000	117.000	45.464	15.241
5	Public works	6.000	20.000	42.000	200.000	1032.624	4049.972	20.000	49.000	22.533	36.167	172.000	107.000	145.924	47.079
6	Social affairs	4.000	14.000	64.000	156.000	1305.293	3190.210	38.000	47.000	24.917	32.833	151.000	115.000	35.426	10.396
7	Fire management	19.000	15.000	146.000	172.000	3356.638	3397.083	46.000	47.000	33.833	33.333	127.000	114.000	262.831	95.879
8	Satpol PP	16.000	12.000	147.000	120.000	3323.055	2457.521	45.000	43.000	32.167	31.167	131.000	121.000	130.486	51.633
9	Water management	11.000	7.000	106.000	98.000	2258.500	1838.739	40.000	43.000	28.667	28.500	143.000	128.000	46.148	13.301
10	Energy and mineral agency	6.000	6.000	46.000	85.000	1168.619	1765.058	28.000	40.000	23.950	27.500	163.000	132.000	55.637	10.710
11	Kesbanglinmas	13.000	9.000	147.000	92.000	3369.695	1792.017	46.000	39.000	30.750	29.000	134.000	128.000	126.474	36.342
12	Inspektorat	2.000	2.000	18.000	13.000	376.957	260.613	17.000	12.000	20.033	20.117	179.000	173.000	3.446	1.000
13	Kecamatan	12.000	12.000	125.000	119.000	2761.541	2143.108	40.000	44.000	29.250	31.167	141.000	122.000	66.789	31.076
14	Kelurahan	15.000	16.000	138.000	149.000	3164.984	2685.426	42.000	45.000	31.167	33.333	135.000	117.000	240.645	84.169
15	DKP	10.000	2.000	100.000	24.000	2252.034	490.245	37.000	22.000	27.667	22.333	147.000	156.000	8.978	2.343
16	BLH	6.000	3.000	36.000	31.000	963.415	652.066	24.000	26.000	23.200	23.500	168.000	151.000	20.392	5.500
17	PSDA	3.000	9.000	53.000	80.000	1024.784	1676.858	36.000	41.000	24.083	29.167	154.000	128.000	108.958	8.793
18	Education agency	12.000	5.000	140.000	34.000	3145.451	603.028	44.000	27.000	30.000	24.833	136.000	146.000	61.009	19.726
19	BMKG	2.000	6.000	45.000	67.000	784.815	1240.923	30.000	40.000	22.417	27.500	163.000	132.000	15.287	1.260
20	BPMPKB	6.000	5.000	34.000	22.000	782.767	423.873	22.000	13.000	23.000	21.650	168.000	171.000	80.275	15.867
21	Transportation agency	7.000	5.000	84.000	96.000	1660.553	1985.384	39.000	41.000	26.583	27.167	147.000	132.000	20.606	2.117
22	Bina Marga	6.000	5.000	66.000	57.000	1326.080	1302.974	36.000	30.000	25.583	25.333	151.000	143.000	11.719	1.150
23	Cipta Karya	5.000	5.000	35.000	57.000	800.133	1302.974	20.000	30.000	22.033	25.333	173.000	143.000	33.645	4.083
24	BPN	1.000	2.000	6.000	12.000	114.942	209.625	7.000	11.000	15.550	18.983	220.000	186.000	0.000	0.000
25	BPSDA	5.000	3.000	38.000	37.000	925.500	856.330	21.000	26.000	22.117	23.500	173.000	151.000	3.846	1.676
26	Agricultural agency	9.000	0.000	87.000	0.000	2028.976	0.000	41.000	0.000	28.250	0.000	139.000	392.000	0.000	0.000
27	PDAM	1.000	1.000	3.000	16.000	114.077	375.843	4.000	16.000	16.700	20.667	201.000	165.000	0.267	0.167
28	RSUD	4.000	5.000	39.000	61.000	617.014	1259.316	31.000	36.000	23.667	26.250	159.000	138.000	77.868	7.333
29	SEKDA	17.000	5.000	151.000	28.000	3355.527	578.668	45.000	17.000	32.583	22.833	131.000	160.000	226.065	60.278
30	DPRD	1.000	4.000	2.000	30.000	42.594	534.779	2.000	22.000	14.467	23.333	228.000	154.000	25.357	1.500
31	Sekretariat DPRD	2.000	2.000	18.000	11.000	376.957	124.860	17.000	7.000	20.033	17.767	179.000	197.000	49.000	1.000
32	BASARNAS	7.000	2.000	62.000	29.000	1272.178	648.012	36.000	19.000	26.167	21.583	149.000	162.000	1.060	0.917
33	KODIM	2.000	5.000	43.000	77.000	784.692	1510.741	38.000	37.000	23.917	26.417	153.000	137.000	21.001	1.833
34	Police	3.000	5.000	59.000	77.000	1152.366	1510.741	41.000	37.000	24.917	26.417	149.000	137.000	23.268	3.101
35	Pramuka	6.000	3.000	64.000	36.000	1388.568	637.025	38.000	23.000	25.833	23.000	150.000	154.000	23.038	4.593
36	PMI	7.000	4.000	55.000	70.000	976.455	1379.458	32.000	36.000	25.333	25.750	155.000	139.000	89.901	8.893
37	Bintari	6.000	6.000	56.000	76.000	1128.766	1457.479	36.000	40.000	25.417	27.417	153.000	133.000	61.448	15.375

```
Input network dataset:                response (C:\Users\Danang\Documents\UCINET data\analisis 2\purworejo\response
Output measures:                      response-Clo (C:\Users\Danang\Documents\UCINET data\analisis 2\purworejo\response-Clo
(Freeman) Set undefined distances to: Max observed distance plus 1
(Freeman) Output options:             Divide totals into N-1 (Freeman normalization)
(Valente-Forman) Handle undefined distances:Set reverse distance to zero
(Valente-Forman) Output options:      Divide averages by diameter
(Reciprocal) Handle undefined distances:Set reciprocal distance to zero
(Reciprocal) Output options:          Averages
```
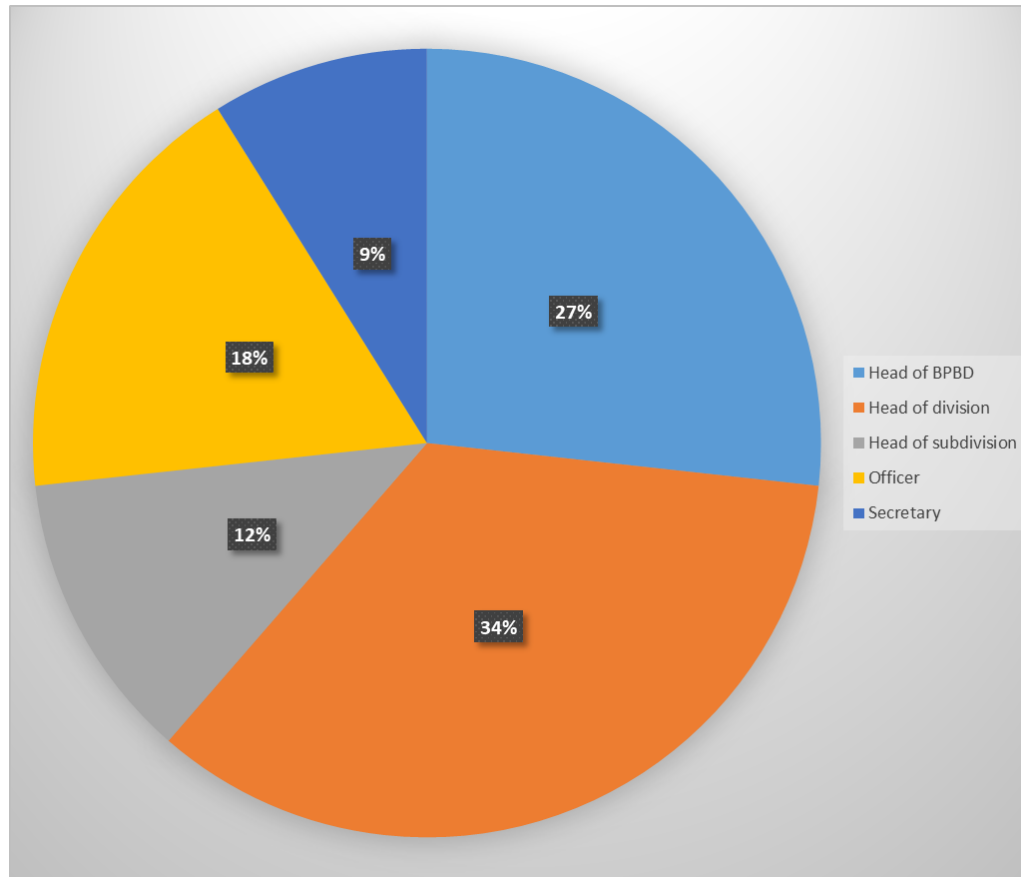
		1 OutClose	2 InClose	3 OutValClo	4 InValClo	5 OutRecipClo	6 InRecipClo
1	BPBD	0.814	0.833	0.924	0.933	0.886	0.900
2	Bappeda	0.593	0.673	0.771	0.838	0.686	0.757
3	Legal Bureau	0.455	0.538	0.600	0.714	0.495	0.581
4	Financial Bureau	0.500	0.648	0.667	0.819	0.538	0.729
5	Public works	0.614	0.614	0.790	0.790	0.695	0.686
6	Social affairs	0.636	0.636	0.810	0.810	0.714	0.714
7	Fire management	0.660	0.614	0.829	0.790	0.743	0.686
8	Satpol PP	0.673	0.648	0.838	0.819	0.757	0.738
9	Energy and mineral agency	0.556	0.593	0.733	0.771	0.600	0.657
10	Kesbanglinmas	0.625	0.593	0.800	0.771	0.700	0.657
11	Kecamatan	0.660	0.603	0.829	0.781	0.743	0.681
12	Desa	0.583	0.625	0.762	0.800	0.643	0.700
13	Health agency	0.614	0.614	0.790	0.790	0.686	0.686
14	Education agency	0.583	0.593	0.762	0.771	0.643	0.657
15	BMKG	0.565	0.515	0.743	0.686	0.614	0.567
16	Transportation agency	0.547	0.565	0.724	0.743	0.605	0.614
17	Bina Marga	0.422	0.574	0.543	0.752	0.467	0.638
18	Cipta Karya	0.593	0.530	0.771	0.705	0.667	0.576
19	Puskesmas	0.507	0.538	0.676	0.714	0.552	0.590
20	Agricultural agency	0.547	0.515	0.724	0.686	0.586	0.548
21	RSUD	0.583	0.479	0.762	0.638	0.643	0.533
22	SEKDA	0.583	0.547	0.762	0.724	0.643	0.595
23	BASARNAS	0.574	0.565	0.752	0.743	0.629	0.624
24	KODIM	0.530	0.565	0.705	0.743	0.576	0.624
25	Police	0.515	0.574	0.686	0.752	0.567	0.648
26	Pramuka	0.565	0.556	0.743	0.733	0.633	0.600
27	PMI	0.473	0.507	0.629	0.676	0.529	0.562
28	Kompak	0.522	0.565	0.695	0.743	0.571	0.633
29	Tagana	0.648	0.556	0.819	0.733	0.729	0.619
30	Karang taruna	0.507	0.507	0.676	0.676	0.571	0.562
31	Kelompok siaga bencana	0.556	0.530	0.733	0.705	0.600	0.576
32	Desa siaga bencana	0.648	0.473	0.819	0.629	0.729	0.519
33	BCA	0.515	0.479	0.686	0.638	0.557	0.533
34	Pertamina	0.515	0.507	0.686	0.676	0.548	0.552
35	Taspen	0.473	0.486	0.629	0.648	0.500	0.538
36	Sinar mas	0.500	0.449	0.667	0.590	0.529	0.490

Annex 5: Profile of respondent from web questionnaire

SUMATERA

Aceh 4, Bangka Belitong 1, Riau 2, Bengkulu 1, Riau island 2, Lampung 3, West sumatera 4, Jambi 2, South sumatera 1, North sumatera 4

- Aceh
- Bangka Belitong
- Riau
- Bengkulu
- Riau island
- Lampung
- West sumatera
- Jambi
- South sumatera
- North sumatera

SULAWESI

West sulawesi 4, South sulawesi 2, Central sulawesi 3, North sulawesi 2, Gorontalo 1

- West sulawesi
- South sulawesi
- Central sulawesi
- North sulawesi
- Gorontalo

MOLLUCAS AND PAPUA

Maluku 2, Papua 3

- Maluku
- Papua

BORNEO

West borneo 2, South borneo 3, Cetral borneo 1, East borneo 1

- West borneo
- South borneo
- Cetral borneo
- East borneo

JAVA

Banten 2, Yogyakarta special region 6, Jakarta special region 3, West java 9, Central java 13, East java 16

- Banten
- Yogyakarta special region
- Jakarta special region
- West java
- Central java
- East java

NUSA TENGGARA

West nusa tenggara 1, East nusa Tenggara 3

- West nusa tenggara
- East nusa Tenggara

Generally, local government officers realize that they already have reliability in managing disasters but they are not sure of giving the same portion at every stage

Legend:
- Greatly reliable
- Somewhat reliable
- Neither reliable or not reliable
- Somewhat not reliable
- Not reliable at all

Pie chart values: 0%, 3%, 11%, 35%, 51%
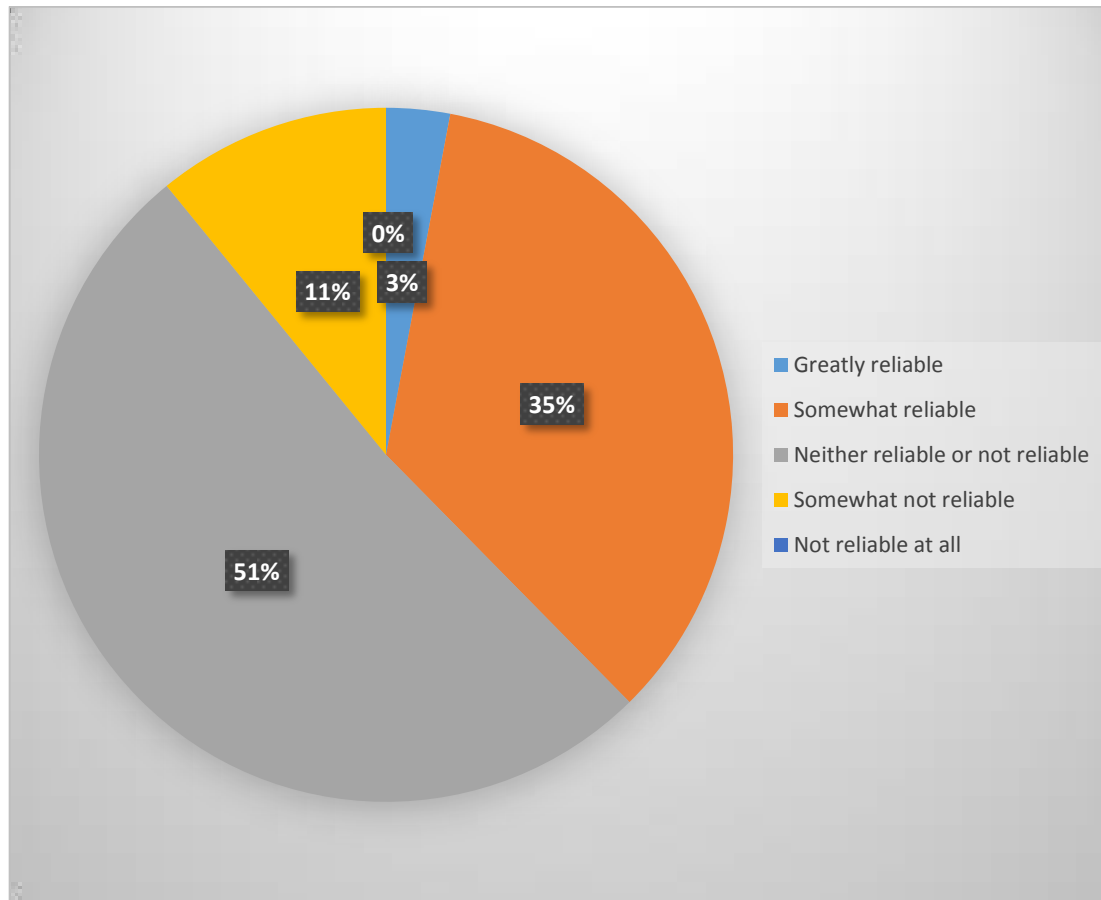
Most local government played more role during preparedness phase (e.g., early warning, exercises training, preparedness plan, etc.)

Legend:
- Prevention
- Mitigation
- Preparedness
- Response
- Recovery
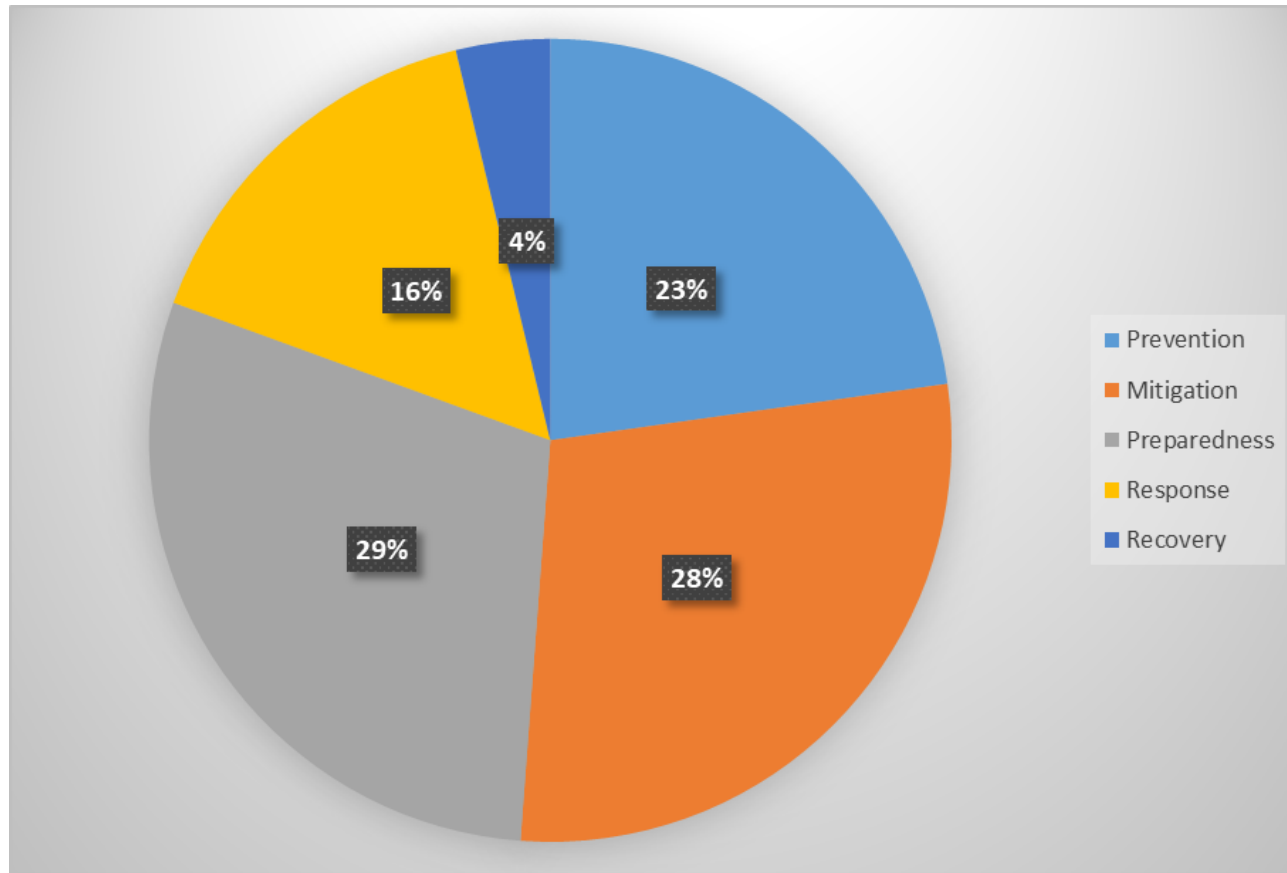
Annex 6: SPSS result for factor analysis

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.818
Bartlett's Test of Sphericity	Approx. Chi-Square	483.033
	df	105
	Sig.	.000

Communalities

	Initial	Extraction
Role	1.000	.505
Structure	1.000	.606
Early warning system	1.000	.560
Disaster plan	1.000	.529
Dutydivision	1.000	.532
Responsibility	1.000	.649
task limitation	1.000	.518
Financial sources	1.000	.607
Allocation	1.000	.613
Communication	1.000	.600
Systeminformation	1.000	.642
Logistic	1.000	.528
Assessment	1.000	.466
Decisionmaking	1.000	.512
Local regulation	1.000	.446

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings[a]
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total
1	4.477	29.844	29.844	4.477	29.844	29.844	3.348
2	1.538	10.251	40.095	1.538	10.251	40.095	1.994
3	1.264	8.429	48.524	1.264	8.429	48.524	2.338
4	1.035	6.898	55.422	1.035	6.898	55.422	2.245
5	.958	6.389	61.811				
6	.892	5.949	67.760				
7	.769	5.129	72.889				
8	.732	4.878	77.767				
9	.697	4.649	82.416				
10	.629	4.196	86.612				
11	.495	3.301	89.913				
12	.449	2.993	92.906				
13	.400	2.667	95.573				
14	.355	2.369	97.941				
15	.309	2.059	100.000				

Extraction Method: Principal Component Analysis.

a. When components are correlated, sums of squared loadings cannot be added to obtain a total variance.

Pattern Matrix[a]

	Component			
	1	2	3	4
Systeminformation	.786			
Role	.684			
Allocation	.632		-.318	
Early warning system	.620			
Logistic	.488		-.328	
Financial sources		.756		
Local regulation		.607		
Assessment		.587		
Disaster plan		.528		-.494
Decisionmaking			-.729	
Responsibility			-.684	
Communication	.380		-.467	
Dutydivision				-.681
task limitation			-.383	-.532
Structure	.478			-.482

Extraction Method: Principal Component Analysis.
Rotation Method: Oblimin with Kaiser Normalization.[a]

a. Rotation converged in 24 iterations.

Component Matrix[a]

	Component			
	1	2	3	4
Communication	.732			
Logistic	.710			
Allocation	.699			.305
Early warning system	.684			
Responsibility	.662		-.381	
Systeminformation	.646	-.362		
Structure	.621	-.373		
task limitation	.534		-.423	
Financial sources	.380	.662		
Disaster plan	.325	.529		-.371
Assessment	.461	.499		
Local regulation		.474	.307	
Role	.367		.595	
Decisionmaking			-.476	.454
Dutydivision	.488			-.542

Extraction Method: Principal Component Analysis.

a. 4 components extracted.