The Influence of Collaborative Governance In Improving Preparedness For A Volcanic Eruption

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Abstract

Disaster is an event that can result in loss of property, life and the environment. One of the disaster that occurred is volcanic disaster. The problems caused by disasters are very complex and require careful and targeted planning. Good collaborative governance in each program is expected to improve preparedness for volcanic eruptions.

The purpose of this study was to know how collaborative governance improving preparedness for volcanic eruptions. The research design used in this study was quantitative with cross sectional approach. The sampling technique used is total sampling with total sample of 530 respondents. Collecting data using questionnaire. Data analysis using the Regresi Linear test showed P = 0.001 meaning that there was the influence of a collaborative governance and increased preparedness in the face of volcanic eruptions.

The results show that collaborative governance in disaster risk management is mostly good and most of the preparedness in facing volcanic eruptions is in ready condition. Collaborative governance is factor that greatly influence the increase of preparedness for volcanic

eruptions.
Suggestions for all elements involved in the management of volcanic eruptions are to improve all elements of governance so the program can be implemented properly. Preparedness for volcanic eruptions also needs further improved.

Keywords: Collaborative, Governance, preparedness, volcanic, eruption

Disasters are events that often result in loss of property, psychological and environmental stress. The occurrence of disasters is caused by several factors including natural, non-natural, and human factors [1]. Disasters can happen to anyone and at any time. Disasters often happen to someone who is not ready, causing a very large number of victims [2]. recent years, huge amount of damage all around the world caused by destructive disasters has significantly increased [3]. Disasters force us to do good collaboration, so that physical and non-physical losses can be reduced. Volcanic eruptions are complex problems that require planned and targeted management [4]. Disaster problems are complex problems that require collaboration that is carried out in a planned and directed manner. Disaster management efforts must be carried out in a sustainable and systematic manner so that disaster victims can be reduced [5], [6], [7]. Geographically, the frequency of natural disasters in Indonesia is still quite high. Disasters can occur with mild conditions or up to extraordinary conditions. One of the disasters that often occurs in Indonesia is a volcanic eruption. Volcanic activity is monitored and observed by volcano observers, namely the Center for Volcanology and Geological Disaster Mitigation (PVMBG) and reported to the local government. Volcanic activity consists of the lowest to the highest levels, namely level 1 or normal category, level 2 or advisory, level 3 or watch, and level 4 or warning. Disasters that can be caused by volcanic eruptions include lava flows, volcanic mudflow, eruptive materials, hot clouds, toxic gases, and ash.

Indonesia has 129 active volcanoes and 70 potentially very dangerous volcanoes [8] [9]. Natural sdisasters in the form of volcanic eruptions are something that often happens in Indonesia, this is because Indonesia's geographical location is surrounded by a ring of fire or is in an area of a volcanic ring of fire. The ring of fire is still active, making Indonesia the first country that has the potential to be exposed to the risk of volcanoes. In its history, about 200 years ago, a mountain in Indonesia was recorded to experience the largest eruption in the world. Indonesia is a volcanic disaster-prone area, which is about 17,000 km2 with a population of approximately 5.5 million people in volcanic disaster-prone areas. It is estimated that there are 585,000 people per year who are threatened by volcanic eruptions. During the last 200 years, Indonesia has experienced volcanic eruptions which have resulted in the deaths of approximately

175,000 people [10]. Volcanic eruptions often occur in Indonesia and have left various impacts such as damage, health problems, and other impacts.
One of the most active volcanoes in East Java, Indonesia is Mount Kelud. The mountain is located on the border between Blitar Regency, Kediri Regency, and Malang Regency. Mount Kelud is located east of the city of Kediri, East Java, Indonesia, the distance is approximately 27 km. Based on disaster risk index data, Kediri Regency is included in the high risk category. Mount Kelud, Kediri Regency has erupted in 1586, 1901, 1919, 1951, 1966, 1990, 2007, and 2014. The eruption of Mount Kelud has caused many casualties. This is due to the lava flood leading to residential areas. The eruption of Mount Kelud that occurred in 2007 caused a change in shape, namely from a crater to a dome so that anticipation was needed to reduce the risk. The peak condition was caused by a destructive (explosive) eruption accompanied by a lava plug such as a kelud peak. The eruption in 2014 was different from the eruption of the previous year, namely the rapid increase in volcanic activity from normal to alert which usually lasted weeks or even months but in 2014 only lasted a few days. The eruption of Mount Kelud that occurred in 2014 has spread ash everywhere in almost all areas on the island of Java. Mount Kelud in the East Java Province of Indonesia is a volcano that still has the potential to erupt again. The impact experienced from the eruption of Mount Kelud is still quite large. The city of Kediri is an area that is prone to throwing stones (incandescent), hot clouds, and ash rain. In the eruption of Mount Kelud that occurred in 2014 all areas were covered by rocks, thick ash rain, and thick sand [11].
In Law number 24 of 2007 it is stated that every region has a disaster management plan as a disaster management effort. The government regulation number 21 of 2008 also mentions the implementation of disaster management. Disaster management is the responsibility of the government and local governments [12]. In addition to the National Disaster Management Agency or Regional Disaster Management Agency, disaster management also needs to involve related sectors and depends on the disaster that occurs [13]. Relevant sectors must work more closely and collaborate, including in disaster risk management [14]. Collaboration between parties involved in disaster risk management is one of the efforts in disaster mitigation [15]. Most of the parties involved in disaster risk management are still responsive (emergency response) or handling during and after a disaster occurs. In dealing with disasters, it is related to programs to increase community capacity so that they are able to anticipate disasters, be able to handle emergencies, and handle disaster recovery [16]. The steps taken require good organization [17], [18]. Plans on disaster mitigation are useful for increasing community preparedness in dealing with disasters [19]. The success of handling critical situations during a disaster is highly dependent on the preparations made before a disaster occurs, including the collaboration carried out on disaster risk management.
The role of the disaster risk reduction forum is needed to increase pentahelix collaboration. With good collaboration in disaster risk

management, it can improve disaster preparedness. Based on the background above, the researchers are interested in researching collaborative governance in dealing with preparedness in risk management for volcanic eruptions.

Methodology

This study uses a quantitative design with a cross sectional research design. The sampling technique used is total sampling with a total sample of 530 respondents in the City of Kediri, East Java, Indonesia. Data collection in this study used a questionnaire containing questions about collaborative governance and volcanic eruption preparedness. Data analysis used Regresi Linear test to determine collaborative governance in increasing preparedness for volcanic eruptions. The validity test of the instrument in this study was carried out using the pearson product moment method on the collaborative governance questionnaire with a P=0.001 value and a P=0.000 preparedness questionnaire, meaning that the items related to coordination and preparedness for volcanic eruptions are valid. The reliability Test carried out with the cronbach alpha test showed a questionnaire about coordination with a value of P = 0.568 and a preparedness questionnaire P = 0.872, meaning that the calculation of the reliability test of the scale was accepted or reliable. The independent variable in this study is the collaborative governnace. While the dependent variable in this study is preparedness for disasters. Univariate data analysis was carried out to obtain an overview of variables affecting collaborative governnace in disaster management.

Results

General Characteristics of Responden

Table 1 General Characteristics of Responden

Indicator	Category	Frequency	%
Gender	Male	314	59,2
	Female	216	40.8
Age	12-25 years old	116	21.9
	26-45 years old	299	56,4
	46-55 years old	115	21.7
Last Education	Primary school	5	0.9
	Junior school	77	14.6
	Senior school	172	32,4
	High school	276	52.1
Profession	Government	152	28.7
	employees	86	16.2
	Pensionary	142	26.8
	Private sector	87	16.4
	worker	63	11.9
	Businessmen		
	Housewife		

Based on the table above, it can be seen that most of the respondents were male by 59,2%, age 26-45% years by 56,4%, graduated friom university bu 52,1%, workes in the government sector by 28,7%.

Collaborative Governance
Collaborative governance in the Kediri region, East Java, Indonesia is classified as good with the following details :

Table 2 Collaborative governance

Aspects	Starting condition	Collaborative Process	Fasilitative Leadership	Institutional Design
Good	57%	52%	71%	51%
Moderate	43%	48%	29%	49%
Less	0%	0%	0%	0%

Outcomes in this study in the form of preparedness in the face of volcanic eruptions. Based on the results of data collection, it was found that starting condition in disaster risk management of volcanic eruptions is in a good condition is mostly 57%, that collaborative process in disaster risk management of volcanic eruptions is in a good condition is mostly 56%, that fasilitative leadership in disaster risk management of volcanic eruptions is in a good condition is mostly 71%, that institutional design in disaster risk management of volcanic eruptions is in a good condition is mostly 51%.

Table 3 Preparedness For A Volcanic Eruption

Aspects	Frequency	%
Ready	298	56%
Less Ready	232	44%
Not Ready	0	0%

Outcomes in this study in the form of preparedness in the face of volcanic eruptions. Based on the results of data collection, it was found that preparedness in disaster risk management of volcanic eruptions is in a ready condition is mostly 56%.

3.3 Collaborative Governance in volcanic eruption disaster risk management

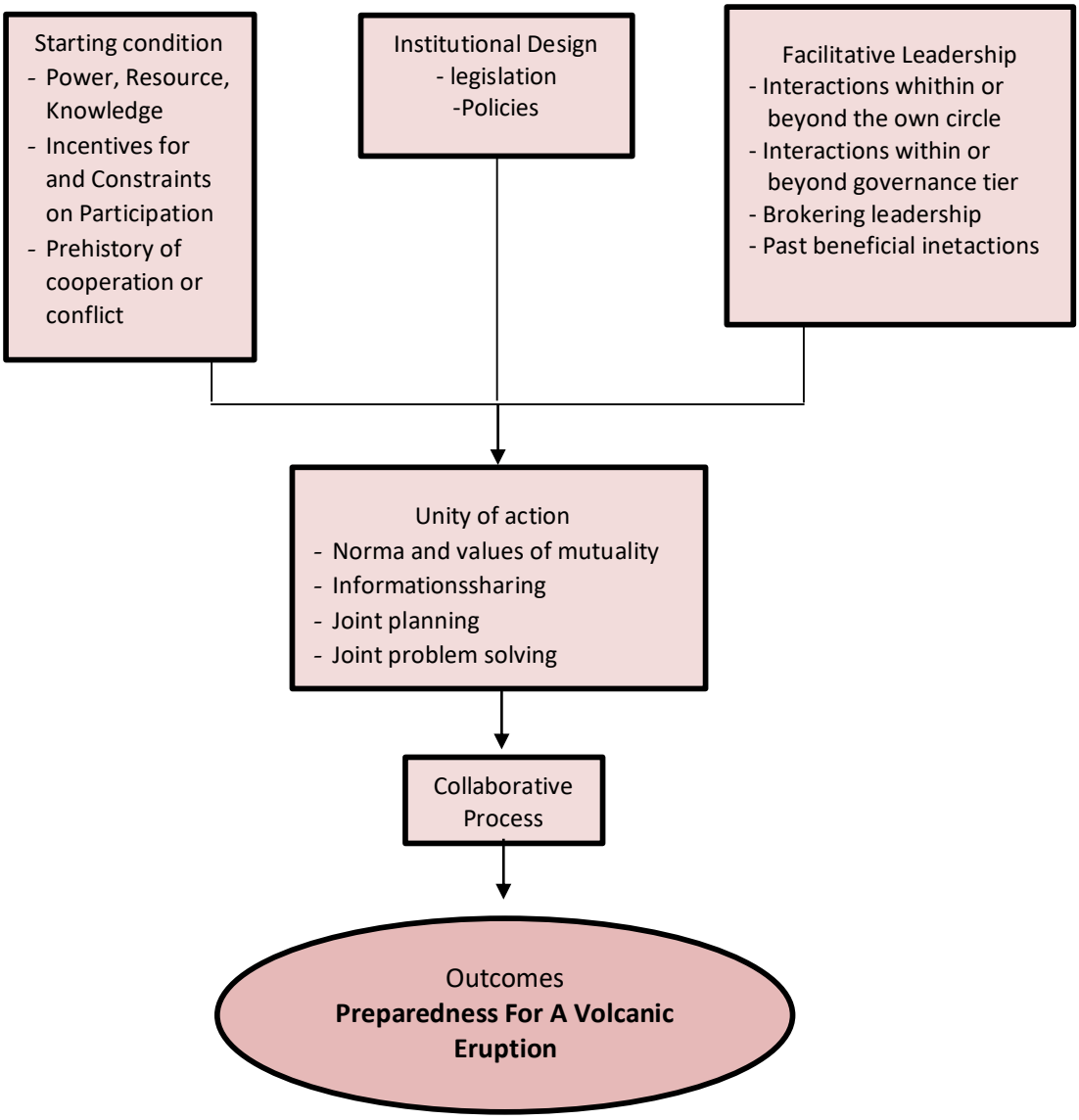

Figure 1 Collaborative Governance Model In Disaster Risk Management

Data analysis using the Regresi Linear test showed P = 0.001 meaning that there was the influence a collaborative governance and increased preparedness in the face of volcanic eruptions. In the collaborative governance model above, it has been divided into starting conditions, collaborative process, institutional design, facilitative leadership, and outcomes. Assessment indicators in the starting condition include power

imbalances in disaster risk management, resource imbalances in disaster risk management, knowledge imbalances in disaster risk management in the pre-disaster phase. While the assessment indicators in the collaborative process include direct face-to-face dialogue from each stakeholder involved, building trust between the parties involved, having a commitment to the process (motivation to be involved or participating), having a common understanding (shared understanding of what they can do), reach through collaboration that is carried out, and has the continued results of the collaboration process manifested in the form of tangible outputs or outputs. Aspects of Institutional Design assessment indicators include having basic procedures and rules in collaboration for procedural legal collaboration processes, having process transparency, inclusiveness of participants (having equality in participating in disaster risk management for volcanic eruptions), and Forum exclusivity (Having a desire to do management) risk of catastrophic volcanic eruptions). The indicators for the facilitative leadership aspect consist of 1. Leadership habits in empowering and involving stakeholders in volcanic eruption disaster risk management, 2. There is a discussion about program plans to be implemented in volcanic eruption disaster risk management.

Discussion

Collaborative Governance In Improving Preparedness For Volcanic Eruptions

Collaborative governance is a process in which various stakeholders are bound to carry out their respective interests to achieve common goals in risk management for volcanic eruptions. Based on the results of data analysis, it shows that the P value: 0.001 means that there is a influence between collaborative governance and preparedness for volcanic eruptions. Collaborative governance is very Important in increasing preparedness in dealing with volcanic eruptions. Collaborative Governance is an arrangement that regulates one or more public institutions directly involving non-state stakeholders in a formal, consensus-oriented, deliberation-oriented collective decision-making process and has the aim of formulating or implementing public policies or managing public programs or assets [20]. Collaborative governance is a process in which organizations that have an interest in a problem and try to find solutions that are determined together to achieve goals that they cannot achieve individually. Collaboration is a process in which related organizations have an interest in a problem and try to find solutions that are determined jointly to achieve goals that they cannot achieve individually [21]. Collaboration fosters a sense of interdependence and joint action by maintaining the autonomy of the collaborating parties. Unity In action eruptions in the form of :m Norma and values of mutuality, Information sharing, Joint planning, Joint problem solving [22]. The impact of volcanic eruptions can be reduced collectively by utilizing technology, knowledge, information, and human resources [23]. Disasters cause almost all life systems to change, this makes people think about how to

build resilience to disasters [24]. Collaborative governance is an arrangement that regulates one or more public institutions to engage directly with stakeholders in the decision-making process that aims to make or implement public policies or manage programs in disaster risk management [2]. Collaborative governance which includes starting conditions, collaborative process, institutional design, facilitative leadership, and outcomes is very important so that preparedness in the face of volcanic eruptions can be improved. Disaster risk management requires good organization [25]. At the local level , this kind of plan is more effective because it even ensures micro-level risk management [26]. Disaster mitigation plans are useful for increasing preparedness in dealing with disasters [27], [28]. Good collaboration can improve preparedness for volcanic eruption disasters. Process when all the related organizations have the same interest of an issue and try to solve the problem together to achieve the goals that cannot solved individually called collaboration [21]. Volcanic eruption disaster risk management activities are further enhanced so that preparedness for volcanic eruptions can be maximized. With good collaboration from the parties involved will be able to increase preparedness in risk management of volcanic eruptions.

Preparedness For A Volcanic Eruption

Based on the results of data collection, it was found that preparedness in disaster risk management of volcanic eruptions is in a ready condition but needs to be improved. The form of preparedness carried out is the formation and strengthening through outreach activities or training to parties involved in disaster risk management. Preparedness is carried out to ensure prompt and appropriate efforts in dealing with disaster events. Preparedness is important in disaster management because with good preparedness it will be easier to adapt to disasters. Preparedness in risk management for volcanic eruptions in the form of : 1. Preparation and testing of disaster emergency management plans 2. Organizing, installing, and testing early warning systems 3. Provision and preparation of supplies to fulfill basic needs 4. Organizing, counseling, training, and rehearsal on emergency response mechanisms 5. Preparation of evacuation sites 6. Compilation of accurate data, information, and updating of permanent procedures for disaster emergency response 7. Provision and preparation of materials, goods, and equipment to fulfill the recovery of infrastructure and facilities [29]. Preparedness include: 1. Developing an early warning system 2. Increasing the capacity of human resources both in managerial and technical terms 3. Empowering the community in health crisis management activities 4. forming an Emergency Medical Team (EMT), Team Rapid Health Assessment Team (RHAT), Public Health Rapid Response Team (PHRRT), and other health teams. Individual capacity development is an effort that can be made to improve or develop a better quality of personal characteristics [30]. Based on the results of the study, it was also found that there was support from the government in disaster risk management. There is a budget that is used for construction and an

early warning system. In addition, preparedness is also carried out through community empowerment which is carried out before a volcanic disaster occurs. Meanwhile, in several aspects of preparedness such as the provision and preparation of supplies to fulfill basic needs, preparation of incident locations, provision of materials/goods/equipment to fulfill the recovery of infrastructure and facilities, as well as team formation (such as emergency medical team, rapid health assessment team, rapid response team), public health, and other health teams) is still not carried out optimally in the pre-disaster phase. All aspects of preparedness in volcanic eruption disaster risk management need to be carried out optimally so that the impact can be reduced.

Conclusion

Based on the results of the study, the following conclusions can be drawn:

a. Collaborative governance in volcanic eruption disaster risk management is mostly good, collaboration has been carried out and the government provides support in the form of budgets for development activities and early warning systems, community empowerment, socialization and training.
b. Preparedness for disaster risk management of volcanic eruptions is in a ready condition but still needs to be improved.
c. Collaborative governance can improve preparedness for volcanic eruptions.

Ethical Considerations

Based on the results of the study, the following conclusions can be drawn:

a. Collaborative governance in volcanic eruption disaster risk management is mostly good, collaboration has been carried out and the government provides support in the form of budgets for development activities and early warning systems, community empowerment, socialization and training.
b. Preparedness for disaster risk management of volcanic eruptions is in a ready condition but still needs to be improved.
c. Collaborative governance can improve preparedness for volcanic eruptions.

Acknowledgments

Ethical issues (Including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc.) have been completely observed by the authors.

Conflict of interest

The author declare that no conflict of interest.

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