Exploring Community Perceptions and Practices in Landslide Risk Mitigation: A Sequential Exploratory Study

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Abstract

Indonesia faces major challenges in disaster management due to its location on the Pacific Ring of Fire, making it vulnerable to earthquakes, tsunamis and volcanic eruptions. This study aims to explore non-structural disaster mitigation elements. This study uses a descriptive exploratory approach. The study population included residents of Genilangit village, with a sample of 25 respondents for in-depth interviews and 30 people for Focus Group Discussions (FGD), taken through purposive sampling techniques. The research instruments included interview guidelines, recording tools and FGD guides while data were analyzed using content analysis techniques.

The results of the study indicate that although the community has a fairly high awareness of disaster risks, their knowledge and capacity in mitigation are still limited and varied. Community participation in mitigation efforts is more effective when carried out collectively, but is constrained by a lack of coordination and resources. The integration of local knowledge with formal approaches shows great potential to improve disaster resilience. The conclusion of the study emphasizes the importance of continuous education, coordination between institutions and policy support for local knowledge. It is recommended to strengthen education and training programs, to develop technology-based early warning systems and to ensure policies that support local knowledge to improve the resilience of Genilangit village to disasters.

Keywords: Community perception, mitigation practices, landslides, exploration studies, disaster mitigation.

Introduction

Indonesia is a country that is vulnerable to various natural disasters due to its geographical location in the equatorial region with two seasons and is located between the meeting of three major tectonic plates in the world[1,20]. This condition makes Indonesia vulnerable to earthquakes, volcanic eruptions, tsunamis, landslides, floods and droughts[1,17]. Indonesia's main problems in disaster management include low public awareness and understanding of disaster mitigation, lack of integration of local wisdom in disaster management efforts and limited resources and coordination between institutions in implementing effective mitigation programs[2,15].

Indonesia faces thousands of disasters every year, with more than 3,000 incidents recorded in 2022 including floods, landslides and tornadoes. The Indonesian Disaster Risk Index shows a high level of risk, especially in areas such as Aceh, Papua and West Java[3,12]. Data shows that Genilangit village in Poncol district often experiences landslides, with an increasing frequency during the rainy season[5,24]. This disaster not only causes material losses but also threatens the lives of local residents. Although most of the landslides are small in scale, their recurrent occurrences indicate that the region is highly vulnerable to disasters and effective mitigation efforts are urgently needed[5,17].

In disaster management, Indonesia has enacted Law of the Republic of Indonesia Number 24 of 2007 concerning Disaster Management, which emphasizes the importance of the involvement of all parties including the Government, private sector and communities in disaster mitigation efforts[6,20]. However, disaster management in Indonesia is often still reactive and less oriented towards long-term prevention[7,14,17]. In fact, to significantly reduce the impact of disasters, a more proactive and sustainable approach is needed including community-based disaster risk reduction[8,25].

Various efforts have been made to improve community preparedness, including through education and training[9,11]. One relevant global initiative is the Hyogo Framework for Action 2005-2015 which emphasizes the importance of integrating disaster risk reduction into development policies. However, at the local level, challenges remain in terms of effective implementation[11]. Therefore, this study aims to develop a more appropriate community preparedness model, especially in dealing with the threat of landslides in Poncol district, Magetan Regency, Indonesia.

Material and Methods

Study design: The design of this research study is qualitative descriptive by adopting in-depth interview and Focus Group Discussion (FGD) approaches[11,12] to explore and understand various aspects of non-structural disaster mitigation. Through in-depth interviews, the researcher will collect detailed information from key individuals regarding their experiences, views and practices related to disaster

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mitigation. Meanwhile, FGD will be used to explore group perspectives and to discuss challenges and potential solutions in implementing non-structural disaster mitigation at the community level.

Population, sample, sample size, sampling technique: The population that is the focus of this study, is the community of Genilangit village, Poncol district, Magetan Regency who live in disaster-prone areas. The sample of this study consisted of community members, community leaders, community groups, Destana forum, business groups, village government elements and related parties who have knowledge and experience in non-structural disaster mitigation. Sample selection was carried out using purposive sampling techniques[13,14], namely selecting individuals who are considered to have relevant information and experience in the research topic. The sample size for in-depth interviews was 25 respondents who will provide an in-depth perspective on disaster mitigation practices and challenges. 30 respondents for the focus group discussion (FGD) activity were divided into 5 groups, each consisting of 6 participants. The selection of FGD participants was carried out by considering the diversity of their backgrounds and roles in disaster mitigation efforts [15].

Data collection / Data used for this study: The data collection technique in this study was through in-depth interviews and focus group discussions (FGD) to obtain comprehensive information on non-structural disaster mitigation. In-depth interviews were conducted using semi-structured interview guidelines designed to explore individual views and experiences related to disaster mitigation efforts[16,20]. This technique was carried out to obtain detailed and contextual data from respondents selected purposively[17]. The FGD activity was carried out to discuss and to analyze group views on challenges and solutions in non-structural disaster mitigation. The instrument for the FGD was a discussion guideline that focused on key issues and open-ended questions that encouraged active participation from all group members[18]. This technique aims to produce broader and deeper insights into community dynamics in the context of disaster mitigation[20].

Data analysis: Qualitative data analysis from in-depth interviews and FGDs began with transcribing the data verbatim followed by open coding to identify important data units. Next, key themes were developed from the codes which were then analyzed thematically to identify patterns and relationships between themes. Verification of the results was done through data triangulation and member checking to ensure the validity of the findings[21]. Finally, the results of the analysis were compiled into a report presenting the findings, themes and recommendations related to non-structural disaster mitigation.

Ethical clearance: This study has obtained ethical approval from the Ethics Committee of the Health Polytechnic of the Ministry of Health of Surabaya, Indonesia with the number No. EA/2393/KEPK-Poltekkes_Sby/V/2024. This approval ensures that the research was conducted in accordance with applicable ethical standards.

Results and Discussion

Data hasil wawancara mendalam dan FGD: The results of this study present the main findings from in-depth interviews and focus group discussions (FGD) conducted in Genilangit village, Poncol, Magetan Regency. This study focuses on community understanding of disaster risk, capacity in mitigation and their participation in prevention efforts. Table 1 of in-depth interview transcription data in this study shows that public knowledge and awareness of disasters, especially in farming communities, are still relatively low. The public is generally aware of the threat of disasters, but the information they receive, is often incomplete and rarely updated. Awareness of specific risks such as landslides is also still limited, indicating that there is a gap in understanding deeper disaster risks.

Several sources stated that structural mitigation emphasizes the importance of more comprehensive and sustainable education at the community level to improve disaster preparedness [21].

In addition, community involvement in disaster mitigation programs also still needs to be improved. The Destana forum, as one of the initiators of mitigation programs at the local level, has carried out various education and training efforts, but public participation is still limited. Communities often feel less involved in the decision-making process related to disaster mitigation which results in low levels of involvement in existing programs. Several findings explain that increasing community participation in decision-making related to disaster mitigation can increase the effectiveness of mitigation programs[22].

Table 2 dealing with the results of verification and validation of in-depth interview transcription data shows differences between initial understanding and more detailed and specific verification results. For respondents from the farmer category, for example, there was a change from a statement indicating general ignorance about landslides to a clearer statement regarding the inability to prevent or handle the disaster. Something similar happened to respondents from the village government element, where the initial statement that only expressed ignorance about budget socialization, changed to an emphasis on specific obstacles in socialization to the community. This correction shows the importance of the verification and validation process in ensuring that the data obtained is not only accurate but also reflects a more appropriate understanding and context[23].

Verification and validation also played an important role in correcting the emphasis on aspects that may have been overlooked in the initial transcription.

Table 1
Transcription data from in-depth interviews

S.N.	Respondents	Theme	Non-Structural Disaster Mitigation Elements	Transcription Summary
1	General Public/Farmers	Knowledge and Awareness	General Knowledge about Disasters	*"We know there is a disaster, but the information we receive is often incomplete and rarely updated."*
2	General Public/Farmers	Knowledge and Awareness	Awareness of Risk	*"We were aware that disasters could happen, but we didn't really understand the specific risks like landslides."*
3	Destana Forum	Knowledge and Awareness	Information and Education	*"The Destana Forum regularly holds training and education, but the general public sometimes still lacks information."*
4	Destana Forum	Community Involvement and Participation	Participation in Mitigation Programs	*"We are active in mitigation programs and inviting residents to get involved, but participation is still limited."*
5	Destana Forum	Community Involvement and Participation	Involvement in Decision Making	*"We are involved in mitigation decisions and sharing information with the community."*
6	Village Government	Policy and Governance	Disaster Mitigation Policy	*"The policy already exists, but often its implementation is inconsistent in the field."*
7	Public figure	Policy and Governance	Governance and Coordination	*"Coordination between institutions is not optimal, sometimes there are policies that are not implemented properly."*
8	Public figure	Planning and Preparedness	Disaster Mitigation Planning	*"Planning already exists, but it needs to be updated and involve more parties."*
9	Community/Teacher	Planning and Preparedness	Preparedness and Training	*"Training is carried out, but it is not routine and requires more participation from the community."*
10	Community/Teacher	Knowledge and Awareness	Awareness of Risk	*"There is a basic understanding of the risks, but educational materials often lack depth."*
11	Business Representative	Knowledge and Awareness	Information and Education	*"We get mitigation information from the government, but the delivery is sometimes not on target."*
12	General Public/Farmers	Community Involvement and Participation	Participation in Mitigation Programs	*"We are rarely involved in mitigation programs, feeling we are not given the opportunity to participate."*
13	Destana Forum	Policy and Governance	Disaster Mitigation Policy	*"Mitigation policies already exist, but there are often obstacles in their implementation in the field."*
14	Village Government	Planning and Preparedness	Disaster Mitigation Planning	*"Planning is done periodically, but there is still a lot to improve."*
15	Public figure	Knowledge and Awareness	Awareness of Risk	*"Awareness at the community level is quite good, but there is a lack of practical information about mitigation."*
16	Destana Forum	Community Involvement and Participation	Involvement in Decision Making	*"The Destana Forum is active in mitigation decision-making, but the general public is less involved."*

17	Community/Teacher	Policy and Governance	Governance and Coordination	*"Coordination between schools and the government needs to be improved for effective mitigation."*
18	Village Government	Planning and Preparedness	Preparedness and Training	*"Preparedness training has been carried out, but it is not routine and needs to be increased."*
19	General Public/Farmers	Knowledge and Awareness	General Knowledge about Disasters	*"Knowledge about disasters exists, but not all people understand mitigation steps."*
20	Destana Forum	Community Involvement and Participation	Participation in Mitigation Programs	*"Participation in mitigation is quite good among the Destana Forum, but not evenly distributed in society."*
21	Public figure	Policy and Governance	Disaster Mitigation Policy	*"The policy exists, but it needs evaluation and updating to be more relevant to current conditions."*
22	Community/Teacher	Planning and Preparedness	Disaster Mitigation Planning	*"Mitigation planning needs to be given more attention, especially in involving the school community."*
23	General Public/Farmers	Community Involvement and Participation	Participation in Mitigation Programs	*"We don't feel involved enough in the mitigation program, we feel like there needs to be more encouragement."*
24	Destana Forum	Policy and Governance	Governance and Coordination	*"Disaster mitigation governance needs improvement to ensure policies are implemented effectively."*
25	Business Representative	Planning and Preparedness	Preparedness and Training	*"The existing preparedness training has not involved all business sectors optimally."*

Table 2
Results of verification and validation of transcription data interview deep

Respondent Category	**Original Data (Transcription Results)**	**Verification Results**	**Notes or Corrections**
Farmer	"We often hear about landslides, but don't know much about how to deal with them."	"We had heard about landslides, but didn't know how to prevent or deal with them."	Change the sentence to be clearer regarding the respondent's understanding.
Village Government Elements	"We have made a budget plan, but we don't know how to socialize it to the public."	"We have made a budget plan, but there are still obstacles in socializing it to the public."	Use more specific words related to the obstacles faced.
Desatana Forum Members	"The community needs to be more actively involved in preparedness activities, but they often don't care."	"The community should be more actively involved in preparedness activities, but their participation is still lacking."	Emphasizing that community involvement is still lacking, not because they don't care.
Public figure	"We teach children in schools about the importance of protecting the environment to prevent disasters."	"We educate children in schools about the importance of protecting the environment to prevent disasters."	Replacing the word 'teach' with 'educate' to make it more appropriate in the context of education.
MTS and SD teachers	"The school has conducted disaster simulations, but not all students have participated."	"The school has held disaster simulations, but student attendance in the simulations is still not optimal."	Explaining that the problem is a lack of student participation.
Business Representative	"We have an evacuation plan, but it has never been tested."	"We have an evacuation plan, but it has never been thoroughly tested."	Added information about trials that have not been performed.

For example, for members of the Desatana forum, the change from the phrase "don't care" to "lack of participation" provided a perspective that was more in line with the reality faced in the field. Likewise, the correction of community leaders who replaced the word "teaching" with "educating", provided a more appropriate nuance in the context of education and socialization. This verification process is very important to ensure that the interview results truly reflect the actual conditions and understanding, which will ultimately enrich the research analysis and conclusions[24].

In table 3 showing the results of the coding of themes and concepts, it was found that community knowledge and awareness of disaster risks still varied.

Table 3
Theme and Concept Coding Results

Main Themes/Categories	Sub-Theme/Code	Sub-Theme/Code Description	Excerpt from Transcript	Frequency of Occurrence	Additional Notes
Knowledge and Awareness	General knowledge	Respondents' understanding of disaster risk.	"Most people do not understand the dangers of landslides that could occur."	15	There was variation in the level of understanding among respondents.
Knowledge and Awareness	Risk Awareness	Respondents' awareness of the impact of disasters.	"We knew that landslides could happen, but we didn't know how serious the impact would be."	20	There is a need for further outreach programs.
Community Involvement and Participation	Active Participation	Level of active involvement in mitigation activities.	"Several community members were directly involved in creating the mitigation plan."	10	Participation tends to be high among Destana Forum members.
Community Involvement and Participation	Limited Involvement	Limited or no involvement.	"Many residents do not participate in mitigation activities due to lack of information."	8	Engagement still needs to be improved through training and information.
Policy and Governance	Disaster Policy	Existing policies related to disaster mitigation.	"Existing mitigation policies have not been fully implemented in the field."	12	Evaluation and adjustment of policies is needed for better implementation.
Policy and Governance	Local Governance	Governance structures and roles in mitigation.	"Local governance is quite good, but coordination between institutions needs to be improved."	14	Coordination between institutions is often not optimal.
Planning and Preparedness	Mitigation Planning	Existing plans for disaster mitigation.	"There are several mitigation plans in place, but they are often not updated."	18	Planning needs to be updated and implemented more frequently.
Planning and Preparedness	Community Preparedness	The level of community preparedness in facing disasters.	"Most communities are not prepared to deal with disasters effectively."	22	Preparedness must be enhanced through training and simulations.

Table 4
Data Analysis Results

Main Themes/Categories	Sub-Theme/Code	Identified Patterns	Relationship Between Codes	Key Insights	Additional Notes
Knowledge and Awareness	General knowledge	The level of knowledge varied between respondent groups.	Related to risk awareness; low knowledge is associated with low risk awareness.	Lack of basic understanding of disaster risks can affect preparedness.	Education programs need to target increasing basic understanding across all groups.
Knowledge and Awareness	Risk Awareness	Disaster risk awareness is often lacking in depth.	Related to community involvement; low awareness is often associated with limited participation.	Limited risk awareness hinders active participation in mitigation activities.	There is a need for more in-depth training and information about the impact of disasters.
Community Involvement and Participation	Active Participation	High participation in more organized groups (Destana Forum).	In relation to knowledge and awareness; groups with better understanding tend to be more active.	Active involvement is influenced by the level of knowledge and organization.	Developing strategies to increase engagement in less organized groups.
Community Involvement and Participation	Limited Involvement	Low engagement in under-informed communities .	Regarding policies and governance; ineffective policies can affect engagement.	Lack of information and ineffective policies lead to limited engagement.	Improve communication and policies that support community participation.
Policy and Governance	Disaster Policy	Policies are often not applied consistently.	Regarding mitigation planning; bad policies can affect the implementation of planning.	Inconsistent policy implementation hampers the effectiveness of mitigation.	Evaluation and improvement of policies to ensure consistent implementation.
Policy and Governance	Local Governance	Coordination between institutions is often not optimal.	In relation to planning and preparedness; poor coordination can affect the effectiveness of planning.	Poor coordination between agencies can reduce the effectiveness of planning and preparedness.	Improve inter-agency coordination mechanisms for better planning.
Planning and Preparedness	Community Preparedness	Community preparedness is often inadequate.	Related to knowledge and awareness; low preparedness is related to inadequate knowledge.	Poor preparedness is directly related to lack of knowledge and training.	Enhance training and simulation programs to improve preparedness.
Planning and Preparedness	Community Preparedness	Community preparedness is often inadequate.	Related to knowledge and awareness; low preparedness is related to inadequate knowledge.	Poor preparedness is directly related to lack of knowledge and training.	Enhance training and simulation programs to improve preparedness.

The sub-theme "General Knowledge" revealed that most people do not fully understand the dangers that may arise from landslides, as stated by one respondent, "Most people do not understand the dangers of landslides that can occur." The frequency of occurrence of this quote shows that although there is basic awareness of disaster risks, in-depth understanding is still limited, highlighting the need for further education programs that focus on disaster risk knowledge and awareness among the community[1,20].

In addition, community involvement and participation in disaster mitigation activities showed significant variations. The sub-theme "Active Participation" showed that some community members were actively involved in the mitigation process, especially those involved in the Destana forum.

However, there was also a sub-theme "Limited Involvement" which showed that community participation in mitigation activities was still limited, mostly due to lack of information. One respondent said, "Many residents do not participate in mitigation activities due to lack of information." This suggests that despite participation, further efforts are needed to increase community involvement through more effective dissemination of information and training[19,25].

Based on the results of the data analysis from in-depth interviews presented in table 4, it was found that community knowledge and awareness of disaster risks varied greatly across respondent groups. Low levels of knowledge often correlate with low risk awareness, which in turn affects the level of community preparedness. Inadequate basic knowledge of disaster risks results in a lack of preparedness in facing disasters, which emphasizes the importance of more targeted and comprehensive education programs to improve basic understanding in all community groups.

In addition, low awareness of disaster risks also impacts community participation in mitigation activities, indicating the need for more in-depth training and information to improve risk awareness at the community level[1].

Community involvement is also greatly influenced by their level of knowledge and awareness. Active participation is seen to be higher in more organized groups such as the Destana forum, indicating that active involvement is closely related to better levels of knowledge and organization. Conversely, limited involvement is found in less informed communities, which are influenced by less effective policies and governance.

This suggests that efforts to improve communication and strengthen policies that support community participation, are essential to increase community involvement in disaster mitigation activities. Evaluation and improvement of policies, as well as enhancement of inter-agency coordination mechanisms, are needed to ensure greater effectiveness of disaster planning and preparedness[12,26].

Data hasil FGD: The main findings of the FGD are the results of discussions from participants from the general public, members of the Desatana forum, village government elements, community leaders, elementary and MTS teachers and business representatives, the total number of participants being 30 people. The results obtained are then analyzed, then a report of the main findings is compiled, verified and then presented to interested parties.

The discussion of the main findings of the FGD reflected diverse perspectives from various elements of society, ranging from the general public, members of the Desatana forum, village government, community leaders, teachers, to business representatives. The discussion process involving 30 participants produced important findings that were then processed and reported. The analysis conducted led to the identification of various crucial issues such as inaccurate risk mapping, varying community knowledge about disasters and inconsistent application of local wisdom in disaster mitigation. The results of the FGD were then verified and presented to stakeholders including the village government and BPBD, to obtain feedback and to determine more targeted follow-up actions.

Table 5, summarizing the main findings of the FGD and feedback provided by stakeholders, shows an urgent need to improve the risk mapping system, to increase community knowledge through training and to integrate local wisdom more consistently into disaster mitigation practices[2,27]. Proposed follow-up recommendations include the preparation of a re-mapping plan, the development of educational programs tailored to the level of community knowledge and strengthening law enforcement related to disasters. With these steps, it is hoped that the capacity of communities and the environment to deal with disasters can be significantly increased,[25,28].

Conclusion

The conclusion of the research results identified that although community awareness of disaster risks is quite high, knowledge and capacity for mitigation are still limited. Community participation is more effective when carried out collectively, but lack of coordination and resources are major obstacles. Mitigation strategies based on local knowledge show good potential, but require ongoing policy and education support.

It is recommended to improve community education and training programs, to strengthen coordination between institutions, to develop early warning systems based on local technology and to ensure policies that support local knowledge. These steps are expected to increase the resilience of Genilangit village to disasters.

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Table 5
Findings Main FGD and presentation to party concerned

Main Themes/Categories	Summary of Findings	Stakeholder Feedback	Suggested Follow-up Actions
Identification and Mapping	Risk mapping is inaccurate and out of date.	The village government requested more detailed and integrated mapping.	1. Prepare a remapping plan with more accurate data. 2. Ensure regular data updates.
Community Knowledge and Capacity	Disaster knowledge varies; some groups lack understanding.	The Destana Forum recommends further training for the community.	1. Develop educational programs tailored to the level of knowledge. 2. Conduct training for the community.
Mitigation Based on Local Wisdom	Local wisdom is applied in various ways; not yet consistent.	Community leaders emphasized the importance of integrating local wisdom in mitigation.	1. Integrate local wisdom consistently. 2. Conduct training for the application of local wisdom.
Discipline and Law Enforcement	Disaster law enforcement is inconsistent; some rules are not implemented well.	BPBD asks for a clearer and more structured law enforcement system.	1. Develop a clearer law enforcement mechanism. 2. Improve training for law enforcement and the community.
Environmental Balance and Space Utilization	Space use often ignores disaster risks; development does not take the environment into account.	Business groups support policies that balance development and conservation.	1. Develop space use policies that take disaster risks into account. 2. Monitor and assess the impact of development.
Environmental Carrying Capacity and Capacity	Environmental capacity is inadequate to support disaster mitigation.	BPBD and Destana Forum request improved management of natural resources.	1. Implement better natural resource management programs. 2. Increase conservation and restoration efforts.
Community Concern	Concern varies; some groups are less concerned about disasters.	Community leaders and business groups suggested broader awareness campaigns.	1. Hold a wider awareness campaign. 2. Provide incentives for active community participation.
Monitoring in Landslide-Prone Residential Areas	The landslide monitoring system is ineffective and poorly integrated.	The village government asked for improved monitoring technology.	1. Improve landslide monitoring technology and methods. 2. Integrate monitoring systems with other risk data.
Mitigation Planning and Budgeting	Planning and budgeting are not always adequate for mitigation needs.	BPBD and village governments asked for a more adequate budget allocation.	1. Prepare a mitigation plan that is integrated with budgeting. 2. Allocate special funds for mitigation.
School Community Disaster Education	Disaster education in schools is inconsistent; the curriculum is not well integrated.	The school community proposed a uniform disaster curriculum across all schools.	1. Develop a uniform disaster curriculum. 2. Conduct training for teachers and evaluation of disaster education programs.

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