

## Conference

# Community-Based Disaster Mitigation: Knowledge and Social Capital in Reducing the Impact of Disaster

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**Abstract.** The National Disaster Management Agency reported that 383 out of 514 districts/municipalities throughout Indonesia are prone to natural disasters. Social capital is seen as one of the community strengths in disaster mitigation strategies. This study examined the model of community-based disaster mitigation, the level of knowledge and the social capital of the communities in disaster-prone areas in Semarang Municipality and Situbondo District. This study employed a mixed-methods approach, interviewing 120 respondents. We found that men had better knowledge of disaster mitigation than women. The involvement of men in awareness-raising about disaster mitigation activities was also higher than women. As a result, women are more vulnerable during a disaster. This study also found a variation in community understanding regarding disaster mitigation and social capital in the two locations. Respondents in Semarang, which is an urban community, reported a lower level of knowledge on disaster mitigation and social capital. Respondents from Situbondo reported higher social capital in four dimensions, including trust, norms, values, and networks. The geographical location and culture likely explain the variation. This reflects that urban areas are more vulnerable than rural areas in disaster mitigation.

**Keywords:** community knowledge, disaster, mitigation, social capital

## 1. Introduction

Indonesia is one of the countries in Southeast Asia which is famous for its islands and active volcanic rings. This active mountain ring causes Indonesia to often experience disasters such as earthquakes, volcanic eruptions, liquefaction and tsunamis. In addition, Indonesia, which has two dry and rainy seasons, causes frequent floods, landslides and hurricanes. If it is the rainy season, some areas will experience landslides, floods and cyclones, while in the dry season there will be drought and crop failure due to plants not getting water supply. Therefore, it is not surprising that Indonesia is called a disaster-prone country. Not only natural disasters that are purely natural phenomena, Indonesia also often experiences disasters caused by people's actions that do not heed natural

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laws such as illegal logging or littering, so that it causes flash floods when the rainy season arrives.

In 2020 the National Disaster Management Agency (Badan Nasional Penanggulangan Bencana/BNPB) noted that there had been 2,925 disasters, with details of hydrometeorological disaster data, namely 1,065 floods. Then the disasters caused by hurricanes were 873 and landslides were 572. Furthermore, there were 326 forest and land fires, 36 tidal waves and abrasion and 29 droughts (1). In Indonesia, disaster management is more often carried out when a disaster occurs (as a disaster response) and after a disaster (post-disaster), while in the pre-disaster stage (as disaster mitigation) there is still very little attention from the competent party (2). In disaster management, disaster mitigation plays an important role in reducing the impact of disasters such as material and non-material losses.

Communities need to be involved in disaster mitigation either before a disaster, during a disaster or after a disaster occurs because they are the ones who experience it and suffer from the impact of the disaster. In the order of community life, there are various kinds of social capital that can be applied in disaster mitigation so that the community is able to play an active role and participate in assisting the government in reducing the impact of disasters. The government can develop community awareness and preparedness in dealing with disasters through the empowerment of social capital (social wisdom) which aims to reduce disaster risk.

Putnam defines social capital as a social institution that involves social networks, norms, and social trust that encourage social collaboration for common interests which then makes it different from other capitals (3). In disaster mitigation involving various groups, of course, it is necessary to have good togetherness and cooperation from all community members who have an interest in overcoming these problems (4). Coleman explained that social capital can be identified from obligations and expectations that depend on trust in the social environment, the ability to communicate in a social structure and norms that are accompanied by sanctions (5). Then Lin tied social capital into a network of relationships, he defined it as a resource that is embedded in a person's social network, a resource that can be accessed or mobilized through ties within the network (6). Aspects in social capital include trust, social norms, social networks, values, beliefs and regulations. This underlies the need to study how community-based disaster mitigation forms are viewed from the knowledge and social capital of the community.

There are several previous studies that discuss knowledge and disaster mitigation in the community, including research by Hariadi, et al which reveals the facts in their research field that the community is able to develop a knowledge to understand the

performance of nature and then follow it and try to avoid what can threaten their own safety (7). Research by Evendi, et al which discusses the social capital of Maringkik Island in the face of disasters that the norms carried out by the community are able to reduce abrasion, such as if you build a house, it is better to buy sand from outside than to mine sand near the beach (8). Research conducted by Gadeng, et al in Aceh on the influence of local wisdom in the Simeuleu community has proven successful in reducing the number of victims from the Smong or Tsunami. This local wisdom has existed since 1907 which have been introduced from generation to generation from children to old people in the form of mananga-nanga (a lullaby), nandong (humming), manafi-nafi (folklore). That local wisdom is socialized through board information and written on the box Small Medium Enterprise (Usaha Kecil Menengah/UKM) products which consumed by Simeuleu community (9). Then research outside Indonesia conducted by Aldrich, et al reveals the fact that the government often focuses on improving building infrastructure to reduce the impact of disasters when in fact what is most needed is social capital in the community, namely social cohesion by increasing trust between communities. Therefore, their research results provides recommendations to the government so that in addition to focusing on improving building infrastructure, the government must also pay attention to social infrastructure (10).

The novelty of this research is that there is no research that discusses disaster mitigation based on knowledge and social capital in the community to reduce the impact of disasters and also there is no research comparing the differences of how community use their social capital for disaster mitigation between urban areas and rural areas in disaster mitigation. This study aims to determine the form of community-based disaster mitigation in terms of community knowledge and social capital.

## 2. Methods

This study used a descriptive qualitative and quantitative approach. The research was conducted in two areas, namely Situbondo Regency and Semarang City. The two locations were selected based on their vulnerability and history of disaster. Situbondo Regency has the potential for landslides, floods and hurricanes, while Semarang City is prone to flooding (National Disaster Management Agency, 2013). This study involved 120 respondents consisting of 60 respondents in each location. The respondents were interviewed using a semi-structured questionnaire. The respondents consisted of 66 men and 54 women, as many as 74 respondents aged between 20 to 39 years, 37 respondents aged 40 to 59 years and 9 respondents aged over 60 years. A total of

36 respondents had Diploma/Bachelor education, 48 respondents had high school education/equivalent, 7 respondents had junior high school education/equivalent, 25 respondents had primary education/equivalent and 4 respondents did not finish elementary school and did not even go to school. A total of 85 respondents were married, 29 respondents were not married and 6 respondents were divorced. The research data consisted of knowledge about natural disaster mitigation and the role of social capital in natural disaster mitigation in terms of trusts, beliefs, norms, values, rules and social networks. The collected data and information were then analyzed descriptively to answer the research objectives without testing the hypothesis. Research credibility was fulfilled by triangulation of research sources, namely from field findings, expert opinions and literature studies. The T-test was employed to examine the score of social capital by sex and location. The T-test is commonly used to test the difference between the mean of two groups (sex and location).

### 3. Results and Discussion

#### 3.1. Knowledge of disasters

Knowledge of disasters is the main factor and is the key to understanding disaster mitigation which allows the community to have preparedness in dealing with disasters. The knowledge possessed can influence the attitude and concern of the community to be ready and alert in disaster mitigation. Community knowledge about disaster mitigation was analyzed from respondents' knowledge about disaster mitigation, namely respondents participated in counseling and socialization about disaster mitigation, then respondents knew there were early warning signs in the event of a disaster, knew the location of the evacuation route and the location of the assembly point in the event of a disaster. Furthermore, knowledge about disaster mitigation was also reviewed from the involvement of the government, the business world and the community in an effort to reduce risks and victims due to disasters, for example, the community prepares survival supplies in case a disaster occurs at any time. Table 1 shows community knowledge of disaster mitigation by gender and research location.

Table 1 describes the knowledge of disaster-prone communities about disaster mitigation based on gender and research location. From the data, it is read that the male gender knows more about disaster mitigation than the female gender. The percentage of men who know about disaster mitigation is significantly higher than women (97% and 83.3%). The involvement of men in counseling or socialization about disasters is also

TABLE 1: Public Knowledge of Disaster Mitigation By Gender and Location

No	Knowledge Details	Male	Female	P-Value	Semarang	Situbondo	P-Value
1	People know about disaster mitigation	97.0	83.3	0.01	93.3	88.3	0.34
2	There are regulations regarding disaster mitigation	84.9	75.9	0.22	66.7	95.0	0.00
3	Community participates in counselling / socialization	86.4	74.1	0.09	80.0	81.7	0.82
4	There is a disaster preparedness group/disaster-resilient village	81.8	88.9	0.28	75.0	95.0	0.00
5	Realize that the place where they live in is prone to disasters	81.8	87.0	0.44	70.0	98.3	0.00
6	There are early warning signs when a disaster occurs	65.2	57.4	0.39	53.3	70.0	0.06
7	Know the evacuation route	72.7	72.2	0.95	75.0	70.0	0.54
8	Know the location of the assembly point in the event of a disaster	86.36	83.33	0.64	78.3	91.67	0.04
9	Prepare survival supplies in case a disaster occurs	77.27	62.96	0.08	76.67	65	0.16

Source: research team results

higher than that of women (86.4% and 74.1%). Men who reported that they prepared survival supplies in the face of disasters were also higher than women. In addition, men are more aware of early warning signs when a disaster occurs than women. These two things illustrate that women in these two research locations are more vulnerable when a disaster occurs.

There were differences in community understanding regarding disaster mitigation and social capital in the two locations. This difference was related to the geographical location related to the culture of the community. Respondents in the city of Semarang who were characterized by urban communities reported that the level of knowledge and social capital was lower when compared to that of rural areas in Situbondo Regency. Judging from the level of knowledge of disaster mitigation in Situbondo Regency, 95 percent of respondents reported that there were regulations on disaster mitigation, 95 percent reported that disaster preparedness groups and disaster-resilient villages had been formed, 98.3 percent of respondents knew that their homes were in disaster-prone areas and 91 percent of respondents knew the assembly point in the event of a disaster. While in Semarang City, 66.7 percent of respondents reported that there were

TABLE 2: Average Social Capital Score by Gender

No	Dimensions	Gender	
		Male	Female
1	Trust	23.6	23.6
2	Belief	12.5**	13.2**
3	Norm	10.2	10.4
4	Value	13.8	14.2
5	Rule	19.8**	20.8**
6	Network	24.0	25.1

Note: significance level \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

Source: research team results

regulations on disaster mitigation, 53.3 percent of respondents stated that there were early warning signs in the event of a disaster.

### 3.2. Social Capital as the Basis of Community-Based Disaster Mitigation Model

Regarding social capital, table 2 explains the variation of social capital by gender and research location.

Table 2 illustrates that male respondents have a lower level of social capital when compared to female respondents. Female respondents have a better understanding of social capital to reduce disaster risk that occurs in the community. It reflects those female respondents better understand that social capital is a tool to reduce disaster risk in the community. The community cooperates and cares for each other who is experiencing a disaster. This condition is reinforced by the results of the average score of social capital from each dimension. The dimension of social capital in the form of belief shows that women have more confidence than men and the results are significant. Respondents believe that disasters can be overcome. Likewise, the dimension of social capital in the form of rules shows that women obey the rules more than men and the results are significant. The community obeys the rules issued by the central or local government, including paying attention to the evacuation route during a disaster. If people do not comply with the regulations made by the government, they will get sanctions.

The dimension of social capital in the form of values also affects risk or reduces a disaster's impact. The community still has a concern, solidarity, mutual respect and a sense of responsibility to help others affected by disasters (11). This attitude should be owned by every human being. Based on table 2, the values dimension is stronger among female respondents than male respondents. Networks such as government or

TABLE 3: Average Social Capital Score by Research Location

No	Dimensions	Location	
		Semarang	Situbondo
1	Trust	23.1**	24.2**
2	Belief	12.6	13.0
3	Norm	9.8***	10.8***
4	Value	13.5***	14.5***
5	Rule	20.0	20.3
6	Network	23.7***	25.2***

Note: significance level \*\*\* p<0.01, \*\* p<0.05, \*, p<0.1

Source: research team results

non-government are an essential element of social capital in disaster risk management. The support from companies, village alerts, or disaster-resilient villages is also a vital element of social capital used for disaster risk reduction. Female respondents have a better understanding of a network as a vital element of social capital. The community, especially women, pays more attention to these networks, which are intended to reduce disaster risk. Meanwhile, the dimension of social capital in the form of trust between men and women has the same average score. This means that respondents have the same level of confidence that the government will help and provide the necessities of life for disaster victims.

Table 3 illustrates that respondents in Semarang City who are characterized by urban communities reported that the mean score of social capital is lower than rural areas in Situbondo Regency. Compared to urban communities, the influence of culture on the social capital of rural communities is more substantial. It indicates that urban areas become more vulnerable when a disaster occurs because social capital is lower than rural areas—instilling the concept of social capital based on local wisdom to every community as a form of public education in disaster mitigation.

The dimension of social capital has a significant influence on disaster mitigation in the city of Semarang. Semarang City is the centre of activity in Central Java Province. Semarang City in the north is a coastal area that is often affected by sea-level rise. The main impact caused by sea-level rise is tidal flooding. The people of Semarang City are a plural society that comes from various areas that are full of the hustle and bustle and cannot be separated from the threat of disasters, such as floods, earthquakes, landslides that require mitigation efforts.

The level of community preparedness in disaster mitigation and facing the dangers of floods, landslides seen from the level of confidence is very significant 23.1. This means that the community has a level of trust in the government, namely institutions that handle

disasters such as the National Disaster Relief Agency (BPBD), the Indonesian Red Cross (PMI), and other related agencies. Communities are instilled to be friendly with disasters.

The mean score of the beliefs dimension of social capital in the Semarang City was 12.6, which is less significant. The community is involved in efforts to reduce disaster risk. The community knows better about the condition of their area and has a variety of local wisdom, which is believed to be an effort to anticipate disasters. Based on these assumptions, it is expected that the community will be able to carry out a risk management and predict or interpret treatment patterns based on needs, determine goals, implement, monitor, and evaluate based on their own experience based on the uniqueness of their area. They have confidence and have the ability to deal with disasters. However, this legacy is not well documented, so that over time the adaptability will disappear by itself. This condition results when a disaster occurs, the community becomes stuttered. It is in a bad situation, namely as victims who lose the ability to survive and adapt to face disasters.

Knowledge about disasters related to norms in Semarang City is very significant, with an average score of 9.8, meaning that knowledge is very important to increase community capacity in dealing with a disaster. The norms of community life related to disaster mitigation are considered a fundamental element. Still, they have a strong influence in determining a person's behaviour in dealing with disasters. Community mitigation training with the Disaster Standby Tarunas (TAGANA) as an effort to introduce disaster situations to be ready to face disasters (12). Disasters come from nature and as a result of the actions of a group of people who are not aware of protecting the environment. Therefore, the government is trying to make people aware of behaving in protecting the environment. Efforts made by the government by implementing environmental education in the form of programs in applying human behaviour to nature is aimed to protect and preserve the existence of nature so that life is sustainable (13). The community realizes that a clean, safe, and smooth environment is a comfortable place to live. Communities in reducing the threat of flood disasters can be done by planting mangrove forests to withstand the big waves.

The value of the people of Semarang City in reducing the impact of disasters is very significant, with a mean score of 13.5. It can be seen from the value of community solidarity and responsibility to reduce the impact of disasters. When a disaster occurs, many parties pay attention and lend a hand to provide moral and material assistance. These various aids are a value of social solidarity, so they must be appropriately managed so that any incoming aid can be effective, targeted and beneficial (14).

Another dimension of social capital is the rules in disaster mitigation. The mean score of the rule dimension in Semarang City is 20.0, which is less significant because people still do not understand the regulations on the disaster. Regulations are still not socialized to the public, such as the Regional Disaster Management Agency of Semarang City, which has the task of assisting the Mayor in implementing regional autonomy in the field of disaster management as regulated in the Regional Regulation of the City of Semarang Number 12 of 2010 concerning the establishment of the Structure and Work Procedure of the National Disaster Relief Agency (Badan Penanggulangan Bencana Daerah/BPBD) of the City of Semarang and the Perwal of the City of Semarang. Number 39 of 2010 concerning the Elaboration of the Main Duties and Functions of the Semarang City BPBD (15). It is likely to cause people not to understand the rules related to disasters.

The mean score of the network dimension of social capital is 23.7, conducted through various ways carried out by the community to deal with disasters through several community networks, various activities to be safe and be able to meet future needs in various elements of life. Each region or region is undoubtedly different in these efforts because it depends on the locality of the region or region so that the ability of the local community that has existed for generations is called local wisdom (16). If carried out before a disaster occurs by recognizing potential threats and disaster vulnerabilities followed by disaster preparedness at the community level, disaster risk reduction efforts through community networks will play a significant role in reducing victims and other risks when a disaster occurs. The community from various elements is needed because the community is both an actor and a sufferer when a disaster occurs.

Table 3 shows that social capital's dimension still has a significant influence on disaster mitigation in Situbondo Regency by looking at the table above that the percentage scores of the six social dimensions are high. People in Situbondo district, namely respondents from Sumbermalang District, are characterized by local residents and live in rural areas and away from the hustle and bustle of urban areas. The distance from the village to the city that far away makes concern for one another still high. The location of this research is in the mountains, and difficult vehicle access to government offices is also a consideration and reason for the community to maintain social relations. This is based on their experience when a disaster hits them, the first people who will help them are the local community. The six dimensions of social capital: trust, belief, norms, values, rules, and networks in the Situbondo community are higher than Semarang City, which can be seen through the table because urban communities characterize the people in Semarang City.

The dimension of trust in the Situbondo community is high by looking at the score index reaching 24.2, and it should be understood that trust, in this case, is the trust that exists between the community and the community, the community towards the local government and the business world. This public trust arises because the government is always responsive when a disaster occurs. This can be seen from the existence of evacuation places and gathering points when a disaster occurs, the availability of material and non-material assistance that is right on target. The Social Service, the Indonesian Red Cross (PMI), the Health Service, the Disaster Standby Tarunas (Taruna Siaga Bencana/TAGANA) and the Disaster Preparedness Group (Kampung Siaga Bencana/KSB) are parts of the government that are very alert when a disaster occurs. In addition, trust in other communities can be seen from their recognition that when a disaster occurs, they dare to leave their belongings to their neighbours' houses who are not affected, and the surrounding community also works together to repair the houses of people affected by disasters such as hurricanes.

The second dimension, namely belief, is still influential in Situbondo with a significance of 13.0. Respondents who live in mountainous areas have several beliefs about natural signs that are still applied today. They believe that if the rooster crows in the middle of the night, it is a sign that there will be a hurricane or landslide that day. In addition, they also believe that if the sky is cloudy and the clouds gather and blacken, the community will immediately go to the gathering point, namely the village hall, following the road markings that are already available. People's belief based on this experience is not strange because it is quoted from Kompas.com that the clouds are layered, and blackened is one of the signs of a hurricane (17). The local community still carries out social capital in the dimension of this belief, and according to them, this belief has a good impact on each of them.

Norms are also still adhered to in Situbondo Regency. The community understands that children, pregnant women, disabilities and the elderly are part of the community that must be prioritized in terms of evacuation during a disaster. Another form of the community's norm of life is doing offerings and praying together when the planting and harvesting seasons arrive. When entering the planting season, the community will perform offerings and recite the Quran to pray that what they plant will be successful and the community will be protected from all harm. As for the harvest season will also hold offerings, eating together and reciting Quran as thanksgiving for their agricultural produce. This activity comes purely from community collaboration by collecting funds from each resident because these activities are also to be enjoyed together. The

principle that evacuation routes are an essential part of disaster mitigation also motivates people to take good care of them, so it is not surprising that the significance is 10.8.

Moreover, the dimension of value is also found in the Situbondo community such as the value of solidarity and responsibility. The mean score of the dimension of values is 14.5. People understand that they can not live alone and would need help from other people. This solidarity can be seen in the way the community responds when a disaster occurs, the residents will immediately move to help the residents affected by the disaster; for example, when a hurricane destroys a resident's house, they will also move to help repair the house and evacuate their belongings during the renovation. The value of responsibility can also be seen in the way people take care of their environment in order to maintain it and understand their rights and responsibilities if they require them to evacuate during a disaster.

Rules as part of the social dimension in Situbondo Regency are still significant with a value of 20.5. There is a Tlogosari Village Head Decree Number 188/04/431/515.9.4/2020 concerning establishing a Disaster Risk Reduction Forum (FPRB) at the Tlogosari Village Level, Sumbermalang District, Situbondo Regency. Then, Tlogosari Village Head Decree Number: 188/05/431.515.9.4/2020 concerning the Formation of a Disaster Resilient Village Volunteer Team in Tlogosari Village, Sumbermalang District, Situbondo Regency. In the decision, a chairperson and members were formed as a team of volunteers in disaster impact reduction from members of KSB and TAGANA. In addition to the decision, there is also the Tlogosari village regulation Number 03 of 2020 concerning the Permanent Procedures for Disaster Management in Tlogosari Village, Sumbermalang District, Situbondo Regency. Its chairman, along with other administrators, socializes this regulation. The community is also involved in making village regulations with the aim that the community understands and does it in their daily life. This decree contains regulations that should be implemented both pre-disaster, during the disaster and after a disaster. In addition, there is also the decision of the Regent of Situbondo Number: 188/342/P/004.2/2018 regarding the KSB "Argopuro" Sumbermalang District, Situbondo Regency. This decision resulted in the names of disaster-resilient village volunteer teams in the village who were expected to participate in disaster impact reduction. Involving the community in disaster mitigation efforts such as being the chairperson and members of KSB or DESTANA, then making regulations and disaster mitigation exercises is a very positive thing that can make the Situbondo community in this case, the Tlogosari and Argopuro villages proof that Situbondo district is a disaster-resilient area.

The network in the dimension of social capital in Situbondo Regency is the public's belief and understanding of the significant role of the central government to the regions, the business world and stakeholders in disaster mitigation efforts. The network that exists in this district is considered good with a significance of 25.2. According to local people, the assistance and information they get from the centre are fast even though they are far from the city centre. In addition, the existence of the Disaster Preparedness Village Group (KSB) and the Disaster Resilient Village Group (Desa Tangguh Bencana/DESTANA) also had a positive impact on the community because they were the closest and most responsive when a disaster occurred before assistance from the regional or central government arrived. This well-established network has made the Situbondo area a ready area in the event of a disaster. The social capital in the community is still very strong and has been implemented until now. Local institutions are generally more effective in strengthening collective agreements and cooperative actions when assets are distributed relatively fairly and profits are shared equally (18). This aspect of the network in social capital works well in the community in line with Rusy and Fathy's opinion that local institutions are relatively more fair and equitable in distributing everything, such as KSB and DESTANA who are more active in helping when a disaster occurs and are involved in the distribution of aid when a disaster occurs. It's no wonder that the Situbondo Regency is much better at disaster mitigation than the City of Semarang.

#### 4. Conclusion

This paper aims to obtain insight into the model of community-based disaster mitigation, the level of knowledge, and the social capital of the community in disaster-prone areas in Semarang Municipality and Situbondo District. This study found a variety of knowledge and level of social capital by sex and location. Male respondents reported better knowledge of disaster mitigation than women. The involvement of men in awareness-raising disaster mitigation activities is also higher than women. Male respondents also reported having a higher percentage of preparing survival supplies if a disaster occurs than female respondents. As a result, women are more vulnerable during a disaster.

This study also found a variation of community understanding of disaster mitigation and social capital between urban areas in Semarang Municipality and rural areas in Situbondo District. Respondents from urban Semarang reported a lower level of knowledge on disaster mitigation than rural areas in Situbondo. The percentage of respondents who reported existing in a disaster preparedness group is significantly

higher in Situbondo than Semarang. Moreover, the percentage of respondents who realized that their neighbourhood is prone to disaster is significantly higher in Situbondo than in Semarang.

In addition to communities understanding, respondents from Situbondo reported having higher social capital in four dimensions of social capital, including trust, norms, values, and networks. The geographical areas and culture are likely to cause the variation as rural communities are more likely to have stronger social cohesion and social engagement than people in urban areas.

## 5. Recommendations

The government should pay more attention to social capital before making regulations related to disaster mitigation and adopting a community-based disaster mitigation model by applying social capital to reduce the impact of disasters. To Revive the local wisdom related to disaster mitigation in each region because each region has different local wisdom. The government needs to do more socialization related to disaster mitigation by considering the minimum level of public knowledge related to disaster mitigation. Increase the number of KSB (Kampung Siaga Bencana) and DESTANA (Desa Tangguh Bencana) because better socialization can be carried out by their administrators.

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