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# Strengthening Social Systems and Social Structure in Facing Disaster Threats in Palu City Indonesia

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## Abstract

Disasters are not only caused by environmental vulnerability but also social system and social structure problems. Anticipating this requires strengthening the social system and social structure. This study aims to analyze (1) social capital strengthening to face disaster threats. (2) strengthening the role of family social institutions to face disaster threats. (3) a model of strengthening the social system and social structure to face disaster threats.

This research used Explanatory-Sequential Transformative design. Data collection used observation, in-depth interviews, surveys, and literature studies. The sample was 149 people. The results showed that (1) social capital strengthening occurred through mangrove planting, reforestation, disaster counseling, and awareness of disaster sites. (2) strengthening family social institutions through knowledge of monitoring systems, early warning systems, and signs and equipment, knowing evacuation routes, and safety of self and others. (3) The model of social capital and social structure to strengthen the face of disaster threats is togetherness and cooperation based on the need for security and safety of residents. The research conclusions are (1) social capital such as togetherness, cooperation, reciprocity, and mutual trust are very urgent to unite communities exposed to disasters. (2) Strengthening family institutions took place through awareness of disaster knowledge. (3) social capital follows the priority of needs with which social capital operates.

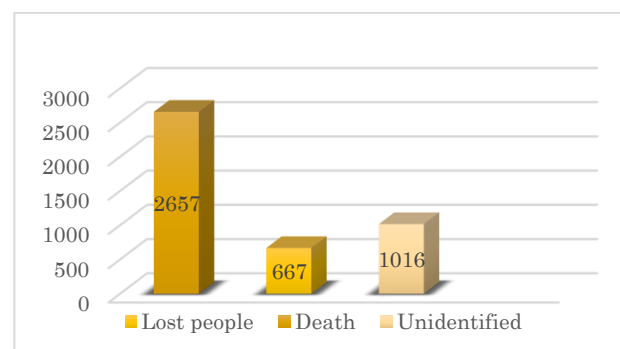
**Keywords:** social capital, social system, social structure, family institution, disaster risk and threat.

## Introduction

Every disaster that occurs always causes disaster risk in the form of casualties, and material and non-material losses. The size of the disaster risk is influenced by the level of physical vulnerability, environmental vulnerability, and social vulnerability of the

community. Vulnerability is understood as a condition of a community or society that causes the inability to deal with disasters. Vulnerability affects the high or low level of risk of a disaster. The higher the level of vulnerability, the greater the risk of disaster. Physical vulnerability is a component of vulnerability in the form of physical objects that can be lost or damaged when exposed to threats. This component is a physical object that is considered to have value. Environmental vulnerability is defined as a function of environmental exposure, sensitivity, and adaptive capacity. Social vulnerability includes social, economic, political, and institutional factors. Social vulnerability factors include human capital, community development, public infrastructure, and community-owned resources.

The disaster that occurred in Palu City in 2018 was categorized as a natural disaster that occurred simultaneously, namely the Earthquake, Tsunami, and Liquefaction or soil that moved due to the influence of the earthquake. The National Board for Disaster Management (BNPB) of Indonesia reported that the death toll was spread across Palu City as many as 2,141 people, Sigi Regency 289 people, Donggala Regency 212 people and Parigi Moutong Regency 15 people or a total of 2,657 people. In addition, there are 667 missing victims, and 1,016 unidentified victims, making the total death toll 4,340 people as illustrated in Figure 1.



**Fig 1: Dead, missing, and unidentified victims**  
Source: Palu disaster victims<sup>29</sup>

This is a very large number and shows that the community was very unprepared for and anticipated the disaster and its risks. The event was sudden, the community's infrastructure was unprepared, and the

area of Palu City was very open and facing the sea. However, one thing that was missing from the social analysis was the vulnerability of the social system and the vulnerability of the social structure. Social system vulnerability includes the vulnerability of the community's social capital and social structure vulnerability, namely family vulnerability, which includes a lack of insight or knowledge about the disaster. The vulnerability is caused by the fact that the people of Palu City are transitioning to a metropolitan society. Transition communities generally experience looseness of social systems and social structures. Theoretically, the vulnerability of the social system and structure of the Palu community can result in social disharmony because the social system is unbalanced or disrupted.

So far, existing studies have not responded to the social aspects of disasters, namely social systems and social structures. Existing studies do not respond to the role of social systems and social structures in strengthening community resilience to disasters. Three trends from existing studies can be mapped. Firstly, studies that emphasize the natural causes of disasters. The main causes of natural disasters are tectonic shifts, lunar activity, earthquakes, soil erosion, air pressure, ocean currents, pollution, global warming, seismic waves, climate change, and so on. Secondly, studies that tend to analyze human actions or deeds as causes. Human activities can contribute to the occurrence and severity of natural disasters, such as landslides, deforestation, hurricanes, and forest fires. For example, activities such as agricultural practices, mining, and deforestation, can increase the likelihood and impact of these events. Third, studies that tend to map demographic aspects as triggering factors such as urbanization. Urbanization leads to land conversion for housing development. Housing development results in a lack of land for water catchment areas and leads to flooding.

The purpose of this paper complement the shortcomings of existing research that does not analyze social systems and social structures as factors that contribute indirectly to the occurrence of natural disasters. Community social systems such as human social capital are essential in human interaction and social structures such as family institutions need to be strengthened in carrying out their role in facing disasters or even before disasters occur. In line with that, three questions can be asked as follows: (1) how to strengthen the social capital of the Palu community as a determinant of facing disaster threats? (2) how to strengthen the family as a determinant of facing disaster threats? (3) how to model social capital and social structure to face disaster threats. The answers to these questions can provide a fundamental understanding as a basis for policy formulation regarding community programs that can strengthen the social system and social structure of the community to face disasters. This research is based on the argument

that the occurrence of disasters is not only caused by the natural environment but also by social aspects of society, namely social systems and social structures. If both are strong, the risk of disaster can be reduced and if vulnerable, the risk of disaster is likely to be very large and endanger the lives of living beings.

## Method

### Research Design

This study used an explanatory sequential approach. Data were obtained through observation, in-depth interviews, surveys, and documentation. Quantitative data was used to describe in general the variables of this study, namely the strengthening of the social system, and the strengthening of social structure. Meanwhile, qualitative data in this study was used to explain the model of strengthening the social system and social structure. Triangulation in this study was used by researchers to check and validate the data by combining the results of data acquisition through observation, surveys, in-depth interviews, and documentation. Furthermore, the case study was chosen with consideration: (1) case characteristics are complex in the sense that data examination is carried out in-depth, detail, and detail; (2) case studies are used to explain the developing situation based on facts found in the field; and (3) case studies are used to explore in-depth information related to the phenomenon of strengthening social capital and strengthening family institutions in facing disasters. The combination of qualitative-quantitative approaches in this study is presented in Figure 2.

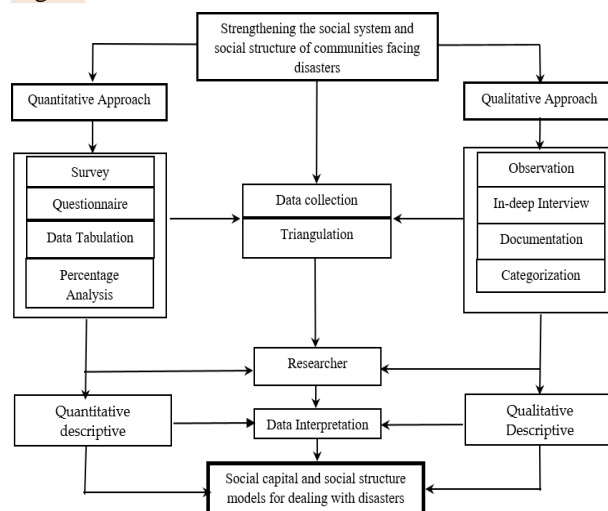


Fig 2: Combined explanatory-sequential approach.

### Study Area

This research was conducted in Palu City, Central Sulawesi. The study was conducted from July 2022 to December 2022. The research area in this study included all disaster-affected areas, namely: (1) Mantikulore sub-district, (2) West Palu sub-district, (3) South Palu sub-district, (4) East Palu sub-district, (5) North Palu sub-district, (6) Tatanga sub-district, (7) Tawaeli sub-district, and (8) Ulujadi sub-district.

Furthermore, the total population of these sub-districts is presented in Table 1.

**Table 1**  
**Total Population of Palu City by Sub-District**

No.	Sub-district	Population	Population growth rate
1	Palu Barat	46.737	0,43
2	Tatanga	54.066	1,51
3	Ulujadi	36.088	1,57
4	Palu Selatan	73.426	1,05
5	Palu Timur	43.643	0,48
6	Mantikulore	79.312	1,77
7	Palu Utara	25.021	1,25
8	Tawaeli	23.279	1,67
	Total	381.572	1,27

Table 1 shows the population of Palu City after 5 years of disaster. The largest population is in Mantikulore and South Palu sub-districts. Both areas are suburbs and when Palu City expanded due to development and population growth, the consequence was a dense population in the suburbs.

Furthermore, the study location, Palu City as the capital of Central Sulawesi Province (red color with arrow) is presented in Figure 3.



**Fig 3: Map of research location, Palu city.**

### Data Collection Method

The questionnaire in this study was used for two functions: (1) descriptive, which describes the strengthening of community social capital in facing floods, and (2) measurement, which refers to the characteristics of the data obtained from the results of data collection using questionnaires. Furthermore, the measurement scale used for the results of data collection through questionnaires is nominal data. The next step is to determine the Likert Scale to facilitate the data interpretation process. The indicator uses 5 scales or numbers, namely number '5' for always, number '4' for often, number '3' for mediocre, number '2' for rarely, and number '1' for never. Furthermore, the measurement results were then produced in the form of quantitative data and became the basis for statistical analysis (frequency tabulation). The questionnaires were distributed to the people of Palu city in the sub-districts affected by the previous disaster. The criteria of the actors who filled out the questionnaires were (i)

disaster-affected communities, (ii) disaster victims or having families as disaster victims, and (iii) local government. The questionnaires were guided by researchers and enumerators. Enumerators were selected with the following considerations: (1) having the ability to collect data; and (2) understanding the characteristics of the local community. Furthermore, to collect qualitative data, the research sample was determined using the purposive sampling method, which was determined by the researcher with certain considerations. To capture quantitative data, the determination of the sample refers to the Slovin formula<sup>31</sup>. The formulation used is as follows:

$$n = N / (1 + (N \times e^2)) \quad (1)$$

where 'n' is the number of samples required, 'N' is the population, and 'e' is the level of sample error in the study using 1% of the 90% confidence level. Furthermore, the number of samples was set to 249 respondents.

**Table 2**  
**Number of disaster-affected people by sub-district In Palu.**

No.	Subdistrict	Population	Number of Samples
1	Palu Barat	46.737	32
2	Tatanga	54.066	35
3	Ulujadi	36.088	27
4	Palu Selatan	73.426	42
5	Palu Timur	43.643	30
6	Mantikulore	79.312	44
7	Palu Utara	25.021	20
8	Tawaeli	23.279	19
	Total	381.572	249

Furthermore, the characteristics of respondents based on age, occupation, gender, education level, and number of family members are presented in Table 3.

**Table 3**  
**Characteristics of research respondents**

No.	Demography	f	%
1.	Age		
	a) 35-40 years	5	2%
	b) 41-45 years	63	25.30%
	c) 46-50 years	131	52.61%
	d) 51-55 years	33	13.25%
2.	Number of family members		
	a) 1-2 person	12	4.81%
	b) 3-4 person	202	81.12%
3.	Level of education		
	a) Primary education	45	18.07%
	b) Secondary education	141	56.62%
4.	Higher education	63	25.30%
	Occupation		
	a) Employee, Teacher, Military, Police.	107	42.97%
	b) Employee	77	30.92%
5.	c) Self-employed	50	20.08%
	d) Farmer	15	6.02%
	Sex		
	a) Man	158	63.45%
b) Woman	91	36.54%	



Furthermore, observation in this study was used in data collection, namely: (i) community activities as a form of strengthening social capital to face disasters, (ii) community activities as a form of strengthening family institutions in facing disasters, and (iii) social capital model of Palu community in facing disasters. The instruments used in data collection through observation were (i) field notes, (ii) periodic notes, and (iii) checklists. Furthermore, the results of observations obtained by researchers were used to describe the situation or events that were taking place about the assumptions and theories used.

In-depth interviews were used to collect data on (i) community activities related to disaster preparation, (ii) activities of family institutions to deal with disasters, and (iii) collaborative efforts of social structures to deal with disasters. Furthermore, the tools used in the in-depth interviews were tape recorders, pictures, and interview guidelines with loose notes, checklists, and rating scales. Thus, the function of in-depth interviews in this study, namely (i) description, in this case to describe the situation and conditions of the community facing disasters, (ii) exploration, in this case exploring the field to obtain information related to the collaborative activities of the community facing disasters. Both of these are used by researchers to emphasize the situation and conditions of the field based on the results of observations that have been carried out.

This study also used several documents, including (1) BPS data of Palu City population in 2022; and (2) BNPB data in 2018 on Palu disaster losses and victims.

### Data analysis

Quantitative data analysis in this study uses the frequency tabulation or descriptive quantitative method while qualitative data analysis refers to the results of data obtained through observation, in-depth interviews, and literature studies. Data analysis is done through three categories, namely data reduction, data display, and conclusion. The three processes are carried out by separating information into categories based on the views of informants and facts found in the field.

## Result and Discussion

**Strengthening the social capital of the Palu community in facing disaster threats:** The social capital of the Palu community was established long before the disaster. The social capital developed as the Palu community developed and modernized and became more heterogeneous. The tsunami, earthquake, and liquefaction triggered the community to strengthen the social capital. Five years after the devastating earthquake, the community rebuilt the social capital that once existed as a foundation for the community to

anticipate greater disaster risks than before, especially casualties. The social capital was built through various activities that have elements of cooperation, togetherness, and social solidarity. The activities in question were a result of the high risk of disaster in 2018 that damaged the social structure and system of the Palu community. The various activities are shown in Figure 4.

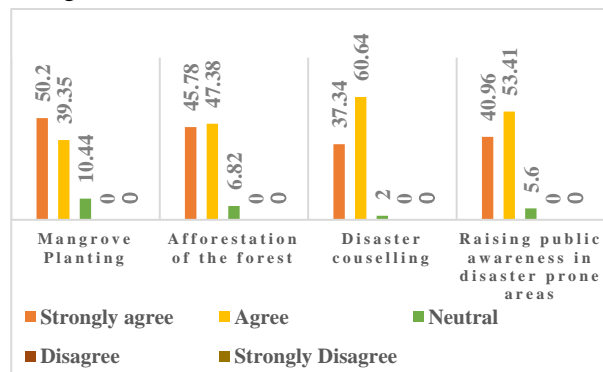


Fig 4. Various activities of the Palu community

Figure 4 explains that there are 4 activities carried out by the Palu community as steps to deal with disaster threats as the main activity. These activities include (1) mangrove planting, (2) afforestation of the forest, (3) disaster counseling, and (4) raising public awareness in disaster-prone areas. All of these activities were responded to positively by respondents (249 people) with answers of strongly agree and agree, neutral, and no one stated 'disagree', and 'strongly disagree'. Indicator 'Mangrove planting', 50.2% of respondents stated 'strongly agree' and 39.35% stated 'agree', and 10.44% stated 'neutral'. Indicator 'afforestation of the forest', there are 45.78% of respondents stated 'strongly agree' and 47.38% stated 'agree', and 6.82% stated 'neutral'. Indicator 'disaster counseling', there are 37.34% of respondents stated 'strongly agree' and 60.64% stated 'agree', and 2% stated 'neutral'. Indicator 'raising public awareness in disaster-prone areas', 40.96% of respondents stated 'strongly agree' and 53.41% stated 'agree', and 5.6% stated 'neutral'. If the four elements above are associated with social capital and its elements, it will be illustrated as follows.

Table 4  
Social capital matrix of Palu community

Shape	Component	Elements of social capital	Types of Social Capital
Physical environment	Mangrove tree planting	Values and Norms Reciprocity Mutual aids	Bonding
Livelihood	Greening	Co-operation Togetherness	Bridging
Rituals	Disaster counseling	Values and Norms Togetherness	Linking

In terms of the physical environment, people living in the same area have the same threats, the same level of vulnerability, and disaster risk. Such physical

environmental conditions encourage people to protect their environment together and work together by doing many things and one of them is through the action of reforestation or reforestation of forests, protecting forests, and caring for them for the common good.

Maintaining livelihoods is also the most important part of their activities. For this reason, the community needs information and knowledge related to maintaining the existence of livelihoods from disaster threats. Through knowledge of disaster aspects such as mitigation measures before flooding, preparedness measures when flooding occurs, actions during post-disaster, as well as disaster risk reduction measures and other knowledge obtained in disaster counseling activities by BPBD Palu City.

Rituals are also one of the activities that have an impact on the community, especially about the existence of the community so that they realize and are introspective about their existence in an earthquake-prone location. This implies the need for them to rely on religious beliefs, and beliefs in God so that doubts about disaster risk are reduced.

Mangrove tree planting and reforestation activities are components or parts of the physical environment. In both activities, social capital is built in the form of common values and norms and reciprocity between humans and the environment, between humans and humans. Values, norms, and reciprocity can materialize as binding social capital because of the homogeneous physical environment experienced by all respondents.

Disaster counseling activities are also a component of livelihoods. This activity will lead to the formation of knowledge about aspects of disaster and indirectly lead to actions that can protect community livelihoods as one of the social structures. In disaster counseling activities, the element of social capital that occurs is a sense of togetherness and cooperation towards the same experience of disaster and these activities increasingly bind them to unite and remind each other.

Activities in the form of awareness of the physical environment that is prone to disasters are an important component of the form of 'Ritual' both in groups in their respective houses of worship and independent rituals. In performing rituals, each person personally realizes their existence in disaster-prone areas that can occur at any time. Through rituals, they can understand the meaning of values, norms, and togetherness in acting in harmony with the environment.

**Table 5**  
**Strength of social capital according to its forming elements**

Component	Modal Social Element of	N	%	Levels of Social
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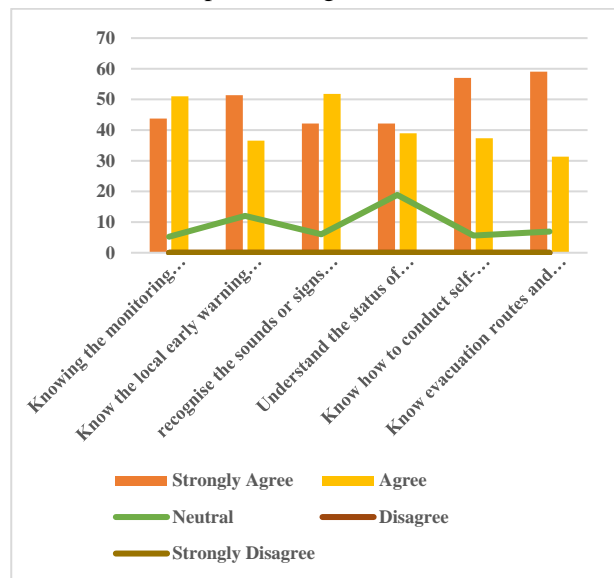
	Post-Disaster			Capital
Mangrove tree planting	Values and Norms	249	91.96	Very strong
Greening	Reciprocity	249	89.55	Very strong
	Mutual aid	249	89.55	Very strong
Disaster counseling	Cooperation	249	97.98	Very strong
	Togetherness	249	97.98	Very strong
Location awareness	Values and Norms	249	91.96	Very strong
	Togetherness	249	97.98	Very strong

Description:  
0-20%=1: Very weak; 21-40%=2: Weak; 41-60%=3: Medium; 61-80%=4: Strong; 81-100%=5: Very strong

Table 5 above illustrates the strength of the Palu community's social capital, all of which are at the 'very strong' level because they realize the importance of all these things to meet their common needs for security and safety in the face of disaster risks that could occur at any time.

**Strengthening families in facing disaster threats:**

The family as the smallest social unit in the social structure of society plays a very central position in the social system. Although individuals perform activities or actions, individuals do not have a place in this analysis but rather social institutions or Institutions that are analyzed as part of functional structural theory, as seen in the description of Figure 5.



**Fig 5. Strengthening Families in the Face of Disaster Threats, 2023**

Figure 5 describes the indicators of family strengthening as follows. First, Indicator 'Knowing the monitoring system to always be prepared for disasters', there were 109, or 43.77% respondents stated 'Strongly agree', there were 127 people, or 51.0% answered 'Agree', and 13 people 5.22% answered neutrally. This

confirms that in general respondents know the monitoring system as a disaster anticipation. Second, Indicator 'Know the local early warning equipment', there were 128 people, or 51.40% who strongly agreed, 91 people, or 36.54% answered 'agree', and 30 people or 12.04 stated neutrally. This situation shows that almost all respondents know the early warning system equipment used. Third, Indicator 'recognize the sounds or signs of a tsunami and earthquake early warnings', there were 105 people, or 42.16% answered 'strongly agree', there were 129 people or 51.80% answered 'agree', and 15 people or 6.02% stated 'neutral'. This also confirms that almost all respondents (93.97%) recognized the sound of tsunami and earthquake signs. Fourth, the Indicator 'Understand the status of early warnings', shows that there are 105 people or 42.16% answered strongly agree, 97 people, or 38.95% answered 'Agree', and 47 people or 18.87% answered 'neutral'. This indicator is certainly understood as an early warning status by 81.12% or almost all respondents. Fifth, Indicator 'Know how to conduct self-evacuation', there are 142 respondents or 57.02% answered 'strongly agree', there are 93 people or 37.34% answered 'agree', and 14 respondents or 5.62% answered 'neutral'. Thus, almost all respondents (94.37%) already know the implementation of self-evacuation during a disaster. Sixth, Indicator 'Know evacuation routes and safe places', there are 147 people or 59.03% stated 'strongly agree', there are 78 people or 31.32% stated 'agree', and 24 people, or 6.93% stated 'neutral'. Thus, it can be said that almost all respondents (90.36%) evacuation routes and safe places when a disaster occurs.

The indicator description in Figure 5 indicates that institutionally, families have knowledge and skills about disasters and gives the community confidence that respondent families have gradually strengthened their social structure in dealing with disasters. The experience of previous disasters has made them aware of everything that they must understand as a form of anticipation such as knowing the disaster monitoring system, knowing the local early warning system, recognizing tsunami and earthquake early warning signs, understanding the status of early warnings, knowing how to rescue and evacuate themselves and knowing safe routes and places to evacuate. All of these indicators have been socialized by the government through sub-districts, the BPBD, and global disaster organizations. Several organizations conduct several trainings and simulations related to these indicators, including evacuation training, training to recognize early warning systems, training to create and recognize evacuation routes, and so on for the community. Every family member must know these things so that individuals can ensure their safety, especially if the disaster occurs at night when everyone is not prepared.

**Model for strengthening social capital and family institutions in the face of disaster threats: Socio-**

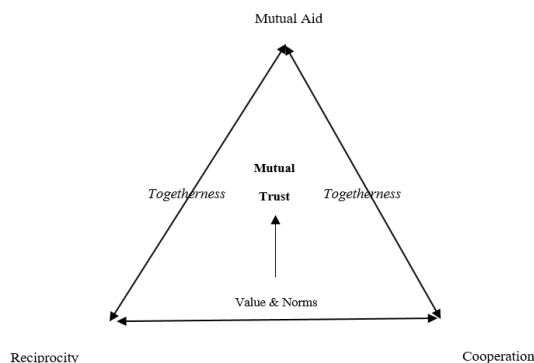
historically, the people of Palu City have the power to survive and experience social processes and changes naturally (evolutive). This shows that the existence of a community in Palu City is not just a group of people who have physically lived together for a certain period, but there is a "spirit" or social spirit that becomes the binding force of their collective life. The disaster in 2018 became a momentum for the people of Palu to strengthen their social capital. It showed a strong initial step among the community to form a sense of mutual trust in the Palu community. The mutual trust, which is the result of interaction and involves community members, is realized in a precarious and threatened community condition, threatening the lives and safety of the community.

For the people of Palu, their primary need is for security and safety from disasters that threaten their lives and the lives of their families. It is about their peace of mind from the things that always disturb them. In addition to the need for security and safety, the next is the guarantee of livelihood availability and the last is the need for a decent place to live. The responses of the Palu community (respondents) to these needs are further elaborated in Table 6.

**Table 6**  
**Needs and roles of family institutions**

Community needs	The Role of Family	The Function of Social Capital
Safety and security of body and soul	Togetherness to face the threat of disaster	Bonding
Continuity of livelihood	Cooperation with various parties that are mutually beneficial	Bridging
Availability of housing	Mutual trust with group networks	Linking

Broadly speaking, the needs of the people in Palu City are categorized into three things as described in Table 6. These needs are accompanied by the role of the family as a social institution and social capital used to fulfill these needs. To obtain security and safety guarantees, they still maintain togetherness, especially related to disaster issues in various forms. This togetherness is a driving force so that they are motivated to unite and be enthusiastic about facing any problems, especially the threat of disaster.



**Fig 6. Social capital model "Common needs as the core and reinforcement of social capital" (Source: the author's elaboration, 2023).**

### Discussion

In general, social capital focuses on three dimensions (trust, cooperation, and network), without paying attention to the values system behind it and the dimension of needs. If the development of social capital is only based on these three dimensions, it is expected to produce ambiguous or contradictory explanations. The cooperation dimension, for example, will not be realized if the community (small or large) cannot build collectivity rules based on mutual respect and common needs, and the progressive development of networks. Networks will not develop if collectivity is not built in them without being based on the principles of common needs and mutual benefit relationships. The development of relationships of mutual trust, mutual respect, and mutual benefit in the social system should be a series of outer circles of social capital<sup>5</sup>. The inner circle or core of social capital is the value system that lives in the community. The formation of social capital cannot be seen as the result of the sum of a group of individuals (strengths) forming the community system but must be seen as the formation of a dynamic and organized network of cooperation. If the collective consciousness of the community can be directed towards cooperation in public action, then only then can it be said that local social capital can be used as a force to support efforts to deal with disaster threats. Threat preparedness is part of the work of symmetrical interdependency or cooperation of the local communal community.

The strength of social capital as a non-material culture is an important factor in why the people of Palu City can survive and quickly bounce back from the downturn of life. Local cultural values and social capital can not only be the core of strength that can accommodate social problems. The aspect of common needs, namely the need for safety, is the main component that forms social capital in Palu City. Other aspects, such as cooperation and network, will not be formed steadily if they are not based on the formation of mutual trust relationships between community members for safety and security from disaster threats. There is a strong relationship between mutual needs and trust and the formation of community cooperation and networks. The strength of cooperation and networks formed in the community is the operational development of the relationship of common needs and mutual trust between community members in the socio-cultural field. In the social life of Palu city, the notion of common needs that requires trust should not be seen merely as an individual issue, but also relates to inter-individual aspects<sup>21</sup>.

Urban communities are generally able to develop a relatively large network of beliefs. The extent to which the network of trust developed by a community in Palu City is highly dependent on the content of the elements of the value system that live in the community daily. It can be stated that three basic elements of values determine the level of progress or strength of a community's social capital<sup>20</sup>. Whether or not a society can progress quickly is determined by how far the quality of the three basic elements of the values system is carried out in daily life. The value system visible in a society is generally not directly visible from each of the three basic elements but will be more easily seen from (for example) the composite value element, namely: (1) an established system of social solidarity based on trust. (2) a fair system in meeting the basic needs of society. (3) the establishment of the social system of society the establishment of a community social system that provides citizens with the opportunity to have a better life collaboratively, especially after a disaster<sup>32</sup>.

The advantage of this research is that it complements and provides insight into how social factors also contribute to society in facing disasters in the form of risk reduction and are not just a matter of technical factors. The weakness of this research is that it only examines 2 social aspects, namely social capital and family institutions, even though many other social aspects could enrich this research.

### Conclusion

In all societies or communities, social capital as part of the social system binds community members together. At the level of community needs, which may be different, the underlying elements of social capital depend on these needs. In all societies, social capital is built based on cultural values, in this case, the system of shared values prevailing in the community. In Palu, where the need is for security and safety from disaster threats, the social capital is built on togetherness and cooperation to create individual peace so that they can face together the threat of disaster, even at the level of family institutions.

### Acknowledgments

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