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# A strategy of local wisdom-based natural disaster management in coastal communities in Barru District

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**Abstract.** Indonesia is a maritime country stretching along the equator. Populations who reside in coastal areas form communities known as coastal communities. In South Sulawesi, especially the west and east coasts, coastal communities occupy areas that are vulnerable to various disasters. Coastal communities in South Sulawesi can survive because they succeeded in developing an adaptive mechanism to manage the failure. Such adaptive capacity is implied in potential is called local-wisdom, containing systems of belief, knowledge and value and habits. The focus of this research is the disaster characteristics that occur in coastal communities, and the socio-cultural potential possessed as a strategy to manage disasters that occur, apply local wisdom as an effort to mitigate disasters, as well as understanding and disaster management. This research is ethnographic with a qualitative approach, conducted in Barru district, South Sulawesi. Data collection was done through in-depth interviews, participatory observation, and literature review. It found that coastal communities in Barru district recognized some disasters such as tornadoes, drought, fire, and floods. They overcome natural disasters by utilizing the local-wisdom in the form of trust, knowledge, and habits. It concluded that the socio-cultural potential in the form of local wisdom that is owned by the maritime community is an adaptive mechanism in overcoming and mitigating disasters.

## 1. Introduction

Geographically, Indonesia is located at 6° North to 11° South Latitude and 92° to 142° East longitude. It has 17504 islands both large and small with three-quarters of the territory is the sea. Coastline length 95.161 km, it is the second longest in the world after Canada. It located in the equator with diverse morphologies ranging from the lowlands to the mountains. Morphological diversity is influenced by geological factors, especially the activity of active tectonic movements around Indonesian waters such as the Eurasian plate, Australia and the base plate of Pacific Ocean. The movement of tectonic plates causes the formation of earthquake pathways, a series of active volcanoes and geological faults which are disaster-prone zones. Also, there are also volcanic belts extending from Sumatra-Java-Nusa Tenggara and Sulawesi which have the potential to cause volcanic disasters, earthquakes, tsunami, winds, floods, landslides and other disasters [1,2].

Seeing from the aspects of potential, disasters in Indonesia can be classified into 2 (two) namely *main hazard potency* and *collateral hazard potency*. The main hazard potency can be seen, among others in the earthquakes, volcanic eruptions, tsunamis, and floods. By the process, disasters can occur suddenly or slowly. Earthquake is one example of a sudden catastrophe, while droughts, floods, and storms are disasters that come with began certain symptoms. Disasters that occur slowly, the time of



occurrence can be predicted in advance, and in general disasters like this are a result of human activities. Various disasters that occurred in Indonesia such as the earthquake and tsunami like in Aceh and parts of North Sumatra at the end of 2004, Nias earthquake that occurred in early 2005 was a sudden disaster. The emergence of various disasters suffered by some people may be caused because the community does not apply local wisdom in utilizing the environment [3].

Disaster is a disruption to the functioning of a community system, causing losses both regarding economy, structure and social order, as well as the environment. It was events that have long existed as the formation of nature itself; disaster events are considered to have not caused problems as long as they occur in places that are not inhabited by humans. Natural disasters become a source of catastrophe when it occurs in areas where there are many people

A change of orientation occurs in responding to the disaster phenomenon, from technical problems such as trigger factors for disasters and procedures for handling disaster victims to the direction of the importance of new approaches by considering human and community existence in disaster phenomena. This perspective raises proposals for disaster management for integrated community development. At this time, even though the government has intensively built coordination with various parties, such as the local government, related institutions, and the community to continue to socialize the mechanisms or procedures for dealing with disaster problems, although natural disasters, especially in coastal areas, continue to occur which gives rise to victim, both soul and property. Every disaster occurs always creates a sense of concern because of the helplessness of the community (victims) in saving themselves, slow aid, pressure, and various problems that arise. The condition of the victims that caused concern shows that the mechanism of disaster management carried out so far has not run optimally. Therefore another mechanism is needed by involving significantly the resources owned by the local communities in the form of social capital and cultural modes [4]. The socio-cultural potential as one of the main capitals in the form of local wisdom and indigenous knowledge is owned by all local communities wherever they live, including the people in Barru district who inhabit the coast of Makassar Strait.

Study of local wisdom related to disaster mitigation in traditional communities in Indonesia is dialectic between natural phenomena and humanitarian. Generally, local communities have local knowledge and ecological wisdom in predicting natural disasters in their area [5]. Likewise, with coastal communities in Barru district, they have local knowledge that guides their activities such as knowing natural signs and symptoms such as whitish clouds, determining the direction of the wind, knowing the course of voyage destinations, knowing the risks or obstacles that might be experienced during sailing. They understand the meaning and of sea watercolor and its change [6].

Also, the understanding possessed by fisherman as seafarers is knowledge of the seasons, the characteristic of the waves and the movement of seawater and various other marine biotas. Also, they have an understanding of astronomical related to the knowledge of the location of the stars in the sky, the season, all the knowledge and beliefs related to the efforts and strategies of local communities in overcoming the disasters they face. Likewise, the belief or ritual that is conducted by the community serves for guiding them in committing all their activities, including strategies to overcome various obstacles, dangers, and disasters that might occur. Ideally, all social-cultural potentials in the form of local wisdom owned by the community should be utilized to overcome the disasters that occur to them. This research examines how people cope with catastrophe based on the social-cultural potential they have.

Described in the background above, the focus of this research is how the characteristics of disaster and the potential of socio-cultural to overcome problems. How fishing communities (fisherman) apply local wisdom as a disaster mitigation effort.

## 2. Materials and Methods

As usual, anthropological research is ethnographic with the qualitative approach is emic and inductive. Representing the west coast of Sulawesi Island in the territory of Makassar Strait, it was conducted in Barru district, in Pancana village, Tanete Rilau Subdistrict, by considering that the potential for

disasters in this region to be more significant than other regions. As in various sources, there are 14 districts/cities prone to landslides, tornado, and 15 districts/cities prone to abrasion. Of the four types of disasters, six districts/cities have the potential to be affected, namely Barru, Bone, Sinjai, Bulukumba, Selayar Islands and Palopo. Also, along with the territory of Barru, there is an extended coastal area, and the majority of the people who live around the coast live as fishermen. This research is planned in March until August 2018.

The technique of data collection is done by using in-depth interviews to obtain data and information related to how the actual conditions in the field about the disasters experienced by the community, and how they overcome them by utilizing the potential of social-cultural and local wisdom they have. Full observation participation is conducted to capture data relating to various activities and behaviors in disaster management activities. While, the literature study is conducted to find various concepts, theories and relevant research results as an effort to complete data and analysis. Informants are determined by purposive sampling by considering involvement in disaster management, and the ability to provide answers and descriptions of the problems under study. Data analyzed by sorting and integrating for the formulation of meaningful statements which are then presented into some propositions and conclusions.

### 3. Literature Review

#### 3.1. A Concept of Disaster Mitigation

Disasters are interpreted as catastrophic that directly affect human life. According to Act No. 24 of 2007, a disaster can be defined as an event or series of events that threaten and disrupt community's lives and livelihoods caused by factors of natural and non-natural as well as human factors resulting in victims, damage environment, property loss, and psychological impact. Based on the sources and its causes, disasters can be classified into (a) natural disasters are all kinds of disasters whose sources, behavior and causing factor source from nature, such as floods, landslides, earthquakes, volcanic eruptions, droughts, wind noisy and tsunamis. (b) Non-natural disasters are disasters caused by events or. Series of non-natural events which include technological failures, modernization failures, epidemics, and disease outbreaks. (c) Social disaster is a disaster caused by a game or series of events caused by humans which includes social conflicts between groups or between communities and terror.

[7] classified patterns of disaster management into 3 (three) types, namely physical, time and social. The pattern of physical management is a pattern of disaster management that prioritizes the problem-solving of physical material such as the supply of ready-to-eat food, bedding, and ready-to-wear clothing. The pattern of problem-solving due to disasters related to time is that it is necessary to look at the context of the time of occurrence so that it is not too long to be able to evacuate effectively and efficiently. Whereas the pattern of social management is always associated with the most obvious impact is a social impact [7]. It was emphasized the need for a clear distinction between the impact of ecological and social disasters. Ecological disasters are defined as the destruction of the environment which is purely caused by nature, while social disasters refer to the instability of the community as actors who experience disasters directly, so that raises *chaos* in the socio-cultural order.

Furthermore, [7] introduced 2 (two) important paradigm models in community-based risk management, *the first crunch model* and *the second release model*. A crunch model assumes that natural disasters occur due to a shift in the earth plate which causes disasters such as earthquakes, tsunamis, volcanic eruptions. In such circumstances, the peoples experience conditions of discomfort both during a disaster and after that. At such a level, disaster risk management led to a passive attitude of the community and asked to wait until the disaster has completely abated until the psychological condition of the victim can be overcome. An emerging dynamic arise in the community such as the ability to absorb physical and socio-cultural shocks from the disaster effect. Here, the community needs the ability to adapt quickly through knowledge in the form of local wisdom to be able to move flexibly in emergency response efforts, in such conditions local wisdom helps the community to understand more about the context of the problem in the disaster. The second model is a *release*

*model*. This model positioned humans to be able to adapt to disasters to mitigate the impact of disasters. This pattern invites the community to be actively involved in disaster prevention such as invitations not to dispose of garbage so as not to cause flooding, a ban on cutting trees to prevent landslides or village reforestation movements [7].

### 3.2. Local Wisdom-Based Disaster Management

Local wisdom in disaster mitigation is a concept that cannot be separated. The interpretation of local wisdom is identical with “labeling” or a characteristic in certain societies and is explained in a variety of ways. Local wisdom as personality, community cultural identity in the form of values, norms, ethics, beliefs, customs and special rules that are accepted by the community and tested for their ability to survive continuously [6]. It is not only about the knowledge and understanding of peoples about humans and how good relations between people, but also about the knowledge, understanding, and customs of humans, nature and how relations between residents of these ecological communities must be built. The definition above provides a perspective that humans are integral beings and unity of the universe and full of responsible, respectful and caring towards the survival of all life in the universe and change the perspective of anthropocentrism to biocentrism and ecocentrism.

Understanding of disaster that owned by a community can minimize the consequences of a disaster. It is obtained and inherited through a cultural process that is contextual and permanent, such as the phenomenon of *Tsunami* in Simeulue community that occurred in 2004, they were able to eliminate the number of victims because they learned from the same phenomenon in 1907 by sharing their experiences through stories and songs repeatedly repeated from generation to generation, so they have understood what to do during *Tsunami* [8].

In the belief system of Bugis Makassar people based on the teachings of *panngadereng*, there are 3 (three) main values that make humans able to get stability in their lives [9] that is God as a central point for humans, honesty, justice, and wisdom. This resignation attitude can be found when the fishermen perform rituals before going out to sea as a form of resignation and self-realization that the sea is a field full of uncertainty that contains various kinds of dangers that might occur [10], as well as life on land that we still found in *Amma Toa Kajang* community in Bulukumba district, in which until now still consistently conserves forest ecology [11]. The values of honesty, divinity, hard work (*reso*) are values owned by the people in South Sulawesi [9].

### 3.3. Indonesian Coastal Community

Indonesia is an archipelago country consisting of various ethnic groups both land and coastal areas. The coastal area is a transitional area between land and sea, which when viewed from the coastline, the coastal area has two kinds of boundaries, namely the parallel and the perpendicular coastlines. According to [12] that coastal areas are unique because, in the context of landscapes, coastal areas are places where land and sea meet. Coastal areas are important areas reviewed from various planning and management perspectives. The Ministry of Marine and Fisheries Affairs in the drafting laws on the Management of Integrated Coastal Areas defines the coastal area as a transitional area that connects terrestrial and marine ecosystems that lie between boundaries to land as far as the highest tides and towards the sea as far as the influence of activity from the land. It has high economic value, but their sustainability is threatened. Having unique potential and economic value causes the coastal area to be faced with a high threat too. Therefore the coastal area is explicitly handled to be managed sustainably [13].

## 4. Results and Discussion

### 4.1. Characteristic of Disaster and Socio-Cultural Potential

As the classification of disaster characteristics, it was ascertained that there were 2 (two) forms of disaster that occurred in coastal communities in Barru district namely natural disasters and social disasters. Both forms of disaster pose a real threat to society and significantly influence their activities,

both as fishermen and as farmers. Natural- and social failures are directly or indirectly have a negative impact on the community's lives, primarily related to psychological, social, economic and environmental life. Based on the awareness of the effects of disasters that are often experienced by community members, they develop mechanisms to anticipate the possible effects of accidents that occur by utilizing the socio-cultural potential they have. Communities pay greater attention to natural disasters because of impact both physically and socially. Based on the existing data, natural disasters that have been experienced by coastal communities in Barru district include; floods, tornadoes and strong winds caused material losses such as several houses destroyed by strong winds, fallen trees, stopped economic activity, prone to various diseases.

As the seasonal calendar, the period of the rainy season (*bare'*) occurs in November to March; this period is considered as a period of disaster risk (*bala'*), especially the danger of hurricanes and floods. Also, in the western season, fishers find it difficult to go to sea, causing peoples to be vulnerable to social problems such as; malnutrition, unemployment, poverty, and various diseases (dysentery, skin diseases). Some disasters that often occur in coastal communities in Barru district were:

*4.1.1 Flooding.* Flood disaster in settlement of coastal community in Barru is a phenomenon that always repeats every year, even flooding comes several times a year, depending on the intensity of the rain. In the past, floods were not considered a threat to society because the construction of stilt houses made them feel safe. The reconstruction of houses into permanent houses made of stone which are attached causes water to clog, water from the river overflows and causes flooding. Floods and its consequences make the peoples worrying because in addition to houses being submerged, also the height of the water can reach a threshold that endangers both humans and livestock and other material goods.

*4.1.2 Tornado.* Coastal communities in Barru district know that tornado (*laso anging*) appears with a blackish white cloud hanging over half the sky rolling upright like a large coconut rod. The cloud roll moves quickly into the power center of the wind accompanied by a thunderous sound and a thin drizzle that gets bigger and blows so fast it ravages all the objects that are passed. The community recognizes *laso anging* as the wind that blows in a spin forming a funnel with a speed of 60-90 km/h, lasts for 5-10 minutes. This type of wind arises due to a very large pressure difference between a place and another place, occurring under or around the cloud. No one can predict exactly when the tornado comes, but the tendency is more frequent during the day. The danger caused by a tornado among others; the houses collapsed, or the house roof flew, coconut trees fell and bear down upon the houses and other facilities, preventing residents to do daily activities.

*4.1.3 Earthquakes.* Many fishing communities in Barru district do not experience natural disasters like earthquakes. The quake only occurred on 12 December 2011 with a magnitude of 5.9 Richter scale shake Makassar Strait at 10:59 p.m. at a depth of 19 kilometers below sea level. The people in this area felt the tremors and caused panic, even though at that time there were no losses suffered by the community.

#### *4.2 The Potential of Socio-Cultural and Strategies for Managing Disaster*

Natural disasters that occur in the community form a specific knowledge through a process of observation and appreciation of natural phenomena that occur before and after a disaster. This natural phenomenon is strengthened through the institutionalization process or the recognition through proof that continues to occur marks the existence of a disaster. Seasonal changes are a common symptom of the three disaster classifications that have been stated earlier. The rainy season is the most potent time for various natural disasters such as floods and tornadoes (*laso anging*), the emergence of various types of diseases, and crop failure. While the potential of the dry season causes drought and lack of water causes the death of various types of plants and livestock.

Through the knowledge system of coastal communities in Barru district, there is an assumption that a sign of nature must precede the occurrence of a disaster. The community has a classification pattern that can distinguish between rain and wind that can bring natural disasters such as floods or tornados with rain or wind that bring blessings to their lives. Such knowledge and classification guide every member of the community to establish a mechanism for anticipating disasters. A tornado is a natural disaster that is most feared by coastal communities, anticipated through cultural strategies such as storing objects that function as hazard repellents on the front of the house ridge. These objects have been given an incantation according to their beliefs so that the tornado evades and does not cause disaster for them. Also, they did rational action by prohibiting the planting of trees that easily fell around their homes. Likewise, with flood disasters, coastal communities in Barru district adapted through cultural mechanisms by controlling flooding using incantation they received from generation to generation. Also, they overcome flood disasters with rational actions such as not cutting trees in the forest so that forests can function to hold water to prevent flooding.

The application of local-wisdom to coastal communities in Barru district to manage natural disasters, efforts and strategies are conducted to establish harmony with nature. Coastal communities adhere to the principle of culture known as “*duai temmallaiseng, tellui temmassarang (two inseparable parts, and three parts that are not divorced)*”. This principle views the universe in 3 (three) singular forms of the cosmos, *botinglangi* (sources of truth and glory), *alekawa* (the body achieved; the earth where living things) and *pertiwi* (under the earth, symbolizing patience and eternity). They are principled that if the balance of the three parts of the cosmos is maintained, then disaster never falls upon them. The view of *anthropocentrism*, mutual-cooperation and living in harmony is a provision for the potential capacity of coastal communities in Barru district to face the threat of natural disasters, through cultural approaches, utilizing local wisdom. How to provide the space for developing local wisdom and traditional social pillars that can be used as part of disaster mitigation effort.

Some examples of the ecological wisdom of coastal communities in Barru district in interacting harmoniously with the natural environment includes; *folklore* is a non-verbal interaction that contains restrictions and prohibitions on “*pemmali*” in the lives of coastal communities in Barru district. The use of this interaction functions as a control in interacting with the natural environment. One example of *pemmali* is the prohibition for people to pollute the sea as a source of life for them. By polluting the sea means making the livelihood field polluted and inviting the wrath of God. *Coastal songs (nyanyian pesisir)* is a kind of interaction of coastal communities that are often singing in the form of songs and performed during the full moon and in Buginese are called “*cellu-cellu bulenreng*” means playing under the bright full moon. *Traditional game*: a traditional game of Buginese using coconut shell media “*Makkadaro*” and played by several people. Sea and land rituals (*maccera*): *maccera tasi* (appreciation of the abundance of catches), *maccera lopi* (pray for the boat used to catch fish), and *maccera bola* (pray for new homes). In ritual *maccera tasi*, it is interpreted as one of the manifestations of local wisdom in Barru regarding the relationship between humanity and the Creator and all living things and the natural environment. Therefore, *maccera tasi* are carried out on the edge of beach right on the coastline at the farthest ebb and an intersection between land and sea. In this ritual, the functional relationship between each living thing, both human and flora and fauna with the universe will be reorganized and will be placed in actual proportions in harmony, or follow the sacred customary provisions, which have been determined by the Creator as a natural law that must be obeyed. Thus, it is expected to avoid chaos and create a cosmos or harmonious order, for a lasting balance in the microcosm as the realization of the Creator.

#### 4.3 Disaster Mitigation by Coastal Communities

For coastal communities in Barru district, something that contains a threat or danger to life is called *bala*’ or *abala* which in a general sense can be understood as a disaster. Disaster mitigation is a concept that is not commonly understood by community members, but in the sense of locality of

concepts related to socio-cultural strategies to overcome or prevent the occurrence of danger is called *mappasili*. For the community, the concept of *bala* or *abala* or the concept of *mappasili* is understood in the sense that is causal, that there is never a danger or disaster suffered by humans if the man himself creates it. To realize prosperity in human life must establish a harmonious relationship with nature. This understanding is far from the reach of the definition of experts which reveals that disaster mitigation is a series of efforts to reduce disaster risk, both through physical development and awareness and improvement of the ability to face threats.

Coastal communities in their daily life recognize various efforts in mitigating the impact of disasters and the efforts made when a disaster occurs. They recognize the efforts with various kinds of local wisdom that have been preserved for a long time ago, until now. The act of treating natural environment haphazardly is believed to result in disasters. There is a belief in them that if the action is not according to the will of nature, being destructive, sooner or later they experience a disaster

As described earlier that coastal communities in Barru district have local wisdom that is used to mitigate disasters. Some elements of local wisdom related to disaster mitigation include:

#### a. Understand the Signs of Nature

Traditionally, the maritime knowledge system has been inherited in the face of danger or tornado and high waves in the sea. Coastal communities navigate the ocean with principles and attitudes united with the sea. This attitude is a reflection of the principle of mitigation "*safety first*". Their traditional knowledge of astronomical and oceanographic is based on natural signs, namely the rising and setting of the sun. The position of the stars in the sky, the movement of the waves, the smell of the wind they breathe, as well as the signs found on the surface of the sea. These natural signs are traditionally known through observation (*pakkita*), hearing (*parengkalinga*), smell (*paremmau*), feeling (*panedding*) and belief (*tuntuang*). For the Master they are able to find out the reef by relying on smell.

#### b. Taboo (*Pemali*)

In the tradition of coastal communities in Barru district is known for some taboo or *pemali*, both in the form of actions and words, they perform certain actions based on beliefs and knowledge in sailing to avoid danger. Taboo or *pemali* are mostly owned by seafarers such as when they sailed – they are taboo or the *pemali* said lies, taboo mentions the names of dangerous animals as they really are. For example, crocodiles they call *punna wae* or others. If they breach *pemali*, it can result in encountering sea hazards such as *laso anging* (tornado), lightning or other hazards.

#### c. Magic Forces

Coastal communities in Barru district generally believe that there are supernatural forces called *magical powers*. Some magical powers that are believed by coastal communities among others *Pake Pettu* is a kind of mysticism that is integrated in a person. It is called *Pake Pettu* because once use their force must be done. Usually used when a wave storm hits a boat. *Pake Pettu* is only used if the boat is in danger of an inevitable danger. At that time the Master raised his hand with a loud noise, along with pointing the waves tilting the ship so that strong winds that turned the bow until the waves or the wind abate again. After using the talisman of necessity to overcome the natural will while sailing, one must be restored through certain rituals. *Aju tui* is a tool that has the magical force to ward off lightning. *Aju tuing* is a kind of wood whose flesh is white and smooth, its leaves like *daung ota* (betel leaf). The informants stated that *aju tui* was always used as a peg (*palacca*) of the boat and the house for "magical" purpose to ward off lightning. Therefore, in the past, parents often plant *kaju tuing* along the coast to ward off lightning into the village. Repellent of *laso anging*, the coastal communities face the danger of tornado by undressing and pulling out a *kris* and then saying "*meddeko iae salessurengmu*" (move, here I am your brother). The magical force contained in the *kris* is believed to be able to drive away the tornado.



## 5. Conclusion

Values, as contained in local-wisdom of coastal communities in Barru district, are functional forms of local knowledge in each context, especially those related to strategies to manage and mitigate disasters. Local knowledge is reflected in how coastal communities interact with the marine environment in a fair and beneficial manner. Coastal communities know how to read natural signs related to disasters, how to anticipate disasters, how to dispel or avoid disaster threats. By the local wisdom they have, they can survive and continue their life in well from generation to generation until now

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