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COASTAL COMMUNITY PERCEPTION OF MANGROVES IN SULI SUBDISTRICT, LUWU

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ABSTRACT

Mangrove forest in the coastal area in the Suli subdistrict is one of the sources of livelihood for the local people. The objective of this research is to analyze the public perception of the coastal community towards mangrove forests. The analysis was carried out using a questionnaire-multilevel scale with the level of assessment that refers to the Likert scale. The questionnaires, which were disseminated to 100 respondents, contained questions about the public perception in the coastal mangrove area. The questions were divided into 5 part questions, namely: 4 questions for the public perception towards ecological functions, 7 questions for community participation, 5 questions for economic benefit, 5 questions for social and culture, and 5 questions for government regulation. The results revealed that the average public perception towards the ecological functions of mangrove was good, with a value of 4.11 (in category 4). The public perception towards public participation was also good, with a value of 3.69 (in category 4). Moreover, the public perception about the economic benefits of mangrove was quite good, with a value of 3.37 (in category 3). The social and culture was quite good, with a value of 3.32 (in category 3). Finally, the public perception towards government regulation (law enforcement) was good, with a value of 3.57 (in category 4). Based on the results, the average value was 3.61, which means that mangroves management is good (in category 4) based on the perceptions of a coastal community in the Suli Subdistrict. The level of education does not affect the perception of the importance of mangrove management. This was caused by the existence of local wisdom, which considers that mangroves are the nails of the earth that can prevent coastal abrasion. This local wisdom is maintained up to now, where the local community formed a group of mangrove lovers that aims to plant and conserve mangroves.

Keywords: ecology, economic, government, participation, perception, socio-culture

INTRODUCTION

Climate change caused by rising temperature (Vicente-Serrano et al., 2014) has generated many disasters occurring worldwide (Hoegh-Guldberg & Bruno, 2010) such as severe economic, social, and political dislocations (Kellog & Schware, 2019),

Human anthropogenic is one of the causes of disasters relating to climate change (Alongi & Mukhopadhyay, 2015; Kauffman & Donato,

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2012). Therefore, the low carbon society program needs to be integrated into the international community to achieve sustainable development (Nakata et al., 2011). The efforts related to this vision have been widely studied all over the world (Ali et al., 2013; Gan et al., 2013; Lutfi et al., 2018; Soccol et al., 2019; Yamin et al., 2018).

Mangrove ecosystem has a critical role in sustainable coastal zone management (Irsadi, et al., 2017; Lee et al., 2014). The existence of mangrove can reduce the greenhouse emissions (Chen et al., 2016), provide carbon stocks (Martuti et al., 2017; Donato et al., 2012) for coastal carbon cycle (Alongi, 2014), and water pollution biofilter from heavy metal poisoning (Kariada & Irsadi, 2014.; Sandilyan & Kathiresan, 2014). Further, strong rooting of the mangroves can reduce the influence of the waves for protecting the beach from erosion (Faridah-Hanum et al., 2013; Sulaiman et al., 2018), hold back waves, and the typhoon (Auliyani & Hendarto, 2013; Blankespoor et al., 2016; Tyree et al., 2012). Therefore, mangrove conservation is a must to implement sustainable environmental management in the coastal area (Donato et al., 2012; Irsadi et al., 2019).

Sustainable mangroves management is one of the efforts to implement a low carbon society. Ostrom (2009) revealed that the community could not by itself maintain environment and resources, stop the destruction of resources, and support the achievement of sustainability without government support. Hence, to achieve a quality and sustainable development on the coastal area, an appropriate policy is required to regulate the balance of development on the social, economic, and environmental, so that collaboration between policymakers, communities, academics, and other stakeholders to achieve social-ecological conditions are needed for sustainable development (Glaser et al., 2012).

Mangrove forests in Indonesia grow along the 95.000 km of Indonesia's coastal. This number represents 23% of the total mangrove ecosystems around the world (Giri et al., 2011). One of the regencies in South Sulawesi Province, whose mangrove ecosystem condition is cause for concern, is in the North Luwu Regency, whose coastline reached 53 km^2.

Studies of mangroves have been conducted by many researchers in the world such as the socio-cultural perception of mangroves (de Souza Queiroz et al., 2017), conservation strategies and local perception in the Indian Sundarban mangrove forests (Ghosh et al., 2015), economic valuation of mangroves for comparison with commercial aquaculture in South Sulawesi (Malik et al., 2015), and perceptions of environmental changes and lethargic crab disease among crab harvesters in a Brazilian coastal community (Firmo et al., 2011). However, we have not come across research on comprehensive community perceptions about mangroves in Luwu regency in the literature, in which, the references only focus on a few aspects of mangrove forest as what has been investigated by Maru et al. (2016) and Ratnawati & Mustafa (2014).

According to the explanation above, the objective of this study was to analyze people's perceptions against mangrove forests by considering many aspects comprehensively so that the sustainable management of mangroves forest could be achieved.

METHODS

This research was conducted from February to November 2018 in Luwu District. It is located between 2° 34' 45"- 3° 30' 30's" South latitude and 120° 21' 15"-121° 43' 11's" east longitude. Luwu District's position is in the northeast of South Sulawesi Province, about 300 Km from Makassar City.

From its geographical position, Luwu District is bordered by several districts, namely North Luwu District and Palopo City in the northern, the Bone Bay in the eastern, Palopo City, and Wajo District in the southern, and Tana Toraja and Kabi Enrekang in the western. Luwu District is divided into two regions as a result of the expansion. There are 22 Subdistricts in Luwu districts with 227 villages, where 9 subdistricts are bordering the Bone Bay on the eastern side. These 9 subdistricts consist of Larompong, South Larompong, Suli, Belopa, Kamanre, North Belopa, Ponrang, SouthPonrang, and Bua. Among the 9 subdistricts bordering the Bone bay, there are 37 villages classified as coastal areas, while 190 villages of subdistricts are villages located far from the coastal area.

The total area of Luwu is 300025 hectares covering 22 subdistricts, 38429.6 hectares of wetland, 230547.8 hectares of non-rice fields, and 31048.1 hectares of non-land farm with a population of 350218 inhabitants. Specifically, the Suli sub-district has 21273 inhabitants living in it (Badan Pusat Statistik Kabupaten Luwu, 2015).

This research was conducted in five villages, namely: North Suli Village in North Muara Village, South Suli Subdistrict in South Muara Village, Suli Subistrict around Tangkalasi area, Cimpu village at Cerekang area, and Tawodu Villages at Tirowali Village, Sulisub-district, Luwu District, South Sulawesi. Descriptive qualitative research was used by explaining the

public perception in five villages against the public perception about the mangrove ecosystem in the Suli subdistrict.

In this study, we collaborated with informants, which is a community located around the coastal area at Suli Subdistrict, Luwu District. The primary data were obtained based on a survey, whereas the secondary data were obtained from institutions-government agencies.

The population in this research included the entire population of the five villages with a population of 21273 inhabitants. The sampling technique was conducted based on the Slovin's method (Ayuniyyah, 2019) as follows:

$$n = \frac{N}{Ne^2 + 1}$$

where n is the number of samples, N is the number of population, and e is the degree of error. Based on the formula, the number of samples is 99.532 (rounded to 100) with 10 % error tolerance, where each of the 20 people is in every village. The samples come from a community living in five villages; thus, they are considered to be able to provide appropriate information needed.

This research's variable is the perception of the coastal community on the function of mangrove and the knowledge about the ecological function, participation, welfare, social culture, and government policies in the research area.

Questionnaires of the community perception on the function of mangrove ecosystems were distributed to the respondents. The questionnaire results were weighed on Likert scales (Wardhani et al., 2019), where each indicator consists of 5 alternative choices. The 'strongly agree' is given a score of 5 (ranging from 4.51 to 5), 'agree' is given a score of 4 (ranging from 3.51 to 4.50), neither 'partly agree' nor 'partly disagree' is given a score of 3 (range 2.51 to 3.50), 'disagree' is given a score of 2 (range from 1,51 to 2.50), and 'strongly disagree' is given a score of 1 (range from 1 to 1.50). As for the number of questions for community perception for each indicator is explained based on Table 1.

Table 1. Questionnaire of Community Perceptions

	Mangrove Ecology Function
No	**Questions**
1	Mangrove ecosystem plays a role in holding down the abrasion, wind, flood, tsunami, and maintain coastal resources.
2	Mangrove ecosystem can manage the waste materials.
3	Mangrove ecosystem is a place for fish, crab, spot prawns in looking for food.
4	Mangrove ecosystem serves as the place for birds, and other animals for breeding and foraging.
	Community Participation to Mangrove Preservation
No	**Questions**
5	Is there any effort to looking for information related to maintaining and conservation of mangrove to the authorized party?
6	Does the community often present in a socialization program and mangrove conservation held by the government or NGO (Non-Governmental Organization)?
7	Does the community invite other parties to plant mangroves around the coastal area?
8	Does the community rebuke when finding people that will damage a mangrove, and giving them an understanding of the importance of the mangrove?
9	Reforestation is an essential thing around the coastal area.
10	Maintenance and preservation of the mangroves are equal responsibilities between the government and the whole community in preserving mangrove.
11	Mangrove destruction ecosystem and coastal area are caused by logging and uncontrolled land utilization such as fishpond and infrastructure.
	Mangrove Economy Benefits
No	**Questions**
12	Mangrove ecosystem can fulfill a family necessity, such as food, medicine, fuel, furniture, and boat equipment.
13	Mangrove ecosystem can give benefit to the family such as fish, shrimp, crabs, shells, and the like.
14	Mangrove ecosystems could provide additional income for families.

15	The fruits from mangrove are already used for food and various drinks.
16	Mangrove ecosystems could be used for medicine and food for livestock.
	Socio-Cultural Benefits
NO	**QUESTIONS**
17	Is mangrove management already proper?
18	What does the Government do with the community around the mangrove forests?
19	Could the problem and solution of socials occur around the community be solved well?
20	Does the government give support to the increase in education quality, empowerment, fund, and training programs for the community around the coastal area?
21	Do the participants have mutual assistance together with another family group? 1) building a ship 2) creating a fishpond 3) trading 4) building a religious service, bridge, and the like.
	Government Regulation toward the Mangrove Forest
NO	**QUESTIONS**
22	Is the government routine program of the mangrove ecosystem often carried out?
23	Does the government hold routine assistance towards the coastal community?
24	Is law enforcement for persons who ruin mangrove applied?
25	Is the Government's socialization about the importance of mangrove ecosystems often done?
26	Is there any socialization about the dangers of coastal areas when mangrove forests are not well maintained?

The observation was carried out to observe directly and the condition of the research location, especially regarding the perception of the coastal community on the function of mangrove ecosystems.

The documentation in this study was used to obtain data on perceptions, responses, and responses of coastal communities to mangrove ecosystem functions. The data were first processed with tabulation and editing techniques to simplify the analysis. The data processing was conducted by classifying data based on research instruments through scoring and tabulation.

RESULTS AND DISCUSSION

Mangrove forest management is crucial for the sustainability of coastal ecosystems in the life cycle; hence, it is indispensable to preserve.

Public perception depends on the necessity and desires of the observer; the variables used should be in accordance with the focus of the research. The questions above are open to revision depending on how many items of variables used because each researcher has different viewpoints. The more the number of public perception towards the mangrove, the broader the view.

The physical condition of the environment of the coastal region is correlated with the activities taken place in it and the community behavior (Kumar et al., 2010; Sales, 2009). The public perception toward the management of mangrove forests is influenced by age, gender, and residence (Paletto et al., 2013).

Figure 1 shows the average scores of the community perception related to the knowledge about mangrove ecology functions. The results revealed the knowledge about the capability of mangrove either as a hydrodynamic disaster preventive, as a place for shallow water organism to search food, or as a place of birds (and other animals) for breeding and foraging, are proper based on the perception score for question 1, question 3, and question 4. On the other hand, the capability of mangrove to filter waste materials from the upstream area is quite good based on the perception score for question 2.

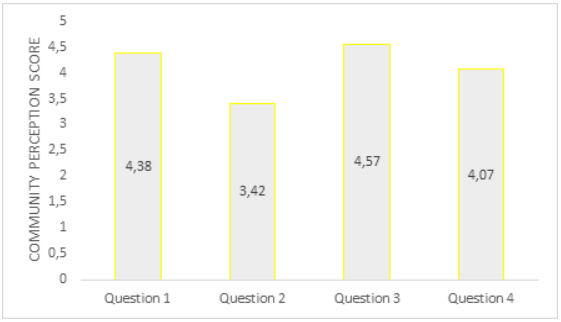

Figure 1. The Perception about Mangrove Ecological Functions in Suli Subdistrict

Figure 2 shows the average scores of the community perception related to the efforts of the coastal community to preserve the mangrove ecosystem.

Community perception scores for question 5 and question 8 revealed that the efforts of the community to find related information about the preservation of mangrove and an understanding of the impact of the mangrove destruction are good.

Knowledge of the coastal community about the mangrove preservation, which is an equal responsibility of all parties, revealed an excellent result. It is caused by a good knowledge about the impact of deforestation due to illegal logging and uncontrolled land use as fishponds and infrastructure. However, this knowledge and understanding are not enough without the actions and cooperation of the related parties. Based on *Badan Pusat Statistik Kabupaten Luwu*/ Luwu District Statistical Center (2017), 24% of the mangrove ecosystem in this regency is in a damaged condition along the coast. North Luwu Regency Government, in collaboration with various NGOs as well as residents, carried out various mangrove planting programs and activities from 2012 up to present. Unfortunately, most of the reforestation efforts have not been entirely successful, in which, from five vegetation declared extinct, only three vegetation were successfully replanted and bred (Purnawan et al., 2019).

The participation in events related to mangrove preservation disseminated by government and NGOs is correlated with the effort to invite other parties to plant mangrove around the coastal area.

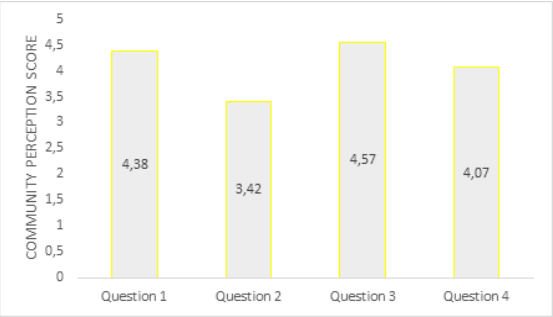

Figure 2. Coastal Community Participation in Mangrove Preservation at Suli Subdistrict

Figure 3 shows the average scores of the community perception related to the economic benefit for local people in utilizing mangrove forests based on their basic knowledge. The results unveiled that the knowledge about the benefit of mangrove as a source of food such as fish, shrimp, crab, shellfish, and the rest, is good. On the other hand, the knowledge about the capability of mangrove to fulfill daily life necessities such as medicine, fuel, furniture, and boat equipment is quite good. The different results were probably caused by the low primary income from several respondents based on the results of the interview, thus, resulting in pessimism.

The knowledge about the advantage of mangrove fruits for food, drinks, medicine, and livestock food is quite good. The perception score for question 15 was the lowest among others so that further research related to the benefit of mangrove for food and drinks needs to be done. Future research is needed to change the pessimistic of some people about the ability of mangrove to fulfill their daily needs.

Internal factors such as interest, unidirectional needs, and community experience in mangrove management are expected to increase community enthusiasm for utilizing mangrove forests for their economic needs. While for external factors such as increasing the socialization intensity of the benefits of mangroves for food and drinks is expected to increase public perception about the importance of mangrove processing.

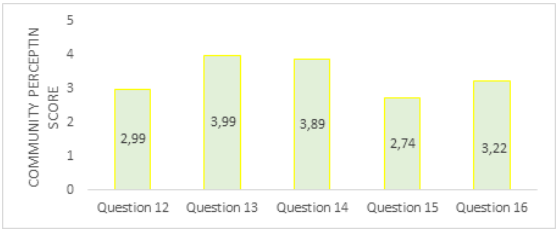

Figure 3. The Economic Benefits of Mangroves on Coastal Community in Suli Subdistrict

Figure 4 informs the average scores of the community perception related to the socio-cultural of local people.

Mangrove management, the cooperation between the Government and the coastal community, and the efforts of the Government to enhance the quality of education, empowerment, financial, and training related to the coastal community are quite good overall.

Social problems occurring in this area are proven to be adequately resolved based on the perception score for question 19. These results are allegedly related to the perception score for question 21, which expresses an excellent spirit of cooperation among the coastal community around the mangrove area.

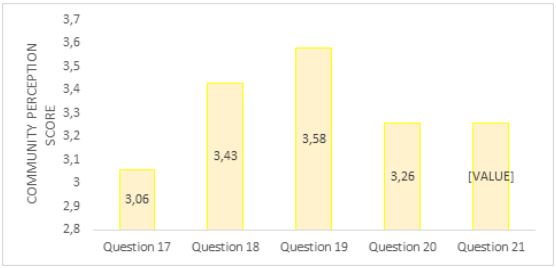

Figure 4. The Coastal Community Perception toward Mangroves related to Socio-Cultural Benefits

Figure 5 shows the average scores of the community perception related to Government regulation on the mangrove forest. The results revealed that the government has routinely carried out programs related to mangrove conservation. This is in line with government efforts in conducting socialization about the importance of mangrove ecosystems. Moreover, the community has been aware of government regulations in the area in terms of community welfare improvement. As a result, law enforcement related to the benefits and damages caused by human activities is quite well done.

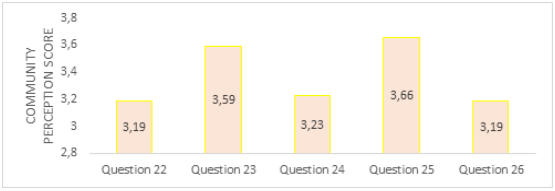

Figure 5. Government Regulations on Mangroves in Suli Subdistrict

Figure 6 shows the average scores for all aspects reviewed. The results revealed that the knowledge of coastal communities about ecology function, participation, and government regulations are good, while the knowledge about the economic benefit and socio-culture is quite good.

Figure 6. The Average Scores of Community Perception towards the Ecological Functions, Participation, Economic Benefits, Social and Cultural Benefits, and Government Regulations

Table 2 shows the age and education background of the respondents. According to Ilyas et al. (2013), two individual factors show a real relationship for community participation in the preservation of mangrove forests, namely education and knowledge. Low education in the community around mangrove forests will be an obstacle in mangrove management efforts. However, the education level of the respondents in the Suli Subdistrict did not affect public perceptions about the importance of mangrove forest management based on the results.

Table 2. The Age and Education Level of the Respondents

The Age of the Respondents		
No	**Age (years old)**	**Number of Respondents**
1	20 – 30	4
2	31 – 40	25
3	42 – 50	36
4	51 – 60	26
5	61 – 70	9
6	71 – 80	0
The Education Level of the Respondents		
No	**Education**	**Number of Respondents**
1	Do not pass from elementary school	4
2	Elementary school	42
3	Junior high school	30
4	Senior high school	21
5	Diploma	1
6	Bachelor degree	2

The average scores of community perception towards the ecological functions, participation, economic benefits, social and cultural benefits, and government regulations are suitable for respondents who do not pass from elementary school and those who pass elementary school. This revealed that even though the level of education is low, their understanding of mangroves was good. Besides, age specifications also did not affect overall community perception, where the scores showed good results (the score is calculated from each group of respondents based on age classification).

Proper management of mangroves in the Suli Subdistrict is caused by local wisdom. There is a belief that mangroves are the nails of the earth that protect the coast from the waves. This understanding has been passed down through generations. This local wisdom led to Suharsono's intention as a youth figure in Suli Subdistrict in the coastal area to form a mangrove lover group that aims to plant mangroves in abrasion areas to preserve and preserve them. The activities of this group are still going well for the time being.

CONCLUSION

The results revealed that the average of public perception towards the ecological functions of mangrove is good with a score of 4.11, the public perception towards public participation is good with a score of 3.69. Moreover, the public perception about the economic benefits of mangrove was quite good, with a score of 3.37. The social and culture was quite good, with a score of 3.32, and the public perception towards government regulation (law enforcement) was good, with a score of 3.57. Based on the results, the average score was 3.61, which means that mangroves management is suitable based on the perceptions of a coastal community in the Suli Subdistrict.

The level of community education and age specification do not affect perceptions about the importance of mangrove management. This is caused by the existence of local wisdom, which considers that mangroves are the earth's nails that protect the coast from the dangers of abrasion or accretion. This local wisdom is still maintained, where the local community formed a mangrove lover group playing a role in planting and conserving mangroves in Suli Subdistrict.

A better perception of mangrove management will encourage the community to do better preservations. Thus, regular and comprehensive socialization should be scheduled so that the public perception towards mangrove forest enhances. This research is expected to increase an understanding of local people about the benefit of mangroves to stimulate active participation among each other and finally will increase the income. Moreover, it is hoped that future research will be conducted by considering another local wisdom comprehensively.

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