

The Influence of Socio-Cultural Approaches on Ecological Disaster Management in Lake Balang Tonjong, Makassar

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Abstract: Ecological pressures on the Balang Tonjong lake ecosystem are currently very strong due to its use as a tourist destination, community settlement, fishing, agriculture, and traditional market. All of these ecological pressures greatly affect the nature of the water, which can influence lake organisms, including gastropods. The purpose of this study was to examine the influence of socio-cultural aspects on the process of ecological disaster management in Balang Tonjong, Makassar. The study was conducted using descriptive quantitative techniques with purposive sampling at five stations considered representative of the study area. In this case, direct observation was carried out by conducting direct interviews with the community in Balang Tonjong. The results of the study indicate that socio-cultural aspects greatly influence the management of ecological disasters in Lake Balang Tonjong. This shows that the community has high awareness and participation, has more effective management knowledge and experience, and has a high appreciation for the condition of the lake and is very concerned about its preservation.

Keywords: Ecological Disaster, Socio-Cultural Aspects, Lake Balang Tonjong, Makassar Indonesia

Introduction

An ecological disaster is a natural phenomenon that occurs as a result of changes in the ecological order caused by several factors that influence each other, including humans, living creatures and natural conditions. Ecological disasters occur when the balance between living creatures and their habitats is disrupted, creating a hazard that can lead to disaster risk if there is vulnerability within an environment [1,2].

Ecological disasters pose a threat to every region, necessitating preventive measures to reduce the risk of disaster. Prevention and environmental management must begin early to assess the risks and unstable natural conditions that pose a threat of disaster to an ecosystem. Uncontrolled activities and environmental management can result in ecological disasters or ecosystem damage. Several factors are considered to be causes of disasters, including environmental degradation [3,4].

Social and cultural aspects play an important role

in reducing the impact of ecological disasters. Various cultural approaches that can be taken include an approach that rewards local traditions and wisdom and assists in developing more effective disaster mitigation strategies; the use of symbols and rituals can be used to increase public awareness and participation in disaster mitigation efforts; and the development of environmental awareness through education and campaigns can help the community understand the importance of protecting the environment. A social approach, namely building strong social networks, can help communities share information, resources, and support during disasters. Community capacity building through training and education can help them better cope with disasters, while the development of inclusive policies that take into account the needs of all community members can help reduce the impact of disasters [5,6].

Ecological disasters have been occurring for decades, based on time series location maps recorded at Lake Balang Tonjong in Makassar. This condition has continued without any meaningful intervention from the government and the community due to conflicts of

interest and land ownership status. This condition needs attention so that the lake can return to its original function as a water reservoir and a healthy habitat for aquatic organisms [7–9].

Eutrophication occurring in Lake Balang Tonjong is greatly influenced by abundant nitrate and phosphate compounds resulting from the decomposition of organic matter from domestic waste. This condition causes a reduction in oxygen levels, which inhibits the growth of other organisms. In addition, these abundant nitrates pollute the water and cause poisoning in living organisms, leading to a reduction in aquatic biodiversity. The biota found and dominant in this study are types or species that are able to adapt to eutrophic and hypertrophic aquatic environments [10–13].

The use of Lake Balang Tonjong Makassar for various community activities has caused an extreme decline in environmental quality due to eutrophication. This occurs because of the accumulation of nutrients such as nitrate and phosphate from anthropogenic activities around the lake, resulting in eutrophication that affects the diversity of gastropods in Lake Balang Tonjong Makassar [1,3]. Based on this, it is necessary to examine the influence of socio-cultural aspects on the process of ecological disaster management in Balang Tonjong, Makassar.

Method

Analysis of social and cultural aspects in this study was conducted using SPSS statistical software, employing analysis of variance on questionnaire results obtained from the community.

Hypothesis: Cultural and social aspects influence disaster management.

Basis for decision making:

1. Based on the significance value (Sig.) from the ANOVA output. If the Sig. value is < 0.05 , the hypothesis is accepted. This means that social and cultural aspects simultaneously influence disaster management. If the Sig. value is > 0.05 , the hypothesis is rejected. This means that social and cultural aspects do not simultaneously influence disaster management.
2. Based on a comparison of the calculated F value with the table F value. If the calculated F value is greater than the table F value, then the hypothesis is accepted. This means that social and cultural aspects simultaneously influence disaster management. If the calculated F value is less than the table F value, then the hypothesis is rejected. This means that social and cultural aspects do not simultaneously influence disaster management.

Results and Discussion

Based on variance analysis, cultural and social aspects have a significant influence on ecological disaster management, as can be seen in Table 1 below:

Table 1. Analysis of variance of the influence of socio-cultural aspects on ecological disaster management in Balang Tonjong

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	170.382	2	85.191	8.257	.002 ^b
	Residual	278.585	27	10.318		
	Total	448.967	29			

a. Dependent Variable: Pengelolaan_Bencana

b. Predictors: (Constant), Aspek Sosial, Aspek Budaya

1. Based on the Significance Value (Sig.) from the ANOVA Output. Based on the SPSS output table above, the sig. value is 0.002. Since the sig. value of $0.002 < 0.05$, it can be concluded that the hypothesis is accepted or, in other words, that social and cultural aspects simultaneously influence ecological disaster management at Lake Balang Tonjong.
2. Based on the comparison of the calculated F value with the F table. Based on the SPSS output table above, the calculated F value is 8.257. Because the calculated F value = $8.257 > F$ table 3.34, it can be concluded that the hypothesis is accepted, or in other words, social and cultural aspects simultaneously influence ecological disaster management in Lake Balang Tonjong.

Table 2. Hypothesis testing of the influence of socio-cultural aspects on ecological disaster management in Balang Tonjong

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.616 ^a	.379	.334	3.212

a. Predictors: (Constant), Aspek_Sosial, Aspek_Budaya

b. Dependent Variable: Pengelolaan_Bencana

Based on Table 2 of the model summary output, the coefficient of determination or R Square value is 0.379. The coefficient of determination (R Square) is 0.379 or 37.9%. This figure means that cultural and social aspects simultaneously influence the ecological disaster management variable by 37.9%. The remaining 62.1% is influenced by other variables outside the variables studied.

Ecological disasters in lakes can be minimised from a social and cultural perspective, as the community and stakeholders have high awareness and participation, possess more effective management knowledge and experience, and have a high regard for the condition of the lake and are very concerned about its preservation [5,14].

Based on respondents' data regarding the statement that ecological disasters occur due to the silting up of Lake Balang Tonjong, it can be interpreted that the majority of respondents (60%) agree or strongly agree that the silting up of Lake Balang Tonjong contributes to ecological disasters. Meanwhile, 40% of respondents disagree or somewhat disagree with this statement. Lake Balang Tonjong, located in Manggala District, Makassar, covers an area of approximately 48 hectares. However, the lake has experienced significant environmental degradation. Uncontrolled growth of water hyacinth and sediment accumulation have caused the lake to silt up, reducing its capacity as a water catchment area and flood control. In addition, domestic and agricultural activities around the lake cause pollution and sedimentation, which reduce the lake's capacity to hold water. The survey results show that most people are aware that the silting of Lake Balang Tonjong contributes to ecological disasters in the area. However, there are still some respondents who do not fully agree, due to a lack of information or understanding about the environmental impact of lake silting. This emphasises the importance of educating and socialising the community about the importance of preserving the lake ecosystem to prevent ecological disasters in the future [15,16].

The silting of Lake Balang Tonjong in Makassar is caused by the disposal of organic materials from household, agricultural, fishery and livestock waste, based on existing survey data. the majority of respondents (73.3%) agreed or strongly agreed that the silting of Lake Balang Tonjong was caused by the disposal of organic materials from household, agricultural, fishery and livestock waste. Conversely, only a small proportion of respondents (26.7%) disagreed, strongly disagreed or very strongly disagreed with this statement. The small number of respondents who disagreed or somewhat disagreed had different views on the main cause of lake siltation. Some reasons behind these perceptions are that some respondents do not have sufficient information about the impact of organic waste on the lake ecosystem; a lack of education or socialisation about the relationship between waste disposal and siltation can influence their perceptions; respondents living around the lake do not directly observe the impact of waste disposal on siltation, so they doubt the connection. Some believe that other factors, such as natural sedimentation, soil erosion, or infrastructure development around the lake, contribute more to siltation than organic waste. Respondents involved in agriculture, fisheries, or livestock farming around the lake feel that highlighting waste from their sector as a

cause of siltation could have a negative impact on their livelihoods [16].

Local wisdom can mitigate ecological disasters in Lake Balang Tonjong, Makassar. The majority believe that local wisdom can play a role in mitigating ecological disasters in Lake Balang Tonjong, Makassar. With 40% agreeing and 43.3% strongly agreeing, more than 80% of respondents acknowledge that traditional practices and local knowledge have a positive impact in reducing disaster risk. Conversely, only 16.6% of respondents expressed disagreement at various levels. This may indicate that a small proportion of respondents see limitations in the effectiveness of local wisdom, or that they place more trust in modern approaches to disaster mitigation. Local wisdom often encompasses community-based environmental management, traditional conservation practices, and an understanding of natural patterns that has been passed down from generation to generation. In many places, this approach has proven to help communities cope with environmental change and natural disasters [10,16,17].

Local communities and stakeholders are very important to involve in preventing pollution in Lake Balang Tonjong Makassar. The majority of respondents (80%) agreed or strongly agreed that the involvement of local communities and stakeholders is very important in preventing pollution in Lake Balang Tonjong. Conversely, only a small proportion of respondents (20%) disagreed, strongly disagreed, or very strongly disagreed with this statement. The involvement of local communities and stakeholders in lake environmental management is crucial because local communities have valuable knowledge and experience regarding the condition of the lake and the changes that occur, which can be used in the planning and implementation of conservation programmes. When communities are involved in decision-making and programme implementation, they tend to feel a sense of ownership and responsibility for the success of the programme. Conservation programmes that involve communities and stakeholders tend to be more effective and sustainable because they are supported by various interested parties. Through active participation, communities can increase their awareness and understanding of the importance of preserving the lake and its surrounding environment [7,16,17].

The provision of environmental education and awareness to the community regarding the management of household and agricultural waste: the majority of respondents (83.4%) agreed or strongly agreed that the provision of environmental education and awareness to the community regarding the management of household and agricultural waste is important to prevent pollution in Lake Balang Tonjong. Conversely, only a small

proportion of respondents (16.6%) disagreed, strongly disagreed, or very strongly disagreed with this statement. Environmental education and awareness play a crucial role in increasing public awareness and knowledge about sustainable waste management. Effective education programmes can encourage behavioural change, such as the application of the 3R principle (Reduce, Reuse, Recycle), composting of organic waste, and reduction in the use of hazardous chemicals in agriculture. Studies show that community participation in environmental education programmes can increase awareness and attitudes towards waste management, as well as have a long-term impact on the environment and community welfare. Although a small number of respondents disagreed that environmental outreach and education are important in managing household and agricultural waste, evidence and experience show that effective education programmes can increase public awareness and change behaviour [1,15,17].

Therefore, it is important to continue to encourage and facilitate environmental outreach and education programmes in order to preserve Lake Balang Tonjong.

Collaboration between community working groups, government and non-government organisations in offering sustainable lake conservation programmes shows that the majority believe that collaboration between communities, government and non-governmental organisations in offering sustainable lake conservation programmes is an effective measure. With 26.7% agreeing and 53.3% strongly agreeing, more than 80% of respondents support this approach as a solution to preserve the lake ecosystem. Conversely, only 20% of respondents expressed disagreement at various levels. This may indicate that a small proportion of respondents may see challenges in implementing collaboration, such as coordination between parties, funding, or the effectiveness of the programmes offered. Cross-sector collaboration often includes community empowerment in maintaining the lake ecosystem. Policy support from the government for environmental regulation and protection. Contributions from non-governmental organisations in education and funding for conservation programmes [5,16].

Encouraging the community to manage waste and refuse properly so as not to pollute the environment, the majority of respondents strongly support efforts to encourage the community to manage waste and refuse properly so as not to pollute the environment. A total of 76.7% of respondents said they strongly agreed, 13.3% agreed, while only 10% strongly disagreed, and none disagreed or disagreed somewhat.

This strong support reflects the high level of public awareness of the importance of proper waste and refuse management to preserve the environment. In order to increase overall community participation, a comprehensive approach is needed, including education, the provision of adequate facilities, and changes in the culture and habits of the community in managing waste [3,5,16].

The integration of material on the importance of preserving lake ecosystems into the school curriculum was supported by the majority of respondents. A total of 56.7% of respondents strongly agreed, 26.7% agreed, while 6.7% disagreed, and 10% strongly disagreed. This reflects an awareness of the importance of environmental education in shaping a generation that cares about the preservation of lake ecosystems. However, to overcome the rejection from a small number of respondents, a comprehensive approach is needed, including training for teachers, provision of adequate resources, and curriculum adjustments so that environmental material can be taught effectively without burdening students [15,17].

The government and community must form a community of lake and environmental enthusiasts as an effort to alleviate the extreme conditions of the lake. The majority of respondents supported the formation of a community of lake and environmental enthusiasts as an effort to alleviate the extreme conditions of the lake. A total of 66.7% of respondents strongly agreed, 16.7% agreed, while 6.7% disagreed, 3.3% somewhat disagreed, and 6.7% strongly disagreed. The existence of this environmental community plays a role in educating the public about the importance of preserving the lake ecosystem. Local communities can also assist in the monitoring and management of lake resources. The formation of communities enables collaboration between the community, government, and other institutions in lake conservation efforts [5,7,15].

Imposing social sanctions on environmental offenders, both verbal and written warnings, the majority of respondents supported the imposition of social sanctions, such as verbal and written warnings, on environmental offenders. A total of 56.7% of respondents strongly agreed, 20% agreed, while 10% disagreed, 3.3% somewhat disagreed, and 10% strongly disagreed. Social sanctions, such as verbal and written warnings, can have a deterrent effect and encourage perpetrators not to repeat their violations. Community involvement in the imposition of social sanctions can strengthen social norms that support compliance with the law and reinforce the effectiveness of law enforcement. To increase its effectiveness, broader education of the community about the importance of social sanctions is needed, as well as clear monitoring

mechanisms to prevent abuse [5,17].

Conclusion

Social and cultural aspects greatly influence the management of ecological disasters in Lake Balang Tonjong, with a value of 37.9%. This shows that the community has high awareness and participation, more effective management knowledge and experience, and a high appreciation of the condition of the lake and great concern for its preservation.

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