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Analysis of Potential Resources and Impact of Mangrove Ecosystem Rehabilitation in The Lantebung Makassar Ecotourism Area

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Abstract
Mangrove ecosystems have a very potential role in the coastal environment both in terms of ecology and in supporting economic growth, including protecting the coast from abrasion, protecting coastal areas from storms and tsunamis, as a habitat and a place to find food for biota, tourist destinations, medicinal materials. -drugs and various other benefits.
The research objectives are; to identify the potential of mangrove ecosystems, and the impact of mangrove forest rehabilitation activities in the Lantebung Mangrove Ecotourism Area, Makassar City. The methods used for analyzing the potential of mangrove resources are observation, interviews and random sampling techniques with 3 observation locations/stations consisting of three sampling plots with a size of 10 x 10 m and mangrove thickness and changes in area using the Ermapper Global Mapper Arcgis. Potential data analysis includes species composition, density, and biota associated with mangroves. As supporting data, measurements of water quality parameters are carried out.
The results showed the potential of the mangrove ecosystem in the Lantebung Mangrove Ecotourism Area consisting of Rhizphora mucronata and Avicennia marina vegetation consisting of: Rhizophora mucronata species density value of 2,267 ind/ha and Avicennia marina species of 1,100 ind/ha, fauna associated with mangroves found 10 species aquatic biota namely: Scylla serrata, Telescopium telescopium, Cassidula espertilionis, Nassarius olivaceus, Egretta garzetta, Egretta sacra, Ellobium aurisjudae, Balanus sp, Pugilina cochlidium, Periophthalmus sp. The impact of rehabilitation is a change in area from 2018 (16,146 Ha) and 2022 (17,079 ha) with an average mangrove thickness of 134 m.

Keywords: mangroves, ecotourism, rehabilitation, Lantebung

Introduction

A mangrove ecosystem is a coastal ecosystem that plays a vital ecological and economic role. Such ecosystems hold significant potential for supporting national economic growth. Physically, they help maintain coastal stability by protecting against erosion, waves, and abrasion; they also serve as a buffer—a filter—against tsunamis, typhoons, seawater intrusion, and various pollutants and pathogens.
Mangrove forest ecosystems are a coastal natural resource of great social, economic, and ecological importance. Their primary function is to act as an ecosystem balancer and a provider of essential needs for humans and other living organisms. Beyond their economic potential as a source of timber, mangrove forests serve as spawning grounds, nursery grounds, and feeding grounds for fish and other marine biota. They also function as a barrier against ocean waves and the inland intrusion of seawater (Suzana *et al*., 2011) [13]. There is a significant correlation between the extent of mangrove coverage and fishery resources; the

larger the mangrove forest, the higher the fish production (Malau *et al*., 2018) [11].

The biological benefits are closely linked to the ecosystem's role in maintaining ecological balance and supporting life on land and in the ocean. The availability of diverse food sources within this ecosystem makes it vital, as it serves as an energy source for various marine organisms—such as fish, shrimp, shellfish, and crabs—while also functioning as a spawning ground, nursery ground, feeding ground, and shelter. Meanwhile, the economic benefits relate to the ecosystem's role in providing products that generate economic gains for humans.

The extent of mangrove coverage along the northern coast of Makassar City has increased over the last decade. In 2001, the mangrove forest area covered 50.3 hectares, and by 2015, it had reached 58.53 hectares—an increase of 8.23 hectares (Bando *et al*. 2017) [3]. This expansion is the result of conservation efforts and mangrove planting activities carried out by various parties along the northern coast of Makassar City. The northern coastal area in question encompasses the Tallo, Biringkanaya, and Tamalanrea districts. Lantebung is a settlement located in the Bira Urban Village, Tamalanrea District, which encompasses a 12-hectare mangrove forest. According to the Makassar City Spatial Plan, this area is designated as a conservation zone for the protection of the coastal ecosystem, specifically the mangrove habitat (BPPD, 2015) [2]. Between 2010 and 2015, the Makassar City Office of Marine Affairs, Fisheries, Agriculture, and Animal Husbandry, in collaboration with the local community, carried out mangrove planting activities along the Lantebung coastline. To ensure that these conservation efforts remain sustainable and continue to provide benefits to the local community, an effective and adaptive management approach is essential.

Materials and Methods

Location and Time

Time and Location of the Study

This research will be conducted over a period of one month, starting in August 2020. The study will take place in the Lantebung Mangrove Ecotourism Area, located in Bira Village, Tamalanrea District, Makassar City. A map of the research site is provided in Figure 1 below.

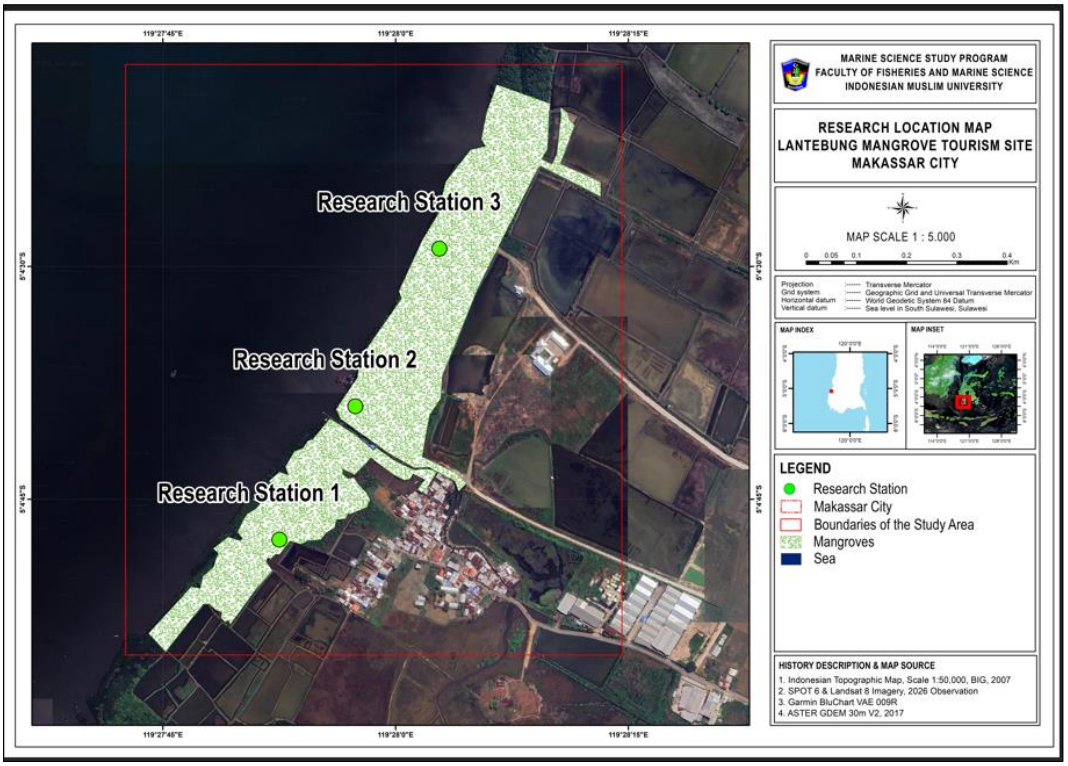


Fig 1: Research Location

Tools and Materials

The tools and materials used in the research are presented in Table 1.

Table 1: Tools and Materials

No	Tools	Utility
1	Writing instruments	To record research data
2	GPS	To determine the coordinate position in the field
3	Measuring tape	To measure seagrass density
4	Raffia string	To create a transect line, which is a technique for outlining plots or stations
5	Camera	For documentation
	Materials	Sample

Mangrove vegetation was assessed using a simple random sampling method across three observation stations, each positioned parallel to the coastline. At each station, three square sampling plots measuring 10 x 10 m were established to survey the tree layer (defined as individuals with a stem diameter > 4 cm). Data collection within the mangrove ecosystem focused on species identification, vegetation density, and associated biota. The parameters recorded included mangrove species, the number of individuals per species (trees), and various physicochemical factors, such as pH, temperature, total suspended solids (TSS), and salinity.

Data Analysis

Mangrove forest potential

Data collected for the analysis of mangrove ecotourism potential include:

a. Species Identification

Mangrove identification is conducted using the "Guide to Mangrove Identification in Indonesia" (Noor *et al*., 2006).

b. Mangrove Density

Species density (D) is the number of stands of the i-th species within a given area (Bengen, 2001) [4], calculated using the following formula:

$$\frac{ni}{A}$$

Where:

D = Species density (ind./m²)

ni = Total number of stands of the i-th species

A = Total area of the sampling site (m²)

The status of the utilization level for ecotourism is analyzed by examining the degree of mangrove damage. The method used to calculate the level of mangrove damage follows the Decree of the State Minister for the Environment Number 201 of 2004 concerning Standard Criteria and Guidelines for Determining Mangrove Damage (Table 2).

Table 2: Standard Criteria for Mangrove Damage

Criteria		Canopy Cover (%)	Density (trees/ha)
Good	Very Dense	≥ 75	≥ 1500
	Moderate	≥ 50 - ≤ 75	≥ 1000 - ≤ 1500
Damaged	Sparse	< 50	< 1000

Decree of the Minister of Environment No. 201 of 2004

a. Associated Biota

Associated biota are assessed through observation only, without counting the number of individuals for each species.

Impacts of Mangrove Rehabilitation Activities

The impacts of rehabilitation activities will affect the thickness and extent of the mangrove area; therefore, the parameters measured are limited to mangrove thickness and changes in mangrove extent, analyzed using ERMapper, Global Mapper, and ArcGIS. (Asri, 2022) [1]

Results and Discussion

Potential of Mangrove Forests

a. Species Identification

The identification process revealed only two mangrove species: R. mucronata and A. marina, with R. mucronata being the dominant species. Rini *et al*. (2018) [12] identified three mangrove species—Avicennia marina, Avicennia alba, and Rhizophora mucronata in the same area. This discrepancy is likely due to differences in sampling during field observations.

b. Mangrove Density

The results of the analysis regarding species density and relative density are presented in Table 3.

Table 3: Average species density by mangrove type.

Mangrove Species	Species Density (ind./100 m²)			Average	
	1	2	3	ind./100 m²	ind/ha
Rhizhopora mucronata	25,67	19,67	22,67	22,67	2.267
Avecennia marina	11,67	10	11,33	11	1.100

Based on Table 3, the highest average density was recorded for the species R. mucronata, at 22.67 trees/100 m² or 2,267 trees/ha. This density value falls into the "very dense" category a favorable classification as it meets the threshold of ≥ 1,500 trees/ha established by the Decree of the Minister of Environment No. 201 of 2004. The high density of these mangroves is supported by growth conditions characterized by a muddy substrate. According to Lewerissa *et al*. (2018) [10], R. mucronata thrives in substrates dominated by silt (mud). Kusmana (2014) [9] notes that the high density of Rhizophora mucronata is due to the fact that Rhizophora species occupy a broad ecological range, allowing them to flourish even in inland areas, provided there is an adequate supply of saltwater. Furthermore, R. mucronata seedlings are consistently used in rehabilitation efforts. As stated by Naohiro *et al*. (2012), R. mucronata Lamk possesses a high capacity for adaptation and provides strong protection against abrasion and ocean waves. This species is frequently utilized for rehabilitation across various regions because its propagules are abundant, easy to grow, and exhibit a high dispersal capacity (Halidah, 2010) [7].

a. Associated Biota

The identification of fauna associated with the mangroves encompasses all organisms found within the area, whether aquatic or inhabiting the space above the mangrove substrate. The fauna identified at the research site are presented in Table 4.

Table 4: Fauna Associated with the Mangrove Ecosystem

No	Type of Biota	Observation Station		
		1	2	3
1	*Scylla serrata*	√	√	√
2	*Telescopium telescopium*	√	√	√
3	*Cassidula espertilionis*	√	-	-
4	*Nassarius olivaceus*	-	√	√
5	*Egretta garzetta*	√	-	√
6	*Egretta sacra*	√	√	-
7	*Ellobium aurisjudae*	√	√	√
8	*Balanus* sp	√	√	-
9	*Pugilina cochlidium*	-	√	-
10	*Periophthalmus* sp	√	-	√

Table 4 shows that there are approximately 10 types of biota associated with the mangroves. In contrast, a study by Rini *et al*. (2018) [12] identified about 19 types of biota associated with the mangroves. This discrepancy is likely due to differences in the timing and locations of the observation stations. Other fishery resources include blue swimming crabs (Portunus pelagicus) and various fish species, which serve as the daily catch for local coastal fishers.

Impact of Rehabilitation

The impact of rehabilitation on changes in mangrove area and width is significantly influenced by active rehabilitation efforts in the Lantebung tourism area, involving the Indonesian National Armed Forces (TNI), banking institutions, provincial and municipal governments, the private sector, university students, and various mangrove-advocacy communities. Measurements indicate an average mangrove width of 134 meters. This differs from the findings of Rini *et al*. (2018) [12], who reported a mangrove width ranging from 119 to 163 meters, with an average of 144.5 meters.

In 2018, the green land cover spanned a total area of 16.146 hectares, while by 2022, the mangrove forest area within the Lantebung Mangrove Ecotourism site had reached 17.079 hectares. This represents an expansion of 0.933 hectares between 2018 and 2022, a result driven by the awareness and participation of the local community and other stakeholders in rehabilitating the Lantebung Mangrove Ecotourism area. In 2020, Gojek—in collaboration with the Indonesian Marine Conservation Foundation (YKL Indonesia) and the Makassar Environmental Agency planted 1,000 mangrove seedlings. Subsequently, in 2022, environmental activists planted another 2,000 mangrove seedlings through the "Hutan Merdeka" (Independent Forest) program (Chandra, 2020; antaranews.com, 2022) [6]. Maps showing the extent of mangrove coverage in 2018 and 2022 are presented in Figures 2 and 3 below.

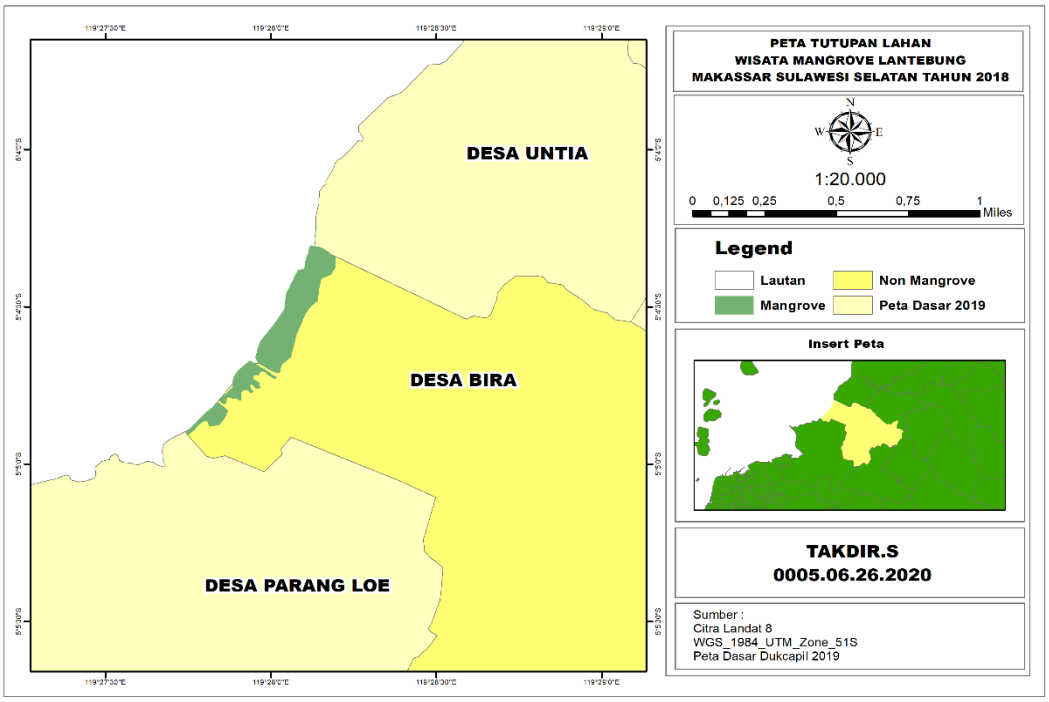


Fig 3: Gambar 2. Peta Tutupan Lahan Tahun 2018

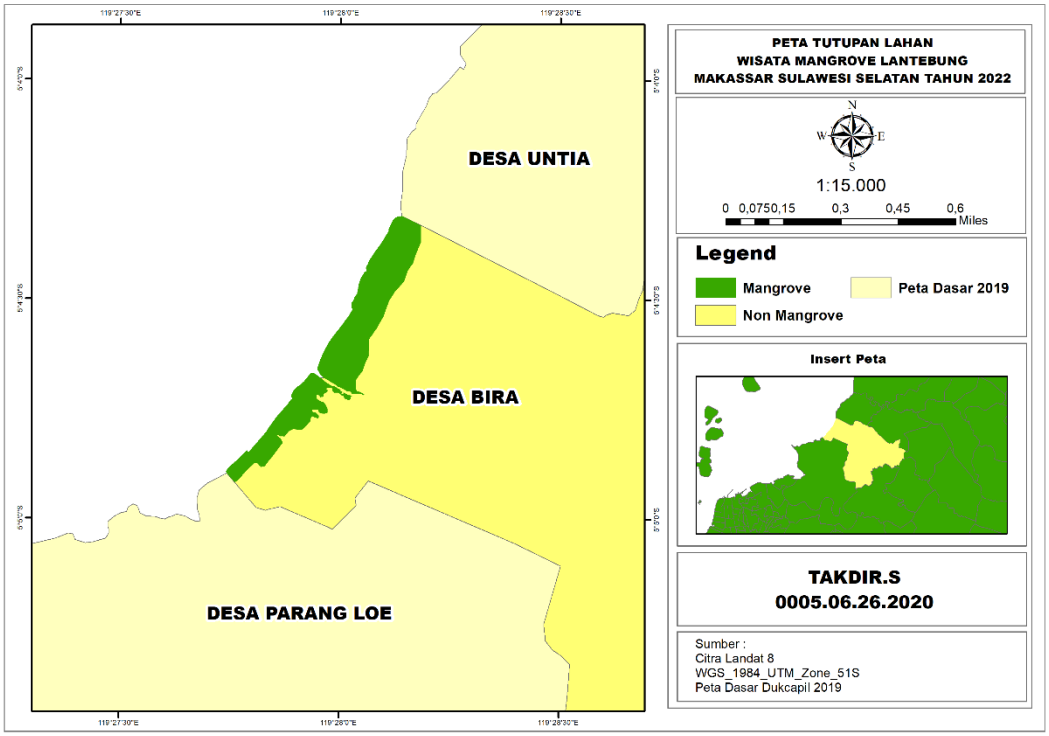


Fig 4: Gambar 3. Peta Tutupan Lahan Tahun 2022

Based on Figures 2 and 3, there was a change in the mangrove area between 2018 and 2022, amounting to approximately 0.933 hectares. This shift was driven by the awareness and participation of the local community, as well as other stakeholders, in rehabilitating the Lantebung Mangrove Ecotourism area. In 2020, Gojek—in collaboration with the Indonesian Marine Conservation Foundation (YKL Indonesia) and the Makassar Environmental Agency—planted 1,000 mangrove seedlings. Subsequently, in 2022, environmental activists planted another 2,000 mangrove seedlings through the "Hutan Merdeka" (Independent Forest) program (Chandra, 2020; antaranews.com, 2022) [6]. Furthermore, Chandra (2018) [5] noted that increasingly intensive mangrove rehabilitation efforts have led to an improvement in the quality of the Lantebung coastline. Catches of fish and crabs have risen, as the mangroves serve as a vital habitat for the spawning of blue swimming crabs and mud crabs.

Conclusions

a.The mangrove forest potential in the Lantebung tourism area consists of two species: R. mucronata and A. marina. R. mucronata exhibits the highest density, at 22.67 trees/100 m² (or 2,267 trees/ha). There are 10 associated biota species, comprising both terrestrial and aquatic fauna.

b.The impact of rehabilitation efforts to date is reflected in the change in mangrove area: from 16.146 ha in 2018 to 17.079 ha in 2022 an increase of 0.933 ha with an average mangrove belt width of 134 m.

References

1. Asri, H. 2022. Mapping Changes in Mangrove Forest Area Using Landsat 8 Satellite Imagery on Karampuang Island, Mamuju Regency, West Sulawesi. Journal of Indonesian Tropical Fisheries, Vol. 5, No. 2. https://jurnal.fpik.umi.ac.id/index.php/JOINT-FISH/article/view/126/155. Accessed on May 25, 2023.
2. Regional Development Planning Agency (BPPD) of Makassar City. (2015). Makassar City Regional Regulation Number 4 of 2015 concerning the Spatial Plan for the Makassar City Region for 2015–2034. Makassar: BPPD of Makassar City.
3. Bando AR, Marsoedi, Susilo A, Tamsil A. The strategy of mangrove forest management for mitigation in the northern coastal area of Makassar. Resources and Environment. 2017;7(2):31-39.
4. Bengen, D. G. 2001. Introduction to and Management of Mangrove Ecosystems. Center for Coastal and Marine Resources Studies, Bogor Agricultural University (IPB). Bogor.
5. Chandra, W. 2018. Mangroves Preserved, Fishermen's Well-being Improves in Lantebung. Mongabay (Environmental News Site). https://www.mongabay.co.id/2018/03/03/mangrove-terjaga. Accessed on June 21, 2023.
6. Chandra, W. 2020. Planting Mangroves in Lantebung: Gojek's Effort to Green Makassar. https://www.mongabay.co.id/2020/11/30/tanam-mangrove-di-lantebung-upaya-gojek-hijaukan-makassar/. Accessed on November 16, 2022.
7. Halidah, 2010. Growth of *Rhizophora mucronata* Lamk under various substrate conditions in the mangrove rehabilitation area of East Sinjai, South Sulawesi. *Journal of Forest Research and Nature Conservation*, 7(4), 399–412.
8. Decree of the Minister of Environment No. 201 of 2004. 2004. Standard Criteria and Guidelines for Determining Mangrove Damage. Jakarta.
9. Kusmana, C., 2014. Distribution and Current Status of Mangrove Forests in Indonesia. In: Faridah-Hanum, I., Latiff, A., Hakeem, K.R., Ozturk, M. (Eds.), *Mangrove Ecosystems of Asia: Status, Challenges and Management Strategies*. Springer New York, New York, NY, pp. 37–60.

10. Lewerissa, Y. A., M. Sangaji, and M. B. Latumahina. 2018. Mangrove Management Based on Substrate Type in the Waters of Ihamahu, Saparua Island. *Journal TRITON*, 14(1), 1–9.
11. Malau, A., B. Utomo, and Z. A. Harahap. 2018. Changes in Mangrove Area and Their Relationship to Fisheries Production in Langsa City, Aceh Province. Aquacoastmarine, Volume 6 (1): 1–11 Naohiro, M., S. Putth, M., and Keiyo. (2012). Mangrove rehabilitation on highly eroded coastal shorelines at Samut Sakhon, Thailand. International Journal of Ecology, Volume 2012: 1–11.
12. Rini, I. Setyobudiandi, and M. M. Kamal. (2018). Assessment of Suitability, Carrying Capacity, and Ecotourism Activities in the Lantebung Mangrove Area, Makassar City. Jurnal Pariwisata, Vol. 5, No. 1: 1–10.
13. Suzana, B. O. L., J. Timban, R. Kaunang, and F. Ahmad. (2011). Economic Valuation of Mangrove Forest Resources in Palaes Village, West Likupang District, North Minahasa Regency. Agri Sosio Ekonomi (ASE), Volume 7(2): 29–38.

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