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Study of Changes in Mangrove Areas Around the Barombong Maritime Polytechnic

Irwan Jaya[1], Faisal Saransi[2], Heri Sutanto[3], Suryansyah Surahman[4]
[1,2,3] Barombong Maritime Polytechnic, [4] Hasanuddin University

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ABSTRACK

Recently, coastlines in several areas of Indonesia have experienced erosion, which is quite worrying. Makassar City is one of 30 coastal cities in Indonesia that is estimated to be potentially affected by rising sea levels. As is the case in the Tanjung Bunga and Barombong Beach areas, the level of abrasion is very high. The beaches in these two areas have experienced a decline in coastline over the years, so they have moved far inland. This is caused by several factors, such as the influence of waves that occur in coastal waters, the influence of local winds, the presence of tides and the existence of coastal currents around Tanjung Bunga due to the lack of physical wave dampening structures, such as the lack of artificial structures/ buildings and mangrove forests. as physical protection of the coast.
This study was conducted to identify changes in the extent of mangrove cover around the Barombong Shipping Polytechnic campus concerning data and information processing using a geographic information system (GIS). Based on the results of the data analysis, there has been a change in the extent of the mangrove ecosystem around the study location. This change in area can be seen from the upward trend over the last ten years. In 2013-2018, there was an increase of 30.38% or around 8.2 ha. In 2018-2023, there was an increase in the area of 7.36% or around 2.6 ha; in 2013-2023, there was an increase of 39.97% or around 10.8 ha.

Koresponden:
Suryansyah Surahman
Email: suryasurahman@unhas.ac.id

Introduction

Coastal areas and small islands are the meeting point of two terrestrial ecosystems, namely land and sea, which are always dynamic, experiencing changes in very short cycles. Under normal conditions, these dynamics are in a state of balance. The coast will continue receiving mass water flows from land upstream and sea downstream. Water that enters the sea will return to land through evaporation by sunlight and fall back to land in the form of rain. Specific marine biota live and breed in this brackish water environment, all in balance in the ecosystem. Disturbances and imbalances in land-sea interactions in coastal areas subsequently arise due to pollution and sedimentation caused by the degradation of watershed areas. Damage to coastal areas also occurs due to mismanagement and lack of environmentally friendly development in these areas.
Environmental degradation is caused by excessive human intervention or intervention in the natural existence of the environment. Several factors can cause environmental degradation. However, the main supporting factors for environmental degradation are natural factors, space utilization, population pressure, weak institutions and governance (DTRLP2K-KKP, 2012). Recently, coastlines in several areas of Indonesia have experienced erosion, which is quite worrying. Makassar City is one of 30 coastal cities in Indonesia that is estimated to be potentially affected by rising sea levels. As is the case in the Tanjung Bunga and Barombong Beach areas, the level of abrasion is very high. The beaches in these two areas have experienced a decline in coastline over the years, so they have moved far inland. Apart from the problems mentioned above, land use also needs to consider the conditions and phenomena that occur in the study area, resulting in land use patterns that do not comply with land use criteria. This study was conducted to determine changes/degradation in mangrove cover around the Barombong Shipping Polytechnic campus concerning data and information processing using a geographic information system (GIS).

Method

This research design includes the research approach model, data sources, and data analysis techniques that will be used. This research approach model uses applied research methods. Data is taken, processed, and analyzed using a Geographic Information System, and then the analysis results are checked with conditions in the field. The data obtained in this research is secondary data in the form of digital Landsat 8 satellite images obtained from the USGS. This research is conducted in two steps. First, remote sensing techniques through visual and digital data analysis are applied to see changes in mangroves. Second, the classification results and supporting data are analyzed to determine the factors causing the event.

Conceptual and Operational Definition of Variables

Description of Research Area

This research was conducted in Makassar City, specifically in the Barombong Maritime Polytechnic campus area. Image data was taken in 2013, 2018 and 2023 to see land cover changes in the mangrove ecosystem.

Image Composite

The band composite process aims at classification, where band selection must follow the classification objective. To identify mangrove vegetation using Landsat 8 satellite imagery using RGB (red, green, blue) 564 composite. The band composite process was carried out using ArcGIS software.

Image Classification

Image classification is arranging, sorting, or grouping pixels into several classes based on objective criteria or categories. Each pixel in each class is assumed to have homogeneous characteristics. The classification used in this research is supervised classification with the maximum likelihood classification method. Maximum likelihood quantitatively evaluates the variance and correlation of response patterns of spectral categories when classifying unknown pixels. Image classification on Landsat 8 has a resolution of 30 m, so corrections are needed to sharpen the classification results. Using the help of Google Earth satellite imagery, provides a more transparent appearance of the mangrove land cover area; the resolution shown is below 5 m, so it is constructive. This process simultaneously converts raster data that has been classified into vector form to make the resulting vector data look smoother.

Area Calculation

The area calculation process aims to see changes in mangrove areas from 2013, 2018 and 2023. Calculation of mangrove area uses the geometric calculation method. Calculating geometrically is an automatic calculation procedure in ArcMap. Converting Raster data into vector data makes it easier to calculate the area of land cover change from the cropped classified image.

Vegetation Density Analysis

The high or low density of vegetation can be determined using NDVI (Normalized Difference Vegetation Index), a spectral sharpening image transformation for Analysing things related to vegetation. For monitoring vegetation, a comparison process is carried out between brightness levels long redlight channel near-infrared light infrared) can be seen in Formula 1.

NDVI = (NIR – RED) / (NIR + RED) ……. (1)

Landsat eight images for the redlight spectrum are in band 4, and near-infrared images are in band 5. Processing can be done with the help of ArcGIS software.

Result And Discussion

Changes in the area of mangroves at a location can include increasing or decreasing the area and changes in the quality of the mangroves. Landsat eight image analysis results show a trend in changes in the mangrove area at the study location (Table 1 and Figure 1). In 2013, 2018 and 2023, the mangrove area will be 27.1 ha, 35.4 ha and 38 ha, respectively. In 2013-2018, there was an increase of 30.38% or around 8.2 ha. In 2018-2023, there was an increase in area of 7.36% or around 2.6 ha. In 2013-2023, there was an increase in area of 39.97% or around 10.8 ha.

The trend in changes in the area at the study location shows a good trend because over ten years, there has been an increase in area of around 10.8 ha. This increasing trend indicates that the community and stakeholders around the Barombong coast already understand the importance of mangroves as an ecosystem that can withstand coastal erosion. This indication can be seen from the new mangrove planting around the study area. This follows Timang's (2013) statement, which states that the level of abrasion in the Tanjung Bunga and Barombong Beach areas is very high. The beaches in these two areas have experienced a decline in coastline over the years, so they have moved far inland. This is caused by several factors, such as the

influence of waves that occur in coastal waters, the influence of local winds, the presence of tides and the existence of coastal currents around Tanjung Bunga due to the lack of physical wave dampening structures, such as the lack of artificial structures/buildings and mangrove forests. as physical protection of the coast.

The values from processing the vegetation index (Normalized Difference Vegetation Index) from Landsat 8 image analysis also show different areas from year to year (Figure 2). In 2013, the NDVI value for non-vegetation was 0.35 ha, sparse vegetation was 7.90 ha and quite dense was 18.87 ha. In 2018, the NDVI value for non-vegetation was 0.05 ha, sparse vegetation was 18.91 ha and quite dense was 16.40 ha. In 2023, the NDVI value for non-vegetation will be 0.25 ha; sparse vegetation will be 19.29 ha and quite dense will be 18.42 ha. Ecosystem characteristics support the increase in mangrove areas in the study location.

Year	Total Area	Vegetation Density (NDVI)		
		Non Vegetation	Sparse Vegetation	Quite dense
2013	27.1	0.35	7.90	18.87
2018	35.4	0.05	18.91	16.40
2023	38.0	0.25	19.29	18.42

Table 1. Table of land changes and vegetation density in the Mangrove Ecosystem
Source: Landsat 8 image data analysis

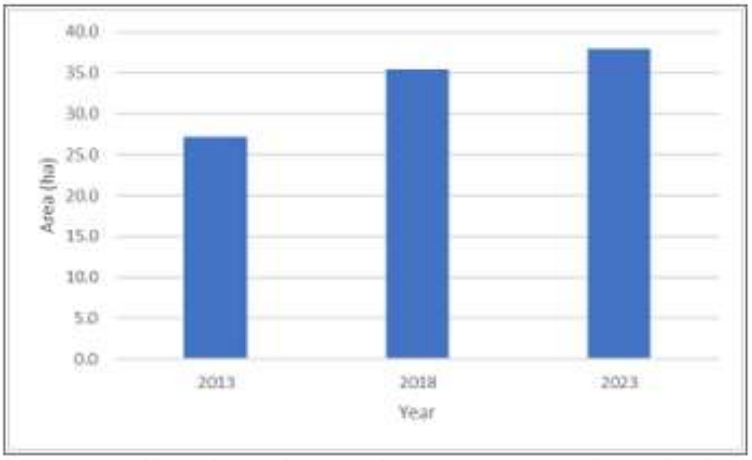

Figure 1. Trend graph of changes in mangrove area at the study location

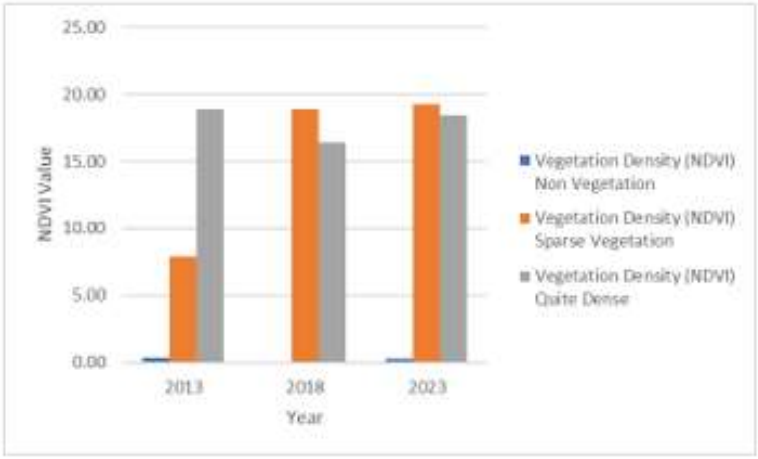

Figure 2. Vegetation density (NDVI) at the study location

Which is characterized by coastal areas that are influenced by sea tides. This is supported by the statement of Sutanto (2000), Nyibaken (1992) and Dahuri (2003), namely that the mangrove ecosystem is a typical tropical and subtropical forest that grows along coastal areas or in tidal estuary areas. Many mangroves are located in coastal areas protected from waves and slopes. Mangroves grow best in coastal areas with large estuaries and deltas where the water flows contain much mud. However, mangrove vegetation growth is not optimal in coastal areas that do not flow into rivers. Mangroves struggle to grow in steep coastal areas with large waves and strong tides. Under these conditions, the mud deposits needed as a basis for growth are not possible.

Conclusion

Based on the results of the data analysis, there has been a change in the extent of the mangrove ecosystem around the study location. This change in area can be seen from the upward trend over the last ten years. In 2013-2018, there was an increase of 30.38% or around 8.2 ha. In 2018-2023, there was an increase in the area of 7.36% or around 2.6 ha; in 2013-2023, there was an increase of 39.97% or around 10.8 ha.

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