

Utilization of Sentinel 2A Image Data to Identify Mangrove Conditions on the Coast of North Sangatta District

First Middle Author : Dwi Agung Pramono
Department : Geomatics Technology
Institutions : State Agricultural Polytechnic of Samarinda
City Postal Code, Country : 75131, Indonesia

Second Middle Author : Dyah Widyasasi
Department : Geomatics Technology
Institutions : State Agricultural Polytechnic of Samarinda
City Postal Code, Country : 75131, Indonesia

Third Middle Author : Suparjo
Department : Geomatics Technology
Institutions : State Agricultural Polytechnic of Samarinda
City Postal Code, Country : 75131, Indonesia

Fourth Middle Author : Hasanuddin
Department : Forest Management
Institutions : State Agricultural Polytechnic of Samarinda
City Postal Code, Country : 75131, Indonesia

Fifth Middle Author : M. Fadjeri
Department : Forest Management
Institutions : State Agricultural Polytechnic of Samarinda
City Postal Code, Country : 75131, Indonesia

Sixth Middle Author : Suwarto
Department : Forest Management
Institutions : State Agricultural Polytechnic of Samarinda
City Postal Code, Country : 75131, Indonesia

*Corresponding author:
Full name : Dwi Agung Pramono
Institutions : State Agricultural Polytechnic of Samarinda
City Postal Code, Country : 75131, Indonesia

Abstract:- North Sangatta is the capital of East Kutai Regency which is also the center of government and economy, one of which is the preservation of mangrove forests which are currently spread across various areas of North Sangatta, which aims to prevent large waves from occurring which could harm residents around the coast.

The aim of this research is to determine the health status of mangrove forests using sentinel-2A imagery. By adding scientific references related to the use of Sentinel-2A Imagery data, a reference can be obtained in determining management policies for mangrove forest areas on the coast of North Sangatta District.

Normalized Difference Vegetation Index (NDVI) is a calculation on an image that is used to determine the level of greenness as a starting point for dividing vegetation areas. By using the NDVI method which is obtained by calculating near infrared with red reflected by plants, information is obtained about the density of mangrove vegetation.

The research results show that the total area of mangroves in the coastal area of North Sangatta District is 32,425.43 ha. Of the total area, some mangroves have a very poor health condition category of around 8,446.82 ha.

Keywords:- North Sangatta, Mangrove, Sentinel-2A, NDVI.

I. INTRODUCTION

North Sangatta is the capital of East Kutai Regency which is also the center of government and economy of East Kutai Regency. North Sangatta is also a sub-district located in East Kutai Regency, East Kalimantan Province, Indonesia. North Sangatta is an area that intersects with activities such as coal mining companies, oil palm plantations, and various other tourist attractions. Apart from that, there are activities for coastal communities to meet their daily needs, such as catching fish, catching crabs, building ponds around the mangrove forest area.

Mangroves are trees or plant communities that live between the sea and land, influenced by sea tides. The mangrove ecosystem is a meeting area between marine ecosystems and land ecosystems, so it has unique ecological characteristics. Beaches or coastal areas are where land and sea meet so that coastal areas are influenced by transitional ecosystems between land and sea which consist of several ecosystems, one of which is the mangrove forest ecosystem. Mangrove forests have the potential to make a significant contribution to national economic development.

Degradation of mangrove forests in Indonesia can be caused by various factors, one of which is the conversion of mangrove forests as residential growth areas, the construction of docks and taluds (retaining walls), as agricultural and plantation areas, and even used as mining locations for oil and gas exploration. Decreasing the quality and quantity of mangrove forests can affect economic life, such as decreasing fish catches and reducing government and local community income (Maulidiyah, et al, 2019).

Community activities in coastal areas can be a factor in damage to the mangrove ecosystem. Currently, the existence of mangrove forests is increasingly being pushed by human needs. Therefore, it is necessary to establish mangrove areas and monitor the health of mangrove forest areas. Mangrove health is a term that researchers often use to describe the status or condition of the mangrove ecosystem in an area. The solid and rare status are still categorized as being in good condition,

while the rare criteria are concluded as being in damaged condition (Mufiah, 2019).

The development of remote sensing science can also be used to monitor mangrove forest areas, based on the development of this technology, not only do various images and sensors appear, but also the spatial resolution of these images. As the spatial resolution of images increases, texture analysis plays an increasingly important role in analyzing and processing images, image classification and interpretation of remote sensing images. Every digital image produced by each image sensor has unique characteristics for each data. These distinctive properties result from the nature of the satellite's orbit, the nature and sensitivity of remote sensing sensors to electromagnetic wavelengths, the transmission lines used, the nature of the target object, and the nature of the radiation power source (Putri, et al, 2021).

One of the satellites that can be used in remote sensing is the Sentinel-2 satellite. Sentinel-2 has 13 spectral bands, namely bands 2,3,4 and 8 with a spatial accuracy of 10 m, bands 5,6,7, 8a, 11 and 12 have a spatial accuracy of 20 m and bands 1, 9 and 10 have a spatial accuracy of 10 m. Sentinel-2 imagery is widely used to identify and analyze problems, one of which is to identify mangrove health using the NDVI method which is derived from the mangrove health classification.

II. METHOD

In this study, the NDVI method was used because it has a high greenness index or photosynthetic activity of vegetation, and is one of the most frequently used vegetation indices, by comparing the reflectance of vegetation received by sensors at red (RED) and near infra-red (NIR) wavelengths.), in analyzing the condition of vegetation in an area, especially in analyzing the health of mangroves in the coastal area of North Sangatta District. With the following formulation:

$$NDVI = (NIR - R) / (NIR + R).....(1)$$

Information :
 NIR = Near Infrared Waves
 R = Red Wave

Mangrove Density Classification based on NDVI can be seen in the following Table 1:

Table 1. Mangrove Health Classification based on NDVI.

No.	NDVI range	Classification
1	(-1) – (- 0.30)	Damaged
2	(-0.30) – (-0.05)	Very bad
3	(-0.05) – 0.32	Enough
4	0.32 – 0.63	Good
5	0.63 – 1	Very good

III. RESULTS AND DISCUSSION

The results of the classification of mangrove health classes based on NDVI data on the North Sangatta coast are as follows:

Table 2. Mangrove Health Condition on the North Sangatta Coast

No.	NDVI range	Classification	Area (Ha)
1.	(-1) - (-0.3)	Damaged	218.78
2.	(-0.3) - (-0.05)	Very bad	419.82
3.	(-0.05) – 0.32	Enough	8,446.83
4.	0.32 – 0.63	Good	7,040.91
5.	0.63 – 1	Very good	16,298.98
Total			32,425.43

From the results of the above research on mangrove health in North Sangatta, East Kutai region, mangrove density classes are divided into very low density, low density, medium density, high density and very high density. From the results of the classification of mangrove density obtained from the vegetation index (NDVI), the area of mangroves on the coast of North Sangatta can be determined.

Based on Table 2, the results of the division of the five mangrove density classes contain information regarding the health condition of mangroves from the Damaged class with an area of 218.78 ha (0.69%); Very Bad Health class with an area of 419.82 ha (1.29%); Enough class with an area of 8,446.82 ha (26.05%); The Good health class has an area of 7,040.90 ha (21.71%) and the Very Good health class has an area of 32,425.43 ha (50.26%). The distribution of mangrove health conditions on the North Sangatta Coast can be seen in Figure 1 below.

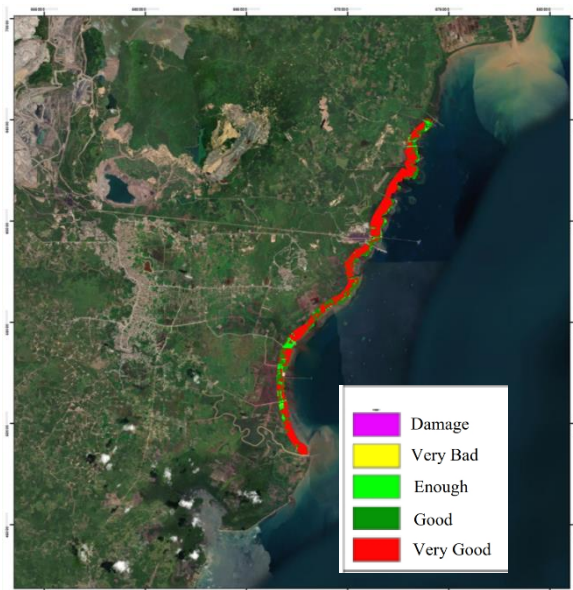


Fig 1. Distribution of Mangrove Health Conditions in North Sangatta

IV. CONCLUSION

The use of sentinel imagery to identify the health of mangroves on the coast of North Sangatta District is taken based on the values from the results of NDVI processing using Sentinel-2A to represent the status of all mangrove health in the research area.

Mangrove health in Sangatta Utara District is divided into 5 (five) health classes with the largest percentage, namely mangroves having very good health (50.26%), the lowest percentage of mangroves having very poor health (1.29%) and damaged mangroves at 0.29%.

The distribution of each class in health is very good with a total area of 16,298.98 ha spread around the New Kenyamukan Pier and the distribution of the classes in the health of the most damaged mangroves is spread around the Batu Putih Pier with an area of 218.78 ha.

ADVICE

Remote sensing is widely used in problem solving analysis. One of them is remote sensing, with Sentinel-2A satellite imagery which can be used to identify the condition of mangrove forest areas.

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