

Study of Mangrove Forest Existing Condition Using Remote Sensing Image in the Karawang Coast of 2018

By R. Ade Komarudin

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Karawang Coast of 2018.**

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Abstract. The northern part of Karawang is a coastal area with mostly mud-sand substrates. This substrate tends to be unstable, so naturally, this kind of sediment is supported by coastal vegetation that forms coastal ecosystems, such as mangroves; therefore, the importance of mangroves in Karawang has taken more attention. Unfortunately, the data regarding the condition of mangroves in Karawang Regency is still very lacking. The information about the existence of mangrove in Karawang Regency is needed as a database for further research and government policies on coastal area management. This research aim is to provide information about the existence of mangrove in Karawang Regency. The method is by using NDVI calculations on Landsat 8 2018 satellite imagery of Karawang to get the data that reveal the information. From the calculations, our research finds out that the existing of mangroves in Karawang Regency in 2018 is 305,14 Ha. Border coast that is vegetated is only 33.75 km of 77 km long coastline of Karawang. Only less than 5% of the total mangrove protected area in Karawang Regency is detected as mangrove from the total 9.055 Ha of the area.

Keywords: coastal vegetation, NDVI, database, coastal management

INTRODUCTION

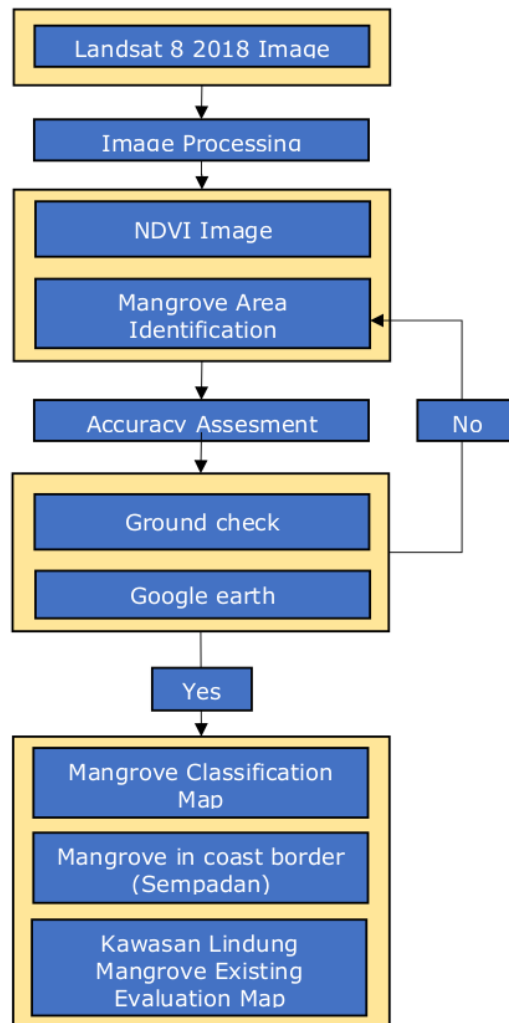
The importance of coastal ecosystems, such as mangroves, has taken more attention lately. Not only beneficial to humans, mangroves also have functioned as keepers of the world biodiversity. Coastal ecosystem, including mangroves, recently been recognized as having an essential role in controlling climate change and global warming (Butcher *et al.*, 2002).

The damage of coastal ecosystem can cause the release of the more significant amount of carbon to the air more than the in-land ecosystem (Alongi, 2012) (Pendleton *et al.*, 2012). This fact has proven that mangrove, along with other coastal ecosystems, stores carbon more than terrestrial ecosystems. This sequestered carbon hold by coastal ecosystem nowadays known as Blue Carbon (Herr *et al.*, 2012).

Karawang is a developing industrial area; therefore, conservation effort needs to be carried out as a counterweight to industrial activities that are usually less environmentally friendly. The northern part of Karawang is a coastal area with mostly mud-sand substrates. This substrate tends to be unstable, so naturally, this kind of sediment is supported by coastal vegetation that forms coastal ecosystems, such as mangroves.

The discovery of blue carbon has attracted scientists to dig more information about coastal ecosystem, which among them are mangrove. Unfortunately, the data regarding the condition of mangroves in the administrative locus scale is still very lacking. This reality is also found in Karawang Regency. The information about the existence of mangrove in Karawang Regency is needed as a database for further research and government policies on coastal area management. Our research objectives is to find out 1) What is the conditions of mangroves in Karawang Regency; 2) What is the conditions of Karawang Regency's coast border (sempadan) vegetation and greenbelt length in 2018; and 3) What is the condition of mangrove in mangrove protected areas in Karawang Regency in 2018.

MATERIAL AND METHODS



Picture 1. Research Design

The shape and canopies of mangrove trees and their specific location are very unique so it is possible to detect them using satellite imagery. Satellite such as Landsat 8 could easily capture the imagery of mangrove precisely. Ground check with coordinate samples and Google Earth

data is used to strengthen the accuracy. The number of sample is determined by the mangrove area polygons produced in the satellites image interpretation process.

As shown in the picture 1, our research process is started by downloading one sheet Landsat 8 satellite imagery of Karawang from ESRI Earth Explorer sites with the imagery date is 12 September 2018. This imagery was then processed with QGIS application and used as basic spatial data to identify the presence of mangrove. Mangrove damage is then identified using NDVI calculations which are commonly used to find out the green index based on the following formula:

$$NDVI = \frac{NIR - Red}{NIR + Red} \text{ (Nir = Band 6, Red = Band 5) Rouse, et al. 1973}$$

This index is classified based on the greenness level which is assessed with a scale of -1 to 1 where the pixel value increasingly positive near 1 indicates the level of greenness which indicates the density and thickness of the vegetation. The range index of damage to mangrove vegetation used in this study is as follows :

Table 1. NDVI Range of Mangrove Condition

Mangrove Conditions	Nilai NDVI	Covering Conditions
No Mangrove	< -0.3	No Covering
Damaged	-0.3 – 0.15	Very Low Covering
Moderate	0.15 – 0.25	Low Covering
Good	0.25 – 0.35	Good Covering
Very good	0.36 – 0.61	Very good Covering

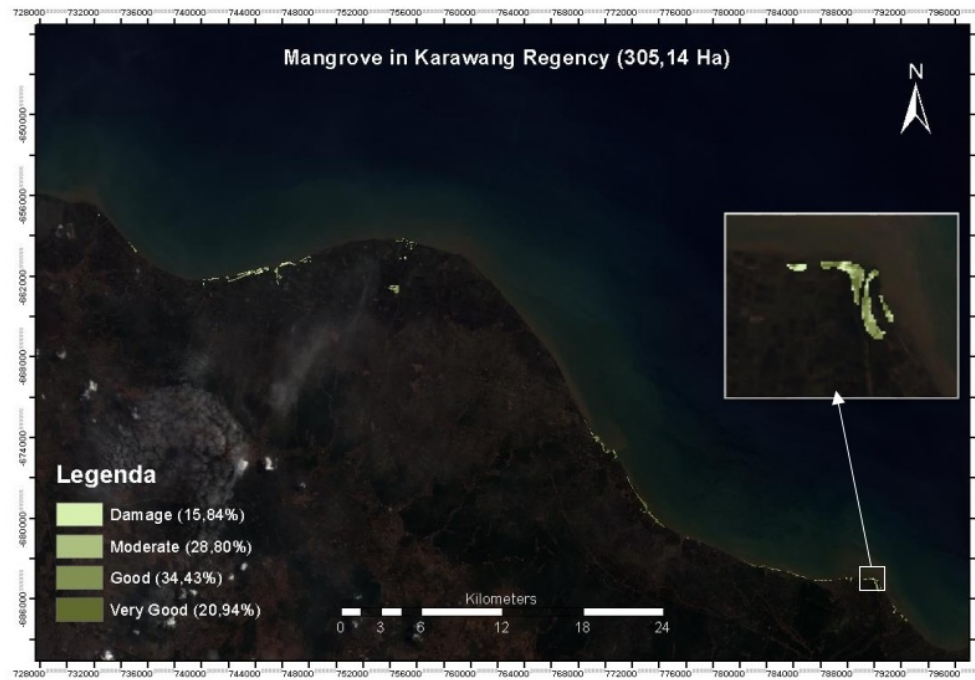
Wahyunto, et al. 2003

The processed data is made as a digital map product. The produced maps are Map of Area and percentage of mangrove damage, map of border vegetation or increasingly positive near 1

indicates the level of greenness which indicate areas. All maps show conditions in 2018 and all spawn spatial data for our research goal

RESULT

Karawang Regency Mangrove Conditions



Picture 2. Mangrove in Karawang Regency

Table 2. The cover and damage conditions of Mangrove in Karawang Regency

No.	Coastal District	Area (Ha)	Conditions			
			damage	moderate	good	Very good
Karawang (%)		100,00	15,84	28,80	34,43	20,94
Karawang (Ha)		305,14	48,35	88,01	105,12	63,67
1.	Pakisjaya	13,65	4,55	8,56	0,54	0,00
2.	Batujaya	4,91	1,13	3,40	0,38	0,00
3.	Tirtajaya	78,61	23,44	33,87	21,30	0,00
4.	Cibuaya	53,24	8,72	17,44	26,26	0,82
5.	Pedes	-	-	-	-	-
6.	Cilebar	84,68	4,13	9,43	30,26	40,86
7.	Tempuran	0,79	-	0,79	-	0,00
8.	Cilamaya Kulon	9,26	-	0,09	3,20	5,97

9.	Cilamaya Wetan	60,00	6,37	14,42	23,19	16,02
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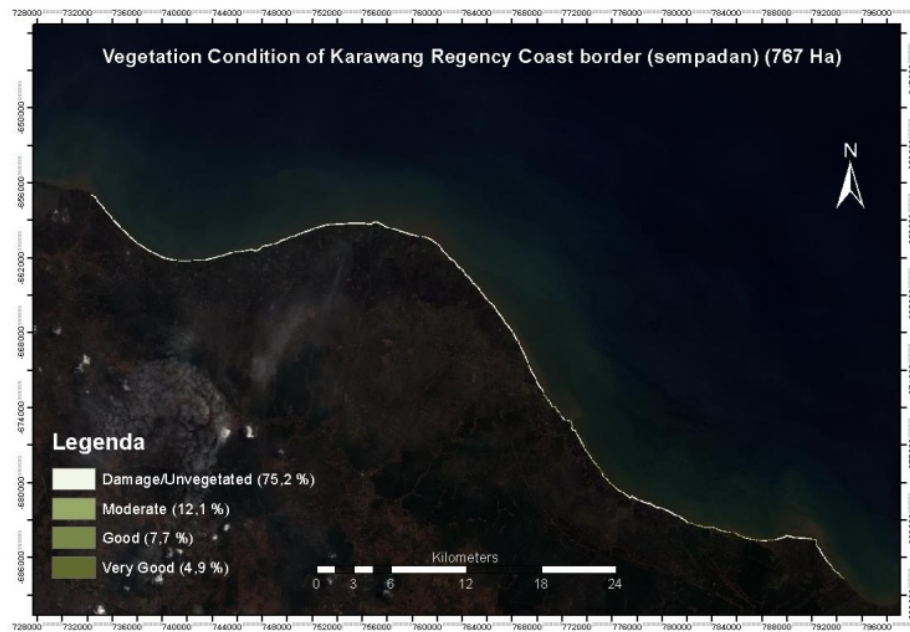
This study found that the area of mangroves in Karawang Regency in 2018 was 305,14 Ha.

This findings is the result of satellites image interpretation process that has been been check by 62 ground check samples. Based on NDVI analysis 15% or around 48.35 Ha of the area is in damaged condition, 28.80% are moderate, and 34.43% or around 105.12 Ha of the mangroves are in good conditions as shown in Table 2 and Picture 2.

Conditions of Karawang Regency's Vegetation Border (sempadan) and Greenbelt length in 2018

The width of the coast border “sempadan” in this research is considered constant that is 100 meter from the highest tide point towards the land. The widht of coast border is determined based on the Indonesian coastal management law number 27 of year 2007. and the length is determined by the result of Karawang coast line digitations based on the satellite imagery. From those data, we have the area of Karawang coast border, which is 767 Ha.

The NDVI value is calculated in the area and found that no vegetation is seen in 75.2% of the border.



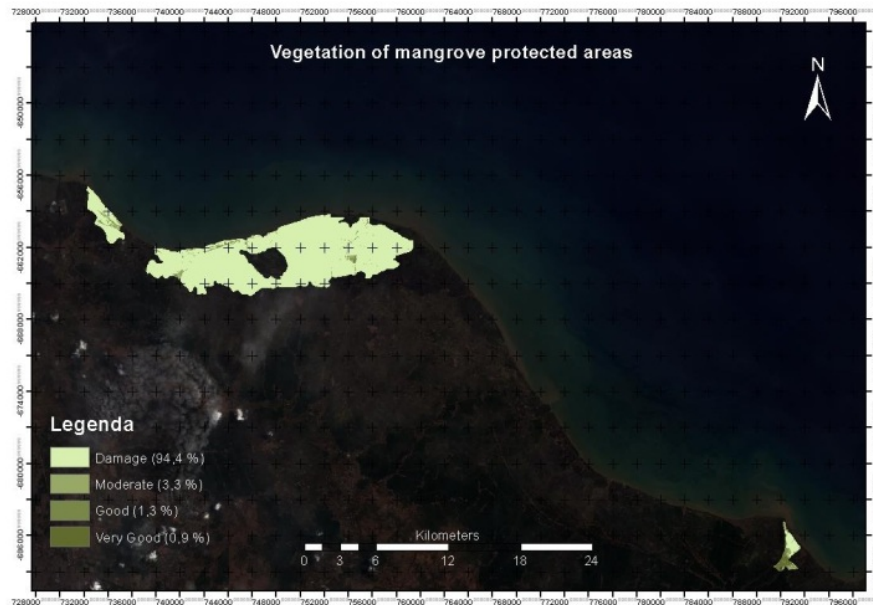
Picture 3. Vegetation condition of Karawang coast border

Table 3. Karawang Coast border (sempadan) and greenbelt in 2018

No.	Coastline (Km)	Border area (Ha)	Greenbelt (Km)
1	77	767	33,75

The length of the green belt is calculated by measuring coastline that still covered by mangrove vegetation with NDVI range between moderate to very good condition. The result found that the coastal length, which is still covered by mangrove vegetation is 33.75 km long. This data shows that more than 50% of Karawang Coastal areas are open without being protected by mangroves.

Mangrove conditions in mangrove protected areas in Karawang Regency in 2018



Picture 4. The vegetation of mangrove protected areas

Mangrove protected areas based on the Spatial Plan Pattern of the Karawang Regency spatial map shown in picture 4 are approximately 9 thousand hectares. This protected areas is specified in Karawang Regency regional regulation number 2 of 2013. With this significant extent, the area is expected to be an oxygen supplier for the regions “lungs” and also an environmental stabilizer in Karawang Regency. However, it is miserable that the presence of vegetation in the mangrove protected area is not as full as expected.

Our research shows that mangrove vegetation in the Karawang regency mangrove protected area that categorized moderate to very good on the NDVI range in 2018 is only 5.59%. The Government should concern with this result because this mangrove protected area needs to be restored to be able to return to its function as a real protected area. The vegetation condition

that reveals by the research data of this mangrove protected area is underwhelming because it turns out that all this time the mangrove in this area is not protected at all.

DISCUSSION

The absence of mangrove vegetations is suspected as one of the causes on sediment instability in Karawang coastal area although further research is needed to add evidence of the aalegation. Our result of Karawang mangrove condition is concerning. But other research conduct in the north java region since 2016 inform a various result. The research conduct in Teluk Pangpang Banyuwangi (Kawamuna, et al., 2017) is shown the same mangrove condition with Karawang while the one conduct in Probolinggo (Diyah, et al., 2019) shows the mangrove Pcondition there is much better.

We have difficulties to find reference that conduct similar method to find vegetation border condition and greenbelt length to compare with our result. But in Sibolga, Zaitunah, et al. (2018) conduct research on Greenbelt vegetation condition in 100, 200 and 500 meters width and found very low vegetation its quite similar with our research that most of the coast border (sempadan) vegetation is degraded and arid

The study about mangrove protected areas has been conduct by Ardiansyah (2019) in KPHL Gunung Balak shows better result than mangroves protected areas condition in Karawang.

CONCLUSIONS

The researchers conclude that the existing of mangroves in Karawang Regency in 2018 is 305,14 Ha.

The NDVI value is calculated in the area and found that no vegetation is seen in 75.2% of the border. Although further research is needed, this condition may be one of the causes of sediment instability in the Karawang coastal area. The greenbelt also in the poor condition

where more than 50% of Karawang Coastal areas are open without being protected by vegetation, especially mangroves.

The condition of vegetation in the mangrove protected areas in Karawang Regency is mostly damage or even unvegetated where the vegetation detected by NDVI calculations with moderate to good conditions is only less than 5% of the total area which is 9.055 Ha.

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ORIGINALITY REPORT

0%

SIMILARITY INDEX

PRIMARY SOURCES

EXCLUDE QUOTES	OFF	EXCLUDE MATCHES	OFF
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