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COMPARISON OF SOIL ADJUSTED VEGETATION INDEX (SAVI) AND MODIFIED SOIL ADJUSTED VEGETATION INDEX (MSAVI) METHODS TO VIEW VEGETATION DENSITY IN PADANG CITY USING LANDSAT 8 IMAGE

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ABSTRACT: This study aims to see how the shape of the vegetation density map uses the SAVI (Soil Adjusted Vegetation Index) and MSAVI (Modified Soil Adjusted Vegetation Index) methods in Padang City using remote sensing data in the form of Landsat 8 imagery. This type of research is quantitative using numerical data. and analysis, as well as presenting data in the form of a numerical table to see a comparison of the accuracy of the SAVI (Soil Adjusted Vegetation Index) and MSAVI (Modified Soil Adjusted Vegetation Index) methods in Padang City. In this study, it was found that the results of the accuracy test of the SAVI (Soil Adjusted Vegetation Index) method were 86.95% while the MSAVI (Modified Soil Adjusted Vegetation Index) method was 91.30%. This research uses the SAVI (Soil Adjusted Vegetation Index) and MSAVI (Modified Soil Adjusted Vegetation Index) vegetation index methods by entering the formula that has been determined for each index to find out how the vegetation density forms in the city of Padang. The results of this study are maps of vegetation density using the SAVI (Soil Adjusted Vegetation Index) and MSAVI (Modified Soil Adjusted Vegetation Index) methods and tables of SAVI (Soil Adjusted Vegetation Index) and MSAVI (Modified Soil Adjusted Vegetation Index) accuracy test results.

Keywords :Vegetation Density, Vegetation Index, Landsat Imagery, Remote Sensing

1. INTRODUCTION

The growth of urban areas cannot be separated from the process of development and expansion of cities which is accompanied by an increase in population. According to Suharyadi (2010), in Pasha et al., (2014), the city is defined as a center of economic activity, center of government and center of settlement. According to Lailia (2014), urban areas have their own attractions for the community including employment, public facilities, health services, education and the economy. This causes the population in urban areas to increase every year.

The increasing flow of urbanizationhigh together withthe trend of new industrial development which causes a decrease in the vegetation index and the quality of the city which causes the ground surface temperature to increase. The vegetation index is a method for analyzing the level of greenness of a plant or vegetation in an area. Vegetation index that can be used as a parameter of drought conditions and monitoring of vegetation growth. The effect of decreasing vegetation is caused by a lack of water availability due to the change of seasons and land use.Vegetation is a natural resourcemajor in the life of creatures life, namely as a provider of food and shelter for animals and humans. In an ecosystem onlycapable vegetation provideenergyforliving things through photosynthesis process with the help of sunlight, in a form that canused by animals and humans in the form of: leaves, fruit, seeds, and sweet potatoes. Disturbance/damage that occurs in a group of vegetation will causebalance change the ecosystem in which the vegetation is located.

Technological development Remote sensing today or in the future provides the possibility to obtain data that is relatively new, fast and accurate. Launching of various kinds of satellites by developed countries is increasingspur development remote sensing as a tool to obtain reliable natural resource inventory data. The existence of Landsat satellites, SPOT, ERS-1, NOAA, and others orbiting the earth with various types of sensors, spectral resolution and spatial resolution greatly benefit the users of satellite data according to their needs. In this study using Landsat imagery. The many channels on the Landsat Thematic Mapper that operate on channels that are sensitive to the spectral response of vegetation are very beneficial in research or studies of vegetation. With the help of a mathematical transformation in the form of a vegetation index, the spectral value of the vegetation can be highlighted, while the spectral values outside the vegetation can be removed or eliminated, making it possible

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to carry out studies on vegetation density, Leaf Area Index (LAI), biomass, stand age and chlorophyll concentration. Padang City is the area taken in this study. The movement and rate of population growth from year to year has an impact on the increasing demands for utilities in various fields, so that it greatly influences the vegetation area in Padang City.

2. THE METHOD

a. Research Form

This research was conducted in Padang City, West Sumatra Province. Geographically, Padang City is located at 00044'00" South Latitude and 100005'05" - 100034'09" Longitude

East. Based on its geographical position, the city of Padang has regional boundaries, namely, to the north it is bordered by Padang Pariaman Regency, to the south by Pesisir Selatan Regency, to the east by Solok Regency, to the west by the Indian Ocean.

The city of Padang has an area of 1,114.96 km2. The city of Padang has a height that varies between 0 – 1,853 meters above sea level, with the highest area in Lubuk Kilangan District.

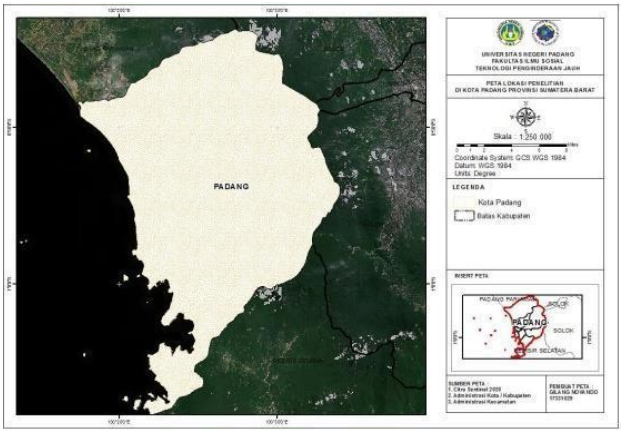

Fig 1.Research Location Map

b. Research Tools

Tabel 1. tools and materials used in this research are:

Eqiutment	utility
Leptop	Hardware
Google Earth	Software
Arcgis	Software
Avenza	Navigasi Software
Kamera	Documentation
Stationary	Documentation

c. Research Materials

Tabel 2.The materials used in this study are as follows:

Name	Year	From
Landsat 8 Image	2020	USGS
Administration SHP	-	BIG
Field Data	2020	Survey

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d. Data Types and Sources

The type of data used in this study consisted of primary data and secondary data. Primary data is a source of research data obtained directly from the original source in the form of field documentation and real conditions in the field. While secondary data is research data sourcesobtained indirectly or through intermediary media. In this study, the secondary data used was Landsat 8 imagery sourced from the USGS website, shapefile data for research administration areas from the Geospatial Information Agency (BIG) website and vegetation density index data based on expert opinion on the website.

3. DATA PROCESSING TECHNIQUES

1. Vegetation Index

a. SAVI (Soil Adjusted Vegetation Index)

Is an algorithm developed to get the value of the vegetation index by eliminating the soil factor. The SAVI algorithm is as follows:

$$SAVI = \frac{(1+L)(NIR-RED)}{NIR+RED+L}$$

The formula above is the SAVI algorithm. With the Soil Adjusted Vegetation Index (SAVI), where the reflectance value of the near infrared spectral band (NIR), the reflectance value of the red spectral band (RED), and the soil calibration factor is 0.5 (L).

b. MSAMSAVI (Modified Soil Adjusted Vegetation Index)

is a vegetation index based on a modified L correction factor from SAVI. The correction factor L decreased in value on vegetation with low and medium density. MSAVI modify factorVI (Modified Soil Adjusted Vegetation Index) L correction to correct uncorrected ground color noise

As for the MSAVI algorithm Thisare as follows :

$$\text{MSAVI} = \frac{2\rho_{NIR} + 1 - \sqrt{(2\rho_{NIR} + 1)^2 - 8(\rho_{NIR} - \rho_{red})}}{2}$$

The formula above is the MSAVI algorithm. With the Modified Soil Adjusted Vegetation Index (MSAVI), where the reflectance value of the near infrared spectral band (ρNIR) is the value of the red spectral band reflectance (ρRED).

2. Accuracy Test

In this study, the researcher conducted an accuracy test by taking samples and going directly to the field, because access to the research area was very easy to reach and the data obtained was felt to be more accurate than other accuracy test methods. Retrieval Technique The sample in this study was simple random sampling, which is a random sampling technique in which the researcher gives equal opportunities to all objects to be used as samples. So that the sample taken is representative of the populationsocan counted useformula Fitzpatrick lins (in Aris Kurniadi, 2014).

N = z2pq

E2

Where, N = Number of Samples

z = normal standard deviation whose value is 2

p = Expected accuracy (90

%)

q = 100 – p

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E = Error received

The results of these samples will be taken at the time of field sampling in the form of coordinate points and field photos as well as the type of vegetation density classification.

4. RESEARCH RESULT

4.1 Vegetation Density Map With SAVI and MSAVI Index

The level of vegetation density in the Landsat imagery data can be identified from an index called the vegetation index and the indices used are SAVI (Soil Adjusted Vegetation Index) and MSAVI (Modified Soil Adjusted Vegetation Index). red (red) and the L value (soil calibration factor value) on Landsat imagery. By utilizing this index, the level of vegetation density in Padang City can be known. The value of the vegetation index can be calculated using the existing formula. This calculation can be done in ArcGIS by using the raster calculator tool by entering the values for the near infrared band and the red band and the L value. Then the raster results from these calculations are cut according to the research area, namely the city of Padang.

The following is a map of Padang City vegetation density in 2020 with the SAVI index (Figure 2) and the MSAVI index (Figure 3).

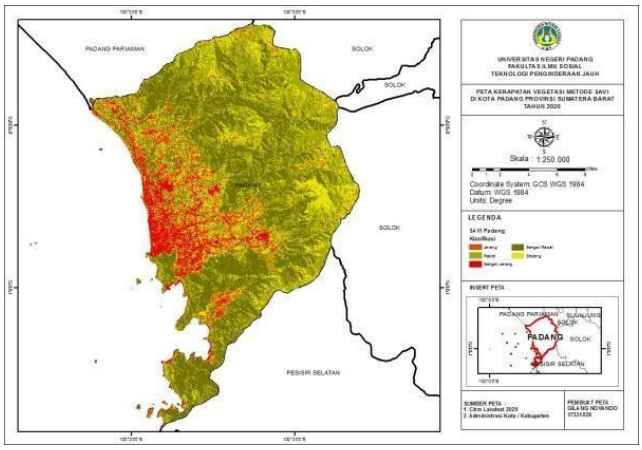

Figure 2.Vegetation Density Map of Padang City SAVI Method 2020

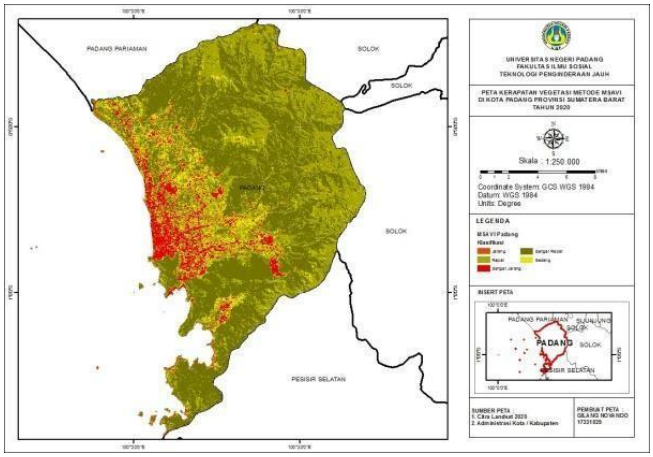

Figure 3.MSAVI Method Vegetation Density Map of Padang City 2020

4.2 Accuracy Level of SAVI and MSAVI Index

Based on the results of the calculation of the vegetation index formula on SAVI and MSAVI which have been given the same sample points in each density class to be tested for accuracy, it can be seen that the level of accuracy of SAVI (figure 4) and MSAVI (figure 5) is as follows:

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Teble 3.SAVI Accuracy Test Table

Classification	Very low	Low	Medium	High	Very high	Total
Very low	1	0	0	0	0	1
Low	0	2	0	0	0	2
Medium	0	1	3	0	0	4
High	0	0	2	6	0	8
Very High	0	0	0	0	8	8
Total	1	3	5	6	8	23

Accuracy rate = Correct sample (yellow color) / Total sample × 100%
= 20 / 23 × 100% = 86.95%

Based on the results of the accuracy test table, the accuracy value of the SAVI method to see the density of vegetation in Padang City has an accuracy of 86.95%. This accuracy test consists of 23 sample points which consist of 1 very rare sample classification, 2 sparse samples, 4 moderate samples, 8 dense samples and 8 very dense samples. The distribution of the sample was carried out using random sampling technique / the samples were taken evenly.

Table 4.MSAVI Accuracy Test Table

Classification	Very low	Low	Medium	High	Very high	Total
Very low	1	0	0	0	0	1
Low	0	2	0	0	0	2
Medium	0	0	2	0	0	2
High	0	0	1	7	0	8
Very High	0	0	0	1	9	10
Total	1	2	3	8	9	23

Accuracy rate = Correct sample (yellow color) / Total sample × 100% = 21 / 23 × 100% = 91.30%

Based on the results of the accuracy test table, the accuracy value of the MSAVI method to see the density of vegetation in Padang City has an accuracy of 91.30%. This accuracy test consists of 23 sample points which consist of 1 very rare sample, 2 rare samples, 2 medium samples, 8 dense samples and 10 very dense samples. The distribution of the sample was carried out using random sampling technique / the samples were taken evenly.

So it can be concluded that the level of accuracy of the results of the MSAVI vegetation density accuracy test is higher than the SAVI vegetation density accuracy level with a level of accuracy reaching 91.30%.

5. RESEARCH DISCUSSION

The results of the 2020 Landsat 8 image analysis obtained data on the vegetation density of the city of Padang which can be seen in the image of the vegetation density map with the SAVI index (Figure 2) and the MSAVI index (Figure 3). Based on the results of calculating the SAVI and MSAVI vegetation index formulas using Landsat imagery in 2020, 5 classifications of vegetation density can be obtained, namely very rare, rare, medium, dense and very dense. The most dominant class in this study is the very vegetation class meeting where this class too dominates in the SAVI and MSAVI indices.

The density of vegetation in the city of Padang in 2020 from the classification results was carried out an accuracy test with a total sample of 23 sample points on the SAVI index and MSAVI index by calculating the confusion matrix table.

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In the SAVI vegetation index accuracy test table (figure 4), the results of a comparison of processing data with original data in the field are obtained in the form of: 1 sample classification is very rarely the same as that in the field, 2 samples of classification are rarely the same as in the field, 4 samples are classified while there was 1 class that changed to a rare classification, 8 samples of dense classification there were 2 classes that changed to medium classification, and 8 samples of very dense classification the same as those in the field.

In the MSAVI vegetation index accuracy test table (figure 5), the results of a comparison of processing data with original data in the field are obtained in the form of: 1 very rare classification sample with that in the field, 2 classification samples rarely the same as in the field, 2 classification samples moderate is the same as in the field, 8 samples of dense classification have 1 class that changes to medium classification, and 9 samples of very dense classification have 1 class change to tight classification.

In the calculation of the confusion matrix table, the results of the accuracy test on Landsat 8 imagery in 2020 using the SAVI index method obtained an accuracy level of 86.95% and using the MSAVI index method, the accuracy level reached 91.30%.

6. CONCLUSION

1. Based on the results of analysis of Landsat 8 2020 imagery, the vegetation indices selected in this study are SAVI and MSAVI. Where each vegetation index has 5 classifications, namely very rare, rare, moderate, dense and very dense. Based on the research results of the two indices, the class that dominates the most is very dense vegetation density.

2. From the results of the classification of vegetation density, the accuracy test was carried out in the field, a confusion matrix table was obtained which showed that the accuracy test results for the SAVI index had an accuracy rate of 86.95% and the MSAVI index had an accuracy of 91.30%.

7. SUGGESTION

1. The need for accuracy when entering the value of the vegetation index variable in Landsat 8 imagery because if it is wrong just a little inputvalue then process statisticsresearch will not work.
2. It is necessary to test the accuracy of the two vegetation index methods, by first determining the sample and then conducting an accuracy test by checking in the field because the data in the software is not necessarily all correct.

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