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DETECTION OF LAND USE CHANGES USING LANDSAT 8 COMPOSITE BAND 4,3,2 AND BAND 7,6,4 COMPOSITE IMAGES IN 2019 AND 2022 USING THE METHODPOST- CLASSIFICATION COMPARISSON PADANG CITY REGION

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ABSTRACT: This study aims to 1) determine the area of land use in the city of Padang in 2019 and 2022 using the 4,3,2 (True Color) composite. 2) to determine the area of land use in Padang City in 2019 and 2022 using composite 7,6,4 (False Colour). 3) to find out changes in land use in the City of Padang in 2019 and 2022 using the Post- Classification Comparisson method. Processing is done using Landsat 8 satellite imagery downloaded from the USGS website. Before performing image interpretation, radiometric correction, atmospheric correction and geometric correction are carried out as well as band composite and satellite image cropping with the boundaries of the study area, namely the administrative boundaries of the City of Padang. The interpretation process is carried out using the Maximum Likelihood method using digital image processing applications and Geographic Information Systems (GIS). Change detection analysis method through Post-Classification Comparisson. Accuracy sampling was carried out systematically random sampling with the confusion matrix accuracy test technique. The results of the study in the Padang City area which has an area of 694.96 km2, Land use changes using Composite Band 4,3,2 Mixed Forests experienced a reduction of around 157.58Ha. Open land increased by around 48.85 Ha, rice fields decreased by 397.84 Ha. built-up area increased by around 94.12 Ha. Shrubs and shrubs, an increase of about 412.45 Ha. Changes in land use using Composite Band 7,6,4 Mixed Forest experienced a reduction of around 155.32 Ha. Open land increased by around 48.70 Ha. paddy fields decreased by 399.03 Ha. built-up area increased by around 94.83 Ha. Shrubs and shrubs increased by around 410.82 Ha of rivers in 2019 and in 2022 there will be no change with an area of 437.33 Ha.

Keywords: Land Use, Maximum Likelihood, Post-Classification Comparisson,

1. INTRODUCTION

The current problem of urban development has become quite a complicated problem to overcome, and often gives rise to negative consequences in several aspects, especially the environmental aspect. City development requires land as a place for residents to live and carry out their activities. Changes in land use are all human intervention, either permanently or cyclically, on a group of natural resources and artificial resources as a whole called land, with the aim of meeting their needs, both material and spiritual or both (Malingreau, 1977). In this way, changes that occur in the community environment will cause population pressure on the need for land. This is what happened in the Padang City area, according to the Padang City Central Statistics Agency (BPS), the population of Padang City in 2018 was 939,112 people, the population of Padang City in 2019 was 950,871. so that the population growth rate of Padang City increased by 1.25%. Meanwhile, the population of Padang City in 2021 will be 909,040 people, so the population growth rate of Padang City has decreased.

In peripheral areas, the development of urban areas has resulted in a change in use from rice fields (agricultural/non-urban) to urban use such as the establishment of regular housing and irregular housing, spread across four sub-districts, namely Pauh District, Kuranji District, Bungus Teluk District Kabung and Koto Tangah District. Meanwhile, in the central area and transitional areas of the city, competition between urban activities has led to

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changes from residential to non-residential (trade and services/commercial) such as the establishment of shops, shophouses, cafes and supermarkets which are spread across four sub-districts, namely West Padang District, North Padang, East Padang and South Padang along arterial roads and along collector roads. Efforts to maintain urban agricultural areas are not only part of urban landscape planning, to limit the occurrence of urbanization of the population or not to shift people's livelihoods from agriculture to others, so that agriculture remains maintained between built-up and undeveloped land. To support these efforts, it is necessary to have technology that can provide information regarding the latest year-to-year changes in land use that have occurred in Padang City, so that information regarding these changes will be useful for both the people of Padang City and the Padang City government.

The use of Landsat 8 (OLI) satellite imagery used to monitor land use changes will be able to overcome this problem. Landsat 8 (OLI) satellite imagery has several advantages such as providing open access or free imagery products. Landsat 8 imagery has a resolution of 30m, has a 12-bit satellite image sensor and records objects using the push-broom method, but when downloaded via the USGS website the bit values are represented as 16-bit or with a pixel value range of 0-55,000. The image display becomes smoother, both multispectral and panchromatic channels.

By comparing Landsat 8 images in 2019 and 2022 using different composite bands, namely composite bands 3,2,1 (Natural color) and composite bands 7,6,4 (False color), the method used to detect changes in land use that occur is using methodPost-Classification Comparisson. According to Reihaneh Peiman (2011) methodPost-Classification Comparisson provide change information"From-to" and efficient transformation of landscape types and areas. The result of this method is a table that is able to display information regarding areas and percentages. Thus, the analysis of land use change detection is carried out through methodsPost-Classification Comparisson It is important to find out how much land use has changed between 2019 and 2022 using Landsat 8 imagery in the city of Padang. By carrying out this analysis, it is hoped that we can find out more actual and accurate land use changes that occur in Padang City. Based on the area obtained from both years.

2. METHODS

2.1. Types of Research

is a quantitative research using Geographic Information Systems (GIS) techniques to provide a detailed picture according to what is in the field, through a spatial approach by interpreting images using composite bands 4,3,2 and composite 7,6,4 using techniques The guided classification of the Maximum Likelihood method is continued by making a tentative map of land use using composite bands 4,3,2 and composite 7,6,4 in 2019 and a tentative map of land use using composite bands 4,3,2 and composite 7,6,4 years 2022 in Padang City to see changes in land use in Padang City, which then carried out an overlay method between land use in 2019 and the 2022 land use map.

2.2. Time and Location of Research

This research was conducted from November in the 2021/2022 academic year to October in the 2022/2023 academic year. This research was carried out in Padang City. Geographically, the city of Padang is between 00°44'00" and 01°08'35" South Latitude and between 100°05'05" and 100°34'09" East Longitude. The city of Padang, which stretches from North to South, has a coastline of 68,126 km and there is a row of Bukit Barisan with a hill area (including rivers) of 486,209 km².

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2.3. Research Design

The tools used in this research are as follows:

Table 1: Research Tools and Materials

No	Tool	Function
1.	Laptop Asus X455L, Windows 10, Intel Core i3-4030U 1,9Hz, Ram 2GB	Data analysis
2.	Software Envi 5.3	Carrying out the correction process
3.	Software ArcGis 10.3	Carrying out the classification process
4.	Software Microsoft Word versi 2016	Processing data
5.	Avenza Maps	Determination of sample coordinate points in the field
6.	Kamera Handphone	For field documentation

The materials used in this research are as follows:Table 2: Research Data Sources

No	Data	Data source
1.	Landsat 8 OLI image	http://earthexplorer.usgs.gov/ Path/Row 127/61 Landsat Collection 1 Level-1 Resolusi 30m
2.	Landsat 8 OLI image	http://earthexplorer.usgs.gov/ Path/Row 127/61 Landsat Collection 2 Level-1 Resolusi 30m
3.	Padang City administrative map Scale 1: 250,000	Ina Geoportal

2.4. Research Phase

2.4.1 Data Collection

The type of data needed in this research is primary data in the form of satellite image data from two different timeperiods and field surveys, while digital spatial data is in the form of administrative area maps and textual data inthe form of regional information documents.

2.4.2 Data Pre-Processing

1. Stages of radiometric correction
   This is the initial stage of data processing aimed at improving image quality as a result oferrors in surface reflection or curvature of the earth and other actors
2. Atmospheric correction stages
   This is the second stage of data processing to eliminate errors caused by data atmospheric influences such as thin fog, smoke and others on Landsat 8 images for 2019 and 2022.
3. Geometric correction stages
   The aim is to reposition according to the existing coordinates so that when doing so processing of images that have been set to coordinates is not inverted and corresponds to the coordinates.
4. Band composite stages
   Aims to combine several bands in Landsat 8 images for 2019 and 2022. Composite bandswhich was carried out using composite bands 432 (Natural color) and 764 (False color).

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5. Stages of image cutting
Carried out to obtain the area under study with the aim of carrying out data processing more focused and detailed based on the needs required within the scope of the research, namely PadangCity area

2.4.3 Data Processing Stage

1. Supervised classification stages
It is one of the most frequently used parts of remote sensing image processing interpret the observed objects. This research uses a supervised classification technique
(Supervised Classification). The method that will be used in this guided classification is method (Maximum Likelihood).
2. Metode Post-Classification Comparisson
The change detection analysis method via Post-Classification Comparisson, is based on images, where the quantity and quality of sample data or training areas used in the classification process is very important influential, to produce good classification results. The results of this method are in the form ofa table "From To" which is capable of displaying information regarding areas, percentage changes over time in 2019 and 2022.
3. Determination of sample points
Sample collection in the field using the simple random sampling method. With determine the level ofaccuracy and then proceed with sample calculations in each class land use. So that the samples taken represent each land use class.
4. Field
Field activities are aimed at carrying out checks directly in the field by carrying out taking documents inthe form of photos at the research location and taking field samples in the form of points coordinate.

2.4.4. Post-Field Processing Stage

1. Accuracy Test
The accuracy test stage in this research is the method used to carry out accuracy tests with using the Confusion Matrix method as in the accuracy test stage in this research error matrix method (confusionmatrix/error matrix).
2. Overlay
The map that will be overlaid is the 2019 land use map with a tentative map of use land 2022.

3. RESULTS AND DISCUSSION

3.1 Knowing the extent of land use in Padang City in 2019 and 2022 using komposit 4,3,2 (True Colour)

3.1.1 Recognizing land use in Padang City in Landsat 8 composite band 4,3,2 imagery Figure 1: Map ofcomposite results for bands 4,3,2 in 2019 and 2020

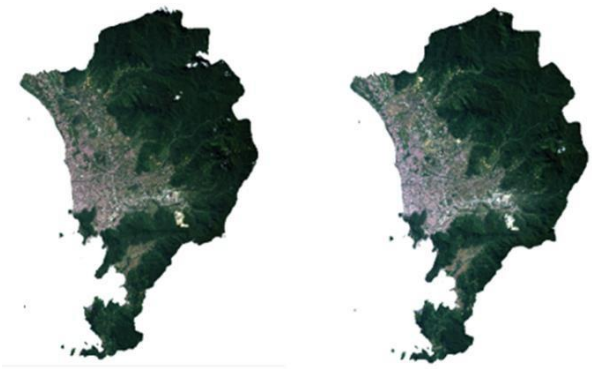

Figure 1: Map of composite results for bands 4,3,2 in 2019 and 2020

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Classification of land use by using nine key interpretations on Landsat 8 OLI obtained six land use objects, namelydarker green mixed forest, open land peach puff, bright brown rice fields, built-up land cloudy, the bushes and bushes are quite light green and the river is dark blue.

3.1.2 Land Use Area in 2019 Padang City

The results of the 2019 land use classification consist of Mixed Forest which has an area of 35,499.70 Ha, then openland which has an area of 383.61, rice fields which has an area of 4,613.60 Ha, then built-up land which has an areaof 8,820.01 Ha, bushes and shrubs which have an area of 19,740.75 Ha and finally the river has an area of 434.33.

3.1.3 Land Use Area in 2022 Padang City

The results of the 2022 land use classification consist of Mixed Forest which has an area of 35,342.12 Ha, then openland which has an area of 432.46, rice fields which has an area of 4,215.76 Ha, then built-up land which has an areaof 8,914.13 Ha, bushes and shrubs which have an area of 20,154.20 Ha and finally the river has an area of 434.33.

3.2 Recognizing land use in Padang City in Landsat 8 composite band 7,6,4 imagery

3.2.1 Mengenali penggunaan lahan di Kota Padang pada citra landsat 8 komposit band 7,6,4

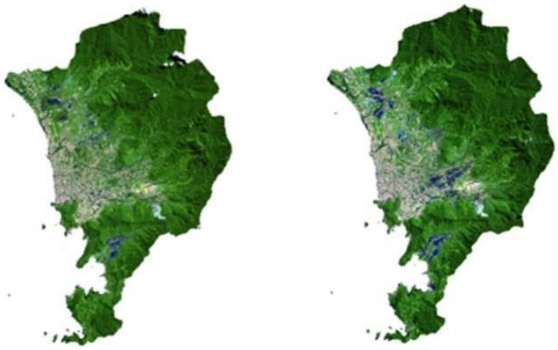

Figure 2: Map of composite results for bands 7,6,4 in 2019 and 2022

Land use classification for the year using nine key interpretations on Landsat 8 OLI obtained six land use objects, namely dark green mixed forest, light blue open land, dark blue rice fields, bright yellow built-up land, bright green bushes and thickets and regal blue rivers.

3.2.2 Land Use Area in 2019 Padang City

The results of the 2019 land use classification consist of Mixed Forest which has an area of 35,496.21 Ha, then open land which has an area of 383.34, rice fields which has an area of 4,609.23 Ha, then built-up land which hasan area of 8,819.56 Ha, bushes and shrubs which have an area of 19,750.33 Ha and finally the river has an area of 434.33.

3.2.3 Land Use Area in 2022 Padang City

The results of the 2022 land use classification consist of Mixed Forest which has an area of 35,340.89 Ha, then open land which has an area of 432.04 Ha, rice fields which has an area of 4,210.20 Ha, then built-up land whichhas an area of 8,914.39 Ha, bushes and shrubs which have an area of 20,161.15 Ha and finally the river has an area of 434.33 Ha.

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3.3 Compare changes in land use in Padang City in 2019 and 2022

3.3.1 Change in land Use using composite bands 4,3,2 I 2019 and 2022 padang city

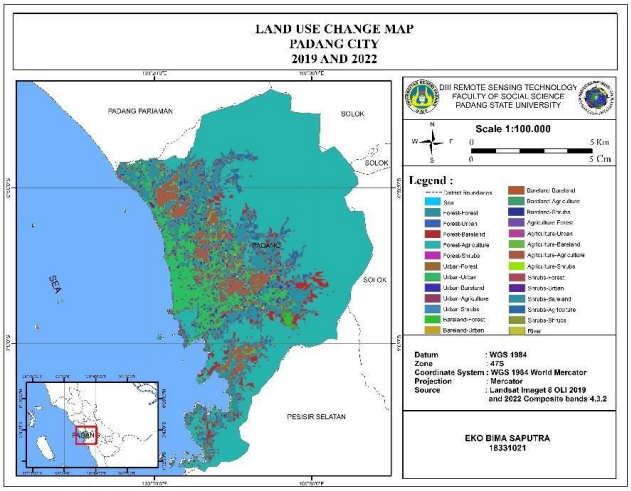

Figure 3 : Tentative Map of Band 4,3,2 Composite Land Use Changes in 2019 and 2022 Padang City

3.3.2 Change in land use using composite bands 7,6,4 in 2019 and 2020 padnag city

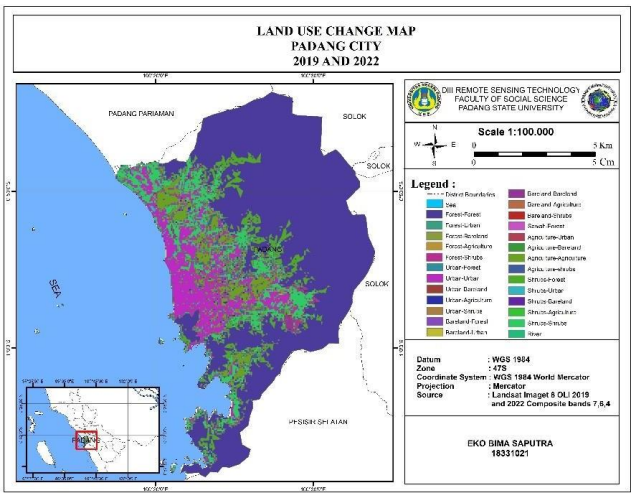

Figure 4: Tentative Map of Band 7,6,4 Composite Land Use Changes in 2019 and 2022 Padang City

3.4 Accuracy Test Level of accuracy of Landsat 8 OLI imagery in 2022 with conditions in the field

The results of the accuracy test for land use with a total of 56 samples used in the total sample, after carrying out field checks, it was found that the results of land use accuracy calculations using the Kappa method were as follows:

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Data Sample	Field Data 1	2	3	4	5	6	Total	*User's Accuracy*
1	27	1	0	0	0	0	28	96,43%
2	2	13	0	0	0	1	16	81,25%
3	0	0	3	0	0	0	3	100,00%
4	0	0	0	1	0	0	1	100,00%
5	0	0	0	0	1	0	1	100,00%
6	0	0	0	0	0	7	7	100,00%
Total	29	14	3	1	1	8	56	
producer's accuracy	93,10%	92,86%	100,00%	100,00%	100,00%	87,50%		
Overall accuracy	92,86%							

Table 3: Composite Accuracy Test Results for bands 4,3,2

The overall accuracy value using composite bands 4,3,2 is 92.86%

Data Sample	Field Data 1	2	3	4	5	6	Total	*User's Accuracy*
1	26	1	0	1	0	0	28	92%
2	3	10	2	0	0	1	16	62%
3	0	0	3	0	0	0	3	100%
4	0	0	0	1	0	0	1	100%
5	0	0	0	0	1	0	1	100%
6	0	0	0	0	0	7	7	100%
Total	29	11	5	2	1	8	56	
producer's accuracy	89,66%	90,91%	60,00%	50,00%	100,00%	87,50%		
Overall accuracy	85,71%							

Table 4: Composite Accuracy Test Results for bands 7,6,4

4. CONCLUSION

Based on the results and discussion above, the conclusions in this study are:

4.1 Land use using composite 4,3,2 in Padang City in 2019 and 2022, namely Mixed Forest in 2019 which has an area of35,342.12 Ha and in 2022 Mixed Forest has an area of 35,499.70 Ha, open land in 2019 which has an area of 383.61Ha and in 2022 the open land area will be 432.46 Ha, it can be seen. In 2019 the rice fields had an area of 4,613.60 Ha and in 2022 the rice fields will have an area of 44,215.76 Ha. The land built in 2019 has an area of 8,820.01 Ha and in 2022 the area will be 8,914.13 Ha. In 2019 the area of bushes and shrubs was 19,740.75 Ha and in 2022 the area of bushes and shrubs was 20,154.20 Ha. The river in 2019 and 2022 will not change with an area of 437.33.

4.2 Land use using the 7,6,4 composite in Padang City in 2019 and 2022, namely Mixed Forest in 2019 which has an area of 35,496.21 Ha and in 2022 Mixed Forest has an area of 35,340.89 Ha, it can be seen. In 2019 the open land area was 383.34 Ha and in 2022 the open land area will be 432.04 Ha. In 2019 the rice fields had an area of 4,609.23 Ha and in 2022 the rice fields will have an area of 4,210.20 Ha. In 2019, the built-up land area was 8,819.56 Ha and in 2022 the built-up land area will be 8,914.33 Ha. In 2019 the area of bushes and shrubs was 19,750.33 Ha and in 2022 the area of bushes and shrubs was 20,161.15 Ha. The river in 2019 and 2022 will not change with an area of 437.33.

4.3 Changes in land use using Composite Band 4,3,2 Mixed Forest experienced a reduction of around 157.58 Ha. open land increased by around 48.85 Ha, rice fields decreased by 397.84 Ha. built-up land increased by around 94.12 Ha. Shrubs and shrubs, an increase of around 412.45 Ha. Changes in land use using Composite Band 7,6,4 Mixed Forest experienced a reduction of around 155.32 Ha. open land increased by around 48.70 Ha. Rice fields experienced a decrease of 399.03 Ha. built-up land increased by around 94.83 Ha. Shrubs and thickets increased by around 410.82 Ha of the river in 2019 and in 2022 there will be no change with an area of 437.33.

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