Characterization of Multispectral Satellite Image for Land Surface Temperature Interpretation

Annisa' Kurnia Shalihat, Yogie Ardiwinata

Abstract: ***The increase in population is of course also accompanied by the development process. Conversion of land use from the vegetation area to non-vegetation, such as settlements for example will affect the surface temperature in the area. In addition, it will directly or indirectly affect the occurrence of global warming. Information about soil surface temperature needs to be known. Given that SPT as a factor that affects global climate change. To avoid urban heat, information about SPT is needed. Whereas in this study an identification process was carried out by utilizing thermal waves (thermal bands) found in Lands at 8. The identification process was carried out by the conversion method Algorithms produced from bands 10 and bands on lands at satellite images 8. The results of the research were high category was interpreted at most in the 2016 recording year with the majority distribution in urban areas, namely Kemuning District, IlirTimur I District and Bukit Kecil District.***

Keywords*: Land surface temperature, Urbanization, Remote sensing*

I. INTRODUCTION

Global warming is still a trending issue in scientific research as stated in Intergovernmental Panel on Climate Change (IPCC) reports. The report stated that there was a 0,6 centigrade increase in global temperature than it was recorded on 1750[1]. This was as a result of Industrial Revolution that had an impact hugely on global scale toward global temperature. Palembang as one of metropolitan cities in Indonesia is also a capital city of South Sumatera and one of the busiest cities in Indonesia which has a population growth rate of 1,45% each year[2]. This growth rate may be one of the factor that contributes to the regional surface temperature. Any positive number of population growth rate may have an impact on the need of housing. In general, the increment of the number of built environment may also decrease the area of natural environment which effect the temperature of the region.

The increase in population believed to have aneffect towards the development process. Conversion of land use from the vegetation area towards non-vegetation area such as settlements and housing will affect the surface temperature in the area.

In addition, it will either directly or indirectly affect of the global warming. The importance of Land Surface Temperature study is to understand the correlation of land use towards regional surface temperature by analysing the spatial distribution area that affects the increase in surface temperature. The analysis of the Land Surface Temperature is based on satellite imagery by identifying the land cover charaterisation and surface temperature.

This research was conducted by analysingthe regional surface temperature in Palembang within four-year period from 2015 to 2018. The aim of this study is to obtain the distribution of surface temperature on the region and to understand the correlation between land surface temperature, land cover and land-use.

II. RESEARCH METHODS

Land Surface Temperature is a product of themal analysis to identify area temperature based on Landsat 8 satellite imagery. This study is an quantitative research which conducted by obtaining the number of percentages of built environment and thermal satellite imagery. The analysis of land surface temperature was first by obtaining the satellite imagery. The data used for this study were Landsat 8 satellite imageries by year for four years from 2015 to 2018 consecutively. The data were collected from satellite by choosing the hottest time of the year. From the collected data, then processed with remote sensing techniques, namely: radiometric correction [3]. In Landsat 8 imagery, it has been geometrically corrected, so in this study, only radiometric correction needed. Furthermore, mosaicking and cropping were carried out according to the administrative area of Palembang. To simplify the process of processing Landsat 8 combined with Geographic Information System tools which use a 1:250,000 scale of Indonesian Earth data for classification of land cover.

Identification of land surface temperature through a calculation process with specific algorithms. This is done by converting the digital number to the spectral value of radians, then from the spectral value converted in units of kelvin. Then, the temperature value of the kelvin unit is converted to the temperature value in Celsius[4]. This calculation process is done by remote sensing techniques.This data then classified into several categories to categorize each range of temperatures.

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III. RESULTS AND ANALYSIS

Interpretation of surface temperature is generated from multispectral calculations on thermal waves found in band 10, band 11, band 4 and band 5. Each thermal wave has a lambda value and a constant, whereas the ratios of the highest and lowest values for each imagery are different. The images below show the raster results from the calculation of each value in the recording period perspectively from Lands at imagery. The images are shown below.

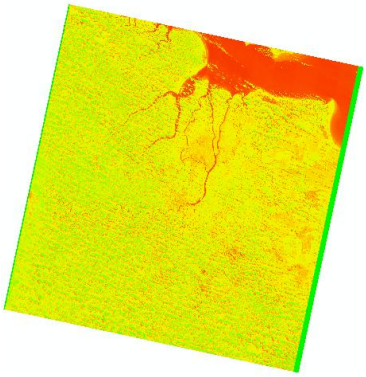

Fig. 1 Band 10 2015 Satellite Imagery

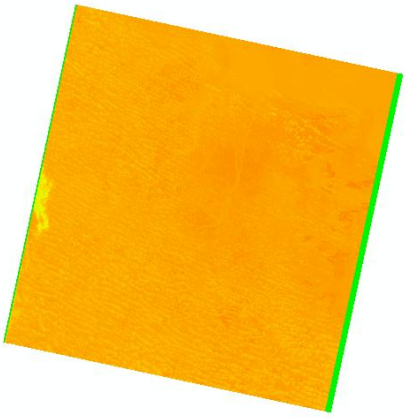

Fig. 2 Band 11 2015 Satellite Imagery

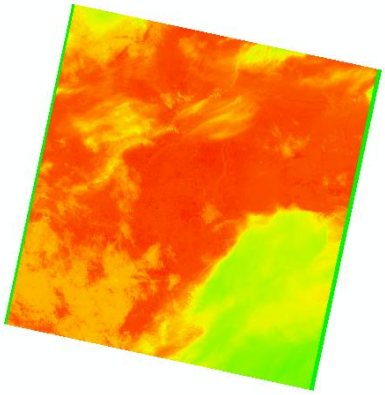

Fig. 3 Band 10 2016 Satellite Imagery

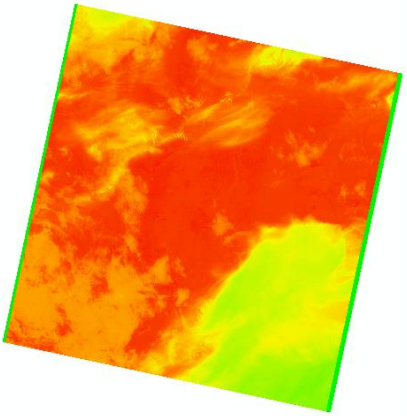

Fig. 4 Band 11 2016 Satellite Imagery

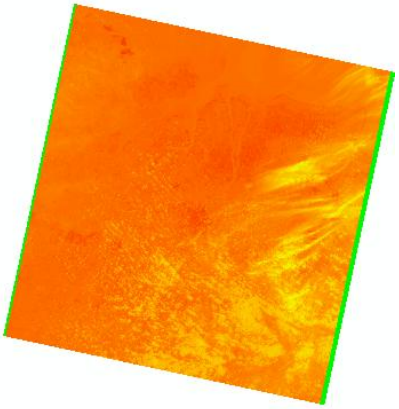

Fig. 5 Band 10 2017 Satellite Imagery

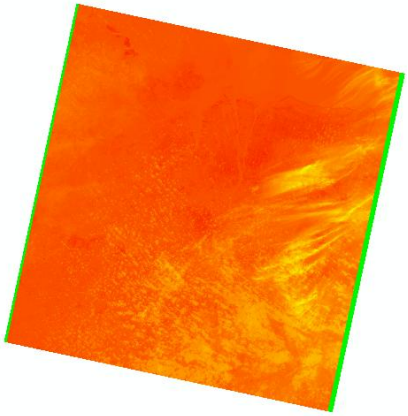

Fig. 6 Band 11 2017 Satellite Imagery

Fig. 7 Band 10 2018 Satellite Imagery

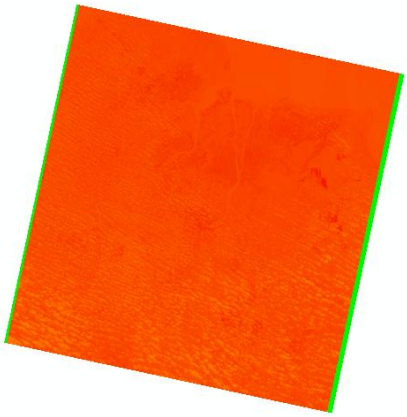

Fig. 8 Band 11 2018 Satellite Imagery

Each figures (Fig. 1 to Fig. 8) represent values quantitatively are shown on table 1 below.

Table. 1 Imagery Values

Year of Imagery	Band 10	Band 11
2015	High value : 124.531 Low value : 51.4982	High value :47.5426 Low value :- 131.389
2016	High value : 31.8536 Low value : - 125.514	High value : 24.2201 Low value : - 131.335
2017	High value : 38.0881 Low value : - 125.514	High value : 30.7898 Low value : - 131.335
2018	High value : 31.7321 Low value : - 125.514	High value : 26.0567 Low value : - 131.335

The spectral waves in each recording year produce different interpretations of surface temperature. The recording period was taken at the peak of the dry season (June-August) each year. The results of multispectral interpretations in band 4,5,10 and 11 indicate a decrease in the thermal distribution and area of the height criteria (shown in red of Fig 9 to Fig.12).

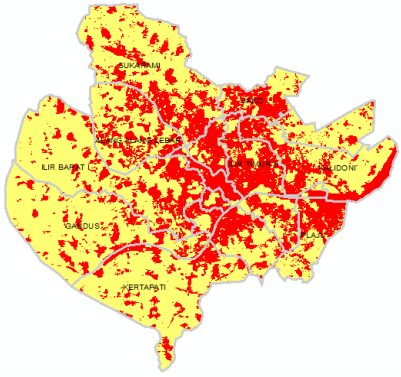

Fig. 9 2015 Interpretation

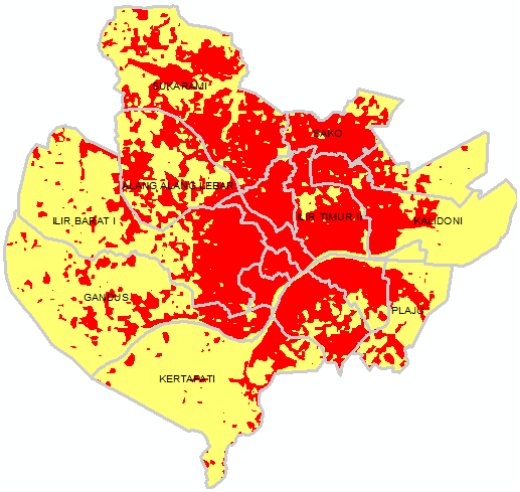

Fig. 10 2016 Interpretation

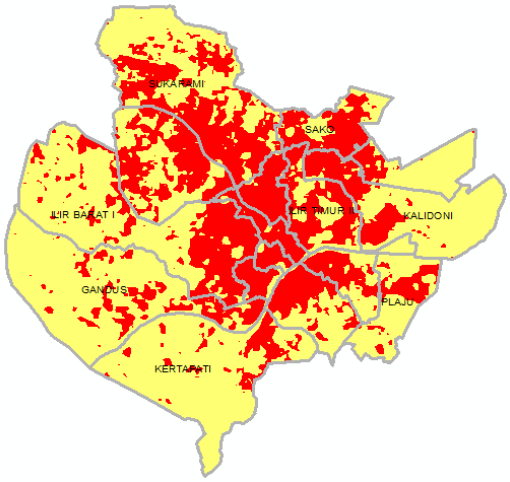

Fig. 11 2017 Interpretation

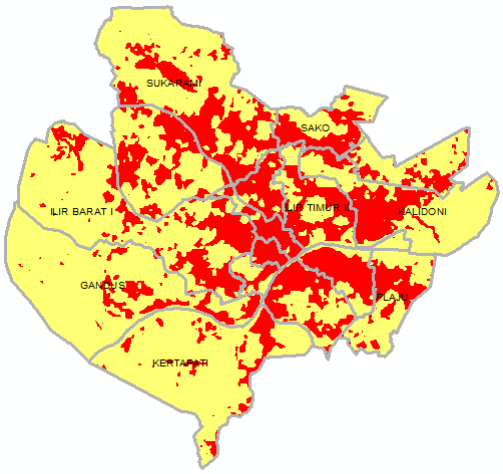

Fig. 12 2018 Interpretation

High temps were interpreted at most in the recording year of 2016 with the majority distribution in urban areas, such as Kemuning District, IlirTimur I District and Bukit Kecil District. Fig 9 showed that high surface temperature were scattered across the region but relatively increased in 2016. The high surface temperature area were lowered in 2017

and 2018 with lesser area with high surface temperature.

IV. CONCLUSIONS

Each recording product has a different spectral value resulting in a diverse interpretation of surface temperature. Most changes were noticable in Fig. 10 where it was considered to be the hottest year in the given time range.

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