Characterization of Multispectral Satellite Image for Land Surface Temperature Interpretation

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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 and housing 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 Landsats 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 an effect 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 characterization and surface temperature.

This research was conducted by analysing the 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 thermal 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 image 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.
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 perspective from Landsat 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
Each figures (Fig. 1 to Fig. 8) represent values quantitatively are shown on table 1 below.

Table. 1 Imagery Values

<table>
<thead>
<tr>
<th>Year of Imagery</th>
<th>Band 10</th>
<th>Band 11</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>High value :</td>
<td>High value :</td>
</tr>
<tr>
<td>2015</td>
<td>124.531</td>
<td>47.5426</td>
</tr>
<tr>
<td>Low value</td>
<td>51.4982</td>
<td>-131.389</td>
</tr>
<tr>
<td>2016</td>
<td>31.8536</td>
<td>24.2201</td>
</tr>
<tr>
<td>Low value</td>
<td>125.514</td>
<td>-131.335</td>
</tr>
<tr>
<td>2017</td>
<td>38.0881</td>
<td>30.7898</td>
</tr>
<tr>
<td>Low value</td>
<td>125.514</td>
<td>-131.335</td>
</tr>
<tr>
<td>2018</td>
<td>31.7321</td>
<td>26.0567</td>
</tr>
<tr>
<td>Low value</td>
<td>125.514</td>
<td>-131.335</td>
</tr>
</tbody>
</table>

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).

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 noticeable in Fig. 10 where it was considered to be the hottest year in the given time range.

**REFERENCES**