

Monitoring of urban expansion of Jakarta using MODIS land surface temperature

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Background

Urban expansion is a serious environmental issue in many countries. Jakarta, as the capital city, is the centre of economic and civilization in Indonesia. As the result of industrialization and deforestation, the air composition on the atmosphere has been changing, in Jakarta itself, the air temperature increased about 0.152°C per decade during 1901-2002 (Subarna, 2017).

Regions with high cloud coverage needs caution for the selection for cloud-free data. So far, many analysis rely on LANDSAT type data with about 100m or less spatial resolution. However, very few cloud-free data are available for these satellite datasets. MODIS provides moderate spatial resolution and high temporal resolution allowing to monitor seasonal variation of land surface temperature in tropical area.

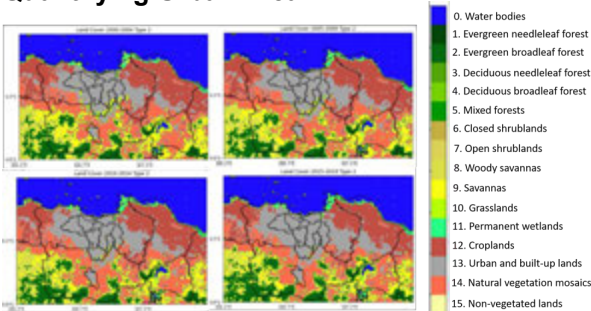
Objectives

1. Identifying the urban expansion of Jakarta urban area
2. Identifying the temperature change of Jakarta urban area

Urban expansion by land cover datasets

Land cover type	Extent of urban areas (km ²)			
	2000-2004	2005-2009	2010-2014	2015-2019
Type 1	2.985	3.173	3.391	3.652
Type 2	2.985	3.173	3.391	3.654
Type 3	2.889	3.084	3.301	3.588
Type 4	2.889	3.084	3.301	3.587
Type 5	2.894	3.092	3.308	3.592

Quantifying Urban Area



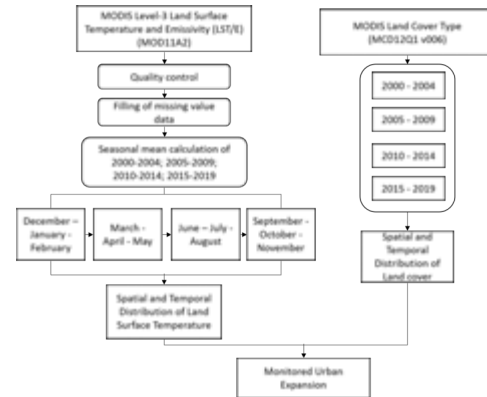
Conclusion and Future Works

Land surface temperature in Jakarta urban area tends to increase during 2000-2014 and decrease during 2015-2019. For seasonal variation, the highest LST occurred in SON and the lowest LST occurred in JJA. For diurnal variation, the day LST is warmer than the night LST.

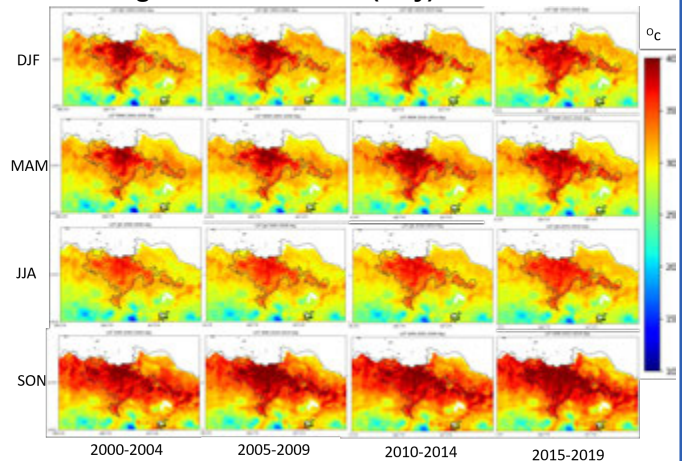
We could show urban area expansion in Jakarta from visible-near infrared satellite data and thermal data. Our approach relies on multiple data sets, which can produce better quality data by picking up cloud-free image.

Application of geostationary satellites (e.g. Himawari-8) are one of the approach to increase number of cloud-free datasets. Before analysis, we need to check how much more cloud-free datasets are available. We also need to analysis other large cities in tropical Asia.

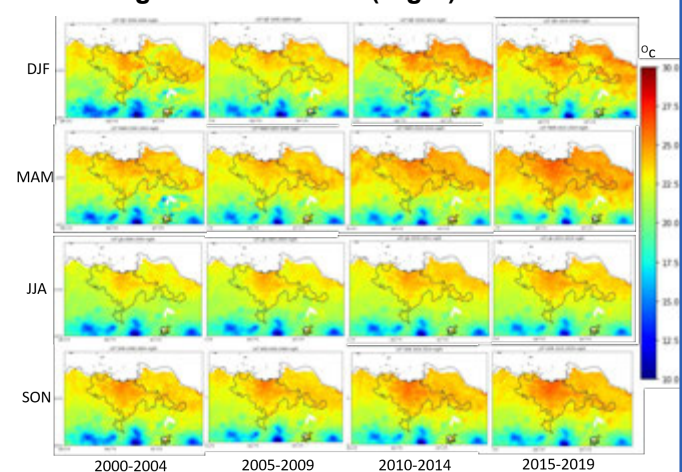
Methods



LST Changes in Urban Area (Day)



LST Changes in Urban Area (Night)



References

Subarna, D. (2017). Analysis of Long-Term Temperature Trend as an Urban Climate Change Indicator. *Forum Geografi*, 31(2), 196–208. <https://doi.org/10.23917/forgeo.v31i2.4189>