# DETECTION OF THE RELATIONSHIP BETWEEN CHANGES OF URBAN SPATIAL STRUCTURE AND URBAN THERMAL ENVIRONMENT USING SATELLITE IMAGERIES - CASE STUDY OF JABODETABEK, INDONESIA

Yuting Lin

## 1. BACKGROUND AND OBJECTIVES

As more than half of the global population inhabits in urban areas and the number of the inhabitants will increase continually in the future, the urban environment is and will be under major anthropogenic pressure. As one part of the urban environment, the urban thermal environment is considered as one of the cause for impaired water quality, compromising citizens' health, increasing energy consumption and air pollution[1]. Urban thermal environment is affected by urban spatial structure, which displays the pattern of physical objects of urban and how they are distributed. This study focused on detecting the relationship between urban spatial structure and urban thermal environment from macroscopic viewpoints.

## 2. STUDY AREA

Jabodetabek Metropolitan Area was chosen as the study area located in Indonesia on the northwest coast of Java Island. Jabodetabek stands for Jakarta-Bogor-Depok-Tangerang-Bekasi, which comprises sevens administrative units. 27.9 million inhabits there in 2010, representing 11.75% of Indonesia's total population. The Gross Regional Domestic Product (GRDP) of Jabodetabek is 39 billion US$, representing about 25% of the whole country's economy[2].

## 3. METHODOLOGY

Land surface temperature was derived from thermal bands of Landsat TM and ETM+ by Gap-filling Landsat ETM+ SLC-off imageries, masking cloud and calculating land surface temperature. Land surface temperature was set as the dependent variable and land covers were set as the independent variables. The multiple linear regression analysis allowed to evaluate the impacts of land cover changes on surface temperature change and to compare the impacts on surface temperature change between different land cover types.

## 4. RESULTS AND DISCUSSION

Land cover, derived from land cover maps, and land surface temperature, derived from satellite images, were used as proxies of urban spatial structure and urban thermal environment, respectively. Three multiple linear regression models were used to detect the relationship between land cover and land surface temperature. As the results, area covered by higher proportion of urban has higher land surface temperature. However, in highly urbanized area, Jakarta in this study, where the albedo of infrared light is no more than determined by the physical characteristics of surface materials, the accuracy of the model was low.

## 5. CONCLUSION

1) Although in the highly urbanized area, where the impact of urban heat island is great, the multiple linear regression is not fit for detecting the relationship, the positive results can be derived in other regions.

2) Along with the continuing urbanization in Jabodetabek, surrounding area of Jakarta will continue to increase, which could cause various environmental issues.

3) Remotely sensed data collected in single time point may cause errors due to limitation of analysis accuracy. High time resolution data such as MODIS may be a necessary supplement for this kind of analysis.

### References

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ii)  Firman, T., 2009. The continuity and change in mega-urbanization in Indonesia: A survey of Jakarta–Bandung Region (JBR) development. Habitat International, 33(4), pp.327–339.