UNIVERSITI TEKNOLOGI MARA

DEVELOPMENT OF
URBAN CLIMATIC MAP OF THE
KUALA LUMPUR CITY

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PhD

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AUTHOR'S DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the results of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any degree or qualification.

I, hereby, acknowledge that I have been supplied with the Academic Rules and Regulations for Post Graduate, Universiti Teknologi MARA, regulating the conduct of my study and research.

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ABSTRACT

After the Industrial Revolution in 1700s, the explosion of industries led to rapid urbanization. Rapid urbanization is noticed as a prominent factor in altering the climate, leading to the formation of urban heat islands (UHI). In many countries, climate-related studies were often difficult to be conducted due to the unavailability of climatic datasets to critically assess the urban climate condition. In Malaysia, the impacts of urbanization have been long studied, pioneered by Sani in 1970s. The alarming status of urban climate has been one of the issues in combating the effects of urban heat island (UHI) especially in Kuala Lumpur. There is an urgent need for innovation in solving this issue effectively. Thus, this study aims to generate a tropical Urban Climatic Map (UC-Map) of the Kuala Lumpur City. Kuala Lumpur was selected as a case study due to its unique urban morphology which consisted of well-planned and unplanned developments. Taking the advantages of technology evolutions to replace the conventional methods, this study was conducted using Geographical Information Systems (GIS), Remote Sensing and Weather Research and Forecasting (WRF) numerical simulation for data acquisition, processing and analyses. GIS was employed as the main platform for data storage, data preparation and data analysis. Remote Sensing technique was utilized primarily to extract important information of the Earth's features existed within the study area. The WRF numerical simulation was used to generate the climate condition of the study area. Due to the complex features of the Kuala Lumpur City, this study utilized non-parametric statistical approach (Kruskal-Wallis test) and Ordinary Least Square (OLS) regression to assess and model the urban climate condition. In this research, six urban parameters were tested due to their severe impacts towards urban climate condition. After a thorough investigation, five of these parameters were identified to have significant effects on the urban climate of Kuala Lumpur. The developed urban climatic map was produced only using these five parameters, which are built-up area, green cover, terrain elevation, building volume and surface roughness. The developed UC-Map consists of two main components namely thermal load and dynamic potential aspect. Based on the map developed by the author, the examination of the current urban climate condition revealed that mitigation measures should be taken seriously in the warming areas while preservation and maintenance of the valuable areas should be enforced. Through the analyses conducted, this study has suggested possible mitigation measures to at least reduce the impacts of UHI. In the future, the improvement of the current model can be made by including other urban parameters. The development of specific UC-Map for other cities in Malaysia is also encouraged since their characteristics might differ from the Kuala Lumpur City.

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