Assessment of Economic Worth of Green Roof To Mitigate Urban Heat Island: A Case Study in Putrajaya

Assoc. Professor Ts. Dr. Firdaus Mohamad Hamzah (Project Leader) Dr. Mohd Khairul Azhar Mat Sulaiman Ir. Dr. Zambri Harun Ts. Dr. Nor Azwan Mohamed Kamari (Universiti Kebangsaan Malaysia)

ABSTRACT

The increase in global temperature is often associated with the occurrence of air pollution and climate change issues, especially since the conditions in urban areas are moderately hot compared to suburban and rural areas due to high pollution and lack of green areas. Indirectly, this impact has had an impact on the rate of energy consumption for the cooling process of the building. Following this, the roof components have been identified to contribute to the building heating effect due to exposure for more than 10 hours a day which at the same time secretes 70% of the sun's radiation. Universiti Kebangsaan Malaysia has selected four Precincts in Putrajaya which can be categorized as urban and suburban areas and the private university building which is Herald Watt University in Putrajaya as a case building. For the urban heat island (UHI) effect, temperature measurement data was collected from the Malaysian Environment Department. Indoor temperature and energy consumption are collected using thermocouples and other instruments to record meteorological parameters. Differences in temporal patterns were evaluated in several precincts in Putrajaya, followed by the determination of factors that cause temperature changes and the Urban Heat Island effect. Preliminary exploration shows no significant temperature trend in Putrajaya, until 2016, followed by a positive trend between 2016 and 2019. As for the effect of building cooling energy consumption, thermocouples and other meteorological devices are used to record air temperature readings and parameters related to this study. Following the field data obtained, a simulation of building modelling using Integrated Environmental Solution-Virtual Environment (IESVE) software was carried out to compare the energy generated to cool the building and calculate the operating costs for buildings with concrete and green roofs. The analysis found that the impact of UHI in Precincts 1, 3, 5 and 9 in Putrajaya is still low and under control. For the cooling energy effect of the building, the concrete roof will increase the cooling energy utilization rate by 50.33% compared to the green roof by 30.14%. In principle, the implementation of a green roof will contribute to the saving of building cooling energy and cooling operation costs accumulatively throughout the year. The results of this research can help the government and relevant agencies to take remedial actions to control the effects of PHB and can help in making decisions related to the feasibility of developing current green infrastructure projects.