PERFORMANCE OF GREEN ROOFS IN TROPICAL CLIMATIC CONDITIONS

Shanika Nisansala Wijerathne

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Degree of Master of Science

Department of Civil Engineering

University of Moratuwa

Sri Lanka

September 2012

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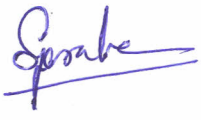
Signature:  **Date:** 8/09/2012

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Abstract

Growth of the world urbanization has been extensively accelerated since past few decades. With the increasing urbanization, the land with permeable layers and moist have been altered. As a result, urban heat island phenomenon has taken place, making the temperature in the cities to be higher than the country sides. Heat island effect in cities is mainly because of non-natural heat absorbing materials use in buildings and other manmade structures. Natural greenery in the cities was replaced by concrete yards and most of the cities urbanizing with more and more concrete. Since there is no space to grow, adding greenery to cities is also an issue. Having greenery over the roof or planting on roofs are now becoming popular in many countries. Green roofs play a major role as a sustainable solution to minimize the heat island effect. This research discusses about the effects on the surrounding temperatures, if the existing flat roofs in the Colombo city, the capital of Sri Lanka, are replaced with green roofs. The reduction in the temperature in the atmosphere was calculated using actual measurements on small scale models and computer simulation. These findings were coupled with the energy balance of the city. From the results obtained, it can be clearly shown that there's a significant reduction in the temperatures, in the city when compared to the prevailing condition. The forecasted condition proves that the foreseeable problem of urban heat island effect with the future developments can be drastically reduced with the introduction of green roofs.

Another problem the world is facing today is energy crisis. Because of that world is now focusing on the sustainable cities. The contribution of the green roofs towards the energy cost saving when it is implemented in the city level in the existing flat roof slabs is calculated. A Derob modeling is done and the A/C loads are obtained for different roof types throughout the year and with the actual roof areas obtained for the city the energy cost saving is calculated. The energy cost saving obtained was 12%. However when it incorporates with the actual practice the desires of the population also should be analyzed. Identifying the implementation possibilities of the green roofs in the city also is vital to achieve these identified benefits in the future. This was achieved through a detailed questionnaire survey. With questionnaire survey it was found that the awareness of the green roofs is 56.8% and the willingness to spend for a green roof is less than 20% than the existing cost for an asbestos roof.

Key Words: Heat island effect, green roofs, computer simulation, energy cost saving, implementation possibilities.

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