



**ARAB ACADEMY FOR SCIENCE, TECHNOLOGY
AND MARITIME TRANSPORT**

**College of Engineering and Technology
Architectural Engineering and Environmental Design Department**

**“The impact of green building envelope on the urban
microclimate”**

Case study: Fawzy Moaz Street, Alexandria, Egypt

By

Amany Haridy Ahmed Messrawy

A thesis submitted to AASTMT in partial

Fulfillment of the requirements for the award of the degree of

MASTER'S OF SCIENCE

in

ARCHITECTURAL ENGINEERING AND ENVIRONMENTAL DESIGN

Supervisors

Prof. Ahmed Bahaa Elden Elseragy

Dr. Fahd Omar Hemeida

Professor

Lecturer

Architectural Engineering and Environmental Design

College of Engineering and Technology

Arab Academy for Science, Technology and Maritime Transport

Alexandria

2018

Abstract

The urban development process has negatively affected the urban microclimate recently. The dominant scene of the most cities around the world is the overcrowded blocks of concrete and bricks. Many phenomena have appeared at the urban microclimate from low precipitation rate and raising of air temperature. The raising of air temperature is clearly noticeable at the dense urban canyon more than elsewhere. Whereas, this phenomenon known as urban heat island. This phenomenon has many effects on ecological life, as well as human health, and causing global warming on the long term. This research has provided evidence of the possibility of reducing the urban heat island by using a green building envelope (green wall and green roof) in Alexandria, Egypt. The City has witnessed a boom in growth in its urban fabric and population.

Through the research a review for the urban heat island and its impacts, and the green building envelope and its role in improving the urban heat island. A simulation analysis using the Envi-met software to find the ratio of air temperature reduction was performed. The simulation depended on the orientation of the green areas and their density, which was defined through a process of climatic analysis made by the Diva plugin using the Grasshopper software. Results showed that the reduction in air temperature varies from 0.8–2.0 °C, increasing with the increasing density of green areas. Many systems of green wall and green roof can be found in the local market. However, treating an existing building requires a careful choice of system to fit the building construction load and the surrounding nature. Among the systems of choice, there were the “geometric system” of vertical greening that can be fixed on a light aluminum structure for walls and the extensive green system for roofs. Finally, using native plants were the best choice on the long term because they fit well in the local climate.

Keywords Envi-met, Green building envelope, Grasshopper, Urban canyon, Urban heat island, Urban microclimate.