

Abstract

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Impact of evolving building morphology on microclimate in a hot arid climate

In Upper Egypt, many new cities were planned without thoroughly considering the environmental impacts. This has led to climatically insensitive urban settlements. On the other hand, in the Greater Cairo Region, older urban communities were originally planned with similar characteristics. However, they have experienced an unplanned evolutionary process over the last decades. These settlements became denser as residents built additions vertically replaced existing structures with higher ones. Consequently, the geometric parameters of outdoor spaces have become more complex, with significant impacts on the local micro climate. As a way of supporting urban planning policies in Upper Egypt's new cities, this study questions the feasibility of this densification phenomenon with regard to outdoor thermal comfort. The data introduced are based on site surveys in The Greater Cairo Region, onsite climatic measurements in New Aswan city, and microclimate simulations using ENVI-met. This study simulates the impact of urban form of two quarters (new and transformed) on Physiological Equivalent Temperature (PET) at pedestrian level. The simulation was conducted under Aswan's extreme hot climatic conditions in summer. The results show that the densification has lowered average PET values by 1 °C throughout the entire quarter and up to 5.5°C in some of the evolved areas during the daytime hours. However, at other locations within East-West oriented streets the increased heights had a negative effect and was insignificant at the wider spaces. These findings may inspire change in new communities' planning policies guide the manner of growth for settlements in arid climates.