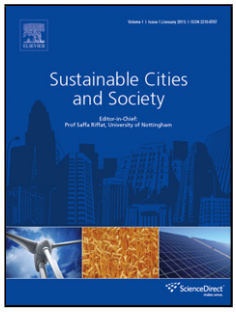

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Evaluation of Heat Exhausts Impacts on Pedestrian Thermal Comfort

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Abstract:

Climate change is considered as one of the biggest challenges in 21st century. Climate change is caused by the excessive use of heat exhausts such as air conditionings. The increasing use of mechanical cooling consumes more energy, discharges anthropogenic heat and CO_2 emissions. This heat causes a rise in outdoor air temperature and worsens the urban thermal environment. Urban thermal comfort is important in promoting peoples' use of outdoor spaces.

The objective of this research is to study the effect of anthropogenic heat on pedestrian thermal comfort within the urban space. Using infrared camera for different places in El Hussein square to identify the thermal performance under the climatic condition and under the mechanical heat generation sources. Different scenarios in El Hussein Square (Historical Cairo, Egypt) were carried out by simulations and modeling using ENVI-met and ANSYS /CFD to quantitatively assess the microclimatic thermal impacts of those heat exhausts. The results show the effect of heat exhaust in increasing the outdoor air temperature (heat island) as well as affect the outdoor thermal comfort of El Hussein Square due to the reduction of air flow between buildings.

Keywords: heat exhausts, thermal comfort, microclimate, convective heat transfer coefficient, infrared camera, anthropogenic heat.

1- Introduction:

Regular physical activity is associated with enhanced health and reduces risk of many diseases. Walking is the most commonly promoted moderate-intensity physical activity, therefore walking and cycling are the most convenient and sustainable mode of transport for all local trips. The built environment has to provide a safe and comfortable network for walking and cycling in order to encourage people to reduce their dependency on cars. Designing public spaces that are accepted and used by pedestrians is a challenging task for urban planners as it addresses a multitude of different architectural, technical and social aspects. One of the key factors determining the quality of an urban space is the local microclimate and the users' thermal comfort which is rarely considered in many researches as stated by Toudert and Mayar "The integration of the climate dimension in the design process is lacking because of poor interdisciplinary work between urban climatology, urban design and architecture." [1]

In fact, the outdoor thermal environment is impacted by the built environment through the anthropogenic heat; land cover; evaporation and evapotranspiration of plants; and shading by trees or constructed objects [2]. From this standpoint the objective of the research is to evaluate in what extent the outdoor thermal comfort could be influenced by the presence of anthropogenic. Whereas the anthropogenic heat is the heat generated by human activities, it is released by mobile sources (e.g., related to transportation), fixed sources (e.g., heating, cooling, lighting) and by people themselves (i.e., metabolism)