

Quantitative Assessment of the Thermal Environment of Urban District's Outdoor Space in an Arid Area

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Abstract — This research focuses on the open urban spaces quality related to the essential need of people to increase their social life in relation to a comfortable physical environment. The current emergence of environmental concerns involves several axes for new development possibilities; this environmental approach encourages research towards eco-urbanization. Improving the thermal quantities in an area's climate characterized by a very hot solar ray remains the main task. The assessment of the thermal comfort requires an analytical study of specific urban microclimates generated by the spaces morphology. To reach our objectives, the impact of different morpho-climatic indicators in urban areas will be tested to determine an optimization of adequate effects on the thermal environment of the open spaces of the studied districts. Three neighborhoods were selected for seasonal measurement campaigns, these urban tissues lend themselves easily to a chronological reading: traditional district, colonial district, and contemporary districts. The measurement tool used is a multifunction digital device (LM/FI 20) 3 in 1 (Anemo-Hygro-Thermometer). Mobile measurements monitoring are made in several timing of the day; the measurement times were chosen to measure the daily air temperature variations and to study the effect of solar radiation and shading in relation to the measurement stations. After the achievement of the measurement campaigns, we have proceeded to the calculation of the air temperature means on several levels in order to establish a thermal map of the studied districts. The results showed that each quarter represents a specific morphology that generates different thermal strata. The increase in air temperature values is mainly due to morphological and dimensional characteristics, solar exposure and the orientation of inter-district streets. It can also be deduced that the solar exposure of the external surfaces is due to: very low building heights, shadows of the constructive and natural elements, and coatings and textures of the different surfaces.

Keywords — Thermal environment; Urban outdoor space; Onsite measurement campaign; Hot arid area