



## Urban design to achieving the sustainable energy of residential neighbourhoods in arid climate

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### ABSTRACT

World Cities contribute to a massive amount of carbon emissions. About 80% of the global greenhouse gasses are emitted from these cities. The sustainable practices should be adopted in built environment for these cities. As an example, a residential neighbourhoods in arid climate has been discussed as a case study in practice in this paper. It has been developed to implement the sustainable strategies and concepts. It demonstrates a mixed-use community which integrates the sustainability dimensions to improve the quality toward sustainable living in a small community (about 4000 persons), allocated in Dubai land area. This paper aims to highlight the sustainable practices in the arid zones and to give an overview about the performance of the clean energy and renewable in these areas. The studied development has been selected to evaluate such techniques and strategies in the gulf region (Dubai). Various environmental categories such as; on energy, water, mobility, energy consumption of the buildings and infrastructure, urban green spaces, solid waste management and urban farming, have been appraised in this study. It has been noticed that the urban design proposed reduces its potable water consumption by 40% and for energy demands by 57% compared to conventional households. The solar production can cover around 38% of the energy consumption on average. Many challenges face the sustainability movement in the region, especially, the affordability and feasibility in such harsh climate zones areas. This manuscript opens new perspectives about the prioritization that should be considered for adopting the sustainable strategies in arid climate.

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### 1. Introduction

Cities are hybrid socioeconomic-natural ecosystems that represent humanity's densest concentrations of people and their activities (Sun et al., 2017). In the cities, the challenges are much greater than other areas especially in energy demand, carbon emissions and generated waste (Brundtland, 1985). Currently half of the people who live in the cities in our planet (United Nations,

2011; Ruza et al., 2015), this percentage is increased 1.85% every year (Central Intelligence Agency, 2013). Because of this massive shift from the suburb to the cities, the awareness level and sustainable practices must be adopted (Reith and Orova, 2015). Therefore, the cities play an important role in promoting the strategies of the sustainable development (Arto et al., 2016). These strategies find solutions for the air pollution, wastes problems, greenhouse gasses emission, depletion of resources as energy (Perea-Moreno et al., 2017). The sustainable cities movement has been considered and pursued in the last decades (Tan et al., 2016; Hernandez-Roman et al., 2017), addressing social and economic strategies within a total system approach to the city along with the environmental dimension to become more livable and flexible (Hiremath et al., 2013). A sustainable city makes these areas smart and livable, improving the economy and the quality of life (Andrich et al., 2013). The sustainable practices in the arid zones are

*Abbreviations:* DEWA, Dubai Electricity and Water Authority; DM, Dubai Municipality; GHG, Greenhouse Gases; HVAC, Heating Ventilation and Air Conditioning; K-8, The Grades from Kindergarten (K) to 8th Grade; LED, Light Emitting Diode; LEED, Leadership in Energy and Environmental Design; RTA, Dubai Roads and Transport Authority; TSC, The Sustainable City; UAE, United Arab Emirates.

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