



Original scientific paper

# A Proposal to Mitigate Energy Consumption through the Sustainable Design Process in Tunis

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## ABSTRACT

*The main objective of this paper is to assess the energy efficiency of residential buildings in Tunis. To this end, three complementary studies were carried out at different levels. Initially, a diagnosis of the building's adaptability to climate change at urban and architectural scales was established. The methodology adopted was based on indicators obtained following a cross-reference of environmental assessment tools. This made it possible to highlight the lacunary factors related to thermal comfort. According to this finding, the second research was set up to focus on outdoor thermal comfort. The methodology adopted is based on numerical simulations and calculations of comfort indices. The results demonstrated the importance of specific morphological indicators at the urban scale. Finally, the third research is interested in the architectural scale to assess the building's thermal comfort and energy consumption. It was performed through numerical simulations. The results demonstrated the impact of specific physical indicators on buildings' thermal comfort and energy behavior. Ultimately, this research highlighted the gap factors in urban and architectural design in Tunis. It detected the most significant physical and morphological indicators to be considered for sustainable urban design.*

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## 1. Introduction

The climate writes the history of peoples and civilizations, it influences our way of being, our way of life, our cities, and our homes (Song & Ye, C., 2017). Men have always been in harmony with their climate and ecosystem until the industrial revolution when this balance was broken, and nature was challenged (Goudie, 2018). The population explosion and pollution have caused unprecedented global warming. Indeed, during this decade, all countries recorded exceptionally high temperatures never experienced before

(Carter, et al., 2015) This global warming is increasingly felt and threatens the environment in various aspects: depletion of energy, food, hydraulic resources, and pollution (Viguié, 2020; Wang, Chen, & Ren, 2011). In August 2021, the Intergovernmental Panel on Climate Change published a report focusing on the state of

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