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# EXPLORING THE DIFFERENTIAL EFFECTS OF URBAN HEAT ISLANDS ON ENERGY USE AND CARBON EMISSIONS IN WARM AND COLD CLIMATES: A CASE STUDY OF NORTH AFRICA AND NORTH EUROPE

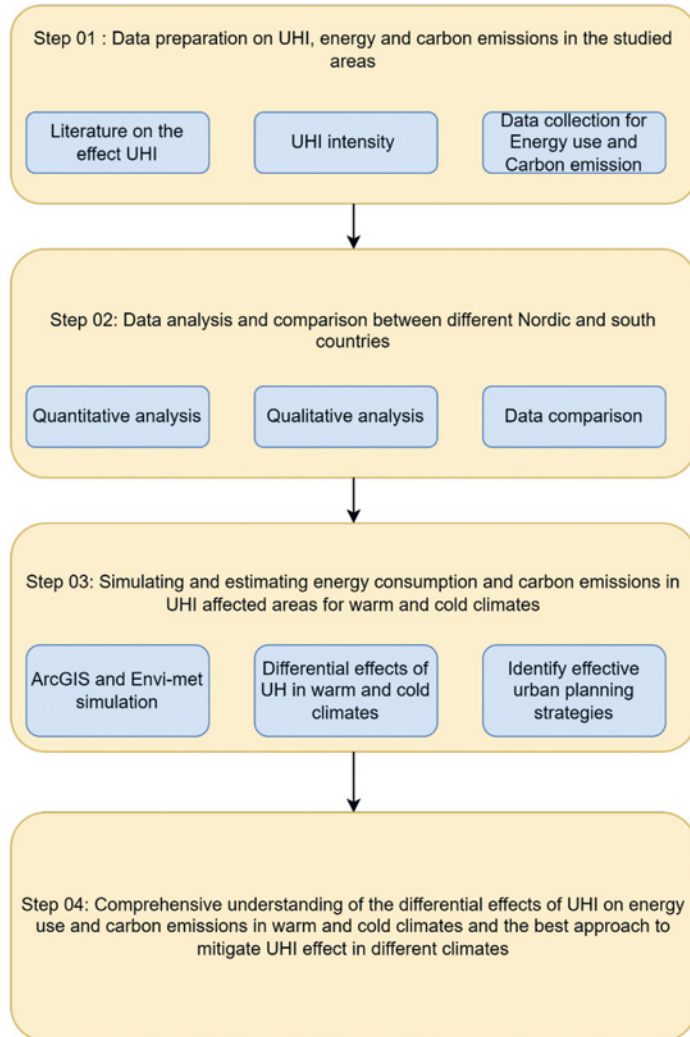
Kamel HAINE<sup>1\*</sup>, Dagnija BLUMBERGA<sup>2</sup>

<sup>1,2</sup> *Institute of Energy Systems and Environment, Riga Technical University, Āzenes iela 12/1, Riga, LV-1048, Latvia*

\* **Corresponding author.** E-mail address: [hainekamel@hotmail.fr](mailto:hainekamel@hotmail.fr)

**Abstract** – The urban heat island (UHI) phenomenon has differential impacts on energy use and carbon emissions in buildings depending on the climate of the region and the urban planning strategies in place. This study explores the differential effects of UHI on energy use and carbon emissions in warm and cold climates, using North Africa and North Europe as case studies. We address the following research questions: 1) How does the UHI phenomenon impact energy use and carbon emissions in buildings in these regions? 2) What urban planning strategies are currently in place to mitigate the negative impacts of UHI on energy demand and emissions in these regions? 3) How effective are these strategies in mitigating the negative impacts of UHI on energy demand and emissions in both warm and cold climates? 4) What additional urban planning strategies could be implemented to reduce further the negative impacts of UHI on energy demand and emissions in both warm and cold climates? The UHI increases energy bills and emissions due to the higher demand for cooling energy in warm climates, while in cold climates, UHI reduces energy demand and emissions by decreasing the need for heating energy. Urban planning strategies, such as incorporating green space, using reflective materials, choice of colors, and designing for natural ventilation, can effectively mitigate the negative impacts of UHI on energy demand and emissions in both warm and cold climates. However, the effectiveness of these strategies varies depending on the climate of the region and the specific urban context. In this study, we will provide a recommendation for urban planning strategies that can be implemented to further reduce the negative impacts of UHI on energy demand and emissions in both warm and cold climates. Our study contributes to the understanding of the UHI phenomenon. It provides insights for urban planners and policymakers in developing effective strategies to reduce energy use and carbon emissions in buildings and cities.

**Keywords** – *Geographic information system (GIS); residential energy consumption; urban heat island (UHI); urban heat island effect; urban planning*



Methodology of the study.