



**Politecnico
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Honors Thesis

Master's degree Science in Architecture Construction City

Abstract

**Nature-Based Urban Acupuncture Strategies for Climate Resilience: The case study
of Curitiba**

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The increasing urban population, which has become the global majority since 2007, has transformed the scenarios of cities into major contributors to the climate crisis. The intensification of human activity and construction, along with the loss of natural areas, have a direct impact on local microclimates, leading to the emergence of phenomena such as urban heat islands. As a result, growing urban populations face higher exposure to climate-related risks, while cities are becoming more susceptible to extreme weather events.

In response to the urgent need for mitigation and adaptation strategies, this research adopts Curitiba as a case study to assess the feasibility and effectiveness of the urban acupuncture methodology integrated with Nature-Based Solutions (NBS), with an emphasis on reducing the effects of heat waves while also addressing co-benefits related to other urban climate challenges.

Structured in three parts, the thesis begins with a theoretical foundation anchored in the principles of the 2030 Agenda, the Sustainable Development Goals and the central concepts related to urban climate, microclimate and sustainable urban strategies. The second part presents a comparative analysis of three case studies that apply NBS through specific and strategic interventions, often associated with the urban acupuncture approach, highlighting their results and potential for replication in cities with similar climatic conditions.

Finally, the third part focuses on the case study of Curitiba. An analysis of the city's climate and environmental vulnerabilities is conducted, allowing for the recognition of priority areas for intervention. For this purpose, the districts of Centro and Rebouças serve as focus areas. Within these neighborhoods, 24 street segments are identified as potential sites for urban acupuncture implementation.

From this list, four sites are chosen as pilot proposals to assess the effectiveness and feasibility of multi-benefit nature-based solutions previously implemented in European contexts. These strategies aim to enhance thermal comfort, mitigate the effects of heat waves, and promote urban resilience. Their evaluation is carried out through microclimate simulations using ENVI-met software, analyzing variables such as potential air temperature, surface temperature, wind speed, and PET (Physiological Equivalent Temperature) values. The project's goal is to use the pilot interventions as guidelines for other locations, contributing to the development of adaptable and replicable strategies. Additionally, it aims to support urban planning decision-making by recommending policies aligned with global sustainability agendas that effectively address local climate challenges.
