

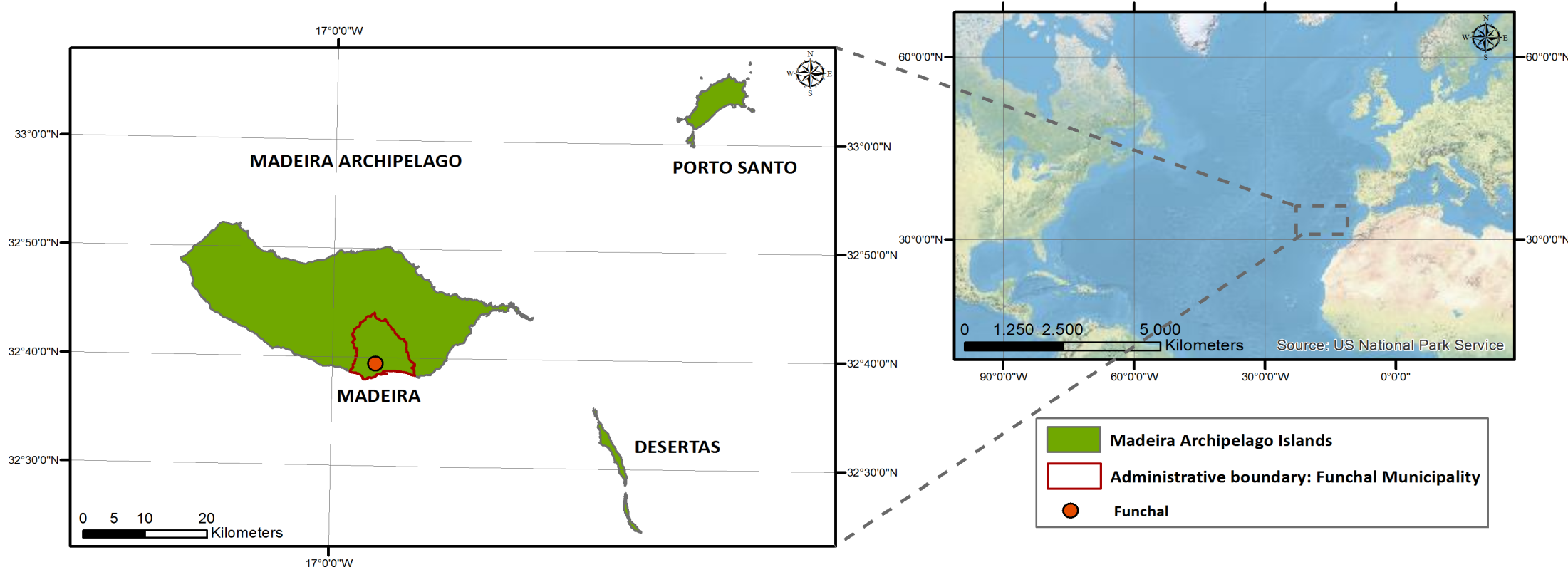
Measuring Social Vulnerability to Natural Disasters with Multicriteria Analysis: the case study of Funchal Municipality (Madeira Island, Portugal)



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Introduction

The municipality of Funchal, located on Madeira Island (Portugal), has an extensive historical record of natural disasters. Since the settlement of the island in the fifteenth century, approximately 30 natural disasters have occurred in Funchal. The study of natural extreme events in Funchal in recent decades, however, has mainly focused on uncovering the characteristics of the disaster agents, such as flash-floods, landslides, and local storms, while the body of knowledge regarding the social system’s vulnerability to natural disasters is still narrow. Consequently, this poster proposes the conceptualization and operationalization of a GIS-based model to measure the social vulnerability to natural disasters in the municipality of Funchal, at the neighborhood level, using Multicriteria Analysis techniques in a group-decision making process.



Objectives

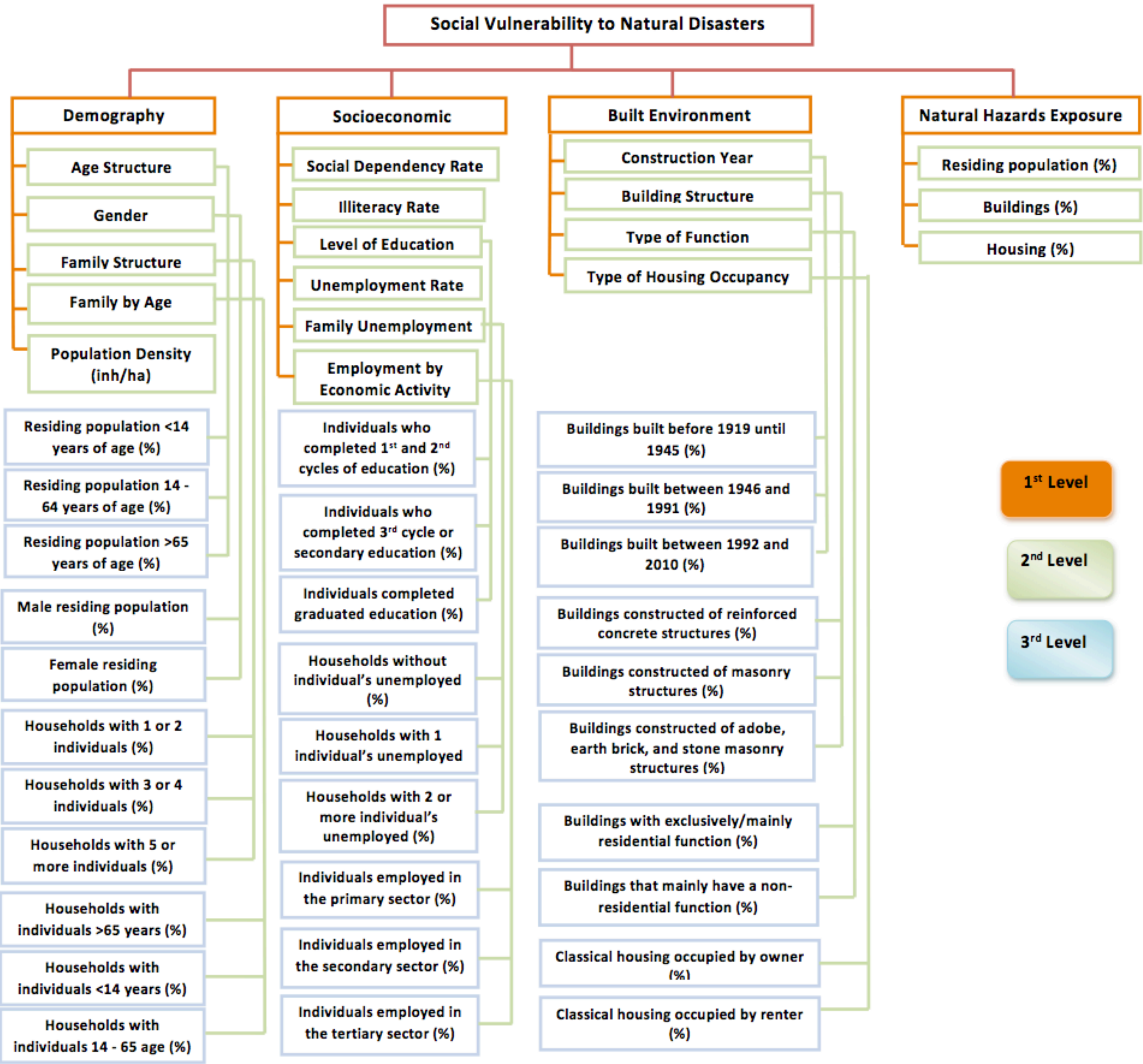
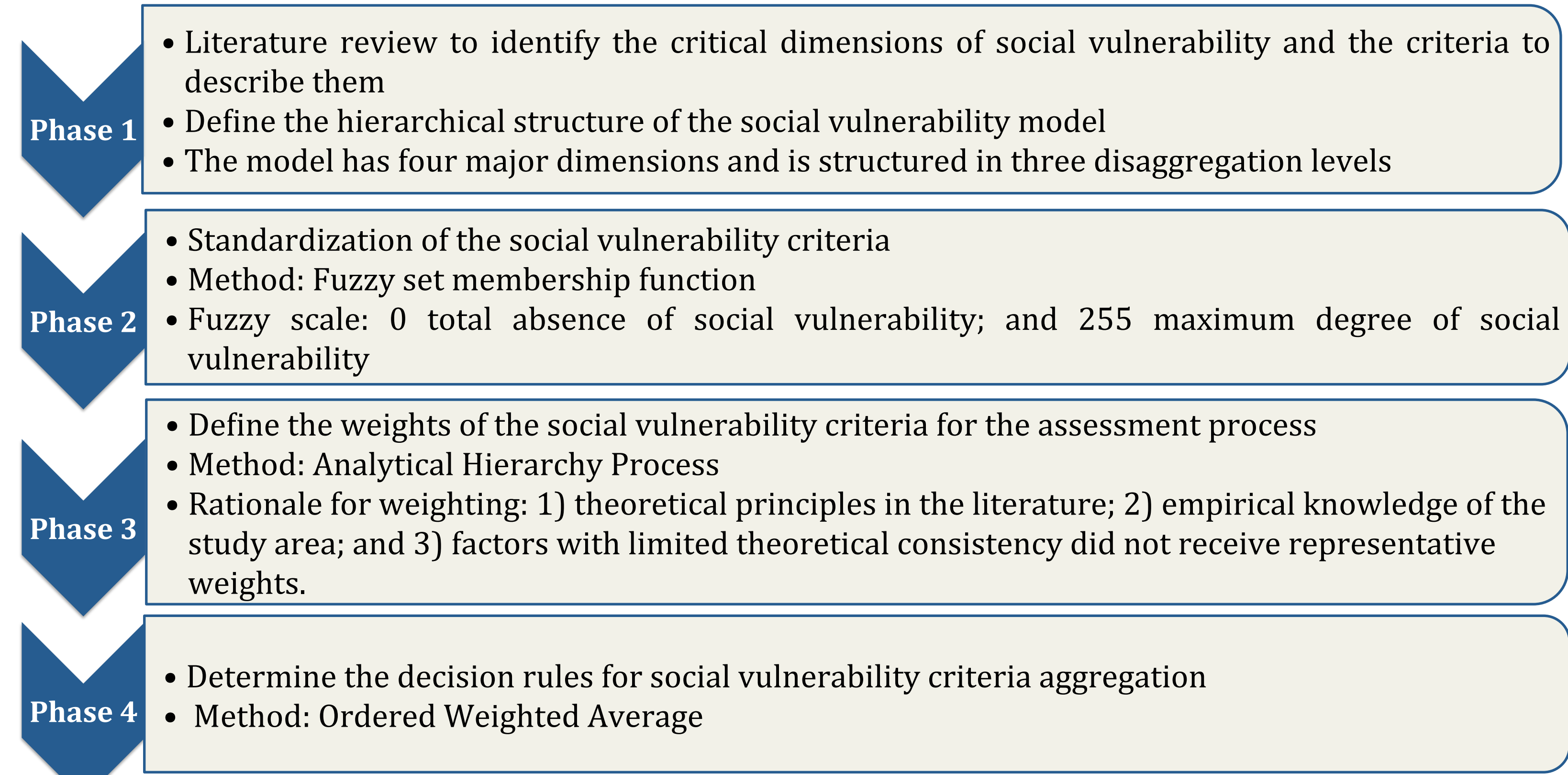
- Propose an alternative methodological approach to measure the social system’s vulnerability to natural hazards that avoids a purely statistical-driven assessment of social vulnerability
- Measure the levels of social vulnerability in the island’s main urban and economic center, as well as identify its patterns and hotspots
- Support disaster risk mitigation policies and strategies

Research Question

What are the levels of social vulnerability in Funchal Municipality at the household level, and how are they distributed across its administrative boundaries?

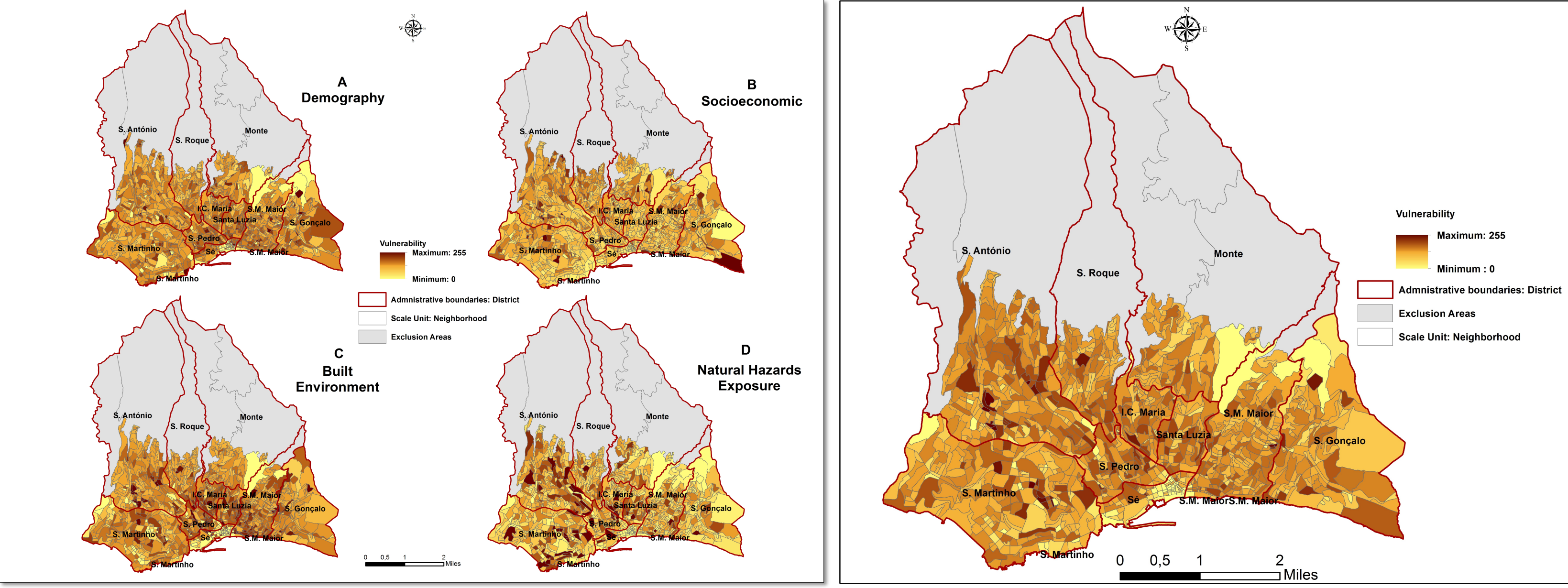
Methodology

Multicriteria Analysis is a method composed of techniques that support decision-making processes based on distinct criteria. The assessment of social vulnerability with Multicriteria Analysis is a methodological process structured in four major stages:



Findings

- The social vulnerability of the municipality of Funchal to natural disasters is classified as moderate.
- The built environment is the dimension with highest social vulnerability scores due to the predominance of old buildings constructed with low-resistant materials that mainly have a residential function.
- Neighborhoods with higher proportion of large families, significant presence of age groups constituted of youth and elderly, and large populations are significantly vulnerable.
- Perfect match between neighborhoods with high scores of socioeconomic vulnerability and those that are extremely exposed to natural hazards.
- The strengths of this model are:
 - The hierarchical structure of social vulnerability model allows a multidimensional analysis of the phenomenon.
 - Decomposing social vulnerability into a hierarchical structure simplifies the standardization and weighting of the social vulnerability criteria and facilitates the assessment process.
- The weaknesses associated with this model include:
 - The weighting of the social vulnerability criteria has an inherently subjective nature.
 - The use of statistical data to describe social vulnerability can lead to the production of false positives, for instance not all women or elderly are equally vulnerable to disasters.



Future Research

- Future works should include a sensitive analysis to be acquainted with the uncertainty related with the input data and to estimate the error propagation through the model.
- Develop an integration of this taxonomic approach to social vulnerability identification and assessment with contextual models of social vulnerability.