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What are the projected effects of climate change on population dynamics in Portugal?

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Abstract

This research examines the projected effects of climate change, integrating demographic and geographic perspectives to assess potential future shifts on population dynamics in Portugal. Using a multi-dimensional approach, the study aims to investigate the primary impacts on fertility, mortality, and migration through extensive literature reviews and analysis of census and administrative data at NUTS III level. By generating population projections that incorporate educational attainment and other critical sociodemographic factors, this research seeks to provide a nuanced understanding of how climate-induced changes could reshape population structures and spatial distributions by 2060. The outputs, including a series of thematic dashboards and policy recommendations, aim to enhance public and policymaker awareness and facilitate informed decision-making in response to evolving climate scenarios.

Keywords

- Climate Change; Demographic Challenges; Social and Spatial Inequalities; Population Dynamics.

Summary

One of the most important metrics to understand the world is the human population size and structure. We need to understand what populations might look like in the future, at different geographical scales, to better allocate resources and budgets, and to anticipate demographic, health, social and spatial inequalities, and environmental trends.

Both population trends and climate change are regarded as two of today's megatrends and their impacts vary significantly among different groups and geographies.

If the world temperature rises by 3 degrees Celsius:

- What are the expected impacts on fertility and maternal health?
- What about temperature rise impacts on health, life expectancy, and quality of life?
- Will all population groups be equally affected? Which will be the vulnerable groups (e.g. new-births, elderly)?
- What public policies do we need in Portugal to successfully integrate displaced migrants from climate change hotspots (e.g. population from the community of Portuguese language countries (CPLP))?

But what if the world temperature rises by 2.9 or 3.1 degrees Celsius?

How much does one decimal matter?

Since one of the most important metrics to understand the world is the human population size and structure, we need to be able to anticipate how future population will be like. Population projections are, therefore, essential to anticipate future challenges and better inform public policies. Population trends and climate change are regarded as two of today's megatrends and their impacts vary significantly among different groups and geographies. Coastal areas, river valleys and deltas, low lying Island states, semi-arid and low humidity areas are more vulnerable to the be impacted by climate change which can ultimately force people to move.

In addition, Portugal may also become a destination for displaced populations due to these climate-related challenges.

A comprehensive understanding of the complex interplay between population dynamics and climate change across past, present and future scenarios in Portugal is essential for designing effective, inclusive public policies. This understanding is crucial for predicting and mitigating the potential effects of climate change on population dynamics and addressing social and spatial inequalities.

Traditionally, population projections have focused primarily on age and gender. However, incorporating additional factors such as education is essential. Education empowers individuals, leading to better health outcomes, more informed reproductive choices, and greater resilience in adapting to climate change. Climate change is recognized as a significant limitation in the forecasting models used in the Global Burden Study.

Shared Socioeconomic Pathways (SSPs) are climate change scenarios of projected socioeconomic global changes up to 2100. They are used to derive greenhouse gas emissions scenarios with different climate policies.

The SSPs provide narratives describing alternative socio-economic developments. These storylines are a qualitative description of logic relating elements of the narratives to each other. In terms of quantitative elements, they provide data accompanying the scenarios on national population, urbanization and GDP (per capita). The SSPs can be quantified with various Integrated Assessment Models (IAMs) to explore possible future pathways both with regards to socioeconomic and climate pathways. 5 Shared Socioeconomic Pathways scenarios were considered and classified according to the socioeconomic challenges for mitigation or adaptation. Adaptation means anticipating the adverse effects of climate change and taking appropriate action to prevent or minimize the damage they can cause or taking advantage of opportunities that may arise. Mitigation means making the impacts of climate change less severe by preventing or reducing the emission of greenhouse gases (GHG) into the atmosphere.

The population projection if all goals in the Sustainable Developments Goals 1 to 3 were achieved by 2030 would mean the lowest projected population size by 2030.

Unfortunately, high temperatures are linked to increased rates of infant mortality, stillbirths, miscarriages, and altered breastfeeding behaviors. Similarly, low rainfall contributes to heightened food insecurity and disease, while also diminishing household resources, which in turn impacts education and healthcare access.

As well has high temperatures are suspected to have caused over seventy thousand deaths in 2022 in Europe.

Kim R van Daalen with the Lancet research team organized a panel of report indicators that help monitor how we are doing, what are the main weaknesses and where are we doing better. This report is the first focused on Europe, using mostly Eurostat indicators that are available for most of the European countries. They explain how the data is treated so all countries can follow the same methodology and have comparable data for insights. They divide the indicators into the following: Climate change impacts, exposures, and vulnerabilities; Adaptation, planning and resilience for health; Mitigation actions and health co-benefits; Economics and Finance - Economic losses related to Climate Change including losses due to extreme events, reduced labor supply and reduced GDP per capita growth, unequally distributed, with Southern Europe generally being the most negatively affected and Politics and governance.

As the global population hit 8 billion in 2020, the link between demographics and climate change has become increasingly apparent, highlighting its importance for the future. In Portugal, social and spatial inequalities significantly affect the ability to respond to and adapt to these changes.

Proactively anticipating the effects of climate change on population dynamics in Portugal is the main goal of this research. The literature tells us that climate change will have direct and indirect effects in population dynamics. This research proposes to address a knowledge gap about the link between climate change and population in the specific Portuguese context.

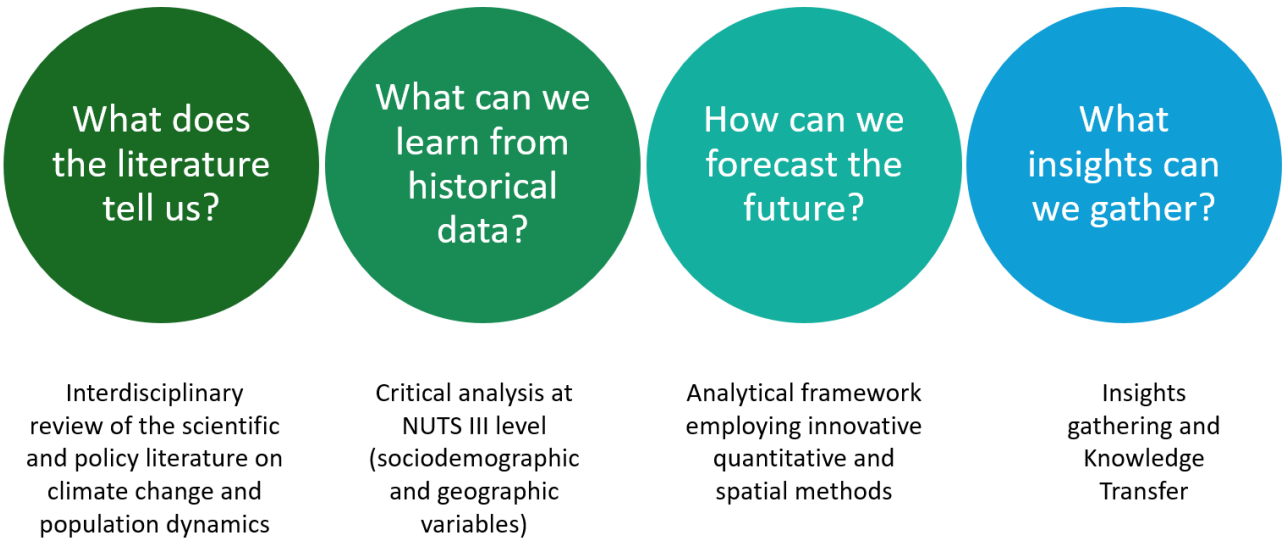
This research proposal is guided by a main research question:

What are the projected effects of climate change on population dynamics in Portugal?

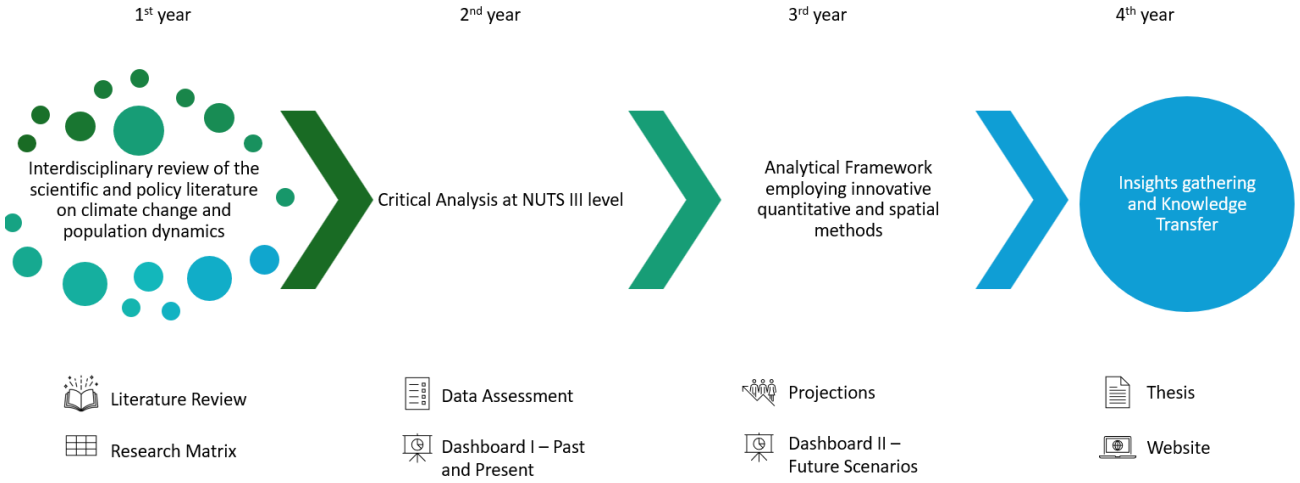
This starting question unfolds into the following research objectives:

- **RO1**: To systematically investigate the primary impacts of climate change on fertility, mortality, and migrations in Portugal via a comprehensive literature review focusing on the potential unequal sociodemographic and geographic distribution of these effects.
- **RO2**: To perform a thorough and critical analysis of available census and administrative data at both the NUTS II and NUTS III levels in Portugal. Within this research objective, the research aims to develop a deep understanding of how to effectively monitor and quantify the impact of climate change on demographic trends, approaching this challenge from a multidimensional perspective.
- **RO3**: To generate population projections by employing both quantitative and spatial methods. This approach will enhance traditional population structures (age and sex) by incorporating educational attainment and other relevant characteristics identified in Research Objective 1.
- **RO4**: To effectively disseminate insights and knowledge in a clear and accessible manner, ensuring that citizens, policymakers, students, and researchers can easily access a broad range of information in one centralized location. This research objective focus on enhancing awareness about the topic, thereby supporting greater citizen engagement and improving public policy-making.

The methodological approach:



The main tasks and timeline:



Task #1, the interdisciplinary review of the scientific and policy literature on climate change and population dynamics, scheduled for the 1st year, will answer the RO1 - To systematically investigate the primary impacts of climate change on fertility, mortality, and migrations in Portugal via a comprehensive literature review focusing on the potential unequal sociodemographic and geographic distribution of these effects.

Task #2, the critical analysis at NUTS III level, scheduled for the 2nd year, will answer the RO2 - To perform a thorough and critical analysis of available census and administrative data at both the NUTS II and NUTS III levels in Portugal. Within this research objective, the research aims to develop a deep understanding of how to effectively monitor and quantify the impact of climate change on demographic trends, approaching this challenge from a multidimensional perspective.

Task #3, the Analytical framework employing quantitative and spatial methods scheduled for the 3rd year, will answer the RO3 - To generate population projections by employing both quantitative and spatial methods. This approach will enhance traditional population structures (age and sex) by incorporating educational attainment and other relevant characteristics identified in Research Objective 1.

Task #4, scheduled for the 4th year, will answer the RO4 - To effectively disseminate insights and knowledge in a clear and accessible manner, ensuring that citizens, policymakers, students, and researchers can easily access a broad range of information in one centralized location. This research objective focus on enhancing awareness about the topic, thereby supporting greater citizen engagement and improving public policymaking.