Chapter 5
The Nexus Among Population Distribution and Climate Risk?
Management in the Case of Saudi Arabia

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ABSTRACT

The geographical distribution of the population in Saudi Arabia plays a crucial role in climate risk management. The country is characterized by a high concentration of urban population, particularly in major cities such as Riyadh, Jeddah, and Dammam, while vast desert areas remain sparsely populated. This spatial configuration exacerbates the varying vulnerabilities to climate hazards: flash floods and heat islands in densely populated urban areas, water scarcity and desertification in rural and desert regions, and coastal threats related to flooding and sea-level rise. This study demonstrates that climate risk management must take into account this territorial heterogeneity to develop appropriate public policies. Recent initiatives, including those within the framework of Vision 2030 and innovative urban projects such as NEOM, illustrate the Kingdom's commitment to integrating sustainability and resilience into its spatial planning.

DOI: 10.4018/979-8-3373-8197-8.ch005

1. INTRODUCTION

Saudi Arabia lies at the intersection of extreme climate zones: both deserts, with low and erratic rainfall, and coastal, exposed to the effects of global climate change such as sea-level rise, coastal erosion, and flooding. The country experiences summers with temperatures frequently exceeding 50°C, increasing energy demands, causing health stress, and reducing the productivity of outdoor activities (Atlantic Council, 2023). Furthermore, its renewable water resources are limited and significantly dependent on desalination and fossil aquifers, making water stress a major current concern (Atlantic Council, 2023; G20 Climate Risk Atlas, 2024).

The issue of population distribution is of crucial importance for vulnerability to climate risks. In Saudi Arabia, the population is highly concentrated in large cities such as Riyadh, Jeddah, and Dammam, while vast desert regions remain sparsely populated or virtually uninhabited. This spatial distribution directly influences the ability to anticipate, prevent, and respond to climate hazards. For example, in dense urban areas, the combination of impermeable surfaces, insufficient drainage, and intense rainfall events favors flash floods, as observed in Jeddah (Water, 2024; "Flood Risk and Vulnerability…", 2023). Conversely, in rural or desert areas, the challenges relate more to water availability, desertification, geographic isolation, and limited infrastructure.

The problem of this work can be formulated as follows: How does the spatial distribution of the population in Saudi Arabia influence the management and adaptation to climate risks? The central hypothesis is that highly urbanized areas (such as Riyadh, Jeddah, Dammam) face specific challenges vulnerable infrastructure, urban flooding, heat islands, pressure on public services while sparsely populated areas present other types of vulnerabilities, including difficult access to essential resources (water, health), desertification, and a lower capacity to react quickly to extreme events.

2. THEORETICAL AND METHODOLOGICAL CONTEXT

2.1. Definitions

- Climate risk: Climate risk is any weather or climate phenomenon that is likely to cause human, economic, or environmental damage. This includes drought, extreme heat waves, flash floods, sandstorms, and coastal impacts related to rising sea levels.
- Geographic distribution of the population: This concept refers to the way in which individuals are spatially distributed across a territory, in particu-