

# The Anthropocene Crisis: Does Resolution Lie in Depopulation?

## Introduction

Humanity's deepening strain on Earth's systems has sparked widespread discussion of an "Anthropocene crisis" (**Foster 2016; Kennel 2021**). This has led to the widespread belief that population growth is a primary driver of the crisis. Hence, if overpopulation underpins the crisis, does its resolution lie in depopulation?

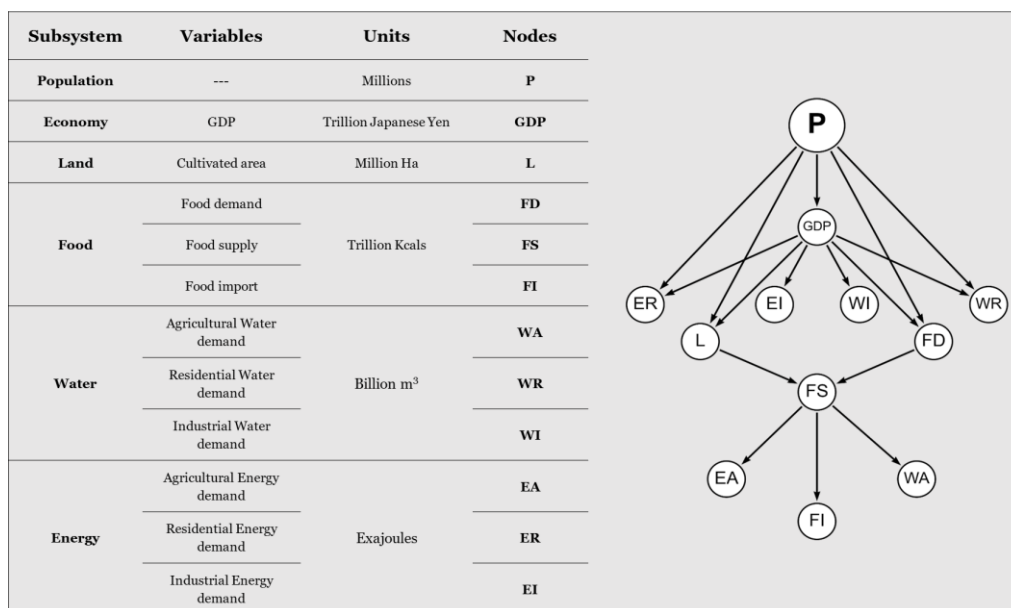
At present, the prospect of global depopulation by century's end transcends scholarly speculation, emerging as an imminent reality evoking widespread concern and hope for the future. Already, fertility rates in 126 countries, including China and India, are falling below replacement level, and many are already depopulating. At the forefront of depopulating nations, Japan has already lost more than four million of its population of its 128 million since the start of its depopulation in 2008 (**UNPD 2024**).

The potential consequences of this demographic trend are well documented, split between political economists highlighting economic and fiscal risks (**Auerbach & Lee 2001; Clement *et al.* 2015**) and environmentalists anticipating dividends (**Matanle 2017; Götmark *et al.* 2018**). Previous research has predominantly focused on speculative views of single aspects of these impacts, yet little has been done to research and understand the interactions among human and natural systems under sustained depopulation scenarios.

## Aims and scope of this research

The theoretical focus of this research lies in understanding how demographic transitions influence resource demands and how these changes interact with broader socio-economic and environmental systems. Here, we explore the impacts of Japan's depopulation on key environmental and economic variables, framed within the context of the Anthropocene. We focus on the interactions between population dynamics and the nexus of economy, land, food, water, and energy resources to explore past, present, and future trajectories of nexus interactions.

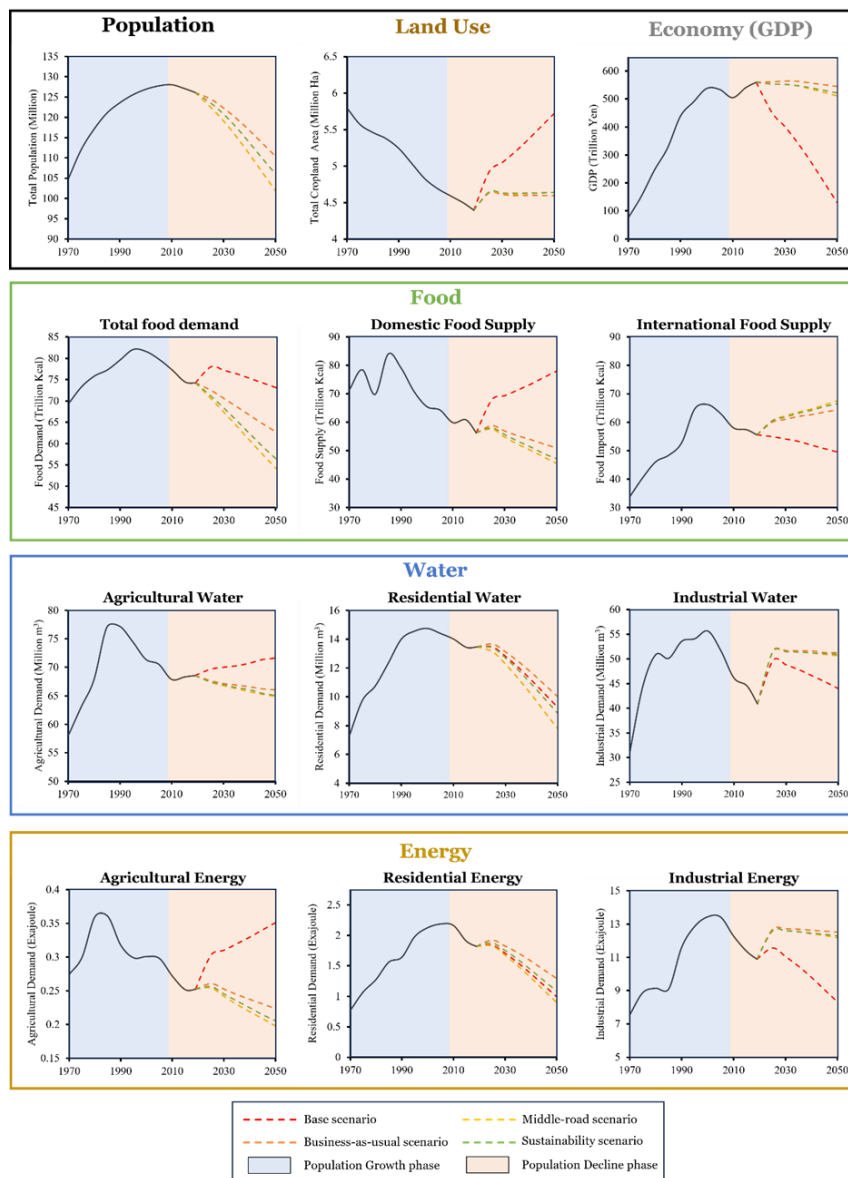
## Data and Methodology



The study employs comprehensive set data spanning 1970 to 2019 for variables related to demographics, economy, land use, food demand and supply, and water and energy demand. We take a systematic Bayesian approach, beginning by identifying key variables and establishing causal relationships from the literature.

We then conduct Bayesian network analysis to examine changes in the strength of these causal relationships across the two critical demographic phases of population growth (1970-2008) and decline (2008-2019). We conclude by leveraging the insights drawn from the literature and data analysis to inform our Bayesian inference and explore future pathway scenarios under Shared Socioeconomic Pathways assumptions.

## Findings and Implications



Our findings reveal significant shifts in the dynamics of the Population-Economy-Land-Food-Water-Energy nexus during the two phases of population growth and decline. We note that population decline has thus far played a pivotal role in driving a notable decrease in resource demand, both directly and indirectly. The magnitude of such, however, was less evident than expected, which suggests a delayed effect of depopulation on resource demand. Our predictions further emphasize this delay throughout the upcoming decades.

We argue that this shift is insufficient to yield immediate and tangible outcomes and might take us much longer to rise to the magnitude required to achieve conceivable environmental dividends. We also stress the need to account for aspects of globalization and the effects of

maintenance of the current economic system, which ceaselessly seeks unrestrained growth by perpetuating unsustainable lifestyles and practices.

We contend that the dividends promised by depopulation will remain modest and unfelt if left unmanaged. Hence, to fully harness the full potential of this demographic shift, we need to take proactive measures to capitalize on any opportunities that emerge as soon as possible.

We stress that our pursuit of global sustainability hinges not only on technological solutions and future demographic trends but equally on radical shifts in societal norms and values.

Only through such endeavours can we hope to navigate a safe path through the Anthropocene toward a future in which humanity coexists harmoniously within nature on Earth.

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