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Climate change, natural disasters, armed conflicts and migrations at the crossroads between food and nutrition insecurity and undernourishment

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ABSTRACT

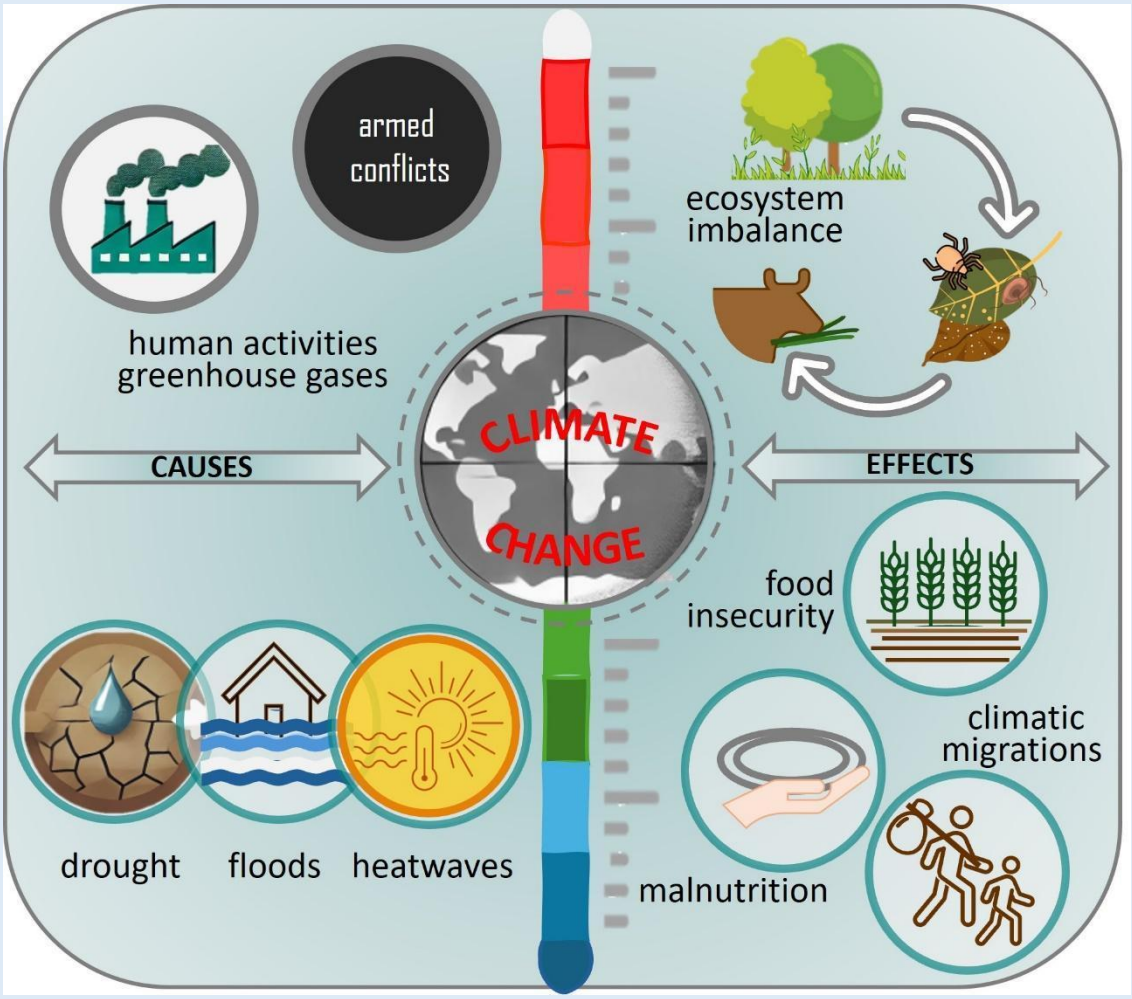
Global climate change refers to the long-term, large-scale shift in the planet's weather patterns and average temperatures, primarily driven by human activities, particularly greenhouse gas emissions from burning fossil fuels. It constitutes a global emergency, profoundly impacting human health, food security, and safety. Despite global efforts to limit temperature increases to 1.5°C, the consequences of climate change are becoming increasingly apparent. According to the World Health Organization, between 2030 and 2050, climate change could cause approximately 250,000 additional deaths annually due to malnutrition and infectious diseases.

Extreme weather events—prolonged droughts, heatwaves, heavy rainfall, and floods—threaten food systems, increasing the prevalence of zoonoses, food-, water-, and vector-borne diseases. These conditions displace millions of people annually, leading to the phenomenon of climate refugees. Beyond environmental factors, climate change also affects agricultural productivity and food quality, exacerbating hunger in vulnerable regions. It disrupts plant health, alters pathogen life cycles, and increases vulnerability to invasive species and diseases. Simultaneously, armed conflicts and geopolitical instability further aggravate migration and food insecurity, creating a vicious cycle that disproportionately impacts economically fragile regions.

This study aims to explore the interconnections between climate change, armed conflict, migration, and global food insecurity. It highlights the causal relationships among these factors, emphasizing how extreme weather events, natural disasters, and conflicts affect food production, access, and distribution. By addressing key drivers—such as forced

migration due to environmental and political crises—and analyzing the impact on vulnerable populations, particularly in Africa, the Middle East, and Eastern Europe, this research underscores the urgent need for a multidimensional response encompassing foreign, economic, energy, and food policies to mitigate the escalating risks to global food security.

Keywords: Global warming, greenhouse gas emissions, extreme weather events, food and nutrition security, natural disasters, armed conflicts, migrations.



Graphical abstract: Climate, Conflict and Food in a Changing World

Based on the latest FAO data, the global prevalence of undernourishment (or malnutrition) slightly exceeded 9% in 2023, affecting over 730 million people. This prevalence is unevenly distributed across continents, reaching 20% in Africa (1 in 5 people) and up to 30% in Central-Eastern Africa (1 in 3). Additionally, global food insecurity affects nearly 30% of the world population, with rates climbing close to 60% in Africa. It represents the 'flip side' of food security, which is defined as a condition in which every individual, at all times, has reliable physical and economic access to sufficient, safe, and nutritious food to fulfill their dietary needs [1].

Gender disparity further intensifies the issue, with a particularly pronounced impact among women: 60% of undernourished individuals are women, who face a 27% higher risk of food insecurity than men, and globally, 1 in 3 women lives in such conditions. [2].

Key drivers of food insecurity are climate change and natural disasters, economic crises, and armed conflicts, all of which inevitably lead to forced migration.

Climate change, now widely evident, is largely attributed to rising global temperatures due to human-induced greenhouse gas (particularly carbon dioxide) emissions, which trap high-energy infrared radiation originating from the incident solar radiation and reflected from the Earth's surface, a phenomenon known as 'global warming'. The consequences include a cascade of related issues: ocean warming (such as the 'tropicalization of the Mediterranean Sea'), accelerated melting of glaciers (including those in the Alps), sea-level rise, and a series of catastrophic occurrences known as extreme weather events, encompassing heavy downpours and floods, heatwaves, prolonged droughts, and more frequent, intense wildfires. A recent study highlighted that over 60,000 people died in Europe due to the 2022 heatwaves, with Italy particularly affected and suffering 18,000 fatalities (approximately 295 deaths per million inhabitants) [3]. The detrimental effects of heatwaves and droughts on agricultural productivity are also well-documented. Over the last 50 years, these phenomena have resulted in a 7-9% reduction in cereal yields across Europe [4]. Climate change and related disasters have further fueled 'forced' migrations, both within and across national borders, particularly in regions already facing food crises or conflicts.

The interaction between armed conflict and climate change exacerbates food insecurity. For instance, the war in Ukraine has led to sharp declines in agricultural output, particularly in eastern regions ('oblast'), along the front lines (Crimea, Donetsk, Kherson, Luhansk, and Zaporizhzhya), where approximately 18% of farmland remained uncultivated in 2022. The most affected crops were wheat, sunflower, and rapeseed, which experienced production declines of 36-37% from pre-war levels (2019-2021), with estimated economic losses of $200-500 million [5]. Overall, the Food Security Cluster reports that around 7.3 million Ukrainians (20% of the population) face moderate to severe food insecurity, including 1.2 million children and 2 million elderly people. The direct damage to production, along with the blockade of Ukrainian wheat exports, has further worsened food insecurity in developing areas that rely on these supplies, such as Africa and the Middle East [6]. The situation is even more dire in the Gaza Strip, where the Famine Review Committee estimates that nearly 50% of the population (approximately 1.1 million people) is currently categorized as severely food insecure [7].

Regarding migration, wars play a significant role in triggering displacements. According to the International Organization for Migration, there are currently 281 million international migrants worldwide, representing 3.6% of the global population, or 1 in 30 people [8]. The data on internally displaced people (IDP) are equally striking: in 2023, 75.9 million were reported globally, of which 68.3 million due to conflict and violence and 7.7 million due to natural disasters [9]. Within Ukraine alone, approximately 9.7 million people (25% of the population) were displaced in 2023, including 6 million refugees across Europe and 3.7 million IDP, marking the largest wave of migration in Europe since World War II [10]. In Gaza, conditions are even more critical, with an estimated 1.7 million IDP (80% of the population) [11].

Though often overlooked, other regions are similarly devastated by protracted conflicts. In Sudan, civil war has generated 4.5 million IDPs, alongside severe food insecurity impacting 25.6 million people (50% of the population) [12-13]. In Yemen, the dual pressures of internal displacement (4.5 million IDP) and widespread food insecurity affect nearly half the population [14-16]. Additionally, the conflict over the Artsakh (Nagorno-

Karabakh) enclave between Armenia and Azerbaijan has forced about 100,000 refugees to Armenia, which already faces food insecurity affecting 30% of its population [17-19].

It is noteworthy that, from a nutritional point of view, starvation and malnutrition lead to macro- and micronutrient deficiencies, including protein-energy malnutrition, and, if they occur over a long period of time, can affect mental state, emotional regulation, and impair cognitive function through several mechanisms. As reported in Artsakh, starvation can alter the balance of essential nutrients, hormones, and neurotransmitters in the brain, including serotonin and dopamine, increasing the risk of developing mood disorders and causing symptoms such as fatigue, weakness, irritation, poor memory, and attention deficit [19].

In conclusion, climate change, armed conflict, and migration each present significant threats to food security, particularly in economically disadvantaged regions [20]. Extreme weather events and natural disasters, along with the disruption caused by wars, directly impact food systems, production, and prices, all of which contribute to heightened migration. Migration, in turn, can exacerbate the risk of new conflicts, as migrants may compete with host populations for limited resources, potentially igniting social or religious tensions.

While the interconnections between these crises are well-documented, their specific impact on populations, especially in terms of gender inequalities in access to food, has been insufficiently explored in literature. This work offers new insights by incorporating a multidimensional perspective, which includes environmental, economic, and social factors with far-reaching implications for the development of policies and strategies aimed at addressing both the immediate and long-term challenges in global food systems, as well as reducing disparities in food security.

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Author's Contributions: Both authors contributed equally to the work.

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