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Solutions for managing food security risks in a rapidly changing geopolitical landscape

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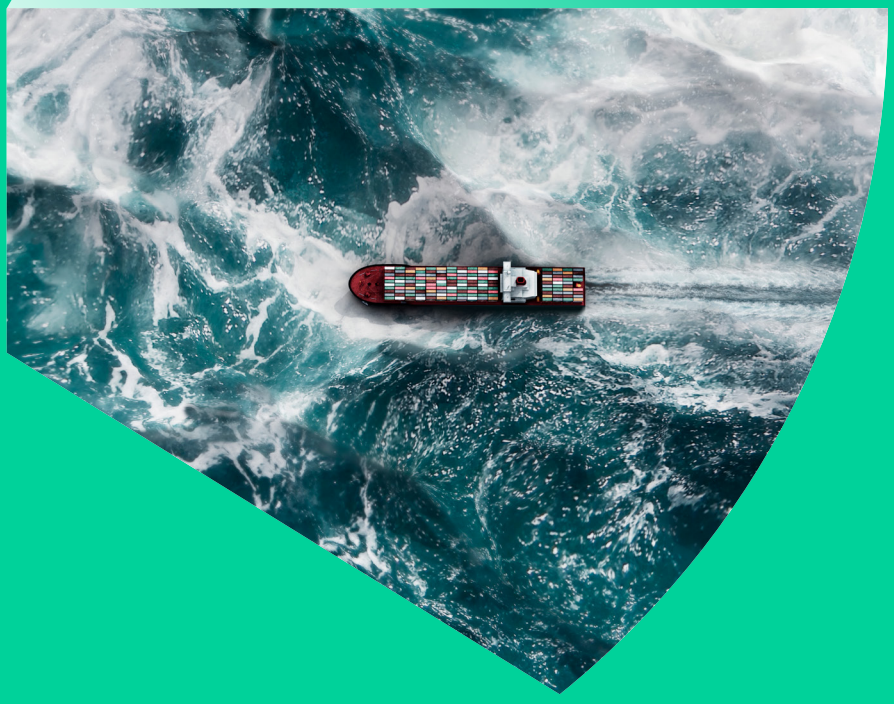
Sara Talebian
Frida Lager
Katy Harris



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Stockholm Environment Institute
Linnégatan 87D 115 23 Stockholm, Sweden
Tel: +46 8 30 80 44
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Author contact

Sara Talebian
sara.talebian@sei.org
https://orcid.org/0000-0001-5014-2515 2

Editing

Naomi Lubick

Layout

Richard Clay

Media contact

Maria Cole
maria.cole@sei.org

Cover photo

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Mistra Geopolitics is a research programme that examines the dynamics of geopolitics, human security and environmental change.

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Contents

Key messages

- **Climate change impacts on agriculture, such as floods and droughts, pose significant risks to food security, spread globally through interconnected supply chains, leading to food price shocks, reduced food accessibility, and social instability across borders and regions.**
- **Rising geopolitical tensions and geoeconomic fragmentation increasingly affect global food security. Food trade, a cornerstone of global food security, is being weaponized in geopolitical conflicts, further exacerbating the risks posed by climate change.**
- **Enhancing domestic capacities for climate-resilient agriculture is crucial for reducing dependency on global food markets and mitigating the transboundary effects of climate impacts.**
- **Collaboration among small groups of countries with common goals or shared risks emerges as a potential solution to manage transboundary climate risks to food security.**
- **Transitioning dietary patterns towards more plant-based food and reducing food waste are recommended to reduce environmental impacts, improve resource efficiency, and enhance food availability and security.**

1. Introduction

The UN 2030 Agenda for Sustainable Development sets out an ambitious goal of zero hunger by 2030 (Sustainable Development Goal, SDG, 2). Less than a decade from the SDGs' deadline, in 2023, over 238 million people in 74 countries across the world suffered from food insecurities due to conflicts, economic shocks and climate events (FSIN, 2023; WEF, 2024). On the current trajectory, the number of undernourished people around the world is projected to increase to over 840 million by 2030 (FAO, IFAD, UNICEF, WFP and WHO, 2020). As global heating accelerates, the impacts of climate change increasingly affect agriculture and food production: higher temperatures and extreme weather events climate shocks reduce yields, changes in precipitation patterns affect water availability for irrigation, and shifting humidity levels expand the range of pests and diseases to afflict both crops and livestock (IPCC, 2023).

Transboundary climate risks – where an impact from climate change in one context generates a risk to people in another (sometimes thousands of kilometres apart) (Carter et al., 2021) – pose significant challenges to the global food system, exacerbating existing vulnerabilities and threatening food security on a global scale. In this report, we use "transboundary", "cascading" and "cross-border" climate risks interchangeably, as they all refer to the knock-on impacts of climate change spreading across jurisdictions, both geographical and administrative (for a systematic review of all terminologies used for describing this phenomenon, please see Bednar-Friedl et al., 2022).

Disruptions in global food supply chains, whether due to extreme weather events, slow-onset climate change, or shifts in agricultural productivity, can have far-reaching consequences for both importing and exporting nations. Studies show that the

spillover effects of heat stress, for example, extend across regions and sectors through increasingly integrated supply chains and have “important consequences” for global food security (Sun et al., 2024).

Transboundary climate risks to food security are compounded by geopolitical tensions, as nations grapple with competing priorities and interests in the face of environmental degradation and resource scarcity. Food trade, a cornerstone of global food security, is intrinsically linked to geopolitical dynamics and a critical pathway through which transboundary climate risks can spread across borders.

Geopolitical tensions and the implications for international trade further exacerbate food insecurities as countries navigate complex dynamics of global rivalry. Transnational cooperation, which is imperative for managing transboundary climate risks to food security, is undermined as a result of geopolitical tensions and geoeconomic fragmentation. The use of food as a “weapon of choice” in international conflict lies at the sharp end of this dynamic (Ocakli, 2023).

Here we adopt a geopolitical lens to better understand policy responses to food insecurities under reversal of global integration and weakening multilateralism. We specifically focus on transboundary climate risks to food production and trade: how climate impacts on agriculture can generate cascading effects through international trade and global supply chains to catalyse risks to countries worldwide.

We discuss the existing geopolitical landscape, including how food and trade policies are used as instruments in geopolitical positioning, and characterize potential dynamics of increased geoeconomic fragmentation and rivalry in future. Finally, we explore solutions to manage food insecurities in such a rapidly changing world. The solutions recommended here were identified and discussed through consultations and co-production workshops with experts in climate change impacts and adaptation, trade and food security, politics and geopolitics, and policy studies (Talebian, forthcoming).

2. Transboundary climate risks to food security

The agriculture sector is highly exposed to the effects of extreme weather events (e.g. floods) and slow-onset climate events (e.g. rising temperatures) (IPCC, 2022). The impacts of climate change on agriculture cause reduced crop yield and major declines in food production, affecting societies, economies and livelihoods in producer countries around the world. According to the 2024 European Climate Risk Assessment, crop failure and reduced yields pose a critical risk to food production and security within the region by mid-century (European Environment Agency, 2024). Climate change impacts and extreme weather events are increasingly exacerbating existing challenges around food insecurities and loss of livelihoods in African countries, where a large share of the population is already affected by undernourishment and hunger (African Union & Adelphi, 2023).

The impacts of climate change on agriculture and food production are transboundary in nature, spreading across countries and continents through interconnected and interdependent systems (Hedlund et al., 2018). International trade is one of the major

pathways through which risks to food security cascade across borders. These risks can manifest in the form of food accessibility challenges, food price shocks resulting in food unaffordability, and reduced food quality, leading to food insecurity, increased hunger and malnourishment, and potential famines in most vulnerable countries. The cascading consequences of these risks can contribute to economic inflation, loss of livelihoods and social instabilities. In 2010, for example, massive crop declines and shortfalls in food production due to an unprecedented heatwave in Russia and extreme flooding in Pakistan led to a surge in food prices in global markets. Countries in the Global North such as the UK, US and Germany felt the impacts in the form of a food affordability crisis (Challinor et al., 2016), while many countries in the Global South such as Bangladesh, Kenya and Zambia (Hossain & Green, 2011) faced food accessibility challenges, with protest and social unrest linked to escalating food prices.

Studies suggest that changes in only a few major "breadbaskets" ... could affect the entire global food market.

Studies suggest that changes in only a few major "breadbaskets", or geographies with advantageous conditions for substantial food production, could affect the entire global food market, and reduced yields or production in these regions could create food insecurities worldwide (Adams et al., 2021; Hedlund et al., 2022). Countries at different levels of development are exposed to transboundary climate risks to food security, dependent on their import of food and essential staples from climate-vulnerable regions and overall vulnerability to global market fluctuations. Countries in Europe, for example, may be relatively shielded from the direct impacts of climate change on their production of food, but the region still faces a transboundary risk via imported food from countries significantly exposed to climate impacts and extreme weather events (European Environment Agency, 2024). The magnitude of the risk to food security will depend on capacities to absorb or manage such effects – with the most vulnerable being low-income countries and low-income households within middle- and high-income countries (Anisimov & Magnan, 2023).

In addition to directly affecting food production, climate change significantly threatens food trade and distribution through global supply chains. Increased floods, landslides and other hazards tied to climate change can pose significant risks to trade infrastructure and land-based transportation of food and other commodities; shipping routes and ports are exposed to climate risks from sea-level rise and extreme events such as hurricanes and storms (Verschuur et al., 2023).

As climate impacts increase in severity and magnitude, disruptions to transportation infrastructure – roads, railways, bridges and ports – are projected to increase in the next several decades. Knock-on delays and escalating costs can disrupt established trade patterns and negatively affect global food security (Mikaelsson & Dzebo, 2023).

Studies show that a large share of global trade in strategic crops and fertilizers passes through a small number of critical maritime chokepoints, such as straits or channels that represent the shortest or most efficient routes between major ports or regions, for which often no alternative trade route exists (Bailey & Wellesley, 2017). Should one of these chokepoints be closed due to the impacts of climate change, maintaining regular supply of essential crops and price stability in the global food markets is going to be extremely challenging.

3. The return of geopolitics and geoeconomic fragmentation

As climate risks cascade across national borders and threaten food security in countries and communities across the world, adaptation to these risks becomes a global challenge in need of global solutions. Within the global policy landscape, countries are increasingly recognizing the need for multilateral and transnational cooperation on adaptation to manage cascading climate risks (UNDRR, 2015; UNFCCC, 2015, 2023; World Trade Organization, 2022), and the insufficiency of addressing these risks in silos at local and national levels. However, the world is moving in the opposite direction, with setbacks for globalization: geopolitical tensions are rising, geoeconomic fragmentation is increasing, and food and trade policies are already being used as weapons of war.

Geopolitical tensions – the escalation of adverse events associated with conflicts among states that disrupt the peaceful course of international relations and multilateralism (Caldara & Iacoviello, 2022) – are accelerating, with severe implications for deepening inequalities, human health, and food and energy security. In 2020, the Covid-19 pandemic accelerated tensions between countries, as some imposed export bans on essential medical supplies and triggered competitions over securing vaccine supplies for their citizens (Cole & Dodds, 2021). Competing powers also used the pandemic to increase their power and influence (Cimmino et al., 2020; Fidler, 2020), which eventually contributed to deeper inequalities, with high-income countries recovering from the crisis significantly faster than low-income and developing economies (Internationaler Währungsfonds, 2021).

In 2022, Russia's invasion of Ukraine was a significant manifestation of increasing international conflict and geopolitical rivalry. Not only has war devastated Ukraine's people and economy, it has also brought concerns over global energy security back to the fore and caused significant shocks to the global food market (Góes & Bekkers, 2023).

Given these developments, the once-certain trajectory of an international order based on open markets and ever-expanding globalization is no longer in our future. As geopolitical tensions intensify and multilateral cooperation weakens, geoeconomic fragmentation – i.e. the reversal of international economic integration – accelerates (Aiyar et al., 2023). Economic and financial engagement and cooperation between countries deteriorate, capital flows and movement of workers across borders decrease, and most importantly for food and transboundary risks, international trade declines due to barriers, restrictions and disputes.

Countries wield trade policies as instruments in geopolitical positioning. Trade restrictions, such as strict tariffs and licensing, and export bans have all been weaponized in recent years, from Russia's import ban on Western agricultural products in 2014 to China's ban on imports of US soybeans in 2018. For example, since Russia's invasion of Ukraine in 2022, governments have imposed 67 new trade policies, of which 38 were new export bans and export-licensing requirements (Ruta et al., 2022). The International Monetary Fund's (IMF's) *Annual Report on Exchange Arrangements and*

Exchange Restrictions 2021 showed a significant rise in trade restrictions driven by geopolitical concerns and national security motives since 2020 (IMF, 2022).

Geopolitical tensions and increasing geoeconomic fragmentation continue to curb and curtail food trade, leading to reduced accessibility and affordability of food commodities and consequently food insecurity globally (Anisimov & Magnan, 2023; WTO, 2022). As geoeconomic fragmentation accelerates, trade restrictions become more attractive, such as locking in exclusive trade partners with bilateral trade agreements and securitizing access to food commodities by blocking other partners from purchasing in the global market, or via economic embargos on countries. These restrictions negatively affect food accessibility and affordability, as do geopolitical tensions that can also negatively affect trade routes and chokepoints, which can result in further price shocks and disruptions in global food markets. As the World Economic Forum's *The Global Risks Report 2019* acknowledged, heightened geopolitical tensions and trade fragmentation within the international community contribute to the politicization of food and exacerbating the risk of "geopolitically motivated" supply disruptions and food insecurities (WEF, 2019).

Food security is increasingly framed as a national security issue and subject to nationalist policies. This is a direct result of the accelerated rise of isolationist and unilateral tendencies due to increasing geopolitical tensions, which results in governments placing greater emphasis on national-level risk management and nationalist policy rather than international coordination and multilateral cooperation (Zhou et al., 2020). For example, during the 2010 Northern Hemisphere heatwave, which caused severe droughts and wildfires, Russia imposed major restrictions on wheat exports to assure its internal food security. In 2011, Pakistan banned exports of rice as a result of extreme floods, leading to massive shortfalls in the global market.

These measures are instated to protect national supply and security and could be seen as adaptive responses to climate impacts at local and national scales. However, such actions have been shown to be counterproductive, as they result in decreased global supply, higher food prices, and an escalation cycle of trade restrictions in the global market. Such restrictions negatively affect not only import-dependent countries and vulnerable communities across the world, but efforts towards system-wide resilience of the global food system at large (Magnan et al., 2016).

4. Changing food security landscape

The impacts of climate change interact with key drivers of social, political, economic and environmental change, such as population, economic growth, income distribution and governance, creating different types of risk to different countries and triggering different types of policy responses (van Ruijven et al., 2014). We define policy responses as governments' proactive or reactive interventions to address transboundary climate impacts through reducing or managing the risks and enhancing the opportunities resulting from that impact (Talebian et al., 2023). Such responses, and how effective they are in reducing transboundary threats to food security, are also shaped by the interactions between countries and the overall global geopolitical dynamics: alternative constellations

of future alliances and coalitions will determine how countries cooperate and compete. Trade policies at the national level, for example, will be formulated differently in a world polarized by two superpowers, such as the US and China, versus a world fragmented by a few isolated "country clubs" such as the G20 or BRICS; managing risks in these alternative contexts would require different approaches and capacities.

While the evidence shows increasing geopolitical tensions, predicting how fragmentation of the international system might unfold is not possible. Historical precedence and monitoring of trends can be instructive, but minor nuances and slight deviances in the trajectories of such trends could result in significantly divergent future contexts with important implications for food security. For example, the rise of nationalist tendencies in recent years signals an ongoing trend towards increased fragmentation at the national level, where countries prioritize their self-interests above any type of transnational cooperation (Zhou et al., 2020). However, with increasing competition over access to critical resources – especially food – in a global system in which few countries are able to attain complete self-sufficiency, countries might shift to creating and consolidating alliances and blocs based on access to food and other resources, and eventually around shared politics and values.

Moreover, future developments do not always follow historical patterns and trajectories. For example, the Russian invasion of Ukraine and the EU response in support of Ukraine, in part by posing multiple sanctions against Russia, makes a future alliance between Russia and the EU very unlikely. However, future socioeconomic drivers and geopolitical dynamics could potentially shift such a pattern in very different directions. In a "future imaginary" where the EU lacks self-sufficiency for essential food commodities, and where access to shipping routes and maritime chokepoints has been securitized by major superpowers, leaving in-land routes and intra-region supply chains as the only alternatives, then entering a strategic partnership with Russia, a major wheat producer – in spite of historical conflicts and diverging values and worldviews – might become inevitable for the EU to maintain its food security (Talebian, forthcoming).

5. Solutions for managing food security risks

In the face of deep uncertainties, effective solutions to address transboundary climate risks to food security need to be robust and resilient to alternative future scenarios; in other words, they must perform well under disparate socioeconomic and geopolitical contexts. Here, we introduce four policy recommendations on how to manage transboundary climate risks to food security in the context of geoeconomic fragmentation and geopolitical tension. These recommendations were co-produced by a group of experts in a participatory workshop and tested against a set of scenarios on "future fragmentation" (Talebian, forthcoming). Whether fragmentation happens at the national level, with individual countries competing over access to food, or the world becomes fragmented into a small number of geopolitical blocs and alliances, these policy responses are perceived to perform well in strengthening food security across multiple geographies and socioeconomic conditions.

5.1 Enhancing climate-resilient agriculture

While cooperation is key, enhancing domestic capacities for agriculture and food production at local and national scales is one of the most evident and important responses to transboundary climate risks to food security. Ensuring a sufficient and stable domestic food supply reduces countries' dependence on the global food market and international supply chains, reducing their exposure to trade disruptions and the transboundary effects of climate impacts elsewhere.

However, as climate change threatens desirable conditions for agriculture and reduces crop yields in most parts of the world, efforts to maintain overall production levels put significant pressures on ecosystems, biodiversity and water resources. A paradigm shift – from practices that harm ecological health and lead to environmental degradation towards practices that nurture climate-resilient agriculture and offer nature-based solutions – is therefore necessary to bolster productivity while mitigating adverse impacts on the environment in long term. This includes the development and implementation of practices that can withstand extreme weather events and changing climatic conditions (Challinor et al., 2014). Sustainable agricultural practices, including agroforestry, conservation tillage and integrated pest management, can enhance soil health, preserve water resources and increase biodiversity, all of which contribute to greater resilience (European Environment Agency, 2024).

Crop diversification is a critical measure for reducing the likelihood of total crop failure due to the impacts of climate change and extreme weather events. Planting different crops with varying levels of tolerance to stressors such as drought, heat and floods can help maintain agricultural productivity at the local and national levels and stabilize food supply. Diverse cropping patterns also contribute to maintaining favourable conditions for agriculture by improving soil structure, enhancing nutrient cycling, and reducing soil erosion. Healthy soils are more capable of retaining water and nutrients, which is vital under changing climate conditions (Shah et al., 2021).

Investment in technological innovations and agricultural research is urgently needed to advance climate-resilient agricultural practices, guide crop diversification, and optimize yields and resource use efficiency. Increasing investments in climate-resilient infrastructure and technologies and effective policy support are crucial to enable local actors across the food production and distribution cycle to maintain and expand operations and develop competitive domestic markets.

5.2 Strengthening plurilateral cooperation

Amid many signals of heightened fragmentation and volatility in the future, realization is growing of the necessity for new forms and scales of collaboration. In this context, plurilateralism – cooperation among a small group of countries – can offer an alternative governance modality to manage specific risks or subsets of risk (Cerny, 1993; Dupuy, 2016). Plurilateral constellations can potentially emerge under conventional international forums, especially when multilateral processes fail to reach consensus. For example, following the collapse of multilateral negotiations to reform

the international trading system, the World Trade Organization (WTO) saw an increase in plurilateral initiatives and trade agreements led by subsets of members (Basedow, 2018). Such subsets and constellations of countries could organize and cooperate on shared transboundary climate risks and accelerate collective action to drive food security, potentially for high numbers of people.

Plurilateral cooperation among neighbouring countries through regional cooperation frameworks ... offers opportunities to enhance food security.

Plurilateral cooperation among neighbouring countries through regional cooperation frameworks, such as economic integration agreements and trade blocs, also offers opportunities to enhance food security through improved market access, resource sharing and coordinated policy responses. Regional cooperation could enhance intraregional trade of food, taking advantage of shorter trade routes and supply chains that are easier to maintain and enhance for resilience against the impacts of climate change. For example, initiatives such as the African Continental Free Trade Area (ACFTA) foster intraregional trade and investment in agriculture and facilitate the movement of goods, services and technologies across borders. The ACFTA could be seen as an appropriate avenue for enhancing plurilateral cooperation to ameliorate transboundary climate risks through trade in the region, despite global geopolitical tensions.

Plurilateral cooperation among like-minded countries and alliances can be another avenue to address shared climate risks to food security in a fragmented and divided world. With increased volatility and conflict, relationships with like-minded countries – that share similar politics, values and worldviews – become even more important to secure access to food and other critical resources. Like-minded partners and allies can take advantage of collective strengths and resources and rely on mutual trust among participating nations – necessary but rare in the context of fragmentation – to enhance their food security.

While acknowledging the existing barriers to cooperation, experts advocate for the establishment of dialogue and new cooperation mechanisms between countries with shared interests in managing transboundary climate risks to food security today. However, it is important to note that efforts to establish and promote plurilateral constellations could accelerate polarization further, exacerbate conflict, and deepen fragmentation within existing multilateral processes and avenues for international cooperation. Such constellations, while facilitating cooperation among a small number of countries, could be exclusive (“country clubs”), leaving less advantaged countries behind and contributing to increased inequalities, while undermining coherence by institutionalizing diverging norms and commitments.

5.3 Transitioning dietary patterns and preferences

Changing dietary patterns and food preferences is an effective measure for enhancing food security and environmental sustainability, regardless of global geopolitical tensions. Shifts from diets high in animal products to those more diverse and rich in plant-based foods have been advocated as a means to address food security while mitigating the environmental impacts of food production (Blomhoff et al., 2023; Muller et al., 2017; Willett et al., 2019). Plant-based diets not only require fewer natural

resources and produce fewer greenhouse gas emissions compared to animal-based diets, they also offer potential health benefits (Springmann, 2023).

Such dietary transitions involve reducing the consumption of animal products, particularly red meat and dairy, in favour of increased intake of fruits, vegetables, legumes and whole grains. Currently, a large share of cereal production globally is used for animal feed. Transitioning away from animal-based to plant-based diets reduces the intensity of agricultural activities for animal feed and makes more resources, including land and water, accessible for food production (Bodirsky et al., 2020).

Moreover, studies suggest that minimizing food loss and waste at all stages of the supply chain can improve food availability and security and reduce environmental pressures. For example, cutting food losses by half could generate enough food to feed an additional billion people. This reduction in food waste would improve resource use efficiency, as it would lessen the unnecessary consumption of resources such as water, cropland and fertilizers, which are currently wasted due to food loss (Gerten et al., 2020).

Policies and measures that promote and support sustainable food choices ... could create an enabling environment for dietary shifts.

Shifting dietary patterns and preferences requires comprehensive strategies that address socio-cultural preferences, economic factors and access to nutritious foods, accounting for food affordability, availability and acceptability across diverse populations. Raising awareness of the health and environmental benefits of plant-based diets and enhancing the availability and affordability of healthy, sustainable food options in schools, workplaces and public institutions can drive consumer behaviour change towards more sustainable dietary preferences. Policies and measures that promote and support sustainable food choices, such as subsidies for fruits and vegetables, incentives for reducing meat consumption, and regulations to reduce food waste, could create an enabling environment for dietary shifts.

Investment is needed into research on “future foods” and development of sustainable food technologies, such as plant-based meat alternatives and improved climate-resilient crop varieties. For example, while the benefits of plant-based diets on reducing environmental impact and ensuring food security are studied extensively, the potential of future foods, such as processed seaweed foods or laboratory-cultured meat, remains underexplored and requires additional investment in research and development (Tzachor et al., 2021).

5.4 Adapting to demographic shifts and pressures

Demographic shifts pose both challenges and opportunities for formulating policy responses to food security challenges. Rapid population growth, particularly in regions with high levels of poverty, leads to higher food demand, putting pressure on agricultural systems, land use and water security, which can exacerbate existing food insecurity. Urbanization often leads to higher food demands and changes in dietary patterns, such as a preference for animal-based products (Seto & Ramankutty, 2016). Rural-to-urban migration alters labour dynamics in agriculture, contributing to shifts in production systems and farm sizes (FAO, IFAD, UNICEF, WFP and WHO, 2020). Aging populations result in labour shortages in many sectors, including agriculture and food production, and pose challenges to maintaining agricultural productivity.

A holistic approach must fully account for demographic considerations in all aspects of policy response, when addressing climate risks to food security in the context of geopolitical tensions and increasing geoeconomic fragmentation. Efforts to enhance climate-resilient agriculture and shift dietary patterns cannot be effective unless population dynamics and their implications for food demand and the labour force are examined and reflected.

Policy responses to food security challenges need to consider demographic dynamics at the local and national scale and address risks to food production, distribution and demand in their light. For example, in regions with rapid population growth, increasing agricultural activities and food production while mitigating environmental impacts and preserving natural resources will be essential to meet rising food demand. Providing support and incentives for agriculture and small- and medium-scale farms could be an effective measure to maintain agricultural productivity amid increased urbanization. In a world characterized by fragmentation, migration between countries is anticipated to be at its lowest levels (KC & Lutz, 2017), and in that context, countries and regions with aging populations cannot benefit from migration and its historical role in filling gaps in the agricultural labour force. Increasing food imports would strengthen dependency on global food markets and hold them hostage to the tactics of others. Therefore, these countries need to implement policy responses to address labour shortages in agriculture, potentially through investment in capital-intensive production methods, and enhancing technology and innovation in agriculture.

6. Conclusion

The impacts of climate change pose dire threats to food production and trade, with critical implications for food security around the world. Geoeconomic fragmentation and the impacts of geopolitical tensions on trade and trade policies exacerbate food security challenges further, increasing the risk of geopolitically motivated food insecurities. Addressing transboundary climate risks to food security in the context of accelerated climate change and growing geopolitical fragmentation requires adaptable policy responses equipped against future uncertainties.

In the absence of multilateralism and effective international cooperation, plurilateral cooperation among a small number of countries with shared interests can provide a pragmatic alternative to the challenges posed by geopolitical divide. At the local and national levels, enhancing climate-resilient agriculture and promoting dietary transitions towards plant-based food are critical measures to reduce dependencies on global markets. Demographic-aware policies are necessary to adapt future food systems to meet higher demand, manage labour shortages and ensure agricultural productivity and efficient resource use.

Together, these multifaceted approaches can improve countries' adaptive capacities and help build resilience in the face of the intertwined challenges of climate change and geopolitical tension.

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Visit us

SEI Headquarters

Linnégatan 87D
Box 24218
104 51 Stockholm Sweden
Tel: +46 8 30 80 44
info@sei.org

Måns Nilsson
Executive Director

SEI Africa

World Agroforestry Centre
United Nations Avenue Gigiri
P.O. Box 30677 Nairobi 00100 Kenya
Tel: +254 20 722 4886
info-Africa@sei.org

Philip Osano
Centre Director

SEI Asia

Chulalongkorn University
Henri Dunant Road Pathumwan
Bangkok 10330 Thailand
Tel: +66 2 251 4415
info-Asia@sei.org

Niall O'Connor
Centre Director

SEI Latin America

Calle 71 # 11–10
Oficina 801
Bogotá Colombia
Tel: +57 1 6355319
info-LatinAmerica@sei.org

David Purkey
Centre Director

SEI Oxford

Oxford Eco Centre
Roger House Osney Mead
Oxford OX2 0ES UK
Tel: +44 1865 42 6316
info-Oxford@sei.org

Ruth Butterfield
Centre Director

SEI Tallinn

Arsenal Centre
Erika 14
10416 Tallinn Estonia
Tel: +372 6276 100
info-Tallinn@sei.org

Lauri Tammiste
Centre Director

SEI York

University of York
Heslington
York YO10 5NG UK
Tel: +44 1904 32 2897
info-York@sei.org

Sarah West
Centre Director

SEI US Main Office

11 Curtis Avenue
Somerville MA 02144-1224 USA
Tel: +1 617 627 3786

Ed Carr
Centre Director

SEI US Davis Office

501 Second Street
Davis CA 95616 USA
Tel: +1 530 753 3035

SEI US Seattle Office

1326 Fifth Avenue #640
Seattle WA 98101 USA
Tel: +1 206 547 4000

SEI Stockholm Environment Institute

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@SEIresearch @SEIclimate