

The Climate Change, Food Insecurity, and Conflict Nexus

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Report on the nexus between climate change and food insecurity,
particularly that caused or accentuated by conflict



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Bonn Contact Group on Climate Peace and Security ahead of COP29

About

The Bonn Contact Group on Climate Peace and Security ahead of COP29 brings together professionals, academics and civil society activists from across Europe and beyond who support the process of bringing to the COP29 process the agenda of peace.

The Group was established at the end of the Bonn Dialogue Meeting on Climate Peace and Security, held in Bonn on 3 May 2024. The landmark meeting brought together representatives of the COP28 and COP29 presidencies (UAE and Azerbaijan), representatives of think tanks, civil society organisations and academics, and other stakeholders, for a dynamic exchange of views on how to build on the success of COP28 in Dubai, and particularly how to take forward the COP28 Declaration on Climate, Relief, Recovery and Peace. It was felt that what was achieved in Dubai should not be lost and that civil society needs to work with the Azerbaijani presidency of COP29 to consolidate the ideas and take them forward.

Given the vastness of the topic, and the limitation of time and resources, the BCG decided that in between now and November, it will focus on three sub-themes: Food Insecurity, water scarcity and Contamination by remnants of war.

The members of the Bonn Contact Group are organised in three task forces, dealing with the three sub themes. Their job is to prepare reports on the three sub-themes that will help inform discussions and decisions.

- To gather expertise on their topic of interest with a view to preparing, by September 2024, a report of a sufficiently robust level to feed into the discussions of the COP29 meeting.
- To engage with the COP Troika countries and other state and non-state parties on the theme in the run-up to the COP29 in Baku and beyond, and to support the holding of a day of peace within the context of COP29 in November in Baku.

Who is Who?

The work of the Bonn Contact Group is coordinated by LINKS Europe Stichting. The general coordinators of the Bonn Contact Group are Dr Dennis Sammut, Director of LINKS Europe; Leo Wigger from the Candid Foundation; and Isabelle McRae from Restart Initiative, are part of the core team. LINKS Europe provides the secretariat and logistical support for the initiative. Around 30 European and international experts have signed up for the contact group. They will be directly involved in the September workshops and in the preparation of the core recommendations on the themes of food insecurity, water scarcity and land contamination.

For more information about the Bonn Contact Group, please contact Maximiliaan van Lange at LINKS Europe. (maximiliaan@links-europe.eu).



This report considers the connections between the nexus of climate change, food insecurity, and conflict. As defined by the United Nations' (UN) Committee on World Food Security, food security is a situation in which “all people – at all times – have physical, social, and economic access to sufficient, safe, and nutritious food that meets their food preferences and dietary needs for an active and healthy lifestyle.” It encompasses the dimensions of food availability, accessibility, and utilization as well as their stability (FAO, 2015).

In 2023, 281.6 million people faced acute food insecurity (FSIN and Global Network Against Food Crises, 2024). For 72 million people, the main driver of this acute food insecurity was weather extremes. 135 million more people faced high levels of food insecurity due to conflicts. Food security is increasingly recognized as an issue of food systems (Cicarelli et al., 2024), which include “the entire range of actors and their interlinked value-adding activities involved in the production, aggregation, processing, distribution, consumption and disposal of food products” (FAO, 2018, p. 1). A food system lens goes beyond traditional food insecurity interventions that have tended to focus on production and increasing supply and is instead a way of thinking about food (in)security that considers sub-systems and related, external systems. It is an approach that acknowledges how changes in these various systems can affect the broader food system, and vice versa.

Climate change and conflict are two of these related systems with increasingly recognized effects on food systems and, thus, food (in)security. Sustainable food systems are economically, socially, and environmentally sustainable. When they function well, food systems sustain livelihoods and support social cohesion (Bunse & Delgado, 2024). Both climate change and conflict can inhibit the effective functioning of food systems through complex, myriad, and interconnected pathways. This report discusses a number of those pathways that link together climate change, food insecurity, and conflict. The concept of pathways is intentionally used as a framework for understanding the complex relationships between parts (Mobjörk et al., 2020).

The report begins by exploring the pathways between climate change and food insecurity. It then integrates conflict and the additional pathways that this element presents. Topics that are of specific importance to the climate change, food insecurity, and conflict nexus are then addressed individually. These include migration, smallholder farmers and pastoralists, gender, and marginalized groups. The report concludes with recommendations for better addressing the nexus in terms of solutions and approaches.

Climate Change & Food Insecurity

Today, there is widespread evidence on and agreement about the dynamic connections between climate change and food insecurity. These connections are multiple, with climate change acting to both directly damage or impair food systems and as a risk multiplier through more indirect pathways. Additionally, interventions seeking to increase food security can also (often inadvertently) contribute to climate change. Each of these pathways are discussed in turn.

The most recent Climate Change Synthesis Report (IPCC, 2023) states that human-caused climate change “has led to widespread adverse impacts on food and water security” (p. 42). These adverse impacts include:

- Increased crop failures and decreased agricultural yields
- Decreased livestock productivity and fertility
- Depletion of natural resources, including water and aquaculture resources
- Decreased productivity of and increased health problems for farm workers
- Degradation of soil and ecosystems, including desertification
- Increased prevalence of diseases and pests

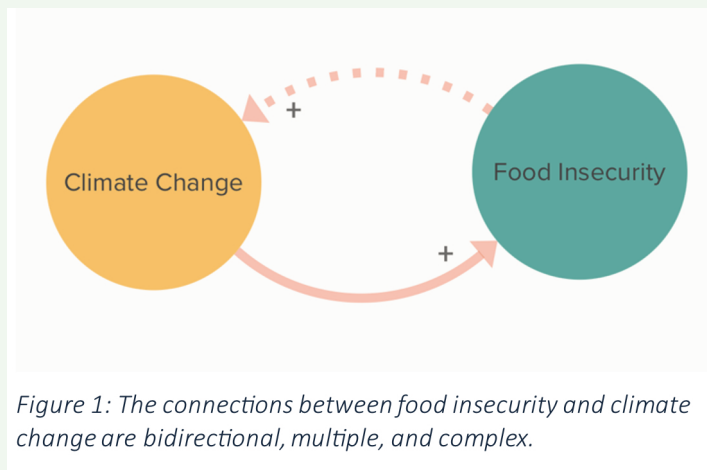


Figure 1: The connections between food insecurity and climate change are bidirectional, multiple, and complex.

One of the strongest and most direct linkages between climate change and food insecurity is through agricultural production systems (FAO, 2015). Agricultural production is directly affected by changes in climate such as precipitation and storm patterns, warming temperatures, rising sea levels that lead to elevated salination of water sources, and increasingly extreme climate events such as droughts and floods. Less direct effects include climate-related changes in pests and disease or resulting effects on forests that, in turn, affect water availability, pollinator habitat, and temperature regulation. These mechanisms can then produce second- and third-order effects related to livelihoods, human health, migration, and increased sociopolitical tensions. This is in addition to the important impacts on crop yields, livestock productivity, as well as the availability of fish and other aquaculture.

The exact pathways between climate change and food insecurity are multiple, variable, and contextually specific. Although climate change has slowed the growth of agricultural productivity and compounded the effects of overfishing globally, these impacts look different in each geography (IPCC, 2023). Africa, Australia, Central and South America, and Small Islands are

the most likely to experience adverse effects on agriculture and crop production. These regions plus Asia are also likely to see negative impacts on fisheries and aquaculture, while every region except Australia and Central and South America will likely face declines in livestock productivity and animal health.

These geographically specific outcomes happen through contextually specific pathways that “strongly depend on the socio-economic development trajectories and adaptation actions” of governments and communities that can enhance or reduce climate vulnerabilities (IPCC, 2023, p. 72). For Small Islands, the destruction of infrastructure and settlements can interrupt food systems and force migration, resulting in food insecurity. In Central and South America, climate risks are related to increasingly frequent and extreme droughts, which negatively affect agriculture and livestock. Similarly, extreme weather events such as floods and droughts will reduce crop yields in parts of Africa (p. 76). Additionally, climate change and food systems interact with other societal systems that can compound and worsen climate-related risks. This includes, for example, increased urbanization and pandemics such as COVID-19.

Pathways are also specific to different geographic scales. At the household and community level, climate change contributes to food insecurity by affecting agricultural yields, livestock, and other aspects of resilience (IPCC, 2023). Reductions in income can drive the sale of productive assets and limit spending on education or healthcare, further reducing long-term resilience (FAO, 2015). This can result in maladaptive behaviors, including those that increase the likelihood of conflict (see below). At national, regional, and global levels, climate change can degrade or destroy essential food system infrastructure, disrupting food supplies and increasing food insecurity for entire populations (FAO, 2015; IPCC, 2023; NATO, 2023). It can also trigger large scale migration within and between countries, limit long-term investment in development, and have wide-ranging economic impacts by increasing food price volatility.

Temporal scales also play a part in determining these pathways. Extreme weather events can lead to acute food insecurity, while long-term climatic changes such as desertification and changes in the availability of safe water will have systemic, complex, and far-reaching implications for resilience. Conflict-induced food insecurity, whether acute or chronic, can create longer-term vulnerabilities (HPLE, 2024). Despite this, many of the current interventions for and policies on food security are focused on emergency humanitarian responses to acute needs rather than long-term resilience (Parera & Femia, 2023/2024). This often results in few lasting positive impacts (Mercy Corps, 2021).

Food security-focused interventions can also increase climate change by contributing to environmental degradation and destruction and the release of greenhouse gas emissions (GHG). This takes place as part of the growing, processing, storage, transport, retail, and consumption of food (Shukla et al., 2019). A 2021 study found that food systems are responsible for 34% of GHG emissions globally (Crippa et al., 2021). A major share of this (75%) comes from land-use change associated with agricultural expansion, largely in developing countries of the Global South. Other food-related sources of GHG emissions include increasing numbers of livestock raised for human consumption as diets change and incomes improve; the further development of unsustainable supply chains; and food waste. The Food Systems and Climate Action Convergence Initiative was founded in 2023 to address this relationship between food systems, pollution and GHG emissions,¹ and there are both supply side solutions (such as reducing food waste) and demand side changes (healthier and more sustainable diets) to make (IPCC, 2023).

¹ See <https://www.unfoodsystemshub.org/latest-updates/news/detail/national-convenors-propel-joint-implementation-of-the-food-systems-transformation-and-climate-action-agendas/en>

Interventions to address or mitigate the role of climate change in food insecurity are as varied as the contextual specifics to which they respond. They often aim for more sustainable food production and land or forest management, improvements to soil and land restoration that increase agricultural outputs as well as carbon management, reduced deforestation and degradation (including from agricultural sources), and reduced food loss and waste as well as GHG emissions along the food value chain. However, there are less direct improvements that also need to be made. These include keeping population growth low, increasing incomes while reducing inequalities, and undertaking governance and policy reforms that lead to effective land use regulation. Some countries are tackling these challenges by incorporating food security concerns and plans for resilient food systems into their Nationally Determined Contributions (NDCs) and other climate action plans (Making Food Systems Work for Peace and Planet, 2023).

Whatever the solution, it is important that they be undertaken in ways that balance climate action and food security needs. Afforestation or biodiversity conservation for the purposes of climate mitigation can increase the risk of food security (IPCC, 2023). It is therefore important to invest in approaches that reduce agricultural emissions while avoiding exacerbating inequalities such as those that affect low-income households and small-holder farmers (Parera & Hugh, 2023/2024).

The Role of Conflict

The international community, donors, national governments, implementing agencies, and practitioners have come to increasingly recognize the role that conflict plays in mediating and modifying the relationship between climate change and food insecurity.² As noted by UN Secretary-General António Guterres at a Security Council high-level open debate on the impact of climate change and food insecurity on the maintenance of peace, “Climate chaos and food crises are serious and mounting threats to global peace and security.”

Indeed, there is a correlation between increasing rates of conflict and increased food insecurity (Brüch and d’Errico, 2019). Since 2017, researchers have produced 60 peer-reviewed journal articles that evidence the ways in which food security contributes to conflict, and half of these studies looked at the relationship through the lens of climate change (Sova et al., 2023). Reviews of the literature have found that climate change, food insecurity, and conflict “are intrinsically linked. The relation between them is bidirectional and mutually reinforcing...” (Bunse and Delgado, 2024, p. 2-3; see also Sova & Zembilci, 2023). These pathways include the following:

- **Food insecurity worsens conflict.**³ Food insecurity – including insecurity caused by increases in food prices, unsustainable agricultural expansion, and competition over food-related resources – is linked to greater interpersonal and intercommunal tensions, civil conflicts, interstate wars, rioting, and more (Brinkman & Hendrix, 2011; IPCC, 2023). These links occur through the interceding mechanisms of poverty, migration, disrupted social cohesion, and political destabilization (Cicarelli et al., 2024; NATO, 2023). Like the relationship between climate change and food insecurity, the pathways between food insecurity and conflict play out differently at individual, community, national, regional, and even global levels. For example, household-level food insecurity can cause maladaptive and even violent coping behaviors, including increased crime and recruitment into gangs and other armed groups

² See, for example, <https://www.securitycouncilreport.org/whatsinblue/2024/02/climate-change-and-food-insecurity-high-level-open-debate.php>

³ Interestingly, hunger itself is not necessarily a precondition for food-related conflict or instability. Rather, it is the belief that food is unavailable, inaccessible, or insufficient that is most important (Sova et al., 2023).

(Mercy Corps, 2021). Community- and national-level food insecurity can result in forced migration, which in turn places higher pressures on limited natural resources and food supplies, leading to growing tensions between groups that can culminate in violence. Food insecurity can also “create vulnerabilities that bad actors can exploit for geopolitical gain, as demonstrated by Russia’s attacks on agricultural infrastructure and weaponization of disrupted Ukrainian food exports” (Cicarelli et al., 2024, p. 2). National militaries and military alliances like NATO are increasingly concerned with the humanitarian crises that may emerge from this nexus and how they will appropriately respond (NATO, 2023).

- **Conflict contributes to food insecurity.** In 2023, 135 million people in 20 countries faced high levels of acute food insecurity due to conflict and insecurity (FSIN and Global Network Against Food Crises, 2024). Conflict and insecurity were also the main driver of ten of the largest food crises. Conflict, and violent conflict in particular, can interrupt, degrade, or destroy food systems, from the act of growing food to food processing and the infrastructure necessary for distribution. People fleeing conflict may end up in areas unable to properly support them, resulting in food insecurity not just for displaced people but for host communities as well. More intentionally, food can be weaponized for the purposes of war (Simmons, 2013). Violent conflict can also make it difficult or impossible for humanitarian interventions to take place. Aggravated by climate change, economic shocks, or pandemics like COVID-19, this kind of acute food insecurity can become chronic and result in long-term vulnerability (HPLC, 2024). Vulnerability is increased when there are other intervening or compounding factors such as poverty, ineffective governance, limited access to basic services, and land degradation (IPCC, 2023; Shukla et al., 2019).

- **Conflict worsens climate change.** In addition to the GHG footprint of military operations, conflicts can destroy important landscapes and ecosystems whether through direct violence or the resulting forced displacement of people (Bunse & Delgado, 2024). Conflict also increases people’s vulnerability to climate change while decreasing their ability to adapt⁴ as social safety nets and access to basic services are disrupted. These effects can, in turn, contribute to increased food insecurity through the above-mentioned pathways.

- **Climate change increases conflict.** The 2023 “Statement of Joint Pledges related to Climate, Peace and Security” highlights the connection between climate change and international peace and its increasing prominence on the international stage and among members of the UN Security Council.⁵ While climate change can increase levels of conflict, this often takes place through indirect pathways, with those related to food insecurity and food systems being one of the most important (Sova et al., 2023). Fragile institutions, damaged social cohesion, and ineffective or nonexistent conflict management mechanisms can also increase the likelihood that climate change increases conflict. The ability to adapt and high levels of resilience are seen as key for mitigating this relationship.

⁴ See <https://www.cop28.com/en/cop28-declaration-on-climate-relief-recovery-and-peace>.

⁵ See <https://uaeun.org/app/uploads/2023/03/CPS-Joint-Pledges.pdf>; note that the statement does not mention food security.

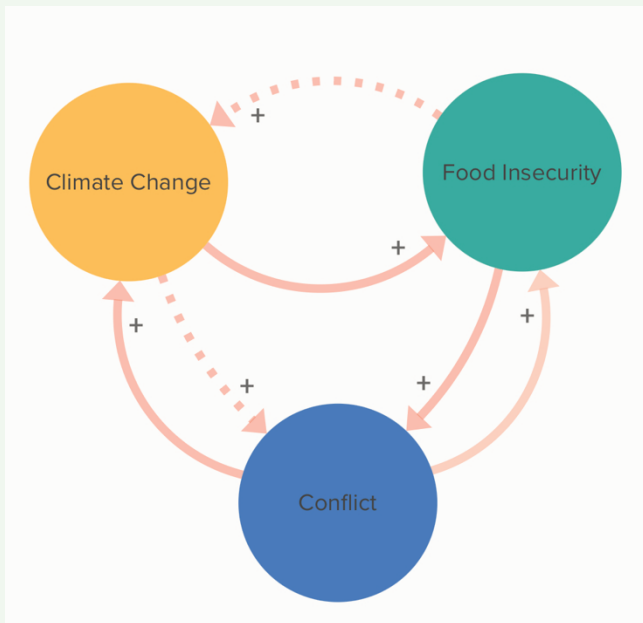


Figure 2: The nexus of climate change, food insecurity, and conflict is one of multiple and diverse direct and indirect impacts.

It is important to acknowledge that neither food insecurity nor climate change are likely to be the primary cause of conflict, particularly violent conflict. Rather, the connections between climate change, food insecurity, and conflict are deeply complex and involve numerous intervening economic and sociopolitical factors (Sova et al., 2023). For this reason, each element is often characterized as a “threat multiplier” or “risk multiplier” (Mbow et al., 2019). Nevertheless, they are mutually reinforcing. For example, food insecurity can both contribute to and result from conflict (Simmons, 2013). The same can be said for each of the relationships in more or less direct ways. This results in a negative cycle if the drivers or causes are not addressed in a holistic and systemic way.

Simultaneously, the role of conflict is highly context dependent, much like the connection between climate change and food insecurity. Economic and sociopolitical structures and dynamics play an important role as do the abilities and capacities of key actors (Mobjörk, 2020). While these dynamics can contribute to conflict and the outbreak of violence, they can also present opportunities for collaboration and partnership. It is therefore important that gaps in understanding of the role of the conflict in the broader context are addressed to decrease the likelihood that interventions have a negative impact (Bunse & Delgado, 2024).

Issue Areas

The nexus between climate change, food insecurity, and conflict contains varied pathways covering multiple thematic areas. The following are a handful of those that are most important as determined by the frequency of their discussion in the literature.

Migration

In 2023, there were 90 million forcibly displaced people in 59 countries (FSN and Global Network Against Food Crises, 2024). A 2017 study by the World Food Programme (WFP) found that “countries with the highest levels of food insecurity, coupled with armed conflict, have the highest outward migration of refugees” (p. 6). As climate change and conflict contribute

directly and indirectly (through, for example, deteriorating livelihoods) to food insecurity, migration will accelerate (Shukla et al., 2019). And because migration and food insecurity are so intertwined, increased migration from climate change or other factors may also contribute to food insecurity as local and national capacities are strained (NATO, 2023). In these same ways, migration can also contribute to conflict (Zeya, 2022), resulting in a reinforcing and negative cycle (see Figure 3).

Iraq provides an example of the relationship between climate change, migration, conflict, and food insecurity. Desertification and the salination of water tables have negatively affected agriculture in the country, forcing migration from rural to urban areas (Fathallah, 2020). Food systems have also been negatively affected by political instability, corruption, and war, which have in turn compounded issues of migration. Indeed, the U.S.-led coalition invasion of Iraq contributed to the displacement of 9.2 million people⁶ and resulted in moderate to severe food insecurity for 4.7 million people.⁷ There are, however, cases in which migration and food insecurity can exist outside of a negative reinforcing cycle. Congolese refugees in Rwanda, for example, have considered how to use their agricultural knowledge and skills to work alongside landless Rwandans to address food security while also building relationships in a region plagued by longstanding conflict (Parent, 2024).

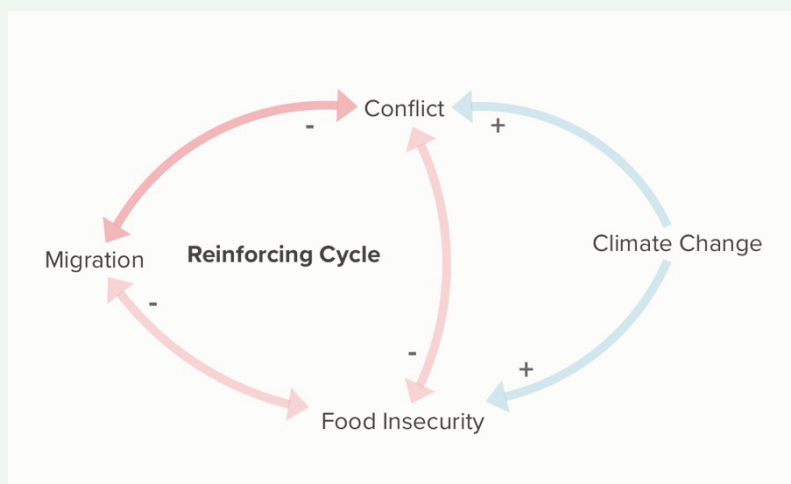


Figure 3: Migration interacts with conflict and food insecurity as part of a negative reinforcing cycle. Climate change compounds this.

Smallholder Farmers & Pastoralists

Smallholder or household farmers are the backbone of the food system in many areas around the world (Fanzo, 2017), and increasing their productivity is considered essential for poverty reduction and food security (FAO, 2015). They are also disproportionately vulnerable to and affected by climate change, which can negatively affect food insecurity (Bedasa & Deksisa, 2024; Cicarelli et al., 2024; IPCC, 2023). Similarly, pastoralists are also negatively affected by climate change as periods of drought and irregular rainfall cause competition over water for livestock, resulting in conflicts manifesting as cattle raiding and even violence (Hegazi et al. 2022; Sova et al., 2023). This results in lower livestock productivity and issues with animal health (Shukla et al., 2019), in addition to increasingly violent cycles of conflict.

As water, pasture, and farmland become scarcer due to climate change, competition over

6 See <https://www.theguardian.com/us-news/2020/sep/09/conflicts-us-war-on-terror-displaced-37-million-people-report>
7 See <https://reliefweb.int/report/iraq/iraq-food-security-quarterly-update-january-march-2017#:~:text=According%20to%20the%202017%20Humanitarian%20Response%20Overview%2C%2011,million%20individuals%20expected%20to%20face%20severe%20food%20insecurity>

these resources increases as does the likelihood of conflict between smallholder farmers and pastoralists. These chances are exacerbated by issues related to land tenure, changes in traditional societal structures, a lack of market access, and more. Conflicts between pastoralists and farmers are common in the African Sahel, where nearly 18 million people are food insecure.⁸ In Burkina Faso, for example, climate change effects such as land degradation and poor livestock health have exacerbated the socioeconomic and political causes of conflict for at least a decade (Abroulaye et al., 2015). In cases such as these, climate change collides with institutional fragility and the growth in extremist groups to transform long-standing ethnic, religious, or other identity-based conflicts into violence (Sova et al., 2023).

Addressing food insecurity and conflict among smallholder farmers and pastoralists requires increasing agricultural and livelihood adaptability (Bedasa & Deksisia, 2024) that in turn increases the ability of these farmers and pastoralists to absorb, adapt to, or bounce back from different shocks and stressors. Building resilience in this way can entail “access to social networks, basic services, and other assets” (Sova et al., 2023, p. 11). Approaches can also include innovative and climate-smart agricultural practices, improved extension services, and better connecting smallholder farmers to food markets such as through processors and traders to improve livelihood outcomes (FAO, 2015). Resilience can limit the incentives to join or support extremist groups or fall back on identity-based, maladaptive coping strategies.

Gender & Other Vulnerable Groups

Climate change and food insecurity have strongly gendered dimensions (Shukla et al., 2019). Women and girls are likely to be disproportionately affected by food insecurity because of their generally higher dependence on natural resources and often restricted access to those resources (Cicarelli et al., 2024; FAO, 2015). They are also likely to be discriminated against when it comes to access to climate adaptation options, including access to important information such as weather forecasting (FAO, 2015), as well as their participation in natural resource management mechanisms. Women and girls are also disproportionately affected by conflict. In places like the Democratic Republic of the Congo (DRC), the combined effects of unpredictable rainy seasons (climate change) and decades-long conflict in the Kasai provinces means that many people are displaced and unable to farm some of the world’s most fertile soil.⁹ As a result, more than 23 million people were projected to face crisis or higher levels of food insecurity in 2024.¹⁰ This has the potential to further exacerbate the ongoing conflicts in the country and the region.

Like women and girls, low-income households and Indigenous People also experience disproportionate effects from climate change, including on their food security (IPCC, 2023; Shukla et al., 2019). Indigenous People are more likely to directly depend on landscapes for food security and, simultaneously, are at higher risk of experiencing the effects of climate change (FAO, 2015). Low-income households and communities’ livelihoods are also more likely to be affected by climate change as they depend on smallholder or subsistence agricultural or other environmentally focused livelihoods. They are also more likely to be affected by the increase in food prices expected because of climate change (Shukla et al., 2019). In Yemen, climate shocks merged with an increase in food costs resulting from conflicts and a subsequent deterioration of the country’s economic situation to produce a spiraling food and conflict crisis that threatens to engulf the region (Brown et al., 2021).

Historically marginalized groups may also face unfair or unequal natural resource management mechanisms, problematic or nonexistent land tenure, and inequitable access to finance

⁸ See <https://news.un.org/en/story/2022/05/1118702#:~:text=As%2018%20million%20people%20in,humanitarian%20response%20across%20four%20countries>

⁹ See <https://reliefweb.int/report/democratic-republic-congo/achieving-long-term-food-security-drc-all-about-building-resilience>

¹⁰ See <https://www.ipcinfo.org/ipc-country-analysis/details-map/en/c/1156611/#:~:text=In%20the%20projected%20period%20of,IPC%20Phases%203%20or%20above>

and other social support mechanisms. Social safety nets and other social protection systems can help vulnerable and marginalized communities by making them more resilient to climate change, increasing their food security, and indirectly affecting conflict dynamics (FAO, 2015; IPCC, 2023). There is also a need for more gender- and group-specific analyses and interventions that can address inequalities and empower these groups to participate in decision-making on issues that relate to their own food security (Shukla et al. 2019).

Conclusions and Recommendations

The systemic nature of the climate change, food insecurity, and conflict nexus makes tackling each independently ineffective (Bunse & Delgado, 2024). Yet current policies and interventions rarely address all three factors (Parera & Femia, 2023/2024). Instead, multi-stakeholder, multi-sectoral, and even multi-level integrated approaches are needed. This is in alignment with the lens of food systems, which seeks comprehensive and systems-based approaches to addressing food security-related challenges.

Consequently, it is essential to incorporate conflict-related considerations into climate change and food insecurity focused work in an integrated way. Much of that work is happening in places characterized by existing tensions between groups, where there is a history of marginalization and even violence. Doing the work therefore necessitates the incorporation of conflict-related objectives into food security and climate-related interventions based on a detailed understanding of the conflict context (Bunse & Delgado, 2024). It may also entail working on food insecurity in ways that align with conflict or peacebuilding-related work happening in the same geography or even finding organizations with which to partner. These options are part of an integrated approach that brings multiple stakeholders together to enhance effectiveness.

As noted in the introduction, the use of “pathways” to frame the connections between climate change, food insecurity, and conflict is an effective framework for capturing the diversity and complexity of those connections. Pathways also allow for the identification of entry points to address important and context-dependent issues (Mobjörk et al., 2020). These entry points are integrated approaches that contribute to a broader enabling environment that encompasses finance and investment options, policies, institutions and other governance mechanisms (FAO, 2015; IPCC, 2023) while simultaneously reinforcing the flexibility necessary to address complex issues (Perera & Hugh, 2023/2024). The following are some of the relevant interventions:

- **Climate-smart agriculture and other innovative interventions help** smallholder farmers to be more resilient to climate change, resulting in greater agricultural productivity (and food security) and indirectly limiting related conflicts. There are also innovative ways to increase access to or ensure more efficient use of water (FAO, 2015). Differentiating crop varieties and other diversification strategies, including for livestock, can also ensure smallholder farmer and pastoralist resilience. Of particular relevance is Ecosystem-based Adaptation (EbA) approaches that “work with natural processes to support food security, nutrition, health and well-being, livelihoods and biodiversity, sustainability and ecosystem services” (IPCC, 2023).
- **Improved natural resource management**, including mechanisms for addressing grievances and conflicts, are also used to improve access to those resources, clarify rights, and restore social cohesion that may have degraded in the face of climate-related impacts on natural resources and livelihoods (Valencia, 2022). Related governance mechanisms and institutions, such as those that ensure secure land tenure, are also important for addressing underlying causes of conflict and increasing smallholder farmer resilience (FAO, 2015).
- **Early warning systems** are one potential solution for forecasting and proactively responding to risks at the nexus of climate change, food insecurity, and conflict. Food can be a “a powerful predictive tool,” with stockpiles serving as a predictor for conflict (Cicarelli et al., 2024, p. 4), and conflict information can be layered onto other information to further build out these tools (Brown et al., 2021).

- **Information sharing**, beyond early warning systems, is another opportunity to address the nexus. Sharing information and evidence that is collected through effective monitoring systems can build collaboration, fill in evidence gaps, and ensure more effective and sustainable solutions more generally (Climate, Conflict, and Global Food Systems, 2015). Shared tools and systems to assess and respond to risks can support effective decision making (FAO, 2015). Information sharing done in appropriate and conflict sensitive ways (see below) can help build stakeholder buy-in and ensure more effective management mechanisms (Valencia, 2022). Cooperation on food systems for food security can also be a mechanism for peace (Cicarelli et al., 2024).

- **Climate finance** is one potentially useful tool to ensure that food insecurity does not exacerbate broader contexts of competition or instability (Cicarelli et al., 2024). However, there is little climate finance available for either food systems or fragile and conflict affected contexts. Insurance and other risk sharing or risk mitigating financial products is one approach (IPCC, 2023). This includes providing livestock insurance to pastoralists (Hegazi et al., 2022) and providing financial services and credit to smallholder farmers (FAO, 2015).

Outside of these specific types of interventions, there are other important considerations for implementing “integrated food, climate and peace interventions... in the same geographical area, [that] depart from a common understanding of the conflict and how it is evolving, understand their place within the broader system and beyond the implementation location, and work towards a shared vision which is jointly monitored and evaluated” (Bunse & Delgado, 2024, p. 13). These relate more to ways of working in implementation and include:

- **Context and conflict analysis** is the initial first step toward addressing the climate change, food insecurity, and conflict nexus. They are essential for understanding the on-ground situation – including the causes and results of food insecurity and conflict – and ensuring that immediate needs are addressed with transformational and context-specific solutions (Mercy Corps, 2021; Simmons, 2013). Conflict is often left out of food security-related analyses, which results in an incomplete picture of the food system and resulting missed opportunities (Hegazi et al., 2022). Gender should also be a focus of these analyses (Valencia, 2022).

- **Conflict sensitive** interventions are essential for effectively addressing the food insecurity, conflict, and climate nexus. In this case, conflict sensitivity means understanding how activities can contribute to or increase the likelihood of conflict (Hegazi et al., 2022). For example, bringing groups together to work on agriculture or water resources can cause harm if stakeholders are asked to provide too much time or labor, if benefits are not shared equitably, or if stakeholders misunderstand the approach to benefits sharing (Valencia, 2022). Indeed, even an increase in the supply of water for farmers and pastoralists can be a cause for conflict if there is a lack of agreement on how to share that water (Hegazi et al., 2022). Going beyond just doing no harm, conflict sensitivity also means focusing on aspects of food security and climate-related work that can increase stakeholder resilience “to turn vicious circles into virtuous ones” (Bunse & Delgado, 2024, p. 11). This can be achieved through equitable and trusted natural resource management schemes, equitable benefit sharing, and the increased resilience of communities and households faced climate and food insecurity (thus decreasing the incentives to engage in conflict).

- **Monitoring and evaluation (M&E)** are essential to ensuring adaptive interventions through learning from experience in fluid and complex contexts and then making appropriate

responses and adjustments (Bunse & Delgado, 2024; FAO, 2015; Mercy Corps, 2021). M&E will also contribute to our understanding about what interventions work where and under what conditions (Brown et al. 2021; Parera & Hugh, 2023/2024).

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