Climate Change, Food Security and Humanitarian Emergencies[1]

WFP World Food Program USA

"Climate change is no longer a problem we describe in the future tense. It is very much here, and its impacts are resounding throughout the Global South where tens of millions of small-scale farmers are already feeling them. The expansive scale of the problem is a formidable challenge for humanitarian organizations whose budgets are already stretched by a rise in manmade conflict. These two drivers of hunger – climate change and conflict – are intimately related, evidenced by a rise in climate-induced resource competition in places like the Sahel. Finding solutions to the climate change and food security challenge is of existential importance and relevant to all nations of the world. As a historical leader in combating hunger around the planet, the United States and its citizens must play a critical role in this fight."

WFP / Matteo Cosorich

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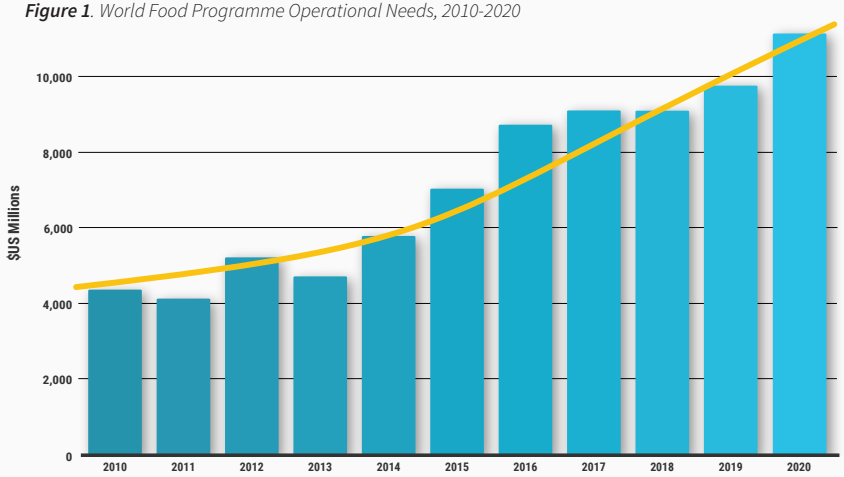
[1] *Portions of this document have been drawn from the Center for Strategic and International Studies Global Food Security Project brief "Climate Change and Food Security A Test of U.S. Leadership in a Fragile World" available at: www.csis.org/programs/global-food-security-project*

The impacts of climate change are threatening a complex global food system that is already struggling to meet the needs of a growing and changing population. After a decade of progress, the number of chronically hungry people around the world has increased for the past four years. Today, 821 million people—one in nine—are undernourished. 135 million are facing crisis levels of food security. These people experience a shortage of food each day, while over twice that number face moderate food insecurity, which means they frequently compromise the quality OR quantity of food they consume. At the same time, over 2 billion people around the world are overweight or obese, and over 1 billion suffer from micronutrient deficiency, sometimes referred to as "hidden hunger."

The number of hungry and malnourished people worldwide has grown in tandem with a rise in human conflict and forced displacement[1]. This, combined with slow economic recovery from the 2008 global financial crisis (and food price spikes) and the increasing frequency and magnitude of climate-related extreme events, has contributed to the reversal of progress in the fight against global hunger[2]. These factors have placed unprecedented stress on humanitarian organizations; humanitarian appeals have ballooned to record levels. The World Food Programme (WFP) has seen its operational need grow to over $10 billion, more than doubling in the last decade (Figure 1).

Unsurprisingly, the places most impacted by food insecurity—especially Africa and South Asia—are also those suffering from the most pervasive forms of poverty and environmental vulnerability. By some estimates, global food production must increase by as much as 70 percent by 2050 to meet the needs of a growing population[3]. This is both a challenge and an opportunity: in developing countries, GDP growth in the agricultural sector is more than twice as effective at reducing poverty than growth in competing sectors[4], but climate change will make it more difficult to meet production needs and reduce poverty through agriculture.

***Figure 1**. World Food Programme Operational Needs, 2010-2020*



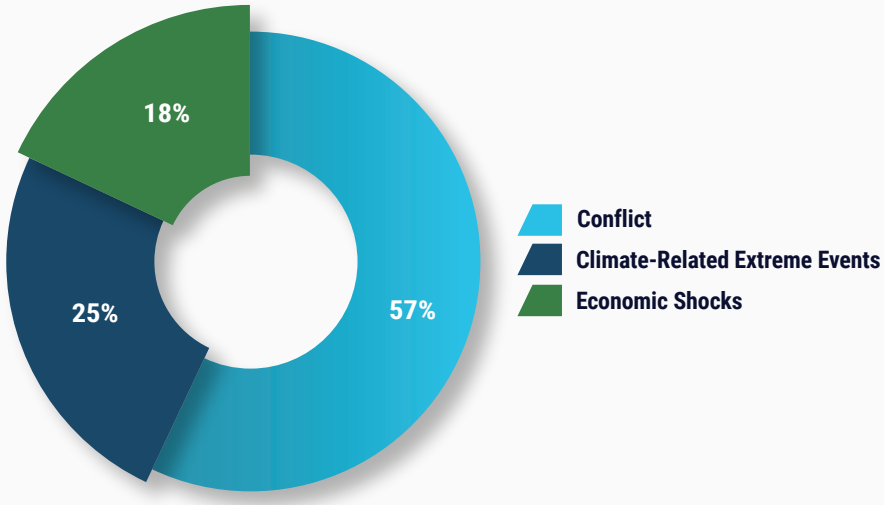
Source: WFP Management Plans

Why our food supply is vulnerable

Despite the millions of acres of industrial cropland, satellite-guided tractors and shining supermarkets in places like the United States, a large percentage of food worldwide is still produced on relatively small parcels of land by small-scale, subsistence farmers who rely solely on rainfall to water their crops and animals. These practices mean that long-term changes in climate intimately impact food production—perhaps more than any other sector of the global economy. Since the mid-1800s and the Industrial Revolution, surface air temperatures over earth's land area have warmed by an average of 1.5°C[5]. Much of that warming has occurred since 1975, as concentrations of carbon dioxide and other greenhouse gases (GHG) in the atmosphere steadily accumulate[6]. The past decade has been the warmest in the history of instrumental record keeping[7].

In places like sub-Saharan Africa – unlike highly industrialized economies – agriculture represents a disproportionately large percentage of countries' gross domestic product (GDP) and employs up to 80 percent of the rural population. Farming there often occurs on heavily degraded land and lacks high-quality inputs like seed and fertilizer and access to agricultural markets. It is no surprise, then, that subsistence farmers represent over half of the world's hungry people (of whom half, in turn, are women)[8].

***Figure 2**. Main Drivers of Food Emergencies (Acute Hunger) in 2018*



Source: Global Report on Food Crises 2020

According to WFP, at least 80 percent of the world's hungry people live in places prone to natural disasters and environmental degradation, including many of the world's poorest places[9] (Figure 2).

Climate change impacts on agriculture vary considerably by geography. Climate change has already been linked, for example, to changing patterns of agricultural pests and diseases, saltwater intrusion from sea-level rise and even the decline of nutritional quality in plants.

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A general rule of thumb in the equatorial tropics is that every 1°C rise in mean temperature is associated with a 10 percent drop in crop yields[10]. Temperature spikes during critical phases of a plant's growth can lead to outright crop failure. Although impacts will vary considerably by crop and production system, some countries in sub-Saharan Africa and other low-latitude places will likely see yields from rain-fed maize, wheat and rice fall considerably in the coming decades[11]. While reports often reference a 1.5°C to 2°C "safe" level of warming that would avoid the most devastating impacts from climate change, agricultural systems—especially where crops are already grown dangerously close to their biophysical limits – are immediately vulnerable to any additional warming.

By some estimates, between 12 and 39 percent of the world's land surface will develop novel climates by 2100 as a result of climate change[12]. Today, agriculture remains land and resource intensive. Agricultural production—both crop and pasture—occupies more than 40 percent of total land area and accounts for at least 70 percent of all freshwater withdrawals globally[13]. Climate change, land degradation and biodiversity are linked in a complex

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AFRICAN SAHEL

The Sahel is an arid region that sits below the Sahara Desert and stretches across the African continent from Senegal to Djibouti. The region is home to almost 100 million people and hosts one of the fastest population-growth rates in the world[16]. Many families in the Sahel rely on subsistence agriculture and pastoralism for their livelihoods and depend heavily on natural resources like land and water. The region is increasingly considered by experts as a climate change hotspot, expected to warm at a rate 1.5 times faster than the global average[17]. The Sahel suffers from desertification from the Sahara Desert: the desert expanded by almost 20 percent over the last half century and creeps south by more than a mile each year[18]. In one of the most striking examples of climate impacts and environmental degradation, Lake Chad, a critical water resource for fishers, pastoralists and farmers in the region has lost 90 percent of its volume since the 1960s[19]. Across the Sahel, water availability per capita has plummeted in recent decades. This pressure on both land and water has caused widespread conflict between herders and sedentary agricultural communities. The Sahel is also home to a growing number of extremist organizations, including Boko Haram, al-Qaeda and Al Shabab. Population growth, pervasive poverty and environmental degradation have fueled these groups' ability to recruit for their causes exploiting desperation and benefiting from limited state security presence in this expansive, sparsely populated region.

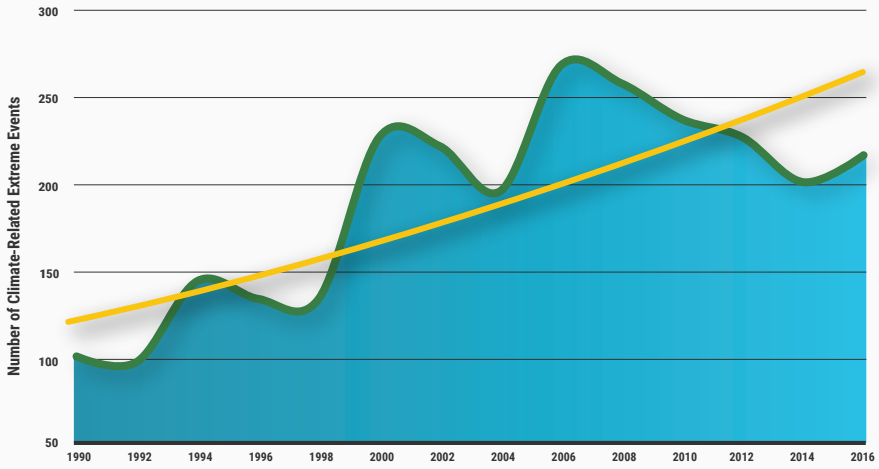
feedback loop—a vicious cycle[14]. A recent report by the Intergovernmental Panel for Climate Control (IPCC) suggests that soil is eroding 10 to 100 times faster than it is being formed, a process accelerated by climate change impacts like drought and high-intensity rainfall[15]. This is devastating, as it can take upwards of a thousand years to develop an inch of topsoil through natural processes.

Ultimately, climate change will most severely impact the places least able to cope. Climate change threatens years of development progress and will thrust many vulnerable populations into poverty—as many as 122 million more by 2030[20]. Increasing evidence shows that climate change may also slow the decrease in inequality between countries – reducing GDP among the world's poorest populations by up to 30 percent[21]. As a consequence, climate change is fraught with questions of global justice and inequality, especially as industrialized countries are the ones that generated an overwhelming majority of historical CO2 emissions.

Drought

Of all the impacts from climate change on agriculture and food security, the quiet, creeping effects of long-term drought are among the most harmful for small-scale farmers and other vulnerable populations. Given improved early warning and humanitarian responses, large-scale deaths from famine are increasingly a thing of the past, but drought in the Horn of Africa, Southern Africa and Central America has been long associated with famine[22]. In these places where rain-fed agriculture is prevalent, over 80 percent of a drought's economic impact is felt in the agricultural sector[23]. Multi-year drought is especially devastating for subsistence farming families. Each year without a good harvest pushes the hunger season further ahead and diminishes seed stock for next year's planting. Long-term drought also destroys precious topsoil, allowing it to blow away in high winds or wash away in heavy rains. From a food security perspective, drought in some parts of the world is increasingly synonymous with El Niño. A climate phenomenon resulting from irregular Pacific Ocean temperatures near the equator off the coast of South America, El Niño is triggered by a change in trade winds that would typically push colder waters westward. Research indicates that a general warming trend on the earth could increase the frequency of so-called "Super El Niño" events[24]. Consistent with this trend, the 2015/16 El Niño event was among the strongest on record, bringing record drought to Central America's Dry Corridor.

***Figure 3**. Number of Climate-Related Extreme Disasters, 1990-2016*



Source: FAO, EM-DAT9

ZIMBABWE *Regional droughts across Africa—and in other drought-prone regions of the world—are cyclical in nature. Through natural cycles, these areas have historically been affected almost each decade by severe droughts. Today, however, these droughts are occurring at greater frequency and intensity, likely due to the impacts of climate change. Within the last five years, the southern African region has had only one 'normal' rainy season. In 2019, Zimbabwe, a country known as a major exporting breadbasket in the region, produced only half of what it needed in its own country. Temperatures as high as 120 degrees were recorded in the country that year[26]. Combined with lingering impacts in the country's eastern regions from Cyclone Idai and rampant hyperinflation, millions of Zimbabweans are struggling to feed themselves.*

Droughts and other climate-related extreme events are becoming more frequent because of the impacts of climate change, some evidence shows. In fact, they have more than doubled in frequency over the last 25 years, as researchers noted in the 2018 edition of The State of Food Security and Nutrition in the World. In the early 1990s, approximately 100 of these events were recorded each year; today, that number is 213[25] (Figure 3). Moreover, in a relatively new area of investigation, researchers have linked the impacts of climate change to so-called "multiple breadbasket failure," or the potential for widespread, weather-related losses to major food-producing regions simultaneously.

Greenhouse gases from agriculture

Although the agricultural sector will suffer from the impacts of climate change—especially in developing countries and for subsistence farmers—agriculture is also increasingly being recognized for its underlying contributions to GHG emissions. In fact, by some estimates, agriculture and food systems account for one-quarter of global GHG emissions. Not all greenhouse gases are created equal. Some, like methane (CH4), remain in the atmosphere for a shorter period but have a much stronger greenhouse gas effect: CH4 has almost 30 times the effect of CO2. Agriculture is the single largest contributor to non-CO2 GHGs and accounts for half of all

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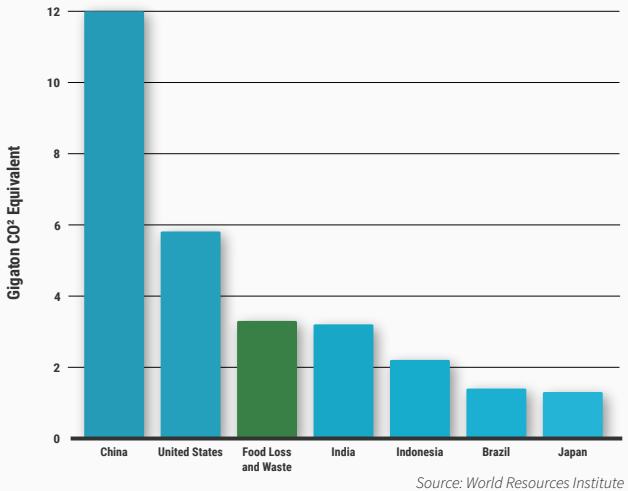
such global emissions[27]. Livestock production alone is estimated to emit almost 15 percent of all global GHGs, mainly in methane from livestocks' digestive systems, but also from the production of animal feed and forage, transportation and processing[28]. The second-largest category of agricultural GHG emissions comes from our soils. Soil represents a significant stockpile of carbon (and non-CO2 GHGs), holding more than three times the amount currently in the atmosphere[29].

***Figure 4**. Annual Greenhouse Gas Emissions, 2016*



Source: World Resources Institute

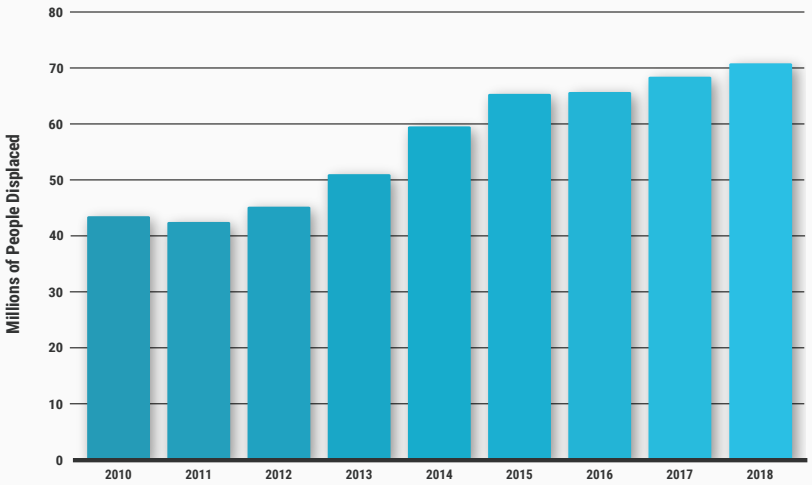
Not all of the food system's contribution to climate change comes from on-farm production. Increasingly, GHG emissions from food loss and waste are capturing headlines. Globally, $1 trillion in food is lost or wasted each year[30]. In industrialized nations like the United States, this often occurs on the demand side: unpurchased or uneaten food ends up in landfills and produces methane as it degrades. In developing countries, up to 40 percent of harvests are lost before making it to market because of inadequate storage or transport infrastructure[31]. All told, if it were a country, food loss and waste would be the third-largest emitter in the world behind China and the United States (Figure 4). The agricultural sector—which combines deforestation from agricultural expansion (agriculture is the leading global driver of deforestation) with emissions from the processing, transportation and marketing of food products—contributes in multiple ways to the underlying problem of climate change.

WFP / Elizabeth Bryant

Climate change, food security, migration and conflict

It is an undeniable fact that global conflict is on the rise. Today, more countries experience violent conflict than at any time in the last three decades, and more people are displaced from their homes because violence, conflict and persecution than any time since the Second World War[32,33], (Figure 5). As a result, manmade conflict is the single-largest driver of hunger today. But conflict, especially in places where WFP works, is often driven by environmental factors and control over critical natural resources like land and water. In fact, the United Nations Environment Programme reports that

***Figure 5**. Global Forced Displacement from Violence, Conflict and Persecution, 2010-2018*



almost half of all internal conflicts over the past 70 years resulted from resource competition[34]. Droughts, floods and extreme weather events—each made more frequent and intense by the impacts of climate change—erode the means of food production and destroy agriculture livelihoods.

Ultimately, food insecurity is almost never the sole driver of instability or conflict. Rather, the conditions are ripe for conflict when food insecurity joins other individual motivations or circumstances – like existing grievances or underlying poverty. WFP USA explored these factors by reviewing over 50 peer-reviewed scientific journal articles on the link between food insecurity and instability and published our findings in Winning the Peace: Hunger and Instability. In this report, our researchers categorized drivers of food-related instability into three interrelated groups: resource competition, market failure and climate-related extreme events. Over 30 percent of the studies analyzed identified that food-related instability was due to increasing climate variability and extremes[38].


WFP / Francisco Fion

CENTRAL AMERICA'S DRY CORRIDOR

The complicated relationship between climate change, food insecurity and conflict is often further filtered through the lens of migration. In sub-Saharan Africa, South Asia and Latin America alone, over 140 million people may be forced to migrate internally from the impacts of climate change by the year 2050, according to World Bank estimates[35]. This migration is often the by-product of food insecurity. WFP estimates that a 1 percent rise in food insecurity is associated with a 2 percent increase in migration[36]. The Dry Corridor of Central America (a geographical area of tropical dry forest that runs from southern Mexico to Panama) has experienced five consecutive years of erratic weather patterns, from prolonged drought to excessive rainfall, with dire consequences for families farming maize, beans and coffee, in particular. Intense drought – driven by one the most powerful El Niño events on record – saw river levels in the corridor fall 20 to 60 percent below normal and crop losses between 50 and 90 percent in 2015 and 2016[37]. Erratic weather events destroyed crops and livelihoods, forcing families into a host of negative coping strategies like selling farm equipment and livestock, and eventually migrating.

Preparing for risk, building resilience

The United States spends billions of dollars each year in the form of crop insurance payments designed to protect famers against production losses and fluctuating market prices. The National Flood Insurance Program is also in place to protect home and business owners in especially vulnerable places. These are just two examples of the many ways in which the United States protects its citizens from climate-related extreme events and the long-term impacts of climate change. American farmers also benefit from consistent and reliable weather forecasts, novel research from land-grant colleges and universities, and agricultural extension agents specially placed to disseminate this information.

WFP is equipping small-scale farmers and their governments with some of these same tools. In addition to supplying lifesaving food assistance in places impacted by climate-related extreme events, WFP is working to build resilience among the communities it serves. The largest humanitarian

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NIGER *Since 2014, food-insecure people in Niger participate in the digging of so-called "half-moons" through WFP's Food Assistance for Assets program. The half-moon is a micro water catchment about two meters across at its widest point, a semi-circle carved out of the hard soil. Separated by as little as a few feet, over a larger area the half-moons resemble a field full of flying saucer crash zones – the red dirt mounded up around the area of impact. When they are working well, half-moons don't look like this at all. Instead they are overflowing with grasses, crops like Sorghum and Millet and even fruit trees. In the community of Boussarague in Western Niger, over 400 households have rehabilitated almost 3,000 acres of land, mainly for use in producing food for livestock. The abundance of grasses and leaves produced in the half-moons has increased the number of livestock in the area and led to reduced conflict between herders and farmers. Productivity has risen so much that the community has established a shared cereal bank, with a portion of the grain sent directly to local school meal programs.*

WFP / Simon Pierre Diouf

organization with the deepest field presence in some of the world's most difficult settings, WFP is uniquely poised to do this. Three examples of this work include: (1) insurance schemes for governments and small-scale farmers; (2) weather forecasts and forecast-based financing; (3) Food Assistance for Assets.

First, index-based insurance allows small-scale farmers to receive insurance payouts as compensation for lost production from weather-related events like drought and flooding. Payments are triggered by rainfall totals, vegetation coverage and other objective measures determined through satellite imagining, weather stations or other sources. Almost 100,000 households across Africa are benefiting from such microinsurance arrangements with WFP. Since 2011, $2.5 million in insurance payouts have been distributed to farmers in Ethiopia, Kenya, Malawi, Senegal and Zambia.

At the country level, WFP is also supporting governments in gaining access to macro-insurance instruments for almost 1 million people across Africa. Through the Africa Risk Capacity (ARC) program, countries across Africa share their risk to extreme weather events, each paying premiums to a central pool. When an event in one country occurs, insurance payments are provided for distribution to affected populations from those pooled resources. WFP has purchased so-called "Replica" insurance coverage through ARC to provide greater protection to supported countries. These insurance policies fund WFP's humanitarian operations and drought responses in these countries when a payout is triggered.

Second, WFP is committed to investing in preemptive measures and disaster risk reduction before disasters strike. In countries like Malawi and Tanzania, WFP provides farmers with weather forecasts and climate information through mobile phones, radio and extension agents. Meanwhile, through its forecast-based financing mechanism, WFP uses sophisticated forecasting tools of its own to trigger anticipatory actions in countries that will be affected by extreme weather events. These actions— providing cash transfers to vulnerable households prior to shock or the movement of people and livestock to shelters / evacuation routes —minimize losses and reduce the cost of humanitarian response in the aftermath of an extreme weather event.

Finally, in exchange for food rations or cash transfers, food-insecure people in communities WFP serves participate in projects like building roads and ponds,

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WFP / Mohammed Awadh

tree planting, land restoration and others that promote resiliency. In the last half century, WFP has worked with partners to plant more than 6 billion trees in dozens of drought-affected countries. Each year, approximately 10 million people across more than 50 countries participate in Food Assistance for Assets programs through WFP – reducing their vulnerability to climate shocks and increasing their capacity to respond when extreme weather strikes.

Conclusion

As United Nation Secretary General Antonio Guterres writes in his introduction to the 2019 World Meteorological Organization Statement on the State of the Global Climate, "We are currently way off track to meeting either the 1.5 °C or 2 °C targets that the Paris Agreement calls for. We need to reduce greenhouse gas emissions by 45 percent from 2010 levels by 2030 and reach net zero emissions by 2050. And for that, we need political will and urgent action to set a different path."

Climate change poses a considerable threat to global food security, with potentially existential economic, political and social outcomes for humanity. Addressing food system impacts from climate change is not merely an environmental challenge, it is a human development imperative. Failing to do so will mean increased hunger, suffering and global instability. WFP and other humanitarian organizations are helping to prepare vulnerable populations to face these climate risks, building more resilient, stable populations along the way.

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