

HERITAGE

I N S T I T U T E

PROSPECTS OF FOOD SECURITY IN SOMALIA UNDER LOOMING CLIMATIC CHANGES



November 2021

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1. Executive summary

- From the climate crisis and the global pandemic to food insecurity, humanity faces unprecedented challenges that require resilient and sustainable solutions. Somalia, a country where conflict and instability meet the hazards of natural disasters caused by a rapidly changing climate, is on the frontline of climate change.
- This report provides an assessment of food security challenges in Somalia in the face of destructive climate extremes. It draws heavily on the most recent peer reviewed scientific literature and internationally trusted and validated databases including weather data for the last 30 years from the Hadley Centre/Climatic Research Unit Temperature (HadCRUT).
- Our findings indicate that Somalia has warmed faster than the global average. Alternating droughts and floods have intensified, causing more households to face the risk of becoming food insecure.
- Climate change is predicted to adversely affect agricultural yields in many African countries including Somalia where crop production relies heavily on environmental factors such as rainfall and temperature. There is an interdependent relationship between food production and climate change; the food production system is a significant contributor to climate change because it generates more than a third of anthropogenic greenhouse gases. For example, land use change (e.g., clearing forests for farming which reduces carbon storage in soils and trees) accounts for 30% of greenhouse gas emissions. On the other hand, the food production system is very sensitive to climate change impacts from farm to market levels. Changes in weather patterns and resultant economic shocks have become increasingly significant sources of food insecurity and related social crises.
- The severity of food insecurity is classified into different categories depending on the gravity of the situation, determined by the Integrated Phase Classification (IPC). The IPC is a widely used analytical tool that aims to analyze and subsequently classify the severity of a food security situation according to well-defined standards. Globally, nearly 135 million people faced levels of food insecurity categorized as phase 3 (crisis) or worse in 2020.¹ Similarly, 2.1-2.7 million Somalis faced phase 3 food insecurity or worse in 2020.² Drought was the most common driver of food insecurity in Somalia, followed by floods. In fact, 44% and 27% of households surveyed said they experienced a food security crisis as a direct result of drought and flood, respectively.

1 Global report on food crisis (2020). <https://www.wfp.org/publications/wfp-saving-lives-preventing-famine> (Retrieved on 5 August 2021).

2 IPC Somalia alert (2021). <https://www.ipcinfo.org/ipcinfo-website/alerts-archive/issue-32/en/> (Retrieved on 5 August 2021).

- Land degradation, exacerbated by climate change and population pressure, is a significant driver of food insecurity. Major causes of environmental degradation in Somalia include, but are not limited to, deforestation, soil erosion and erratic weather, which eventually lead to poor farm harvests and livestock mortalities. For countries impacted by extreme weather events because of climate change, when the agriculture and livestock production system get damaged, or annihilated in some cases, it takes a long time to regenerate and recover. Somalia's weak institutions limit its capacity to collect timely data to quantitatively examine the severity of food crises affecting vulnerable populations. This report contributes to filling that quintessential knowledge gap.
- Analysis of the climate change problem as a function of population growth is relevant. Climate change is the consequence of more and more people consuming more resources and releasing enormous quantities of heat-trapping gases. The global population has more than tripled since 1950, from 2.5 billion to 7.9, and is expected to reach close to 10 billion by 2050 (United Nations Population Fund [UNFPA], 2020).³ The population in Somalia is increasing exponentially and much more rapidly than the global average. Population must be included in climate change discussions and the search for solutions.
- Climate change acting as a trigger of violent conflicts is a comparatively new field of study. Hence, the causation connection between climate change and social unrest are still not completely understood. From a socio-political perspective, however, recent studies show that countries that are vulnerable to climate change are more likely to experience civil unrest and risks of political volatility.⁴ This report, therefore, recommends that the Heritage Institute for Policy Studies (HIPS) conducts a separate study and analysis on this important topic.
- The disruption that has been set in motion by the COVID-19 pandemic may push even more households and communities into deeper food insecurity. According to the latest United Nations report⁵, there was a dramatic worsening of world hunger in 2020. Much of that spike was due to the COVID-19 pandemic, with Africa reporting the biggest jump of food insecurity. From a food security standpoint, the most evident impact of COVID-19 has been the increase in food prices, which disproportionately affected countries recovering from conflicts like Somalia. Whether climate factors play any role in the transmission of the virus remains a hotly debated topic of research, with conflicting results depending on the region and climate zone.⁶

3 United Nations Population Fund (UNFPA) 2020). World population trends. <https://www.unfpa.org/data> (Retrieved on 16 July 2021).

4 Warming increases the risk of civil war in Africa (2009). Proceedings of the National Academy of Sciences. 106 (49) 20670-0674; DOI: 10.1073/pnas.0907998106. <https://www.pnas.org/content/106/49/20670>

5 United Nations report (2021): Pandemic year marked by spike in world hunger. <https://www.who.int/news/item/12-07-2021-un-report-pandemic-year-marked-by-spike-in-world-hunger/> (Retrieved on 26 August 2021).

6 Abraham J, Turville C, Dowling K, Florentine S (2021). Does Climate Play Any Role in COVID-19 Spreading? An Australian Perspective. International Journal of Environmental Research and Public Health: 18:9086. <https://doi.org/10.3390/ijerph18179086>

- Somalia is facing food security challenges because of changing weather patterns. To achieve sustainable solutions that address food security concerns, farmers everywhere will need to adapt to inevitable environmental changes and their destructive impacts. Without climate change adaptation policies, the food insecurity situation will continue worsening. Somalia will need to formulate an integrated climate impact management system in which all relevant drivers and humanitarian impacts are included. Most importantly, promoting a climate change resilient system of food production should be prioritized. Adaptation is all about becoming more resilient in the face of climate-related impacts that may occur.

2. Introduction

Somalia has been in ruins, in terms of physical and institutional structure, for the better part of past 30 years. The physical destruction, however, might have concealed a subtle but more precarious form of societal decay: environmental degradation and with that a near total dependency on foreign aid for almost every aspect of livelihood including food security and other necessities. Somalia is a frontline country for climate change because of its geographic location. It is a country where conflict and instability meet with natural disasters caused by a rapidly changing climate. The food security issue cannot be addressed in isolation from the institutional capacity to enhance food production resilience, fending off food price volatility in global markets because of climate shocks and/or other natural disasters.

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Somalia is a frontline country for climate change because of its geographic location. It is a country where conflict and instability meet with natural disasters caused by a rapidly changing climate. The food security issue cannot be addressed in isolation from the institutional capacity to enhance food production resilience

Food security exists when all people at all times have physical, social and economic access to sufficient, safe and nutritious food which meets their dietary needs and food preferences for an active and healthy life ^{7,8}. This definition recognizes the importance of looking beyond hunger towards the goals of ensuring access to safe, nutritious and sufficient food for all people, all year round. The quantity and quality of food are closely related in order to meet satisfactory food security condition. During the past few decades, dietary preferences have shifted globally towards animal-derived products as incomes have increased and urbanization expanded.⁹ Being able to eat a healthy, nutritious diet is now recognized as a basic human right. Yet, according to the latest available estimates, approximately three billion people cannot afford a healthy well-balanced diet.¹⁰ That is around four in every 10 people in the world. Also, as gloomy as it may sound, it may not be entirely surprising to assume that the food security situation in Somalia is at the lower end of that scale. For this reason, this report examines several factors related to the quantity (food availability, accessibility) and quality of diets consumed at the household level.

7 Reform of the committee on world food security final version. Rome, 14, 15 and 17 October 2009. <http://www.fao.org/3/k7197e/k7197e.pdf> (Retrieved on 26 July 2021).

8 World Food Summit (1996) Rome Declaration on World Food Security and World Food Summit Plan of Action. World Food Summit 13-17 November 1996. Rome.

9 Popkin, B. M., Adair, L. S., and Ng, S.W., 2012. Global nutrition transition and the pandemic of obesity in developing countries. *Nutrition Reviews*, 70, 3–21. doi: 10.1111/j.1753-4887.2011.00456.x

10 Herforth, A., Bai, Y., Venkat, A., Mahrt, K., Ebel, A. Masters, WA. 2020. Cost and affordability of healthy diets across and within countries. Background paper for The State of Food Security and Nutrition in the World 2020. FAO Agricultural Development Economics Technical Study No. 9. Rome, FAO. <https://doi.org/10.4060/cb2431en> (Retrieved on 26 July 2021).

Interestingly, dietary shift comes with huge environmental cost: global greenhouse gas emissions from animal-based foods are about twice those of plant-based foods.¹¹ Attaining food security goals in the face of a growing population with shifting dietary preferences, land degradation and a changing climate is the greatest challenge of 21st century.

The notion of securitizing the food supply and demand system (i.e., food security) represents an interestingly important paradigm shift. People's ability to secure enough food for healthy and productive lifestyles has reached such a level that it needs to be treated as a matter of national security. Historically, it was Thomas Malthus¹² who, for the first time in recorded history more than 200 years ago, sounded the alarm to predict that the world's population growth would eventually exceed its food supply, causing massive global food insecurity. Malthus rationalized his thesis by noting that the human population is growing exponentially while food production increases linearly at best. Therefore, famines would become more commonplace as environmental resources are outstripped and earth's carrying capacity exceeded. One striking manifestation of Malthus's prediction is the Irish potato famine of the 1840s when over a million people perished after the harvest of the country's main staple food crop, potato, failed.¹³ What was particularly remarkable about this tragedy was that it happened in one of the world's richest countries, Ireland. What was missing from Malthus's grim analysis, however, was the effects of climate change on food production.

Climate change is an emerging challenge for the future of food security.¹⁴ The impact of climate change takes two major forms: alternating droughts and floods. Droughts and floods, both of which are serious natural disasters, have common causes: shifting rainfall patterns and extreme weather due to climatic changes. The deadly floods that swept through large parts of Europe in 2021 (Fig. 1), Germany and Belgium in particular, are the most recent and striking illustration of the kind of devastation that climate change can inflict on societies,¹⁵ despite ample warnings and technological capacity. These floods claimed hundreds of lives, and German authorities estimate that the damage caused amounted to over \$2.3 billion. Consequently, floods now rank as one of the most destructive natural disasters in Europe. The flooding in Europe was caused by a severe storm and continuous rainfall during which the soil's natural drainage was overwhelmed and no longer able to absorb the excess water. The water flooded onto nearby areas causing damage to farms, buildings and infrastructure. The extreme weather events in the summer of 2021 are likely to serve as a turning point for a global awareness over the looming climate crisis.

11 Xu, X., Sharma, P., Shu, S. et al. (2021) Global greenhouse gas emissions from animal-based foods are twice those of plant-based foods. *Nature Food* 2, 724–732.
<https://doi.org/10.1038/s43016-021-00358-x>

12 Malthus, T (1798) *An Essay on the Principle of Population*, London: J. Johnson.

13 Roser, M., Ritchie, H. & Ortiz-Ospina, E. (2019) 'World Population Growth', Our World in Data, <https://ourworldindata.org/world-population-growth> (Retrieved on 26 July 2021).

14 Lobell, DB, Burke, MB, Tebaldi, C, Mastrandrea, MD, Falcon, WP, and Naylor, RL (2008) Prioritizing Climate Change Adaptation Needs for Food Security in 2030. *Science* 319: 607-610.

15 Cornwall, W (2021) Europe's deadly floods leave scientists stunned.

<https://www.sciencemag.org/news/2021/07/europe-s-deadly-floods-leave-scientists-stunned> (Retrieved on 21 July 2021).

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Typically, Somalia has two rainy seasons: the Gu’ from April to June and the Dayr from October to November, with annual average rainfall ranging from 50 mm in coastal Globally, droughts that may have occurred only once in 10 years now happen 70% more frequently, with greater intensity and resulting damage

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The time has come to move forward and try to undertake science-based research on critical issues such as environment and food security

It is worth noting that if climate change in the form of alternating droughts and floods can cause this kind of destructions in the most advanced countries in the world, economically and technologically, then it is plausible to theorize that the impact of climate change on all aspects of human life will be more disastrous in less developed countries like Somalia.

Typically, Somalia has two rainy seasons: the Gu’ from April to June and the Dayr from October to November, with annual average rainfall ranging from 50 mm in coastal Globally, droughts that may have occurred only once in 10 years now happen 70% more frequently, with greater intensity and resulting damage.¹⁶ Nomadic communities eke out a living on just a few inches of rainfall each year. When the rainy seasons become insufficient, livestock die in large numbers and rain-fed crops fail, damaging and rendering destitute the communities that depend on these products. Weak or non-functioning government institutions in Somalia means the country is not in a position to mitigate the climate change impact crises. After three decades of conflict and insecurity which shattered the livelihoods of the entire population, Somalia is now on the road to recovery. The time has come to move forward and try to undertake science-based research on critical issues such as environment and food security.



Fig. 1: Floods in Germany (AP Photo/Michael Probst) and fires in Oregon in the US in 2021.

¹⁶ IPCC, 2021: Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press. In Press. <https://www.ipcc.ch/report/ar6/wg1/> (Retrieved on 19 August 2021).

2.1 Objectives

The objectives of this study are as follows:

1. Analyze the long-term (30-year average) earth temperature to detect warming trends in order to project future temperature scenarios.
2. Identify relationships between environmental changes and food insecurity from farm level to the market.
3. Understand the coping strategies used by households, farmers, various levels of government and international bodies.
4. Recommend strategies and policies to prevent and mitigate climate change-induced disasters.

3. Research questions

1. What does science tell us about climate change?
2. How does climate change affect food accessibility in the country?
3. What strategies do people use to access food when faced with food insecurity?
4. To what extent are various levels of governments responsive to and addressing food accessibility problems?
5. How may climate change-induced food insecurities catalyze violent conflicts among groups competing over limited resources?
6. What are the best practices in addressing food security challenges in Somalia in the face of a changing planet?

4. Methodology and data collection

This report takes a mixed methodology approach, combining quantitative and qualitative research. Secondary data from reliable sources was used for analysis. For climate change data, the HadCRUT model from the Climatic Research Unit (University of East Anglia) in conjunction with the Hadley Centre (UK Met Office) was used. We used the Food and Agriculture Organization (FAO) of the United Nations' country profile and other reliable databases to assess the current level of food production and land use. In the absence of baseline data to demonstrate change in food security over time, a survey questionnaire was distributed to a representative household sample in six selected cities: Bosaso, Garowe, Galkayo, Belet-weyn, Baydoa and Kismayo. The survey questionnaire consisted of sequential questions designed to dissect opinion and views on household food security and likely triggers. The Food Security and Nutrition Analysis Unit for Somalia (FSNAU) which contains an abundance of raw data was used in order to analyze the food security situation for the most recent years. Food insecurity data for 2017, 2018 and 2020 for all the 18 provinces was extracted and analyzed. 2020 was included to ascertain the impact of COVID-19 on household food security. We averaged the seasonal data to estimate annual Integrated Phase Classification (IPC) levels. Officials of federal and regional governments with food security portfolios were interviewed to examine the policies in place to mitigate climate change and its impact on food security. The findings of this survey constitute an important database to be used in the future as a baseline against which to evaluate progress or lack of progress for national food security in a changing climate.

5. Literature review

5.1 Scientific evidence of climate change: Somalia at the tipping point

Human actions are transforming ecosystems across the globe. Huge quantities of greenhouse gas are being released into the atmosphere. An analysis of available data provides discernible evidence that the earth is warming, with more frequent droughts and floods over the past decades^{17, 18}. The increased frequency of drought, fires, floods and heatwaves in different parts of the world over the past decade surprised predictive models.

17 NASA (2020) "Consensus: 97% of climate scientists agree." Global Climate Change. <https://climate.nasa.gov/> (Retrieved on 28 July 2021),

18 NOAA (2020) What evidence exists that Earth is warming and that humans are the main cause? <https://www.climate.gov/news-features/climate-qa/what-evidence-exists-earth-warming-and-humans-are-main-cause> (Retrieved on 26 July 2021).

Greenhouse gas concentrations in the atmosphere have increased since the industrial revolution, driven largely by economic activities and population growth.¹⁹ Climate change is a universal problem that transcends physical and political boundaries; it ties the fate of humanity together, with a widely varying degree of impact mitigation efforts and technological abilities to adapt to its consequences. The issue of climate change has never been higher on the agenda of global leaders seeking to limit greenhouse gases emissions into atmosphere. The Glasgow COP 26 meeting, where global leaders attempted to reach a binding cap on greenhouse gas emissions with mixed results, represented the latest example of efforts to accelerate action towards reducing heat-trapping gases.

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Among East African countries, Somalia experienced the greatest earth temperature increase from 1987 to 2017 (Fig. 2). This indicated accelerated warming. The net temperature change stood at 2.5 oC, well above the 1.5 oC which is considered a global tipping point

One important scientific means of tracking the extent of climate change is the use of indicators. An indicator represents the state or trend of certain physical environmental conditions over a given area and a specified period. Ambient temperature is a convenient, simple and easily measurable indicator of the state of global climate change. It is readily available and can be obtained from world meteorological stations in the absence of local data. One widely used indicator in climate science is the Hadley Centre/Climatic Research Unit Temperature (HadCRUT) global land and ocean temperature dataset, providing gridded temperature anomalies from across the world.

Raw data on Somalia was extracted from HadCRUT²⁰ which showed that, among East African countries, Somalia experienced the greatest earth temperature increase from 1987 to 2017 (Fig. 2). This indicated accelerated warming. The net temperature change stood at 2.5 oC, well above the 1.5 oC which is considered a global tipping point. In comparison, the newest estimates of global surface air temperatures showing a warming of about 0.89 oC,²¹ suggesting that Somalia and East Africa may already be at the tipping point at which the earth's temperature crosses a threshold that triggers irreversible impacts. The assumption is that if we can keep global warming below 1.5 oC, we can remain within our adaptive capacity.

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The reason Somalia is warming faster certainly has something to do with its geographical location.

As shown in Fig. 2, temperatures in Somalia warmed faster than the global average from 1987-2017, according to our modelling data analysis, which suggests Somalia is potentially facing frequent climate disasters. The reason Somalia is warming faster certainly has something to do with its geographical location. Somalia's relatively flat landscape and long coastline are favorable conditions for the accumulation of large quantities of solar radiation on the earth's surface. It remains quite difficult, however, to model with a high degree of accuracy to what extent the temperature will increase in the coming decades.

19 IPCC (2018). Climate synthesis report. https://www.ipcc.ch/site/assets/uploads/2018/05/SYR_AR5_FINAL_full_wcover.pdf (Retrieved on July 25, 2021).

20 <https://crudata.uea.ac.uk/cru/data/temperature/#sciref> (Retrieved on 3 September 2021).

21 IPCC (2014) Part B: Regional Aspects. <https://data.globalchange.gov/report/ipcc-ar5-wg2-partb> (Retrieved on 3 September 2021).

“
 If this proves to be a consistent trend, then Somalia will be a place where the hazards of conflict meet with the hazards of climate change, creating an agonizing feedback loop that punishes some of the world's most vulnerable people and destroys their ability to maintain a decent life

There is, however, abundant empirical and model-based evidence that weather extremes will increase in correlation to a warming climate.^{22/23} If this proves to be a consistent trend, then Somalia will be a place where the hazards of conflict meet with the hazards of climate change, creating an agonizing feedback loop that punishes some of the world's most vulnerable people and destroys their ability to maintain a decent life. Adapting to rising temperatures and the extreme weather associated with it will be a difficult and costly task for which countries like Somalia are not prepared.

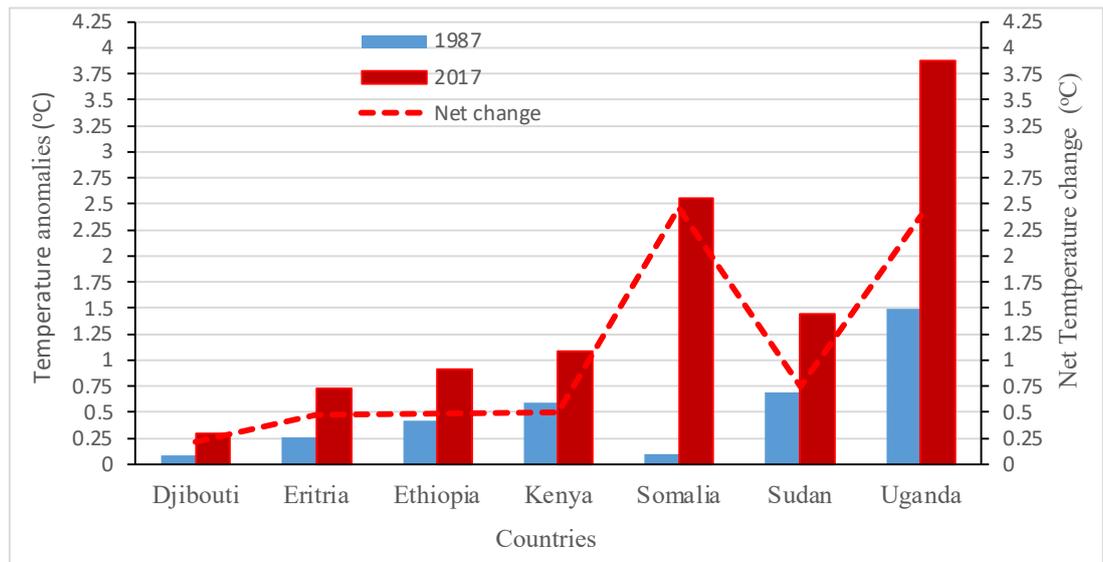


Fig. 2: Surface temperature anomalies between 1987 and 2017 (the latest available long-term data for Somalia). The baseline is 1987-2017 average. The raw data was extracted from: <ourworldindata.org> <https://ourworldindata.org/grapher/hadcrut-surface-temperature-anomaly>

The latest report from the Intergovernmental Panel on Climate Change (IPCC) of the United Nations²⁴ finds that limiting warming to 1.5°C or even 2°C will be beyond reach unless there are comprehensive, rapid and immediate reductions in temperature-increasing greenhouse gas emissions. Greenhouse gases differ in two respects: 1) persistence in the atmosphere (atmospheric residence lifetime) and 2) the contribution that each gas makes to global warming (climate forcing). Among major greenhouse gases, carbon dioxide (CO₂) is the main contributor to global warming. The difference between 1.5°C and 2°C may seem negligible, but for every tiny increment of global warming, changes in extremes become larger.

22 wain, D.L., Langenbrunner, B., Neelin, J.D. et al. (2018) Increasing precipitation volatility in twenty-first century California. *Nature Climate Change* 8, 427–433.

23 Pendergrass, A. G. et al. (2019) Nonlinear response of extreme precipitation to warming in CESM1. *Geophysical Research Letters*. 46, 10551–10560 (2019).

24 IPCC, 2021: Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press. In Press. <https://www.ipcc.ch/report/ar6/wg1/> (Retrieved on 19 August 2022).1



A warmer atmosphere can hold more moisture, resulting in more extreme rainfall that raises flood risks. It also increases evaporation, leading to more intense droughts

For example, an extreme heat event would happen 4.1 times a decade at 1.5°C of warming, compared to 5.6 times at 2°C.²⁵ A warmer atmosphere can hold more moisture, resulting in more extreme rainfall that raises flood risks. It also increases evaporation, leading to more intense droughts.

Overall, the consensus among the climate scientists and modeling experts is that the earth's surface is warming, causing high weather variability. In the first half of 2021, record-breaking extreme weather events were recorded across the globe. For example, temperatures reached 50°C in British Columbia, Canada. The world is nowhere near on track to limiting the global temperature rise to the 1.5 °C agreed by the Paris climate treaty (COP 21) in 2015. The COP 26 climate summit in Glasgow in November 2021 was billed as a last chance to limit global warming to 1.5 °C. There is an intense debate about whether we have entered a new phase of climate change, where extreme weather may become the new normal. For example, on 21 July 2021, the New York Times²⁶ published an article entitled “Climate Change Comes for Rich Countries” in which the brutal heat in North America and deadly floods in Europe were analyzed. The most important takeaway message was climate change is current and real, not a distant problem, with serious consequences, and it will get worse if we continue our present course.



Particularly concerning is that many countries, including Somalia, don't have what it takes to adapt to extreme weather events

From a food production perspective, higher air temperatures will increase evapotranspiration losses which, in turn, will result in less groundwater recharge and less water availability in the surface soil layers for plant growth. The major impacts of frequent drought include the reduction of vegetation for grazing and more variable water availability, with grave impacts on livestock herding and related livelihoods.²⁷ Furthermore, rising temperatures are associated with higher levels of pollution, which is likely to worsen. Particularly concerning is that many countries, including Somalia, don't have what it takes to adapt to extreme weather events.

The health effects of climate change have been more subtle, but the health challenges created by global warming will likely last decades, perhaps centuries. Global warming, according to a 2021 Lancet report,²⁸ is not just an environmental disaster but also exposes humans to scorching heat and extreme weather events, increasing the transmission rate of infectious diseases, putting food security at risk and sustainable development goals out of reach.

25 IPCC, 2021: Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press. In Press. <https://www.ipcc.ch/report/ar6/wg1/> (Retrieved on 19 August 2021).

26 New York Times. <https://www.nytimes.com/2021/07/21/climate/nyt-climate-newsletter-wildfires-disasters.html> (Retrieved on 21 July 2021).

27 FAO (2017) The impact of disasters and crises on agriculture and food security. <http://www.fao.org/3/i8656en/i8656en.pdf> (Retrieved on July 26, 2021).

28 The 2021 report of the Lancet Countdown on health and climate change: code red for a healthy future. The Lancet 398: 1619-162. October 2021. DOI: [https://doi.org/10.1016/S0140-6736\(21\)01787-6](https://doi.org/10.1016/S0140-6736(21)01787-6)

5.2 Environmental resources and food security



Lack of a fully functioning government and effective public institutions have subjected the country to extreme environmental degradation both natural and manmade. Consequently, environmental degradation exacerbated by changing climatic conditions is a critical environmental issue in Somalia

Food systems completely rely on a variety of earth natural resources which, in many regions of the world, represent major limiting factors of production. There are a number of challenges to assuring food security in a sustainable manner. These include:²⁹ 1) widespread poverty which inhibits people's capacity to grow and/or purchase the needed food; 2) large increases in developing country populations, especially in urban areas; 3) and degradation of natural resources such as soil and water which undermines productive capacity. Thus, food security challenges become exponentially more difficult for fragile nations recovering from crises like Somalia for two main reasons: weak policy-making institutions and a lack of sustained economic development. Poverty is both a cause and an effect of environmental degradation. Poor people often destroy their environment, not because they are ignorant or do not care, but to survive in the short-term which leads to further degradation, in turn making people even poorer. This vicious cycle is illustrated in Fig. 3. Lack of a fully functioning government and effective public institutions have subjected the country to extreme environmental degradation both natural and manmade. Consequently, environmental degradation exacerbated by changing climatic conditions is a critical environmental issue in Somalia.

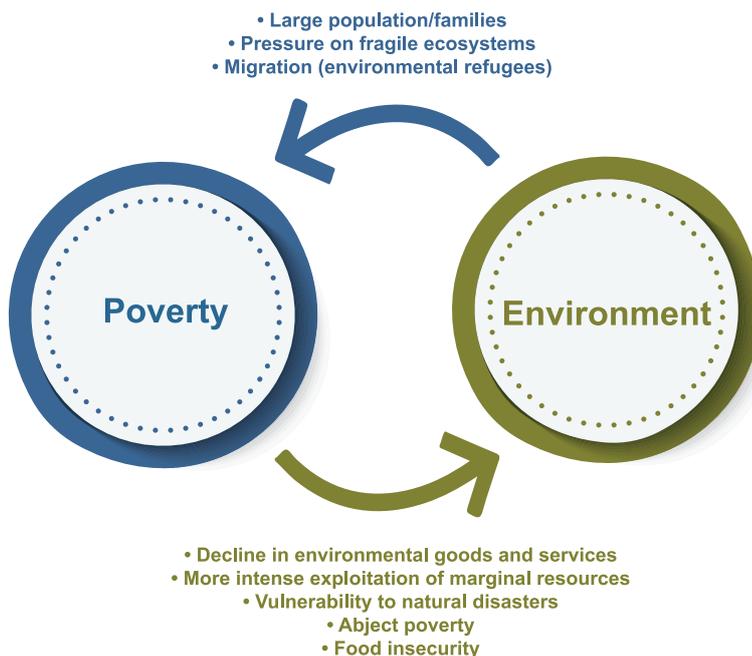


Fig. 3: Schematic representation of the linkages between environment and human wellbeing

29 Pinstrup-Andersen, P; Pandya-Lorch, R (1998) Food security and sustainable use of natural resources: a 2020 Vision. Ecological Economics 26: 1-10.

5.3 Environmental constraints of food security

Rising demand for food by expanding population presents great challenges. Less obvious, however, are the connections between them. See Fig. 4. Environmental resources necessary for agricultural practices to support society's growing demands are not evenly distributed. Key food security constraints in Somalia, like other arid and semi-arid regions of the world, can be summarized as follows: 1) rapidly growing population requiring more resources; 2) land resources: soil erosion which affects soil's productive capacity and ever-increasing resultant losses; 3) water resources: supply (quantity), accessibility and quality based on the intended uses; 4) and climate change trends: temperature, rain, frequency and intensity of droughts and floods.

Besides water, the second most important resource upon which food production relies on is soil. Sustainable land use practice is an important frontier to improve productive capacity and enhance the quality of degraded soils in desert ecosystems. Therefore, for the sake of brevity, we will limit our discussion on four interlinked critical factors: 1) population growth pressure, 2) water resources, 3) arable land, and 4) climate change and famine.



Fig. 4: Interconnected demands of the food production system with population growth, production factors, and natural factors.

5.3.1 Population growth and food security implications

“
It is possible to use models to predict future growth scenarios under different assumptions. For example, using the equation in Fig. 5, the population is expected to double again by 2042 to 28 million, and the increase will continue exponentially

Human population is the main driver of environmental change and the number of people living on earth is rising rapidly. Global population has more than tripled since 1950, from 2.5 billion to 7.9 billion, and is expected to reach close to 10 billion by 2050 (United Nations Population Fund [UNFPA], 2020).³⁰ In Somalia, the population is increasing exponentially, as depicted in Fig. 5, and much more rapidly than the global average. In fact, Somali population growth is among the highest in the world with average fertility rate of 7.5 children per woman.³¹ From 1991 to 2017, the population of Somalia doubled to reach 14 million. It is possible to use models to predict future growth scenarios under different assumptions. For example, using the equation in Fig. 5, the population is expected to double again by 2042 to 28 million, and the increase will continue exponentially. This will create greater demand for food, energy, water and other environmental goods and services from a planet already strained under enormous pressures on multiple fronts. If the population grows faster than predicted, Somalia would be in even more serious trouble than it is today. The lingering challenge is how Somalia, and the world, can feed the rapidly increasing population without: i) exceeding earth's carrying capacity, ii) depleting vital environmental resources and iii) generating pollution levels that can exceed earth's ability to absorb, all amid a changing planetary climate.

“
On a global scale, it is not only the number of people that matter in terms of resource consumption, but also how people are organized (e.g., urbanization), the level of affluence, changing dietary preferences and the planet-warming gases emission rates

Producing enough food for a booming population is an urgent global mission. On a global scale, it is not only the number of people that matter in terms of resource consumption, but also how people are organized (e.g., urbanization), the level of affluence, changing dietary preferences and the planet-warming gases emission rates. For example, rich countries, including Canada, Japan, the United States and countries in Western Europe, account for 12% of global population but are responsible for 50% of greenhouse gases released into the atmosphere.

Despite Malthusian's concerns more than 200 years ago about our ability to increase the supply of essential resources to keep pace with demand, we have so far been largely successful and most social indicators have improved. But these measures of progress come with serious environmental consequences; greenhouse gases concentrations in the atmosphere are higher than ever before, causing climate change which leads to more extreme weather conditions and major humanitarian impacts.

30 United Nations Population Fund (UNFPA) 2018). World population trends. <https://www.unfpa.org/data/world-population-dashboard> (Retrieved on 16 July 2021).

31 UN (2020) World Population Prospects <https://population.un.org/wpp/DataSources> (Retrieved on 1 August 2021).

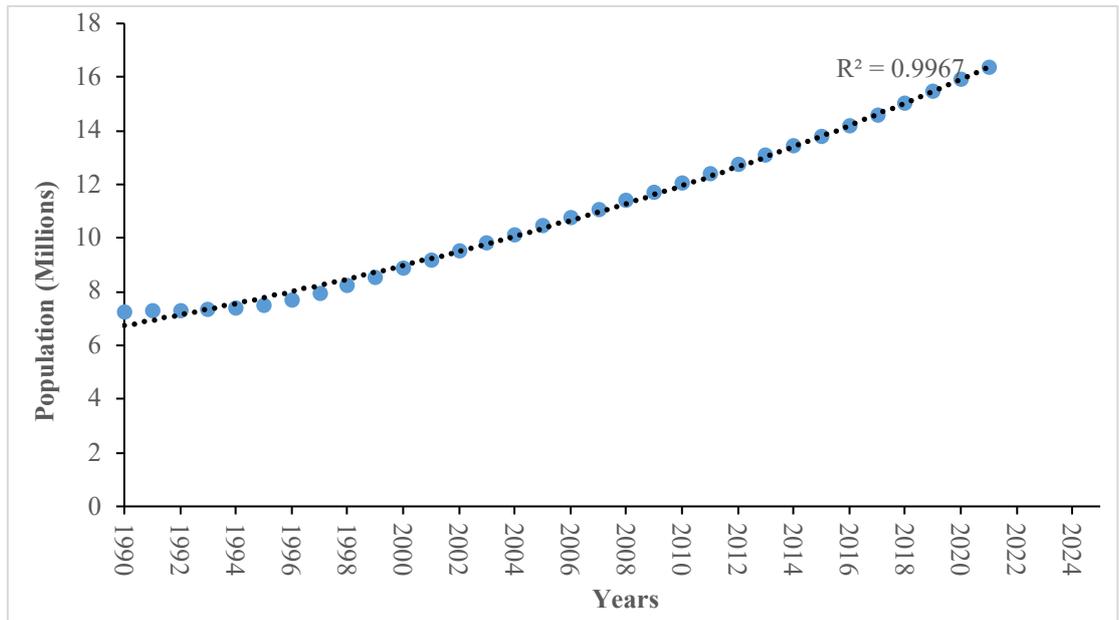


Fig. 5: Somalia's population growth from 1990-2020

5.3.2 Water resources

“*In Somalia, this means that the food demands of a growing population will have to be met with fewer resources and more sustainable practices. The best way of creating a water conservation system is to promote a culture of “every drop of water must count”³⁴ in order to make the most of limited resources*”

On a global scale, agriculture consumes close to 80% of the freshwater resources³² and is currently coming under extreme pressure from other competing sectors. According to some estimates, by 2025, water supply will fall to approximately 500 m³ per capita, per year due to high population growth and changing dietary preferences. That is 15% of what it was in 1960 when it stood at 3,300 m³ per capita, per year³³. In Somalia, this means that the food demands of a growing population will have to be met with fewer resources and more sustainable practices. The best way of creating a water conservation system is to promote a culture of “every drop of water must count”³⁴ in order to make the most of limited resources. In arid regions like Somalia, water productivity is far below its potential and there is definitely room for improved efficiency. Irrigation technology has the potential to achieve better efficiency (less water with higher yields), saving huge amounts of water in the face of a declining supply due to climate change, competing demands, or a combination of both.

32 IFAD. 2009. “Fighting water scarcity in the Arab countries.” Rome: IFAD. Available http://www.ifad.org/operations/projects/regions/pn/factsheets/WWF_factsheet.pdf (Retrieved on 26 July 2021).
 33 IFAD. 2009. “Fighting water scarcity in the Arab countries.” Rome: IFAD. Available http://www.ifad.org/operations/projects/regions/pn/factsheets/WWF_factsheet.pdf (Retrieved on 26 July 2021).
 34 Postel, S (2000) Water and world population growth. American Water Works Association. <https://doi.org/10.1002/j.1551-8833.2000.tb08927.x>

5.3.3 Arable land resource

The most obvious solution to meet exploding demands of food for an exponentially increasing population is to bring more land under cultivation. As societies try to keep pace with rising demand, agriculture has become the single largest user of land, occupying 38-40% of the earth's surface³⁵ Lack of suitable land to grow crops, along with water scarcity, are major issues in a growing number of countries. Concerns about food security have led some governments and investors to seek control of land in other countries. FAO projections for 1999–2030 estimate an increase in global agricultural production by 56%, with arable land expansion accounting for 21% of production growth in developing countries.³⁶ As a consequence, the soil is increasingly becoming degraded, and the problem is likely to get worse as a result of climate change. One of the results of intensive agriculture is the desertification of once productive land. Human-induced soil degradation has already made large areas unsuitable for farming and grazing, especially in semi-arid parts of the world. Improving production on existing agricultural land by managing available resources more efficiently is a key part of the solution and should be a priority on Somalia's food security policy agenda. An additional challenge is that much of the remaining parts of the terrestrial surface are covered by deserts, cities (urbanization) and land unfit for cultivation. While it is difficult to tell how much more arable land would be required to keep pace with population growth for the long-term, it is conceivable that there is still enough cultivatable land in Somalia for the short/medium term. Currently, slightly more than 70% of Somalia is classified as agricultural land.³⁷ Therefore, on the land resource front, there is no acute shortage of arable land that can be cultivated to enhance domestic food production.

5.3.4 Food insecurity and climate change

Historically, all famines that have had devastated Somalia in recent memory were caused by droughts. Traditionally, Somalis give names to droughts depending on their duration and severity. For example, in the early 20th century, the great poet Ismael Mire composed a famous poem describing an extreme drought named “Gaag ma reebto” that nearly wiped-out entire communities (Abaar gaag ma reebta ah baa dhacdiyo Gaadamoo kalée), which roughly translates to “extreme levels of drought similar to Gaadamo are reported in our region”. More recently, the 1974-1975 drought became known as “Dabadheer” which translates to “the long-tailed one” because it persisted for a longer time than Somalis were used to or had heard about from their ancestors.

35 FAO. (2015). food security indicators. <https://www.fao.org/publications/card/en/c/c2cda20d-ebef-44678a94038087fe0f6e/> (Accessed on 27 October 2021).

36 FAO. (2018). FAOSTAT - FAO database for food and agriculture, Rome Food Agric. Organ. U. N. FAO. <https://www.fao.org/faostat/en/#home> (Accessed 3 October 2021).

37 <https://data.worldbank.org/indicator/AG.LND.AGRI.K2?end=2018&locations=SO&start=196&view=chart> (Retrieved on 3 August 2021).



As recently as February 2021, over 2.6 million people in Somalia were facing extreme food insecurity³⁸ caused by a combination of poor and erratic rainfall, flooding, the socioeconomic impacts of Covid-19 and instability

There was a massive mobilization of national resources which saved countless lives and helped rebuild their livelihoods. After this drought, important lessons were learned, and mitigation actions were implemented. What is different now, however, is that droughts are becoming more frequent with greater intensity and lasting damage, which severely strains food production systems.

The effects of climate change vary with locality; low-lying regions like Somalia are amongst the most vulnerable and have been hit hardest. Subsistence farmers, because of their meager resources and limited technological capacity, are the least able to cope with the changing climate. During the last decade, Somalia experienced its worst drought in decades, killing millions of livestock animals (Fig. 6) and pushing millions of people into food insecurity. The 2010-2011 drought was described as the worst drought for 60 years and triggered a declaration of famine. The impact of this kind of disaster on livelihood is often irreversible in the short term, with immensely damaging effects. As recently as February 2021, over 2.6 million people in Somalia were facing extreme food insecurity³⁸ caused by a combination of poor and erratic rainfall, flooding, the socioeconomic impacts of Covid-19 and instability. On the other hand, recurrent floods cause population displacement and damage to crops and farmland in riverine areas of Hiiraan, Shabelle and Juba.



From an environmental governance viewpoint, a major lesson from the Dabadheer drought disaster was the creation of the National Range Agency (NRA) to preserve forests

Prior to the collapse of the Somali state in 1991, there were many initiatives and agriculture and agri-food programs aimed at addressing national food security objectives, albeit with mixed results. From an environmental governance viewpoint, a major lesson from the Dabadheer drought disaster was the creation of the National Range Agency (NRA) to preserve forests. Deforestation causes the rainforest system to collapse, releasing CO₂ into the atmosphere rather than storing it. A key reason for the creation of the NRA was to spearhead conservation efforts, protect pastures from overgrazing and prohibit charcoal exports in an effort to halt deforestation and preserve forests. This illustrates the importance of functioning institutions to mitigate the impacts of natural disasters and dispel the myth that food security is separate from environmental policies.

³⁸ Food Security and Nutrition Analysis Unit – Somalia. <https://www.fsnao.org/node/1857> (Retrieved on 28 July 2021).



Fig. 6: Hundreds of dead sheep and goats litter the landscape in the Awdal region of Somaliland as pasture and water supplies disappear. (Adapted from Concern Worldwide, US)



Many Somalis rely on their relatives in the diaspora in times of severe weather and other extreme events. Members of the diaspora provide an estimated \$ 1.4 billion in remittances annually, equivalent to 25% of Somalia's GDP

Moving forward, climate change represents an unprecedented challenge for sustainable food security goals. The harvest of countries that depend primarily on rain for crops and livestock grazing will be hit hardest.³⁹ Inevitably, this will cause an increase in food prices,^{40/41} with the economic effects felt most acutely in low income households where governments do not have economic tools to subsidize basic commodities. Many Somalis rely on their relatives in the diaspora in times of severe weather and other extreme events. Members of the diaspora provide an estimated \$ 1.4 billion in remittances annually, equivalent to 25% of Somalia's GDP, to aid recovery and mitigate vulnerability to some extent.⁴² A survey conducted by IOM⁴³ found that recipients spend most of their remittance money on basic needs like food, alleviating food insecurity.

6. Imports fill food security gap

Food security demands can be met through supplies from domestic production, import capacity (trade) and food aid during periods of unexpected crises. Food security metrics focus primarily on food availability at the global and national scales, access and utilization at the household and individual levels. The stability of food security over time at all these levels is an important guide to the national food security goals.

39 World Water Day (2017) Coping with water scarcity challenge of the twenty first century. 22nd March 2017 world water day. <http://www.unwater.org/downloads/escarcity.pdf> (Retrieved on 28 July 2021).

40 Intergovernmental Panel on Climate Change (IPCC). (2014) AR5 Climate Change 2014: Impacts, Adaptation, and Vulnerability. <https://www.ipcc.ch/report/ar5/wg2/> (Retrieved on 28 July 2021).

41 Coumou, D., Rahmstorf, S (2012) A decade of weather extremes. Nature Climate Change, 2: 491-496. <https://www.nature.com/articles/nclimate1452>

42 Somalia National Development Plan 2020-2024. <https://mop.gov.so/wp-content/uploads/2019/12/NDP-9-2020-2024.pdf> (Retrieved on 28 July 2021)

43 IOM –UN migration <https://medium.com/@UNmigration/unflattered-by-covid-19-somali-diaspora-maintain-remittance-flows-c2b9d315c5a7> (Retrieved on 29 July 2021).

A simplified diagram showing the otherwise complex ways in which these metrics are interconnected is illustrated in Fig. 7.



Furthermore, food can be used as a weapon for geopolitical reasons

Trade has always played a critical role in supplementing domestic food production deficiency since no country in this world is totally self-sufficient. Food imports assume a special significance of economic, political, and social dimensions in certain situations. Firstly, there are genuine concerns that import routes can become vulnerable to disruption or closure if armed conflicts flare up along transportation routes.⁴⁴ Secondly, food importing countries depend on the political, environmental and economic situations prevailing in the exporting countries that might choose or be forced to alter the supply of food available to the market.⁴⁵ For example, following severe drought in 2010, Russia imposed a temporary ban on wheat exports out of concern for domestic food security. Similar situations also emerged during the world food crisis of 2007/2008. Governments of major exporting countries took steps to impose restrictions and/or bans on exports for fear of food shortages for their populations. Inevitably, this had led to food prices spiking. Furthermore, food can be used as a weapon for geopolitical reasons.⁴⁶



Food Policy Research Institute shows that climate change is expected to diminish crop yields, lifting prices by up to 78 percent. The challenges of dealing with the economic effects of climate change on food prices is much greater for economically impoverished countries like Somalia

For food importing countries, these natural and/or human made events represent an existential threat to national food security and overall national or regional stability. The issue of food import dependence is increasingly becoming more acute as the world becomes more integrated ecologically, economically, technologically and epidemiologically. At the beginning of the COVID-19 pandemic, a sense of food insecurity was felt globally, but most acutely in food importing countries including wealthy nations. The latest study from the International Food Policy Research Institute shows that climate change is expected to diminish crop yields, lifting prices by up to 78 percent.⁴⁷ The challenges of dealing with the economic effects of climate change on food prices is much greater for economically impoverished countries like Somalia.

44 Bailey, R. and Willoughby, R. (2013). Edible Oil: Food Security in the Gulf Energy: Environment and Resources | November 2013 | EER BP 2013/03. Available at <https://www.chathamhouse.org/sites/files/chathamhouse/public/Research/Energy,%20Environment%20and%20Development/bp1113edibleoil.pdf> (Retrieved 10 August 2021).

45 Elmi, A. (2017). Food Security in the Arab Gulf Cooperation Council States. *Sustainable Agriculture Reviews* 25: 89-114.

46 Natalie Koch (2021). Food as a weapon? The geopolitics of food and the Qatar–Gulf rift. *Security Dialogue* 52: 118-134. <https://doi.org/10.1177%2F0967010620912353>

47 International Food Policy Research Institute (2021) <https://www.ifpri.org/publication/food-security-farming-and-climate-change-2050> (Retrieved 12 August 2021).

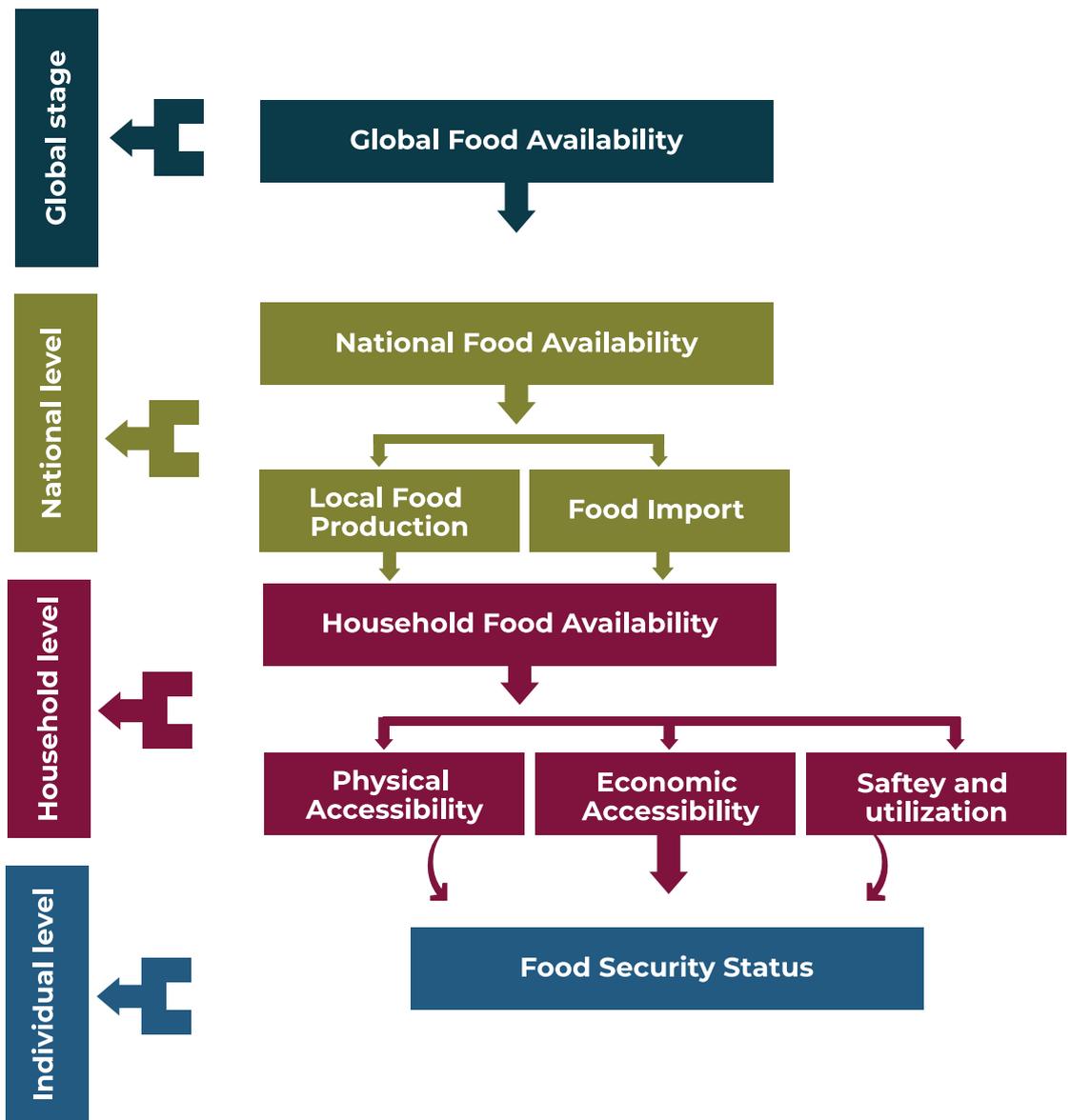


Fig. 7: Hierarchy of food security from the global to the individual level.

7. Climate change as a precursor of violent conflicts



Despite this self-evident link, climate change as a cause of violent conflicts is a comparatively new field of study, and the links between climate change and social unrest are still poorly understood because of the lack of reliable quantitative data

The consequences of climate change pose cascading threats to the global security system, ranging from colossal shortages of essential resources to massive population movements (environmental refugees). This could lead to rising social tensions and armed conflicts within regions. Despite this self-evident link, climate change as a cause of violent conflicts is a comparatively new field of study, and the links between climate change and social unrest are still poorly understood because of the lack of reliable quantitative data. That is not to say, however, that environmental changes as a multiplier of conflict is in any way new. The logic for this is simple: changes in climate systems can often lead to an escalation of conflict between pastoralist herders and farmers over the access to scarce resources such as water. There is accumulating evidence suggesting that natural disasters, particularly recurrent droughts, contribute to aggravating existing civil conflicts.⁴⁸ Consequently, there is a growing consensus that climate change should be considered as an integral part of broader national security issues.

A recent study in continental Africa concluded at statistically significant levels that regions exposed to rapid climate changes are more likely to experience political instability and civil wars.⁴⁹ These climate change-induced shocks frequently cause internal conflicts revolving around issues of contested land use, grazing rights and insecure access to water and pasture between farmers and herders and between pastoralist groups. Existing tensions and conflict risks are amplified during extended dry periods when pastoralist livelihoods become particularly precarious. This results in economic insecurity and resource scarcity, leading to increased risks of resource claims and violent conflict. Furthermore, climate change impacts could push 200 million more people out of their homes to become environmental refugees⁵⁰, with sub-Saharan Africa being the most vulnerable region due to land degradation, fragile coastlines and the population's dependence on agriculture.

8. Current food security situation

The current food security situation at the household level was assessed using available databases such as the Food Security and Nutrition Analysis Unit (FSNAU). An analysis of the data extracted from FSNAU⁵¹ is presented in Fig. 8. The Integrated Food Security Phase Classification (IPC) is a set of analytical tools and processes to analyze and classify the severity of a food security situation according to scientific international standards.

48 Global Report on Food Crises (2020). <https://www.wfp.org/publications/2020-global-report-food-crises> (Retrieved on 5 August 2021).

49 Warming increases the risk of civil war in Africa (2009). Proceedings of the National Academy of Sciences. 106 (49) 20670-0674; DOI: 10.1073/pnas.0907998106. <https://www.pnas.org/content/106/49/20670>

50 World Bank Report (2021). Groundswell Part 2: Acting on Internal Climate Migration <http://hdl.handle.net/10986/36248> (Retrieved on 14 September 2021).

51 FSNAU Food Security Analysis System (FSNAS). <https://www.fsnau.org/analytical-approach/fsnau-foodsecurity-analysis-system-fsnas> (Retrieved on 2 August 2021).

“
 In 2020, above-average rainfall was received, but food security was poor for most population groups and deteriorated further due to multiple risk factors

In Somalia, the number of people falling under phase 3 or worse were highest in 2017, especially in the Bay, Galguduud and Hiiraan regions (Fig. 8). Severe droughts gripped almost all parts of Somalia, leading to widespread crop failure and livestock mortality (Fig. 6). The values for Bay, Galgudud and, to a lesser extent, Hiiraan in 2017 appear to be too far off the mark and may well be erroneous due to data collection and/or during data input. The situation improved significantly in 2018, except for Awdal and Woqooyi Galbeed. In 2020, above-average rainfall was received, but food security was poor for most population groups and deteriorated further due to multiple risk factors. These included a desert locust invasion which devastated pastures amidst the Covid-19 pandemic and the depletion of food stocks from own production among farmer households. Urban populations were likely to have been adversely affected by a decline in remittances due to Covid-19.

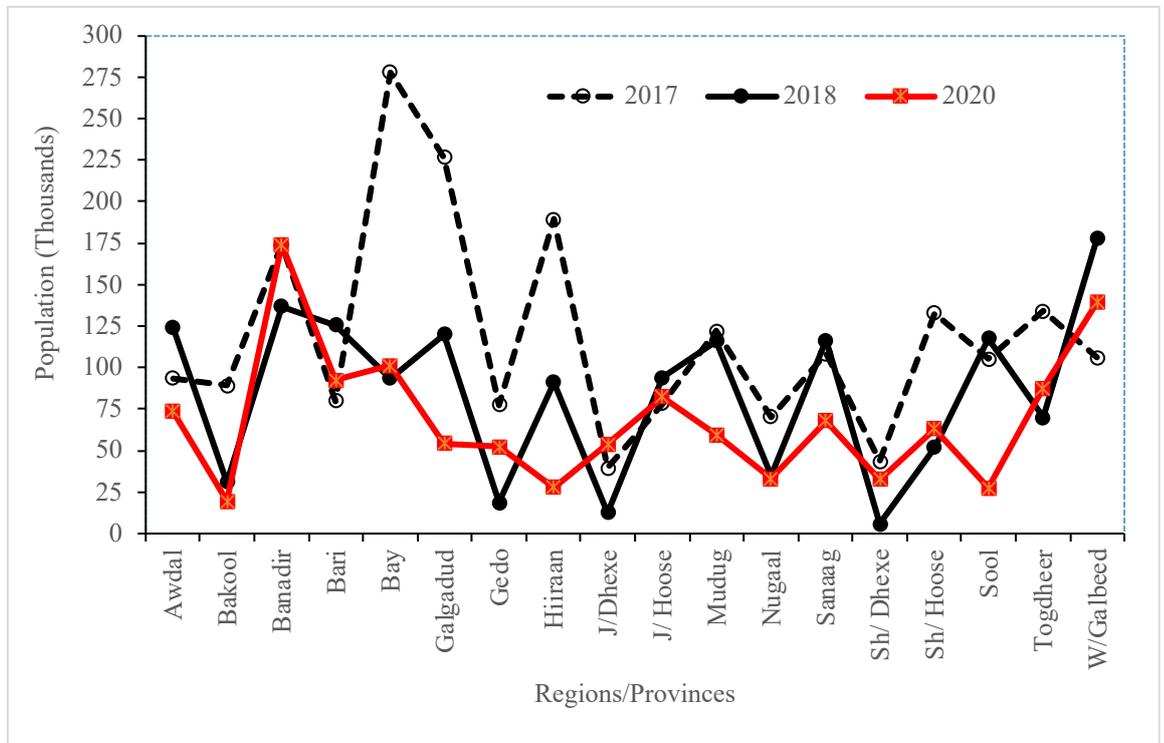


Fig. 8: Number of people (in thousands) in crisis or worse (IPC/CH phase 3 or above) in the 18 regions of Somalia in 2017 compared to 2020. Raw data was extracted from the Food Security Analysis Unit - Somalia, Food and Agriculture Organization of the United Nations. <https://www.ipcinfo.org/ipc-country-analysis/en/?maptype=77106>

Overall, the numerical analysis of the data presented in Fig. 8 reveals that up to 2.7 million people, almost one in every five individuals (22%), are facing high levels of acute food insecurity, phase 3 or above according to the IPC in 2020,⁵² which was higher than in 2017.⁵³ These findings clearly indicate that in countries where large segments of the population live in abject poverty, extreme weather can be devastating. The majority of households have no savings, while governments with limited resources struggle to secure international assistance needed to help communities to recover. Selected food insecurity phases, a description and mitigation responses are summarized in **Table 1**.

Table 1: Selected food insecurity phases, description and mitigation responses⁵⁴

IPC Phase	Description	Response priority
3 (Crisis)	Households are marginally able to meet minimum food needs but only by depleting essential livelihood assets or through crisis- coping strategies	Urgent action required to protect livelihoods and reduce food consumption gaps.
4 (Emergency)	Households can mitigate large food consumption gaps but only by employing emergency livelihood strategies and asset liquidation	Urgent action required to save lives and livelihoods.
5 (Catastrophe/ famine)	Starvation, death, destitution, and extremely critical acute malnutrition levels are evident. For Famine classification, area needs to have extreme critical levels of acute malnutrition and mortality.	Urgent action required to revert/prevent widespread death and total collapse of livelihoods.

52 Food Security Analysis Unit - Somalia, Food and Agriculture Organization of the United Nations. <http://www.ipcinfo.org/ipc-country-analysis/details-map/en/c/1154881/?iso3=SOM> (Retrieved on 3 August 2021).

53 Food Security Analysis Unit - Somalia, Food and Agriculture Organization of the United Nations. <https://www.ipcinfo.org/ipc-country-analysis/en/?maptype=77106> (Retrieved on 3 August 2021).

54 This classification information is selectively extracted from Food Security Information Network available at <https://www.wfp.org/publications/2020-global-report-food-crises> (Retrieved on 5 August 2021).

9. Interpretation of survey and interviews data

Households in six cities were included in the survey (Fig. 9). It showed that the population in Somalia is facing tough food security challenges because of changing weather patterns. For example, when asked did you or any household member go to sleep at night hungry during the past 30 days because there was not enough food, 42% said yes. Bay and Lower Juba regions were the worst hit (Fig. 9 a). Similarly, the frequency with which households experienced this level of food insecurity was high (Fig. 9 b). When asked to estimate how frequently they face food insecurity, 77% of the people we surveyed stated that either frequently (> 7 days) or mostly (> 15 days) combined. According to IPC food security classification, this could mean phase 3 or worse where households are only marginally able to meet minimum food needs or are employing emergency livelihood strategies.

We wanted to determine if households could identify the cause of this disastrous food insecurity situation. When asked about the main causes of household food shortages, 44% and 27% stated it was because of drought (Fig. 9c) and floods (Fig. 9e), respectively. The intensity of food insecurity caused by drought was greatest in Lower Juba and Bay regions (Fig. 9d), whereas flood-caused food insecurity was greatest for Hiiraan and Lower Juba (Fig. 9f). The most important takeaway message from this analysis is that food insecurity episodes are increasingly becoming common occurrence and that climatic changes is to blame.

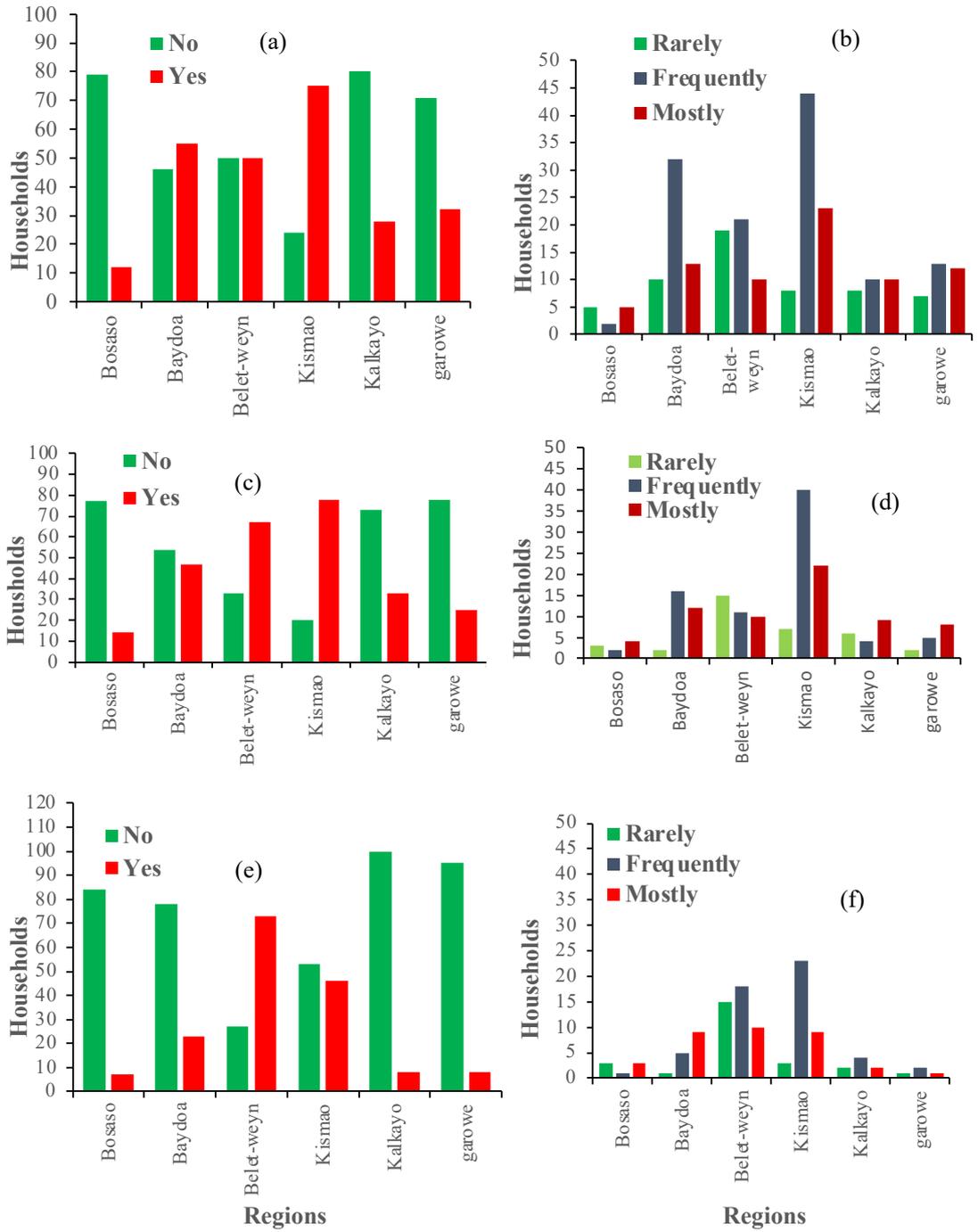


Figure 9: Household food insecurity for the past 30 days (a) and frequency (b), food shortage caused drought (c) and frequency (d) food shortage caused by floods (e) and frequency (f).

10. Pathways for sustained food security in Somalia



One obvious path to food security is establishing sustainable local production strategies. However, reaching a satisfactory level of domestic food security in Somalia is a daunting challenge

One obvious path to food security is establishing sustainable local production strategies. However, reaching a satisfactory level of domestic food security in Somalia is a daunting challenge. This is because the agri-food production capacity in Somalia is limited by hydrological, pedagogical, and climatic factors. For example, annual rainfall averages are typically less than 300 mm/year which is well below rain-fed crop production water requirements. Low productivity of arable land, limited natural water resources, and technological constraints are all major limitations of input resources. Climate change will further exacerbate the already-precarious situation.

Greater production with fewer resources input (efficiency) and better quality of the produce with competitive market advantage appears to be the best practice for sustained domestic food security. However, several challenges will need to be addressed. These include: 1) meeting the food and nutritional needs of growing populations; 2) increasing sustainable agricultural productivity with limited resources; and 3) enhancing resilience to climate change.



Crops that are tolerant to changing patterns of temperature, rainfall and water availability are good candidates for combating food insecurity in the long term.

Crops that are tolerant to changing patterns of temperature, rainfall and water availability are good candidates for combating food insecurity in the long term. However, there are genuine concerns that food production may not keep up with a rapidly growing population for a number of reasons: 1) the volume land that is agriculturally productive is shrinking; 2) land conversion often incurs high environmental and social costs; 3) soil degradation and water scarcity are curtailing production capacity and 4) erratic weather. Because food production is critically dependent on local temperature and precipitation conditions, any changes force farmers to adapt their practices.

11. Scope and limitations of the study

COVID-19 has severely strained global food systems that were already under pressure due to climate change. As the COVID-19 pandemic continues to ravage the world, its impacts on food security and nutrition in Somalia remains largely unknown. Nonetheless, this report attempts to provide an assessment of how the pandemic might affect food security, within the limitations imposed by the availability of current information. Consequently, it is important to recognize that any assessment at this stage is subject to a high degree of uncertainty and should be interpreted with caution.

12. Conclusions



Somalia is among the most vulnerable countries to climate change and is most likely to remain amongst the hardest hit countries

Simply put, addressing food security in the old style will not work. This study illustrates that food security, environmental resources and population growth must be addressed all together, considering climate change as a risk multiplier. Weather records are being broken around the world. Recent literature reviewed during this research reveals that almost every part of the world is experiencing climate change. Somalia is among the most vulnerable countries to climate change and is most likely to remain amongst the hardest hit countries. Findings of this research show that Somalia's climate is warming much faster than the global average. The impacts of frequent and more extreme weather events have undermined food security. The number of people falling under the IPC's phase 3 or worse category were highest in 2017, especially in the Bay, Galguduud and Hiiraan regions because of below average rainfall.

Those residing near rivers are at greater risk as rivers can rupture their banks while recurrent droughts cause massive damage to livestock and crop failures. Somalia needs a clear plan on the kind of food security policy that should be implemented, as well as financial support to deal with the economic and social trade-offs. Adaptation efforts (primarily social) to the impacts of climate change should be a top national priority. Adaptation and mitigation are complementary strategies for reducing and managing the risks of climate change. The COVID-19 pandemic has worsened the food security situation due to the global economic slowdown, loss of income, as well as global supply strains. To sum up, the ability to adapt in the face of increasing pressure is the most effective way to withstand devastating impacts of a changing climate.

13. Recommendations

Climate change has emerged as a major global environmental problem characterized by increases in the earth's ambient temperature due to large emissions of greenhouse gases. Global food supply is suffering, and food security is at risk. The climate crisis is not going to be solved by one action or approach. In Somalia, the following recommendations can be made:

- 1) **Food storage system:** Establish a food storage system to be used during climate-related crisis, which are now 70% more frequent than 30 years ago.
- 2) **Financing critical infrastructure:** Federal and regional governments should prioritize dedicated funds with a mandate to provide financing for secure road and sea routes infrastructure projects in order to prevent a manageable food security situation from becoming famine.
- 3) **Flood control:** Plant vegetation and, where possible, construct levees along riverbanks to retain excess water during flood periods.
- 4) **Environmental conservation:** Establish a national and independent environmental protection agency run by experts to help formulate appropriate mitigation measures against the impact of climate change.
- 5) **Enhancing soil productivity and water conservation:** Improve soil quality, store rainwater for emergency use and develop more diverse agriculture for adaptation.
- 6) **Halting deforestation and planting more trees:** Halt deforestation and plant more trees to fight climate change.
- 7) **Future study:** Conduct a nationwide public survey to identify experiences and understandings of Somalis in relation to climate change causes, impacts, mitigation, and adaptation.



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