

**IMPLICATIONS OF CLIMATE CHANGE FOR SECURITY IN SUB-SAHARAN AFRICA:
INCREASED CONFLICT AND FRAGMENTATION**
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INTRODUCTION

What are the implications of climate change for security in low-income countries? As global warming approaches and passes 1.5°C, climate change will reduce income, disrupt social relations, and fragment authority. I focus on Sub-Saharan Africa (SSA) because its large agricultural sector is sensitive to climate change and will likely see effects earlier than in other regions.

The first section discusses climate change, particularly on the large agricultural sector in SSA. The next two sections analyze two channels by which climate change will affect SSA. First, a survey of quantitative analyses demonstrates a correlation between the level and growth of income and the outbreak of civil wars; climate change will likely decrease income in the agricultural sector so the frequency of civil war outbreak will likely increase. Second, climate change will reduce the salience of then-current qualitative strategies of survival and increase the salience of new ones, which will likely increase social disruption and reduce government authority. The last sections discuss adaptation and conclude that a major effect of climate change will be fragmented authority and increased disorder in low-income areas.

CLIMATE CHANGE AND SUB-SAHARAN AFRICA

The 2014 Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report (AR5) reported that: “The atmosphere and ocean have warmed, the amounts of snow and ice have diminished, and sea level has risen.”¹ AR5 considered four future scenarios, including a stringent mitigation scenario and other scenarios with very high emissions of greenhouse gases (GHGs). The baseline, in which no attempt is made to constrain GHG emissions, is between the highest and second highest of the four scenarios. The IPCC projects that surface temperatures will rise over this century in all these scenarios and that it is “very likely that heat waves will occur more often and last longer, and that extreme precipitation events will become more intense and frequent in many regions.”²

The pace and extent of effects is likely to increase. According to the 2018 IPCC *Special Report Global Warming of 1.5° C* (SR5), global warming has increased almost 1°C since the period 1850–1900 and will likely reach

1.5°C between 2030 and 2052 indicating that the world will experience half as much warming again in the coming 12 to 34 years as in the preceding 118.³

Climate change can harm lives and livelihoods, particularly for low-income populations. AR5 assessed that:

*Climate-related hazards exacerbate other stressors, often with negative outcomes for livelihoods, especially for people living in poverty (high confidence). Climate-related hazards affect poor people's lives directly through impacts on livelihoods, reductions in crop yields or the destruction of homes, and indirectly through, for example, increased food prices and food insecurity.*⁴

AR5 projects that climate change will “reduce economic growth...further erode food security and prolong existing poverty traps and create new ones, the latter particularly in urban areas and emerging hotspots of hunger (*medium confidence*).” AR5 estimates with medium confidence but with high agreement that climate change will increase displacement of people.⁵

AR5 assessed that “Africa as a whole is one of the most vulnerable continents due to its high exposure and low adaptive capacity.” Agriculture is sensitive to climate change, and the sector in SSA is large. Of the nine regional risks identified by AR5 as “medium or high for the present under current adaptation,” five are directly linked with agriculture, including biome distribution, reduced crop productivity, adverse effects on livestock, disease, and undernutrition.⁶ According to the United Nations Food and Agricultural Organization (FAO), much of Africa’s population is involved in small-scale agriculture, with agriculture directly employing more than half of the labor force (including 10 to 25 percent of urban households), and more than 80% of farms in SSA are smallholder farms.⁷

CHANNEL 1: AGRICULTURAL PRODUCTIVITY, INCOME, AND CIVIL WAR

One channel by which climate change will affect SSA is increased frequency of civil war. Civil war outbreak is more frequent in low-income countries and follows growth shocks; climate change will reduce income in a low-income areas so civil war outbreak is likely to be more frequent.

Climate change alters agricultural productivity. Existing agricultural areas with increased temperatures, less available water, and increased frequency of drought and extreme weather events yield less of the same crops at the same level of technology; these effects will be more significant for agricultural areas that depend on rainfall.

Lower productivity will mean fewer people can live in an area and income will be reduced; if people do not leave or adapt adequately, per capita income will be reduced and prevalence of undernourishment will increase. As the climate changes, a farmer’s crops may not grow as before, and they may not grow at all. She may have little to eat at home, little to sell at markets, little income with which to buy, little with which to barter, and her labor may generate less income than before.

Low per capita income is correlated with the frequency of civil war outbreak and reduced per capita income will likely increase the frequency. Christopher Blattman and Edward Miguel observe that: “The correlation between low per capita incomes and higher propensities for internal war is one of the most robust relationships in the literature.”⁸ Paul Collier, Anke Hoeffler, and Dominic Rohner find that the predicted risk of civil war is 4.6 percent in a hypothetical country at the mean of their sample while the predicted risk increases to 5.34 percent if the level of income is halved.⁹ James Fearon and David Laitin found that per capita income is strongly significant and that a country at the tenth percentile of per capita income has an 18 percent chance of civil war outbreak over a decade while a country at the median percentile has an 11 percent chance.¹⁰

SSA currently has low per capita income and is more prone to civil war than other regions. According to the World Bank, SSA per capita income at purchasing power parity was \$1624 in 2017, lower than any other geographic region except South Asia (\$1194). The list of countries with low per capita GDP is dominated by SSA, with twenty-one of the lowest twenty-two countries in SSA (the exception is Haiti).¹¹ The Correlates of War Project observes that eighteen of thirty-one intra-state disputes since 1998 have occurred in SSA.¹² Monty Marshall observed that about 40 percent of “major episodes of political violence” between 1998 and 2016 occurred in SSA versus about 17 percent in the Middle East and North Africa.¹³

Growth shocks increase the frequency of civil war outbreak. Collier, Hoeffler, and Rohner found that the predicted risk is decreased by 0.6 percent for every percentage point of economic growth. They also find that the growth rate of GDP per capita during the five years prior to the outbreak of civil war averages -0.05 percent while it increases 2 percent in peaceful countries.¹⁴ Edward Miguel, Shanker Satyanath, and Ernest Sergenti found that the likelihood of civil war increased by almost one-half following a five percentage-point negative growth shock.¹⁵ Oeindrila Dube and Juan Vargas found that a fall in price of a labor-intensive good (e.g., coffee) will disproportionately increase violence in areas where that good is produced by reducing wages and lowering the cost of recruiting workers into armed

groups. Hanne Fjelde found that “negative changes to the value of local agricultural production increases the risk of armed conflict in Africa.”¹⁶

It may be more useful to analyze per capita income at a disaggregated level, looking at opportunity cost for potential rebels and at other metrics (e.g., military expenditures) for state capabilities. Climate change will likely reduce income among those dependent on the agricultural sector; this will reduce the opportunity cost of rebellion while not necessarily affecting the trajectory of rents available to elites. Elites may be able to continue to buy the coercive capabilities sufficient to support government authority in some areas. However, demand for coercion may exceed supply and there will be areas where coercive capability is less effective. The less wealthy governments of SSA will continue to be challenged to generate coercive capability that can pervade the areas experiencing reduced income consequent to climate change.¹⁷

CHANNEL 2: STRATEGIES OF SURVIVAL AND THE SOCIAL MATRIX

Climate change (and conflict) may also affect qualitative strategies of survival, defined by Joel Migdal as “blueprints for action and belief in a world that hovers on the brink of a Hobbesian state of nature.” Strategies of survival help an individual survive, provide meaning and help an individual meet material needs, and link individuals with groups.¹⁸ As an illustration, Julie Flint and Alex de Waal write of a woman living in Darfur on the edge of the desert who:

*...will know how to gather a dozen varieties of wild grasses and berries to supplement a meager diet of cultivated millet and vegetables, along with goat's or camel's milk. She will know the farms and village markets within a hundred miles or more, and will not hesitate to walk or ride such distances to buy, sell, or work.*¹⁹

Existing strategies may not support long-term survival as the climate changes. The farmer's strategies in the form of knowledge of how to grow and gather on land and buy and sell at area markets will be less functional. This will not be a straight-line decrease: subsistence agricultural income from a single growing season is affected by weather; inasmuch as “climate in a narrow sense is usually defined as the average weather,” climate change is a change in average weather over multi-decadal periods.²⁰ Climate change will affect average weather and thus growing conditions, and strategies that enabled populations engaged in subsistence agriculture to survive will be less and less functional. This will be worsened by increased frequency of

extreme weather events.²¹

Quantitative per capita income and qualitative strategies of survival are related – strategies include knowledge that can lead to monetary and non-monetary income, and strategies of survival that are less salient likely lead to reduced income. However, the effects of reduced salience are broader because a person's strategies may not enable survival anywhere. She will need to acquire new strategies, a socially disruptive process.

The quantitative effect of faster climate change projected by the IPCC – half as much warming again in the coming twelve to thirty-four years as in the preceding 118 with increasingly severe effects- will reduce income. It will also likely have substantial qualitative social effects in lower income countries. Many in lower income countries will have to help themselves.

Part of a person's strategies of survival is integration in a social matrix – a network of family, tribal, social, and economic interrelationships, traditions, and relationships with authority and sources of support. As climate changes, she will look to the social matrix in which she is embedded.

Adaptation may include involvement with new organizations that can help her survive in a changed or new setting. Organizations can help coordinate work, redistribute work to aid those in need, set and enforce mutual expectations, help resolve disputes, and provide a sense of purpose and meaning. Governments can provide many of these functions. Representatives may provide some aid and assistance, enforce property rights, and help resolve disputes quickly, and they can provide a roof and framework in which non-governmental organizations can supply others. On the other hand, governments may also lack capacity (e.g., budgetary funds and Weberian bureaucrats). They may provide selective or no aid; selective, corrupt, and slow dispute resolution; and cover for extraction and self-gain.

People encountering the latter situation may turn to alternatives, such as non-governmental organizations that can provide services, which will supplant government and government-sponsored organizations. Some of these will provide social services such as, alternative dispute resolution, or educational systems. Some may engage in armed self-help in competition with government authorities. Some organizations may attempt to overthrow the government, engaging in civil war. The effect will be to reduce the level of attachment to government and increase attachment to non-governmental alternatives, so decreasing the ambit of government authority and fragmenting authority between organizations. While climate change could cause dislocation in society which would allow for the emergence of Migdal's “strong state” which is able to exert social control, on the other hand society through the above mentioned organizations will compete with states and

fragment social control, thus weakening state institutions.

ADAPTATION

People will attempt to adapt to the effects of climate change. The woman in Darfur will emphasize remaining sources of food and income, sell assets to buy food, and she may find different sources of food. She may move to an area where her strategies of survival are relevant, but that area will itself be changing over years because climate change is a large-scale phenomenon. She may move to where she has relatives, but residents may object to increased competition for resources and the social differences of an outsider.²² She may move to an urban area in her country, in another lower-income county, or to a high-income country intending to use a social network to find work, though many would already have availed themselves of economic opportunities in cities if they were available and cities will be affected by climate change as well. Lacking better alternatives given her resources, she may move to an internally displaced persons (IDP) camp.

She will have to learn new strategies of survival in each of these situations, including formation of a new social network. The strategies suitable farming in, say, Nigeria, will be loosely related to those suitable for life in Lagos and even less for life in Berlin. And those living in the areas where she moved may encounter a presence they view as foreign. Awareness of migrants, and possibly encounters with migrants, has increased support for European political movements opposed to migration, thus making migrants' strategies of survival and access to supportive social networks even more important.²³ Social networks may help gain access to resources to sustain a livelihood in rural and urban environments, will help people minimize exploitation by helping them understand who is trustworthy and who is not, and will help resolve disputes. Social networks may be informal, or they might be formalized. But, under pressure of collapse of earlier strategies of survival and reduced income, both of which are possible consequences of climate change, people will seek the shelter of groups.

CONCLUSION

Climate change likely leads to reduced income.²⁴ It will also likely reduce the functionality of existing suites of survival. Quantitatively, reduced income points to more frequent civil war, which further reduces income and increases the likelihood that conflict will return. In the words of Collier, Hoeffler, and Rohner, "The principal legacy of civil war is a

grossly heightened risk of further civil war."²⁵ Reduced income and lowered salience of strategies of survival reduce the opportunity cost for joining an organization involved in civil war. All lead to a search for new survival strategies and social networks that can increase the odds of survival.

So why is this significant? Heat waves occur more often and last longer and extreme precipitation events become more intense and frequent. The agricultural sector and its dependencies in SSA are sensitive to a warming climate. People experience reduced income, lowered salience of strategies of survival, and undernourishment. They move within the country of their birth to another rural area or to a city to look for work, or to an IDP camp. Or they move to the rural or urban area of a nearby country. They acquire new strategies of survival and modify the social matrix in which they were embedded. That adjusted matrix will likely involve organizations that reduce transaction costs, help avoid and resolve disputes, and provide some sense of meaning. Reduced transaction costs may mean access to necessities like food and income, dispute resolution may entail armed self-help, and meaning may mean the mission of "protecting" a community and the comradeship of arms. Some of these organizations will be parties to a civil war, contesting with a central government. Others will be engaged in lesser armed conflict. Others will be engaged in banditry. All will stress central government authority. Governments might attempt to maintain their authority in critical areas, like cities, but government authority will decrease in rural areas and will be fragmented among competing organizations. The cycle will be climate change reducing income and salience of strategies of survival and increasing undernutrition, the emergence of armed organizations and civil conflict, stressed governments, and propagation of armed conflict as earlier conflict reduces income and salience of strategies of survival. None lead to greater peace, tranquility, and stability.

Per Bill Gates, we may not see much change in two years but we may see much in ten as the effects of climate change accelerate in a SSA that already has low income and high frequency of conflict. The effects of low income and climate change might be mitigated by economic growth that absorbs labor from the agricultural sector and increases per capita income, technological change that mitigates climate change, increased coercive capacity of lower-income countries, or some combination. However, the effects of accelerating climate change in low-income SSA is likely to decrease central government authority faster than offsetting factors increase it. The net result is likely to be increasing disorder in low-income areas. It will be visible early in SSA but will include Asia over time.

This will have implications for policy. First, mitigation of global

warming would make these channels moot. Aid might enable adaptation that eases pressure on people and policy. Failing effective mitigation and aid, security demands in low-income areas will be closer to armed social work, Conflict will motivate people to move; some of those able to do so will move to high-income countries, which will become an issue of political contestation. Finally, countries may need to find ways to deal with unrecognized armed entities that behave like governments, including control of territory, without alienating central governments.

Carmel Davis earned his Ph.D. from the University of Pennsylvania in 2004.

NOTES

- 1 Intergovernmental Panel on Climate Change, *Climate Change 2014: Synthesis Report* (Geneva: IPCC, 2014), 2 and 40, <http://ipcc.ch/report/ar5/syr/>.
- 2 *Climate Change 2014*, 58.
- 3 IPCC, "Summary for Policymakers," in IPCC, *Special Report Global Warming of 1.5° C*, October 6, 2018, <http://ipcc.ch/report/sr15/>.
- 4 IPCC, *Climate Change 2014*, 54. SR1.5 includes similar language: "Populations at disproportionately higher risk of adverse consequences of global warming of 1.5°C and beyond include disadvantaged and vulnerable populations, some indigenous peoples, and local peoples dependent on agricultural or coastal livelihoods (*high confidence*)." IPCC, *Global Warming of 1.5° C*, 11; "Displacement will likely be multi-causal, with climate change both driving migration and affecting other drivers of migration." See: Richard Black, *et al.*, *Foresight: Migration and Global Environmental Change Final Report* (London: The Government Office for Science, 2011), p. 9 and p.12, https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/287717/11-1116-migration-and-global-environmental-change.pdf which identifies five drivers affected by environmental change: the environment itself, politics, demographics, economics, and society.
- 5 IPCC, *Climate Change 2014*, 73.
- 6 Isabelle Niang *et al.*, "Chapter 22: Africa" in IPCC Working Group II, *Climate Change 2014: Impacts, Adaptation, and Vulnerability*, <http://www.ipcc.ch/report/ar5/wg2/>.
- 7 Organization for Economic Cooperation and Development and Food and Agricultural Organization, *OECD-FAO Outlook 2016-2025*, 60 and 65, https://www.oecd-ilibrary.org/agriculture-and-food/oecd-fao-agricultural-outlook-2016_agr_outlook-2016-en.
- 8 Christopher Blattman and Edward Miguel, "Civil War," *Journal of Economic Literature* 48, no. 1 (March 2010): 4, <https://doi=10.1257/jel.48.1.3>.
- 9 Paul Collier, Anke Hoeffler, and Dominic Rohner, "Beyond Greed and Grievance: Feasibility and Civil War," *Oxford Economic Papers* 61 (2009): 12, <https://www.csae.ox.ac.uk/papers/beyond-greed-and-grievance-feasibility-and-civil-war>.
- 10 James D. Fearon and David D. Laitin, "Ethnicity, Insurgency, and Civil War," *American Political Science Review* 97, no. 1 (February 2003), 83.
- 11 World Bank Development Indicators, "GDP per capita, PPP (current international \$)," https://data.worldbank.org/indicator/NY.GDP.PCAP.PP.CD?year_high_desc=-

false.

- 12 Correlates of War, "Intrastate War Data (v4.1)," <http://www.correlatesofwar.org/data-sets/COW-war>.
- 13 Monty G. Marshall, "Major Episodes of Political Violence, 1946-2016," <http://www.systemicpeace.org/warlist/warlist.htm>.
- 14 Collier, Hoeffler, and Rohner, "Beyond Greed and Grievance," 12.
- 15 Edward Miguel, Shanker Satyanath, and Ernest Sergenti, "Economic Shocks and Civil Conflict: An Instrumental Variable Approach," *Journal of Political Economy* 112, no. 4.
- 16 Hanne Fjelde, "Farming or Fighting? Agricultural Price Shocks and Civil War in Africa," *World Development* 67 (March 2015): 533, <http://dx.doi.org/10.1016/j.worlddev.2014.10.032>.
- 17 Jeffrey Herbst, *States and Power in Africa: Comparative Lessons in Authority and Control* (Princeton: Princeton University Press, 2000).
- 18 Joel S. Migdal, *Strong States and Weak Societies: State Society Relations and State Capabilities in the Third World* (Princeton: Princeton University Press, 1988), 27.
- 19 Julie Flint and Alex de Waal, *Darfur: A New History of a Long War, Revised and Updated* (New York: Zed Books, 2008), 1.
- 20 IPCC, *Climate Change 2014*, 119.
- 21 IPCC, *Climate Change 2014*, 16.
- 22 Rafael Reuveny theorizes that environment-induced migration may lead to conflict or intensify it because of competition, ethnic tension, distrust, fault lines, and auxiliary conditions like the difficulty of absorbing migrants, and political instability and civil strife; Rafael Reuveny, "Climate Change-Induced Migration and Violent Conflict," *Political Geography* 26 (2007), p. 659.
- 23 See, for example, Gary Chazan and Tobias Buck, "Germany's CDU toughens line on immigration," *Financial Times*, February 11, 2019 and Miles Johnson, "Migration spat stokes tension within Italy's coalition," *Financial Times*, January 7, 2019. Migration was particularly salient in 2015 and 2016. See, for example, "Forming an orderly queue; Europe's Migrant Crisis," *The Economist*, Feb. 2, 2016, "The Migration Crisis" at <https://www.economist.com/migrationcrisis>, and Richard Wike, Bruce Stokes, and Katie Simmons, "Europeans Fear Wave of Refugees Will Mean More Terrorism, Fewer Jobs," Pew Research Center, July 11, 2016., <http://www.pewglobal.org/2016/07/11/europeans-fear-wave-of-refugees-will-mean-more-terrorism-fewer-jobs/>.
- 24 IPCC, *Climate Change 2014*, 73.
- 25 Collier, Hoeffler, and Rohner, 12-13.