

Africa Current Issues

Climate Change and Conflict in West Africa

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1.0 Introduction

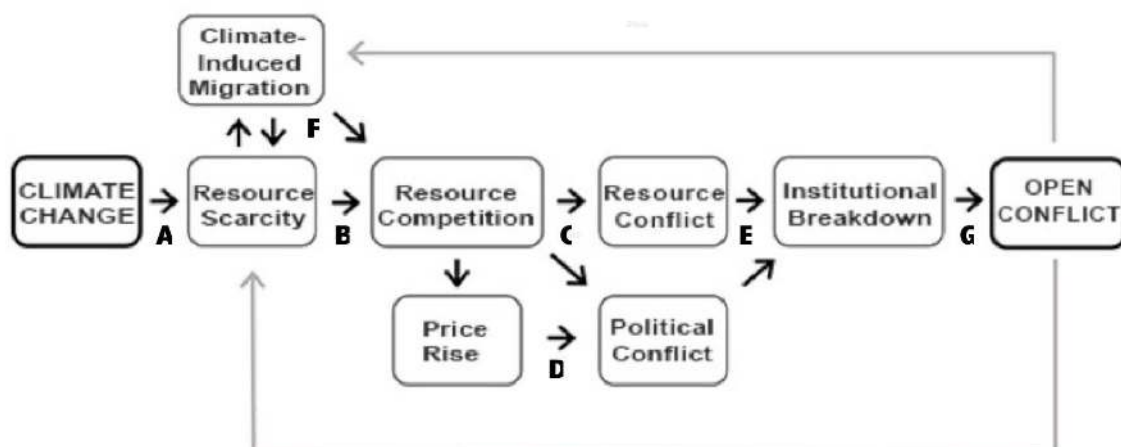
Climate change is the long-term modification of the Earth’s climate resulting from atmospheric changes and interactions among the atmosphere and other geological, chemical, biological, and spatial factors within the Earth’s powerful energy system.¹ Climate scientists who collect and analyze information about our planet and climate on a global scale report an accelerating global rise in average temperature from the late 19th century to the present, nearing one degree Celsius. Leading scientists view this temperature change, accompanied by sea ice losses, sea level rises, longer, more intense heat waves and other increases in extreme weather events, as robust evidence of climate change.

West Africa is particularly vulnerable due to its high climate variability, heavy reliance on rain-fed agriculture and limited economic and institutional capacity to offset the consequent scarcity and conflict effects.² This paper identifies evidence linking climate change and conflict, traces the impact on the population of the West African region, and describes a case, set in West Africa, of conflicts arising from climate change. Finally, the author proposes a model to guide stakeholder interventions intended to minimize the extent of such conflicts.

2.0 Evidence linking climate change and conflict

Formal evidence of causal links between climate change and violent conflict is mixed.^{3,4,5,6,7,8} The dominant view is that climate change potentially contributes to political instability and resource insecurity across the world, and thus poses a threat to peace (see Figure 1).⁹ However, critics argue there is no evidence of a direct relationship between climate change and violent conflict.¹⁰ They acknowledge that in some circumstances, and in association with other factors, climate change can induce or worsen conflict – for example among pastoralists and farmers competing for land and water. The circumstances cited by researchers include deteriorating livelihoods, increased migration, changes in the movement patterns of pastoralists, and opportunism by merchants of violence and the political and business elites.

Figure 1: Schematic representation of relationships between climate change & conflict¹¹



The arrows in Figure 1 trace the path from climate change to conflict, while the letters mark potential opportunities for intervention. Reducing the impact of climate change on resource scarcity (A) is a task well beyond the scope of even a large individual nation. At best, nations within a region may be able to cooperate to minimize the impact of resource competition (B) on market prices, thus reducing resource and political conflicts. Examples of institutional interventions at the resource scarcity stage include water rationing, more efficient irrigation methods; pasture management, and natural resource rejuvenation and protection. Interventions in markets, such as resource rationing (C) or price controls are often unpopular, and the resulting conflict may result in political intervention (D).

The consequences of climate change vary with the context. As climate change impacts the world's physical landscape, it alters our geopolitical structure. For example, drought will increase competition for a diminishing amount of fertile land. Combined with other market forces, scarcity leads to price rises that generate conflict among supply and demand resources, which may result in resource and political conflict (E), especially when prices rise faster than incomes. Rising sea levels will inevitably force coastal dwellers to migrate inland (F), further adding pressure to what are likely to be increasingly scarce land and water resources. When social and political institutions are strong, they can address these conflicts through community leaders, ombudsmen, and other dispute resolution mechanisms. When they are weak, institutional breakdown opens the door to violent conflict (G).

One 2018 Stockholm International Peace Research Institute report finds “there is context-specific evidence that climate change can have an effect on the causes and dynamics of violent conflict in the region when: (a) it leads to a deterioration in people's livelihoods; (b) it influences the tactical considerations of armed groups; (c) elites use it to exploit social vulnerabilities and resources; and (d) it displaces people and increases levels of migration.”¹²

Several studies find evidence of strong links between climate shocks and conflict.¹³ One reports that the risk of armed conflict increases when water is scarce.¹⁴ Another researcher finds that a standard deviation increase in temperature raises the risk of interpersonal conflict by 2.4% and intergroup conflict by 11.3%.¹⁵ Severe drought and water variability owing to climate change are found to cause conflict among farmers and pastoralists in several African countries.^{16,17} Across Africa, researchers report a strong linear relationship between temperature and civil war, with a 1 degree Celsius increase raising the risk of civil war by 4.5% within a one year span.¹⁸

Hsiang et al. contend that El Niño events bring hotter and drier weather and therefore serve as a model of future climate change. Examining the tropics between 1950 and 2001, they found that civil conflicts were twice as likely to commence in El Niño years as in cooler, wetter La Niña years. They estimate that El Niño may have contributed to 21% of civil conflicts during this period.¹⁹ Other research links the recent conflict in Darfur to climate change, exacerbating pre-existing tensions between farming villagers and pastoralists as rainfall and vegetation declined, and suggests that the government exploited these tensions to foment conflict and bolster its support among specific ethnic groups it favoured. This conflict was marked by violence directed at civilians, with reports of poisoned wells.²⁰

A recent study, authoritative in light of the pedigree of its unprecedented number of authors for a scholarly article, concludes that “climate has affected organized armed conflict within countries” and “intensifying climate change is estimated to increase future risks of conflict.” Consistent with other findings, the authors also conclude that low socioeconomic development, intergroup inequality, and weak states worsen already difficult situations.²¹

The research cited above links the environmental impacts of climate change to their impacts on people, identifies the knock-on effects of climate change on the population, and identifies the propensity for these effects to act as sources of stress that may lead to conflict, especially where institutional weaknesses come into play.

3.0 Africa is most vulnerable to climate change

The future effects of climate change are likely to be extremely severe in Africa. As a largely agrarian economy, based on a diverse landmass with wide climatic variations, and with limited adaptive capacity and political will to manage the consequences of adverse climate change, the continent is inherently vulnerable.²² Africa's forests are diminishing: Sub-Saharan Africa's forest area, as a proportion of total land area, was 27.1% in 2015, down from 30.6% in 1990.²³ Due to logging and farming, only about 10 percent of West Africa's coastal rainforests remain.²⁴ The effects of climate change could be quite severe in these parts, because trees mitigate the effects of climate change.²⁵

Climate change promises to bring more frequent and intense floods and droughts around the world, with the number of people suffering severe water stress estimated to be as many as 3.2 billion to 5.7

billion by 2050, depending on the season.²⁶ In Africa, droughts have become increasingly frequent and last longer. The resultant water stress affects agricultural production and threatens the sustainability of farming communities. As shown in Table 1, there is almost a 100% probability of warmer and more frequent hot days, warmer and fewer cold days and nights on the continent. Agricultural yields are less in warmer environments. There would also be increased insect outbreaks. Wildfires, increased livestock deaths and greater water stress are also some of the expected impacts.

Table 1: Impact of climate change on Africa (Intergovernmental Panel on Climate Change)

Phenomenon	Probability	Impact on agriculture, forestry, ecosystem & water resources
<ul style="list-style-type: none"> • Warmer & fewer cold days & nights • Warmer & more frequent hot days & nights 	>99%	<ul style="list-style-type: none"> • Decreased yield in warmer environments • Increased insect outbreaks
<ul style="list-style-type: none"> • Warm spells/heat waves 	>90%	<ul style="list-style-type: none"> • Reduced yields in warmer regions owing to heat stress • Increased dangers of wildfires • Increased water demand • Water quality problems, e.g. algal blooms
<ul style="list-style-type: none"> • Areas affected by drought increases 	>66%	<ul style="list-style-type: none"> • Land degradation • Lower yields/crop damage & failure • Increased livestock deaths • Increased risk of wildfire • More widespread water stress

Source: Cilliers (2009)

Climate change has already begun to affect food production in Africa and around the world.²⁷ During the 2017-18 Kenyan drought, semi-nomadic Maasai and Samburu herders reportedly exchanged their daughters for livestock so they could survive.²⁸ After frequent droughts diminished their livestock, other nomadic Maasai herders in Kenya turned to crop farming to make ends meet.²⁹

In West and Central Africa, owing to water shortage, 45% of farmers have experienced an increase in crop failure, 38% have seen a decrease of their farm income, 17% have observed a reduction in the availability of water for irrigation and 13% of families have seen at least one of their relatives forced to migrate.³⁰ In most African countries, state capacity is weak and agricultural production is largely rain-fed. Thus, although Africa produces the least amount of greenhouse gases per capita, its people are likely to suffer the greatest consequences.³¹

4.0 Climate change, conflict & institutional vulnerability in West Africa

As climate change impacts the world's physical landscape, it alters our geopolitical structure. For example, drought will increase competition for a diminishing amount of fertile land. Rising sea levels inevitably force coastal dwellers to move inland, further adding pressure to what is likely to be increasingly scarce land and water resources, and combined with other market forces, leads to price rises. These forces generate conflict between supply and demand resources, which may lead to political conflict as the population realizes that prices are rising faster than incomes. When social and political institutions are strong, they can address these conflicts through community leaders, ombudsmen, and other dispute resolution mechanisms. When these institutions are weak, their breakdown opens the door to violent conflict.

Few West African countries have built the strong institutions needed to resolve such disputes. The Fragile States Index (FSI) assesses states' vulnerability to conflict or collapse, ranking all sovereign states with membership in the United Nations.³² The FSI ranks West African nations Guinea, Guinea-Bissau, Ivory Coast, Liberia, Mali, Mauritania, the Niger, and Nigeria in the highest risk band for the 178 nations in their report, indicating their current vulnerability to conflict, rather than as a predictor of their

collapse. However, as the FSI provides a surrogate measure of institutional weaknesses and the potential for climate change to generate conflict, the assessment that half of West African nations are highly vulnerable to internal conflict is cause for concern.

Pastoralism describes an economy that derives the bulk of its food supply from animal herding, usually in the form of secondary products such as milk, yoghurt, meat, cheese and blood.³³ Some, but not all, pastoralists are mobile or nomadic. Pastoralism is important to the West African economy, with more than 40 percent of its agricultural GDP attributable to livestock.³⁴ The Sahel (a semi-arid band from the Atlantic Ocean to the Red Sea) and West Africa account for a large proportion of the cattle, sheep and goats in Sub-Saharan Africa (see Table 2).

Table 2: Livestock in the Sahel & West Africa

Type	% of Sub-Saharan Africa
Cattle	25.0
Sheep	33.0
Goats	40.0
Source: Kamuanga, et al. (2008)	

Tensions between sedentary farmers and itinerant pastoralists is unsurprising, due mainly to inherent conflicts in their use of the land and other scarce natural resources (see Table 3 for types and causes of pastoralist-related conflicts). Such tensions are present on every continent. Until recently, such conflicts were resolved relatively amicably within the communities involved. However, today's economic, demographic and political situation is increasingly demanding, with lakes drying up, populations on the move, and violent extremist ideologies poisoning the traditionally accommodative politics of a number of West African countries.³⁵

Table 3: Conflicts related to pastoralists in West Africa

Types	Causes
Transhumant herders vs. farmers	<ul style="list-style-type: none"> • Occupation of pastoral areas (cattle tracks, grazing areas, access routes to watering points) • Damage to crops or harvests in fields
Transhumant herders vs. forestry services	<ul style="list-style-type: none"> • Non-existence or lack of development of transhumance corridors, forcing exhausted animals to make wide detours • Grazing of protected areas, degradation of wildlife and its habitat • Ill-treatment of confiscated animals, systematic slaughtering of animals
Transhumant herders vs. hunting concessionaires	<ul style="list-style-type: none"> • Degradation of wildlife & its habitat • Bad image of hunting zones among foreign visitors because of the presence of domestic animals in concession areas
Transhumant herders vs. resident livestock farmers	<ul style="list-style-type: none"> • Night-time grazing, damage to fields, exacerbation of conflicts with farmers • Overgrazing, forcing resident livestock farmers to move
Transhumant herders vs. uniformed bodies	<ul style="list-style-type: none"> • Administrative harassment, including "wildcat" taxes • Failure to respect national & regional regulations on cross-border transhumance • Human injury (women raped, men killed, etc.)
Source: Kamuanga, et al. (2008)	

Seeking pasture, pastoralists follow the seasons across the region. During the rainy season, many tend to settle in their primary locales in northern semi-arid parts of the Sahel sub-region. When rains are scarce, they move south for pasture and water, having made arrangements with farmers at specific

locations governing where and when their livestock can graze and drink. Occasionally, violent conflicts emerge between members of the two groups. Historically, however, the relationship tends to be symbiotic. Farmers benefit from payments and livestock excrement to fertilize their crops, and pastoralists nurture their livestock on the land of the farmers. Pastoralists benefit from the crops of farmers for their own nutrition and survival, just as farmers do from the dairy products derived from livestock of the pastoralists.

As available fertile land diminishes, farmer-farmer and farmer-herder tensions rise. Lake Chad, once the world's 6th largest freshwater lake, borders Cameroon, Chad, Niger, and Nigeria. By 2000, its shallow waters had shrunk to less than ten percent of their area in 1983, with devastating social and economic consequences for adjacent countries.^{36, 37} Farmers, pastoralists, and fishermen lost livelihoods. Unsurprisingly, the Lake Chad region has experienced a great deal of conflict. Violent conflicts between farmers and pastoralists are reported in most West African countries: Nigeria, Ghana, Ivory Coast^{38,39,40}, Chad⁴¹, Mauritania⁴², Mali, Senegal^{43,44}, Cameroon⁴⁵, Burkina Faso⁴⁶ and Benin.⁴⁷

Related conflicts, including criminal violence such as banditry, kidnapping, and political assassinations, are most severe in Nigeria. Pastoralists in Nigeria have invaded farms, colonized villages along their grazing routes and meddled in the local politics of farmer communities with relative impunity.^{48,49} In response, some Nigerian state governments implemented grazing bans.^{50,51} A proposed organized settlement programme by the government for pastoralists in the greener south has been met with political resistance.⁵²

Nigerian authorities view the root of the crisis as the shrinking of Lake Chad.⁵³ Food shortages and violence have already forced at least 2.4 million people to flee the Lake Chad area.⁵⁴ In March 2017, the United Nations (UN) Security Council identified climate change (drought, crop failure, etc.) and ecological changes as factors responsible for Lake Chad's instability.⁵⁵ The UN plans to facilitate raising \$50 billion to regenerate Lake Chad by transferring water from more abundant Central African lakes.⁵⁶ One UN goal is to create more jobs in the area.⁵⁷

5.0 Managing farmer-herder conflicts: The case of Ghana

Farmers and nomadic Fulani pastoralists in Ghana clash violently every year; especially during the dry season from December to March. These conflicts have multiple causes, including scarcity of pasture and water resources due to climate change, cattle rustling and weak laws governing ranching.⁵⁸ Ethnic differences are an added cultural factor: "farmers construct Fulani identity as non-Ghanaian."⁵⁹ There is a historical basis for this distinction: the Fulani originally migrated to Ghana from Burkina Faso, Niger and Mali early in the 20th century.⁶⁰ They did so in search of pasture, water, land and better economic opportunities.

A recent rise in farmer-herder conflicts in Ghana follows increased cow purchases, as a signal of increased wealth from agricultural development.⁶¹ The combination results in less grazing land, yet more cows that need pasture. When we add increased migration of Fulani herders to Ghana from drought-hit Niger, Mali and Burkina Faso, we see the seeds of conflict.

Whether in times of peace or conflict, farmers and herders in Ghana have a history of cooperating with one another as "cultural neighbours". As shown in Table 4, this pattern of cooperation takes the form of neighbourly interactions, intermarriages, friendships, trade, and resource sharing. However, recent increases in conflict among members of the two groups spurred the Ghanaian government to institute a ranching programme.⁶² This intervention led to a reduction in the number of violent conflicts among members of the two groups in the pilot area of the programme.^{63,64} This success suggests such interventions by the state might serve as a template for other West African countries grappling with similar issues.

Table 4: Cooperative Farmer-Fulani relationships in Ghana

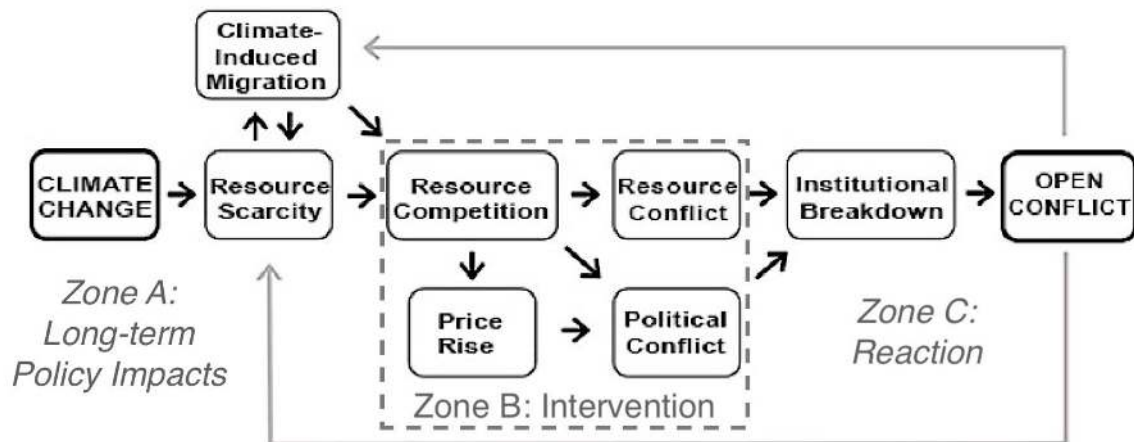
Sharing of resources	<ul style="list-style-type: none"> • Chiefs give out land to herders to settle and rear their cattle • Cooperating with landowners in land leases despite community evictions, refusal, & opposition to land leases • Allowing cattle to drink from dug-out boreholes • Allowing cattle to eat leftovers/residues from the farms after harvest
Friendships & exchange	<ul style="list-style-type: none"> • Visitations to each other's homes • Everyday greetings • Conversations • Sharing jokes • Sharing gifts • Eating & sharing meals • Exchange of food • Material support • Loaning of money to each other • Entrustment of cattle to herders • Provision of food items, clothing & money for the upkeep of herders
Communal labour	<ul style="list-style-type: none"> • Help in community activities & projects • Financial contribution towards community projects like boreholes & their repair • Help in farm labour like ploughing & harvesting
Payment of compensation	<ul style="list-style-type: none"> • Most effective mechanism for reaching compromise after crop destruction
Unit committee in conflict resolution	<ul style="list-style-type: none"> • Help mediate conflicts among members of the two groups • Determine payment of compensation; including the amount
Institution of chieftaincy	<ul style="list-style-type: none"> • The highest authority for building cooperative interactions • Settles and adjudicates in disputes • Determines the payment of compensation; including the amount
Worshipping together	<ul style="list-style-type: none"> • Praying in the mosque together • Cooking & sharing food during religious festivals • Travelling together in bigger towns to say Friday prayers
Social solidarity	<ul style="list-style-type: none"> • Attending each other's funerals, naming ceremonies, weddings, & festivities • Financial contribution towards social gatherings
Trade	<ul style="list-style-type: none"> • Petty trading such as sale of food items to herders • Sale of milk • Sale of animals (e.g. cattle, sheep, etc.) to community members

Source: Bukari, et al. (2018)

6.0 Conclusion

Africa is vulnerable to the effects of climate change. Climate change, in association with socio-economic factors, definitely leads to conflict, and considerable evidence points to causal relationships among the effects of climate change and violent conflict. Climate change causes resource scarcity, which spurs competition that ultimately feeds conflict. Studies reveal that the strength of the climate change-conflict links depends on several factors, including social and political contexts. In the specific case of West Africa, solutions to conflict that focus on long-term issues such as slowing climate change miss the urgent need to manage emerging conflict before it leads to violence. Ideally, states will take action to mitigate the potential conflicts generated by climate change before these conflicts lead to violence. The relevant questions for policymakers are how and where should they intervene to best effect?

Figure 2: Climate change conflict prevention & mitigation framework



Moving from left to right in Figure 2 reveals a wide range of potential opportunities to mitigate the impacts of climate change and weaken emerging links among climate change and open conflict. Current evidence suggests that global policy initiatives such as the Paris Agreement (Zone A) are unlikely to offset resource scarcity issues in the near term. Even those measures that nations agree to implement will take many years to make a substantial impact on current climatic trends. Also, few African nations currently have the institutional capacity needed to successfully respond to intense resource and political conflict at a national level (Zone C).

Thus, we propose that African governments focus their efforts to mitigate the impacts of climate change on proactive interventions to minimize the conflicts associated with resource competition (Zone B). Figure 2 suggests institutional interventions in the areas within Zone B to minimize competition for scarce resources, thus alleviating both resource and political conflicts leading to open conflict. Examples of these interventions are listed in Table 5, and range from efficient irrigation, water rationing, pasture management, resource rejuvenation, to public education and institution-building.

Table 5: Recommendations

1.	Restore neglected water resources
2.	Plant trees
3.	Build irrigation infrastructure for agriculture
4.	Incentivize ranching & commercial grazing for livestock production
5.	Increase use of alternative & renewable energy sources
6.	Increase climate change awareness
7.	Strengthen institutional capacity, democracy & good governance

Restore water bodies. Drying river and lake basins may be restorable. If the proposed Lake Chad inter-basin water transfer (IBT) project succeeds, it would help restore livelihoods in the region, which would in turn reduce potential conflict.⁶⁵ However, review of other IBT projects suggests the social and environmental costs may be significant.⁶⁶ If this is true, the Lake Chad IBT may have long-term and perhaps more serious implications for climate change and conflict.

Plant trees. Planting trees is a simple and cost-effective measure to rebuild capacity for CO₂ absorption. According to the recent study by Bastin et al., planting trees on as much as almost a billion hectares of currently suitable land could absorb up to a quarter of carbon currently in the atmosphere. The study recommends a greater sense of urgency in this regard, however. This is because over time there would be less land suitable for afforestation efforts. For instance, the authors estimate about 223 million hectares of land for planting trees could be lost to climate change effects by 2050.

Build irrigation infrastructure for agriculture. African agriculture, which is largely rain-fed, is currently the least productive in the world. Studies estimate that improved irrigation could boost agricultural productivity on the continent by as much as 50%.⁶⁷ According to the International Food Policy Research Institute (IFPRI), only 4% of cultivated land in sub-Saharan Africa is irrigated, compared to 37% for Asia. Thus, the livelihoods of most African farmers are subject to the elements. To move forward, African farmers must adopt modern agricultural methods. These would go beyond irrigation to include complementary measures such as cheaper fertilizer, better-yielding seeds, post-harvest storage and processing facilities, improved access to markets, and the training of and support for farmers.

Incentivize ranching and commercial grazing for livestock production. Ranching, a well-established alternative to nomadic pastoralism, is clearly a success in Ghana. It can be incentivized to be attractive to itinerant pastoralists. Grazing bans are ill-advised. We suggest the creation of enabling environments for commercial grazing instead. This would be privately managed pasture that herders can bring their cows to graze for a fee.

Increase use of alternative & renewable energy sources. The International Energy Agency (IEA) estimates renewable energy could constitute almost half of all new power generation capacity in sub-Saharan Africa by 2040.^{68,69} The case for alternative and renewable energy to replace fossil fuels in Africa is robust. Although some worry that commitments to reducing global warming would slow Africa's economic development, the continent has a unique opportunity to develop sustainably without externalizing its carbon emission costs to the earth's climate.⁷⁰

Increase climate change awareness. Africa has the opportunity not to join the current culprits in the developed world by emitting GHGs to the atmosphere. This will require increased awareness of climate change and its potential effects on the continent. The United Nations Environment Programme (UNEP) has many resources to aid governments in this regard.⁷¹

Strengthen state capacity, democracy and good governance. In areas with strong institutional capacity for conflict resolution, disagreements between farmers and herders should be easy to resolve. Few African countries have built such institutions. This weakness, coupled with poor governance and politics riddled with corruption, allows conflicts generated by climate change to escalate into violence, as evidenced by clashes between sedentary farmers and itinerant pastoralists in countries bordering Lake Chad. It would likely take many years for most African countries to build the state capacity needed to manage the tensions triggered by the impacts of climate change. Still, the example of Ghana shows how state authorities were able to position themselves for effective mediation of conflicts between farmers and herders when they arose.

In summary, initiatives to proactively mitigate conflicts resulting from climate change must be context-flexible, as locational and situational factors determine the specific interventions that stakeholders will accept. In the case of farmer: herder conflict, ranching might be ideal and mutually agreeable in one context, while commercialized grazing might be preferred by the parties in other specific geographic, socioeconomic and political environments. Various near-term initiatives such as ranching may well be accompanied by long-term measures such as land restoration programmes to green increasingly arid grazing lands. Thus, near-term measures should be harmonized with long-term policy action that addresses root causes.

Author: Dr. Rafiq Raji

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References

- ¹ Jackson, S.T. (2019, July 12) Climate change. *Encyclopaedia Britannica*. Retrieved from <https://www.britannica.com/science/climate-change>
- ² Sultan, B. & Gaetani, M. (2016). Agriculture in West Africa in the twenty-first century: Climate change & impact scenarios, and potential for adaptation. *Frontiers in Plant Science*. Retrieved from <https://www.frontiersin.org/articles/10.3389/fpls.2016.01262/full>
- ³ Burrows, K. & Kinney, P.L. (2016). Exploring the climate change, migration and conflict nexus. *International Journal of Environmental Research and Public Health*, 13(4), 443. Retrieved from <https://www.mdpi.com/1660-4601/13/4/443/pdf>
- ⁴ We need to do more to understand how climate change and conflict are linked. Here's why. (2018, September 21). *World Economic Forum*. Retrieved from <https://www.weforum.org/agenda/2018/09/we-need-to-do-more-to-understand-how-climate-change-and-conflict-are-linked-heres-why/>
- ⁵ Meyer, R. (2018, February 12). Does climate change cause more war? *The Atlantic*. Retrieved from <https://www.theatlantic.com/amp/article/553040/>
- ⁶ Nordas, R. & Gleditsch, N.P. (2007). Climate change and conflict, *Political Geography*, 26, 627-638. Retrieved from <https://www.clisec.uni-hamburg.de/en/pdf/data/nordas-gleditsch-2007-climate-change-and-conflict.pdf>
- ⁷ Gleditsch, N.P. (2012). Whither the weather? Climate change and conflict. *Journal of Peace Research*, 49(1), 3-9. Retrieved from <https://www.openbriefing.org/docs/JPRclimateconflict.pdf>
- ⁸ Buhaug, H. (2015). Climate-conflict research: some reflections on the way forward. *WIREs Climate Change*, 6, 269-275. Retrieved from <https://onlinelibrary.wiley.com/doi/pdf/10.1002/wcc.336>
- ⁹ Elks, S. (2019, June 12). Climate change seen posing threat to global peace in next 10 years. *Reuters*. Retrieved from <https://www.reuters.com/article/us-global-climatechange-peace/climate-change-seen-posing-threat-to-global-peace-in-next-10-years-idUSKCN1TD0C6>
- ¹⁰ Schaar, J. (2018). The relationship between climate change and violent conflict (Green Tool Box/Peace and Security Tool box: Working Paper, 2017). Stockholm: Swedish International Development Agency. Retrieved from <https://www.sida.se/contentassets/c571800e01e448ac9dce2d097ba125a1/working-paper---climate-change-and-conflict.pdf>
- ¹¹ Figure adapted from Brown, et al (2007). Climate change as the 'new' security threat: implications for Africa. *International Affairs* 83: 6 (2007) 1141–1154
- ¹² We need to do more to understand how climate change and conflict are linked. Here's why. (2018, September 21). *World Economic Forum*. Retrieved from <https://www.weforum.org/agenda/2018/09/we-need-to-do-more-to-understand-how-climate-change-and-conflict-are-linked-heres-why/>
- ¹³ Hendrix, C.S. & Salehyan, I. (2012). Climate change, rainfall and social conflict in Africa. *Journal of Peace Research*, 49(35), 35-50. Retrieved from https://www.researchgate.net/profile/Idean_Salehyan/publication/227574799_Climate_Change_Rainfall_and_Social_Conflict_in_Africa/links/0c96052ebb2c98406e000000.pdf
- ¹⁴ Tir, J. & Stinnett, D.M. (2012). Weathering climate change: Can institutions mitigate international water conflict? *Journal of Peace Research*, 49 (1), 211-225. Retrieved from https://www.researchgate.net/profile/Jaroslav_Tir/publication/227574791_Weathering_climate_change_Can_institutions_mitigate_international_water_conflict/links/5672d74b08ae1557cf4934ac/Weathering-climate-change-Can-institutions-mitigate-international-water-conflict.pdf
- ¹⁵ Burke, M., Hsiang, S.M. & Miguel, E. (2014). Climate and conflict. *Annual Review of Economics*, 7(1), 577-617. Retrieved from <https://www.nber.org/papers/w20598.pdf>
- ¹⁶ Werrell, C.E. & Femia, F. (2018). Climate change raises conflict concerns, *The UNESCO Courier*, 2, 20-22. Retrieved from <https://en.unesco.org/courier/2018-2/climate-change-raises-conflict-concerns>
- ¹⁷ Maystadt, J. & Ecker, O. (2014). Extreme weather and civil war: Does drought fuel conflict in Somalia through livestock price shocks? *American Journal of Agricultural Economics*, 96 (4), 1157-1182. Retrieved from <https://academic.oup.com/ajae/article-pdf/96/4/1157/8638380/aau010.pdf>
- ¹⁸ Burke, M.B., Miguel, E., Satyanath, S., Dykema, J.A., & Lobell, D.B. (2009) Warming increases the risk of civil war in Africa. *PNAS*, 106 (49), 20670-20674. Retrieved from <https://i.unu.edu/media/ourworld.unu.edu-en/article/1129/Warming-increases-the-risk-of-civil-war-in-Africa1.pdf>
- ¹⁹ Hsiang, S.M., Meng, K.C., & Cane, M.A. (2011). Civil conflicts are associated with the global climate. *Nature*, 476, 438-441. Retrieved from <https://www.nature.com/articles/nature10311>

- ²⁰ Bowles, D.C., Butler, C.D. & Morisetti, N. (2015). Climate change, conflict and health. *Journal of the Royal Society of Medicine*, 108(10), 390-395. Retrieved from <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4622275/>
- ²¹ Mach, K.J., Kraan, C.M., Adger, W.N., Buhaug, H., Burke, M., Fearon, J.D., Field, C.B., Hendrix, C.S., Maystadt, J., O'Loughlin, J., Roessler, P., Scheffran, J., Schultz, K.A., & Von Uexkull, N. (2019). Climate as a risk factor for armed conflict. *Nature*, 571, 193-197. Retrieved from <https://www.nature.com/articles/s41586-019-1300-6.pdf>
- ²² Collier, P., Conway, G. & Venables, T. (2008). Climate change and Africa. *Oxford Review of Economic Policy*, 24(2), 337-353. Retrieved from https://ora.ox.ac.uk/objects/uuid:00a75d5e-24bf-41fe-92ea-7aba758384c9/download_file?file_format=pdf&safe_filename=ClimateChangeandAfrica.pdf&type_of_work=Journal+article
- ²³ FAO (2018). The state of the world's forests 2018. Rome: Food and Agricultural Organisation of the United Nations. Retrieved from <http://www.fao.org/3/i9535en/i9535en.pdf>
- ²⁴ Swanborough, J. (2016, November 17). We need to save Africa's forests. Here's how. *World Economic Forum*. Retrieved from <https://www.weforum.org/agenda/2016/11/deforestation-africa-palm-oil/>
- ²⁵ Bastin, J., Finegold, Y., Garcia, C., Mollicone, D., Rezende, M., Routh, D., Zohner, C.M., & Crowther, T.W. (2019). The global tree restoration potential. *Science*, 365 (6448), 76-79. Retrieved from <https://www.larchmontbuzz.com/wp-content/uploads/2019/07/Bastin-et-al-2019-The-global-tree-restoration-potential-Science.pdf>
- ²⁶ Long, S. (2019, February 28). Climate change and population growth are making the world's water woes more urgent. *The Economist*. Retrieved from <https://www.economist.com/special-report/2019/02/28/climate-change-and-population-growth-are-making-the-worlds-water-woes-more-urgent>
- ²⁷ De Sousa, A. (2018, September 11). World hunger rises as climate change, conflict curb food access. *Bloomberg*. Retrieved from <https://www.bloomberg.com/news/articles/2018-09-11/world-hunger-rises-as-climate-change-conflict-curb-food-access>
- ²⁸ Yi, B.L. (2018, June 28). More parents trade girls for cows as war and climate change hit east Africa. *Reuters*. Retrieved from <https://af.reuters.com/article/topNews/idAFKBN1J00QK-OZATP>
- ²⁹ Rioba, B. (2019, August 2). Dried-up pastures push Kenya's Maasai to mix cattle with crops. *Reuters*. Retrieved from <https://af.reuters.com/article/kenyaNews/idAFL2N23C1GZ>
- ³⁰ WWAP (2019). *The United Nations World Water Development Report 2019: Leaving no one behind*. Paris: UNESCO. Retrieved from <https://unesdoc.unesco.org/ark:/48223/pf0000367306/PDF/367306eng.pdf.multi>
- ³¹ Cilliers, J. (2009). Climate change, population pressure and conflict in Africa. *Institute for Security Studies Papers*, 178, 20. Retrieved from <https://www.africaportal.org/documents/2862/PAPER178.pdf>
- ³² The Fragile States Index, retrieved from <http://www.fragilestatesindex.org>
- ³³ Pastoralism. (n.d.) In *The Concise Oxford Dictionary of Archaeology*. Retrieved from <https://www.oxfordreference.com/view/10.1093/oi/authority.20110803100309746>
- ³⁴ Kamuanga, M.J.B., Somda, J., Sanon, Y. & Kagone, H. (2008). Livestock and regional market in the Sahel and West Africa: Potentials and challenges. Paris: SWAC-OECD/ECOWAS. Retrieved from <https://www.oecd.org/swac/publications/41848366.pdf>
- ³⁵ Shettima, A.G. & Tar, U.A. (2008). Farmer-pastoralist conflict in West Africa: Exploring the causes and consequences. *Information, Society and Justice*, 1(2), 163-184. Retrieved from http://repository.londonmet.ac.uk/55/1/InformationSocietyAndJustice_v1n2_p163-184.pdf
- ³⁶ How climate change can fuel wars. (2019, May 23). *The Economist*. Retrieved from <https://www.economist.com/international/2019/05/23/how-climate-change-can-fuel-wars>
- ³⁷ Peyton, N. (2019, May 15). Climate change pushes farmers to 'tipping point' in Lake Chad crisis. *Reuters*. Retrieved from <https://www.reuters.com/article/us-environment-lakechad-conflict/climate-change-pushes-farmers-to-tipping-point-in-lake-chad-crisis-idUSKCN1SL2EG>
- ³⁸ After deadly clashes, Ivorian farmers and herders try dialogue. (2019, February 17). *France24*. Retrieved from <https://www.france24.com/en/20190217-after-deadly-clashes-ivorian-farmers-herders-try-dialogue>
- ⁴⁰ Bassett, T.J. (1988). The political ecology of peasant-herder conflicts in the northern Ivory Coast. *Annals of the Association of American Geographers*, 78 (3), 453-472. Retrieved from https://www.researchgate.net/publication/240649168_The_Political_Ecology_of_Peasant_Herder_Conflicts_in_Northern_Ivory_Coast
- ⁴¹ Campbell, J. (2019, May 21). Farmer herder clashes in Chad follow familiar pattern. *Council on Foreign Relations*. Retrieved from <https://www.cfr.org/blog/farmer-herder-clashes-chad-follow-familiar-pattern>

- ⁴² Tabary, Z. & Cardi, V. (2018, May 30). Corridor to the future? Mauritania's nomadic herders seek safe passage through drought. *Reuters*. Retrieved from <https://www.reuters.com/article/us-mauritania-livestock-drought-feature/corridor-to-the-future-mauritanias-nomadic-herders-seek-safe-passage-through-drought-idUSKCN1IV011>
- ⁴³ UNOWAS (2018). Pastoralism and security in West Africa and the Sahel. Dakar: UNOWAS. Retrieved from https://unowas.unmissions.org/sites/default/files/rapport_pastoralisme_eng-2.pdf
- ⁴⁴ O'Bannon, B.R. (2006). Receiving an "Empty Envelope": Governance reforms and the management of farmer-herder conflict in Senegal. *Canadian Journal of African Studies*, 40 (1), 76-100. Retrieved from https://www.researchgate.net/publication/260326845_Receiving_an_Empty_Envelope_Governance_Reforms_and_the_Management_of_Farmer-Herder_Conflict_in_Senegal
- ⁴⁵ Pelican, M. (2012). Friendship among pastoral Fulbe in northwest Cameroon. *African Study Monographs*, 33 (3), 165-188. Retrieved from https://repository.kulib.kyoto-u.ac.jp/dspace/bitstream/2433/159427/1/ASM_33_165.pdf
- ⁴⁶ Brockhaus, M., Kambire, H., Pickardt, T., Schliephake, S., Hoffmann, I. & Steinbach, J. (2003, July). *Conflict management in farmer-herders conflicts in south west Burkina Faso*. Paper presented at VIth International Rangelands Congress, Durban, South Africa. Retrieved from https://www.researchgate.net/publication/259602384_Conflict_management_in_farmer-herders_conflict_in_South_West_Burkina_Faso
- ⁴⁷ Le Meur, P. & Hochet, P. (2010). Property relations by other means: Conflict over dryland resources in Benin and Mali. *European Journal of Development Research*, 22(5), 643-659. Retrieved from https://www.researchgate.net/publication/47758068_Property_Relations_by_Other_Means_Conflict_over_Dryland_Resources_in_Benin_and_Mali
- ⁴⁸ Ibukun, Y. (2018, December 17). Clashes between Nigerian farmers and herders have killed thousands, Amnesty says. *Bloomberg*. Retrieved from <https://www.bloomberg.com/news/articles/2018-12-17/more-than-3-600-killed-in-nigeria-pastoral-conflict-group-says>
- ⁴⁹ Mwanza, K. (2018, June 25). Nigeria herders, farmers conflict highlights squeeze on arable land. *Reuters*. Retrieved from <https://www.reuters.com/article/us-nigeria-security-landrights/nigeria-herders-farmers-conflict-highlights-squeeze-on-arable-land-idUSKBN1JL2QG>
- ⁵⁰ Iruoma, K. (2019, June 26). Deadly clashes over cattle continue in Nigeria despite grazing ban. *Reuters*. Retrieved from <https://www.reuters.com/article/us-nigeria-climatechange-herders-feature/deadly-clashes-over-cattle-continue-in-nigeria-despite-grazing-ban-idUSKCN1TR1NC>
- ⁵¹ Nigeria grazing ban to stop deadly cattle wars. (2017, November 2). *BBC*. Retrieved from <https://www.bbc.com/news/world-africa-41844655>
- ⁵² Gansler, K. (2019, July 16). Nigeria: The politicized herders and farmers conflict. *DW*. Retrieved from <https://www.dw.com/en/nigeria-the-politicized-herders-and-farmers-conflict/a-49598457>
- ⁵³ Environmental cooperation as a pathway to resolve Nigeria's deadly farmer-herder conflicts. (2018, October 4). *United Nations Environment Programme*. Retrieved from <https://www.unenvironment.org/news-and-stories/story/environmental-cooperation-pathway-resolve-nigerias-deadly-farmer-herder>
- ⁵⁴ Siebold, S. & Shalal, A. (2018, September 3). Over \$2 billion pledged to drought-stricken Lake Chad region. *Reuters*. Retrieved from <https://www.reuters.com/article/us-germany-africa/over-2-billion-pledged-to-drought-stricken-lake-chad-region-idUSKCN1LJ1K9>
- ⁵⁵ Security council strongly condemns terrorist attacks, other violations in Lake Chad Basin region, unanimously adopting Resolution 2349 (2017). (2017, March 31). *United Nations*. Retrieved from <https://www.un.org/press/en/2017/sc12773.doc.htm>
- ⁵⁶ Onuah, F. & George, L. (2019, April 23). UN to help raise \$50 billion for Lake Chad revival project. *Reuters*. Retrieved from <https://www.reuters.com/article/us-environment-lakechad/un-to-help-raise-50-billion-for-lake-chad-revival-project-idUSKCN1RZ282>
- ⁵⁷ Hoey, N. (2018, February 28). More jobs key dealing with Lake Chad crisis, UNESCO says. *Reuters*. Retrieved from <https://af.reuters.com/article/chadNews/idAFL8N1QI5BY>
- ⁵⁸ Bukari, K.N., Sow, P. & Scheffran, J. (2018). Cooperation and co-existence between farmers and herders in the midst of violent farmer-herder conflicts in Ghana. *African Studies Review*, 61 (2), 78-102. Retrieved from <https://www.cambridge.org/core/journals/african-studies-review/article/cooperation-and-coexistence-between-farmers-and-herders-in-the-midst-of-violent-farmerherder-conflicts-in-ghana/16A94FD119CAECC178B12F5A3721A5A3>
- ⁵⁹ Kuusaana, E.D. & Bukari, K.N. (2015). Land conflicts between smallholders and Fulani pastoralists in Ghana: Evidence from the Asante Akim North District (AAND). *Journal of Rural Studies*, 42, 52-62. Retrieved from http://udspace.uds.edu.gh/bitstream/123456789/479/1/LAND%20CONFLICTS%20BETWEEN%20SMALLHOLDERS%20AND%20FULANI%20PASTORALISTS%20IN%20GHANA%20_%20EVIDENCE%20FROM%20THE%20ASANTE%20AKIM%20NORTH%20DISTRICT%20%28AAND%29.pdf

- ⁶⁰ Dary, S.K., James, H.S. & Mohammed, A.S. (2017). Triggers of farmer-herder conflicts in Ghana: A non-parametric analysis of stakeholders' perspectives. *Sustainable Agriculture Research*, 6(2), 141-151. Retrieved from <https://ageconsearch.umn.edu/record/265151/files/P14-p141-151.pdf>
- ⁶¹ Peyton, N. (2018, August 2). Growing wealth brings rise in deadly conflict in northern Ghana. *Reuters*. Retrieved from <https://www.reuters.com/article/us-ghana-agriculture-conflict/growing-wealth-brings-rise-in-deadly-conflict-in-northern-ghana-idUSKBN1KN1S6>
- ⁶² Ghana cattle ranching project launched in Accra. (2017, July 31). *Government of Ghana*. Retrieved from <http://www.ghana.gov.gh/index.php/media-center/news/3873-ghana-cattle-ranching-project-launched-in-accra>
- ⁶³ Afram plains cattle ranch helping to end clashes – Akufo-Addo. (2018, November 25). *Ghana New Agency*. Retrieved from <https://www.ghanaweb.com/GhanaHomePage/NewsArchive/Afram-Plains-cattle-ranch-helping-to-end-clashes-Akufo-Addo-703656>
- ⁶⁴ Government will strengthen the pillars of security – President. (2018, February 22). *Government of Ghana*. Retrieved from <http://www.ghana.gov.gh/index.php/news/4410-government-will-strengthen-the-pillars-of-security-president>
- ⁶⁵ Conference recommends inter-basin water transfer to save Lake Chad. (2018, March 9). *United Nations Development Programme*. Retrieved from <http://www.ng.undp.org/content/nigeria/en/home/presscenter/articles/2018/03/09/conference-recommends-inter-basin-water-transfer-to-save-lake-chad.html>
- ⁶⁶ WWF (2009). Interbasin water transfers and water scarcity in a changing world – a solution or a pipedream? Frankfurt: WWF. Retrieved from <http://assets.panda.org/downloads/pipedreams18082009.pdf>
- ⁶⁷ You, L., Ringler, C., Nelson, G., Wood-Sichra, U., Robertson, R., Wood, S., Guo, Z., Zhu, T. & Sun, Y. (2010). What is the irrigation potential for Africa? A combined biophysical and socioeconomic approach (IFPRI Discussion Paper 00993). Washington DC: International Food Policy Research Institute. Retrieved from <http://ebrary.ifpri.org/utils/getfile/collection/p15738coll2/id/2205/filename/2206.pdf>
- ⁶⁸ Valentine, K. (2014, October 16). Renewable energy in Africa set to surge by 2040, IEA says). *Our World*. Retrieved from <https://ourworld.unu.edu/en/renewable-energy-in-africa-is-set-to-surge-by-2040-iea-says>
- ⁶⁹ IEA (2014). Africa Energy Outlook: A focus on energy prospects in sub-Saharan Africa. Paris: International Energy Agency. Retrieved from https://www.iea.org/publications/freepublications/publication/WEO2014_AfricaEnergyOutlook.pdf
- ⁷⁰ IRENA (2013). Africa's renewable future: The path to sustainable growth. Abu Dhabi: International Renewable Energy Agency. Retrieved from https://www.irena.org/documentdownloads/publications/africa_renewable_future.pdf
- ⁷¹ UNEP (2006). Raising awareness of climate change: A handbook for government focal points. Geneva:United Nations Environment Programme. Retrieved from http://apps.unep.org/redirect.php?file=/publications/pmtdocuments/unep_cc_handbook.pdf



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Contact Information:

Yvonne Chong
Email: cas@ntu.edu.sg
Phone: +65 69081940
Address: S3-B1A-35 Nanyang Business School
Nanyang Technological University
50 Nanyang Avenue Singapore 639798