Climate Change, Population Displacements, and Conflicts in Northern Ghana

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Abstract

Climate change and its adverse impacts on the environment, population, and sources of livelihood remains a significant global concern; especially in economically disadvantaged regions like Africa. Therefore, this paper delves into the pressing issue of climate change and its profound effect on the northern regions of Ghana—a less developed area already grappling with socio-economic challenges. Through rigorous empirical research in key cities and towns, the study elucidates the intricate connections between climate change, population displacements, and farmer-herder conflicts. It unveils the far-reaching consequences on human security; encompassing food, health, water, and communal stability. Notably, the research underscores the region's vulnerability to flooding, drought, and resource competition due to these interlinked challenges. Recognising the disproportionate impacts on critical aspects of well-being, the paper concludes with a set of policy recommendations. These recommendations aim to guide effective interventions and policies that can alleviate the identified issues; offering a pathway towards enhancing resilience, sustainability, and overall human security in northern Ghana.

Keywords: Climate change, Population displacement, Conflict, Northern Ghana, Human security.

Introduction

Climate change poses a significant global challenge with particularly severe consequences for economically disadvantaged regions like Africa and Latin America. Despite Africa's minimal contribution to anthropogenic emissions and the processes driving climate change in comparison to industrialised countries,[1] it remains highly vulnerable to the resulting socio-economic implications, security risks, and potential conflicts.[2] Within Ghana, although the impact of climate change is not as severe as in neighbouring Sahelian countries such as Mali, Niger, and Burkina Faso,[3] it still presents challenges for urban planning[4] and affects multiple sectors of the economy, including agriculture, healthcare, and energy, with far-reaching implications for ecology, land use, and welfare.[5] Projections indicate that temperatures will rise and rainfall will exhibit significant variability across all agro-ecological zones in Ghana.[6] Consequently, the frequency of extreme events such as droughts and floods, which are closely associated with climate change, is expected to increase throughout the country.[7] These challenges are more pronounced in the northern regions of Ghana[8] compared to the southern regions, due to factors such as high temperatures, unpredictable precipitation patterns, and frequent worm infestations. In 2017, certain areas in the northern regions experienced a devastating influx of fall armyworms; severely affecting agricultural productivity and destroying sources of livelihood. For instance, the infestation rate reached 1,083 hectares in the Northern Region; greatly impacting on food security.[9]

In addition, improper farming practices also contributed to destroying vegetative covers, accelerating the rate of erosion; thereby, impoverishing soils to sustain productive agricultural activities. These circumstances together with external environmental imperatives—climate change in the Sahel—have not only disrupted livelihoods in several communities in northern Ghana but have also created conditions that aggravate flooding, drought, and fuel inter-communal conflicts particularly between cattle herders and farmers.[10] Worse still is the concomitant population displacements that arise from these environmental phenomena. To gain a comprehensive understanding of these situations, several key questions need to be addressed; namely—what is the scope and the magnitude of climate change in northern Ghana? How does climate change contribute to the phenomena of population displacement, environmentally induced migration, and conflicts in the northern regions?

This paper investigates the aforementioned research questions through examining fieldwork conducted in selected cities and towns in northern Ghana; specifically, Tamale, Yendi, Walewale, Bolgatanga, and surrounding areas. The choice of the northern regions was based on a combination of factors. These factors included the perception of multivariate impact of climate change and the extended duration of the dry season. The latter subjects the region to harsh environmental conditions and results in poor soil quality, which is partly attributed to unpredictable rainfall patterns. At its core, the study posits that climate change, population displacements, and farmer-herder conflicts in northern Ghana are intrinsically interlinked, with this nexus manifesting through recurrent episodes of flooding, periods of drought, and heightened competition for increasingly scarce natural resources. This argument is validated through a comprehensive analysis that delves into the intricate and multifaceted interactions among these elements within the regional context. These findings hold significant policy implications for addressing the complex challenges posed by these intertwined issues in the region.

The paper is organised into six interrelated sections. After the introductory section, the second section conducts an examination into the nature and underlying causes of climate change in northern

[1]Cabot, C. (2017). *Climate Change, Security Risks and Conflict Reduction in Africa: A Case Study of Farmer-Herder Conflicts over Natural Resources in Côte d'Ivoire, Ghana and Burkina Faso 1960–2000*. Berlin & Heidelberg: Springer. See also Scheffran, J., Link, P. M., & Schilling, J. (2019). Climate and Conflict in Africa. *Oxford Research Encyclopedia of Climate Science*. Retrieved from https://oxfordre.com/climatescience/view/10.1093/acrefore/9780190228620.001.0001/acrefore-9780190228620-e-557

[2]Ibid.

[3]Tonah, S. (2005). *Fulani in Ghana: Migration History, Integration and Resistance.* Legon-Accra: University of Ghana.

[4]Cobbinah, P. B., Asibey, M. O., Opoku-Gyamfi, M., & Peprah, C. (2019). Urban Planning and Climate Change in Ghana. *Journal of Urban Management,* 8(2), 261-271.

[5]Asante, F. A., & Amuakwa-Mensah, F. (2014). Climate Change and Variability in Ghana: Stocktaking. Climate, 3(1), 78-99.

[6]Antwi-Agyei, P., & Nyantakyi-Frimpong, H. (2021). Evidence of Climate Change Coping and Adaptation Practices by Smallholder Farmers in Northern Ghana. *Sustainability*, 13(3), 1308.

[7]Adu-Prah, S., Appiah-Opoku, S., & Aboagye, D. (2019). Spatiotemporal Evidence of Recent Climate Variability in Ghana. African Geographical Review, 38(2), 172-190.

[8]The northern regions are five; namely—Northern Region, Upper East Region, Upper West Region, Savannah Region, and North East Region.

[9]GNA. (2017). Fall Armyworm Attacks 18,000 Hectare Farmlands Costing Ghana $64m. June 12. Ghana Business News. Retrieved from https://www.ghanabusinessnews.com/2017/06/12/fall-armyworm-attacks-18000-hectare-farmlands-costing-ghana-64m/

[10]Alhassan, O., & Asante, R. (2022). Addressing Conflicts over Resource Use in Ghana: The Case of Operations Vanguard and Cow Leg. *Contemporary Journal of African Studies,* 9(1), 53-65.

Ghana. The third section delves into climate challenges and their common manifestations, while the fourth section focuses on how these challenges contribute to population displacements and conflicts and their general impact on human security within specific regions of northern Ghana. Moving forward, the fifth section scrutinises the existing response and coping mechanisms that have been deployed to address the imminent threat of climate change in the region. Lastly, the sixth section concludes the paper by presenting a set of key policy recommendations that have been derived from the research findings. By following this structure, the paper aims to illuminate the complex relationship between climate change, conflicts, and population displacements in northern Ghana and propose actionable policy recommendations to mitigate its adverse effects and enhance human security.

Nature and Causes of Climate Change in Northern Ghana

Climate change in Ghana is evidenced by various elements such as increasing temperatures, decreasing rainfall patterns, extreme weather events, and rising sea levels.[11] However, the five northern regions of Ghana experience significantly higher temperatures compared to the southern regions, with an average high of 34 degrees Celsius and an average low of 23 degrees Celsius.[12] This temperature differential is attributed to the fact that the northern regions fall within the Sudan and Guinea ecological zones, which receive the lowest amount of rainfall with a unimodal distribution.[13] Conversely, the southern regions, which comprise of coastal savanna, forest-savanna, transitional zone, semi-deciduous forest, and high rainforest zones, are characterised by a bimodal rainfall distribution; making them less susceptible to drought conditions.[14] Due to these ecological variations, the northern regions of Ghana experience significant alterations in their rainfall patterns, primarily during the rainy season, which traditionally extends from May to November. This recurring phenomenon has wielded notable environmental ramifications in these areas. For instance, in 2021, a substantial portion of the region received meagre rainfall; resulting in drought conditions that exacerbated the proliferation of armyworm infestations, ultimately impacting food production.[15]

A similar erratic rainfall pattern was observed in 2022, with a delayed start of the rains in August. This delay posed challenges for the production of yam, rice, soybeans, and millet in Yendi and surrounding communities.[16] The Acting Municipal Director of the National Disaster Management Organisation (NADMO) in Yendi highlighted that apart from unreliable rainfall patterns, the high temperatures experienced also contributed to increased evaporation and drought conditions. These combined climatic factors created challenges in food security, land management, and livestock rearing in rural communities across northern Ghana.[17] Interviews conducted in Yendi, Bolgatanga, and Tamale revealed that unregulated human activities played a role in the deterioration of the environment. While agriculture remains the primary livelihood source, associated activities such as land clearing, bush burning, and vegetation removal, pose threats to the climate.[18] The use of earthmoving machines, like combine harvesters dependent on fossil fuels, further contributes to environmental degradation by emitting significant quantities of carbon into the atmosphere; thereby, destroying vegetation cover.[19] Additionally, the quest for charcoal production, wood processing for carpentry, sand winning, and illegal logging for fuel wood exacerbates the depletion of the environment with negative consequences on the climate.[20]

Climate Challenges and Common Manifestations

The consequences of climate change, relating to flooding and drought, when explored, highlighted insights enumerated hereinafter.

Flooding

Literature on climate change suggests that in sub-Saharan Africa, Ghana is one of the countries exposed to occasional flooding with disproportionate consequences on urban development and agricultural activities.[21] While the southern part

[11]Adonadaga, M. G., Ampadu, B., Ampofo, S., & Adiali, F. (2022). Climate Change Adaptation Strategies Towards Reducing Vulnerability to Drought in Northern Ghana. European Journal of Environment and Earth Sciences, 3(4), 1-6.
[12]WorldData.Info. (nd). The Climate in Ghana. Retrieved from https://www.worlddata.info/africa/ghana/climate.php
[13]Adonadaga et al. (2022) Op. cit.
[14]Ibid.
[15]Interview with Programme Officers, Environmental Protection Agency (EPA)-Wa. October, 2022.; Interview with Director, National Disaster Management Organisation (NADMO)-Tamale. October, 2022.
[16]Interview with Director, NADMO-Yendi. October, 2022.
[17]Ibid.
[18]Interview with Programme Officers, EPA-Tamale. October, 2022.
[19]Ibid.
[20]Ibid.
[21]Amoateng, P., Finlayson, C. M., Howard, J., & Wilson, B. (2018). A Multi-Faceted Analysis of Annual Flood Incidences in Kumasi, Ghana. *International Journal of Disaster Risk Reduction*, 27, 105-117. See also
Aggrey, F. K. N. (2015). Governance of Climate Change Adaptation for Flooding in Accra: The Role of National Disaster Management Organization. *Master's Programme in Urban Management and Development.* Retrieved from https://www.academia.edu/21373279/MASTERS_PROGRAMME_IN_URBAN_MANAGEMENT_AND_DEVELOPMENT_Title_Governance_of_Climate_Change_Adaptation_for_Flooding_In_Accra_The_Role_of_National_Disaster_Management_Organization

of the country experiences intermittent flooding due to poor drainage systems, indiscipline relating to disposal of waste, and unpredictable rainfall patterns,[22] the northern part of the country suffers huge consequences of climate change.[23] The severity of the flooding in northern Ghana is also as a result of unpredictable rainfall patterns as well as the annual spillage of water upstream from the Bagre Dam in the neighbouring Burkina Faso. For example, between 2004-14, large parts of the northern regions experienced six different flood situations—2004, 2007, 2008, 2009, 2010, and 2012—with disastrous implications on agriculture;

particularly, food security.[24] In 2018, the volatile heavy rainfall in the region, combined with the opening of the Bagre Dam affected nearly 100,000 persons and destroyed 196 kilometres squared of farmland in northern Ghana.[25] Further, the dependence on the annual precipitation pattern for crop cultivation frequently aligns with the wet season, during which flooding events transpire in local communities due to the inundation of water originating from streams and perennial rivers that swamp cultivated farmlands of farmers.[26] A study by Derbile and others in 2015, confirmed the recurrent nature of the flooding, which in the past had significant adverse effects on food crop farming in the northern regions, including pest infestation, diseases, death of crops, poor seed development, soil nutrients erosion, and crop decay.[27] It also affected growth of crops; leading to poor yields.[28] In the August-September 2021 rainy season, serious flooding occurred in the northern regions, which affected farming activities. With particular reference to the Upper West Region, the flooding caused the destruction of 6,880 acres of farms and affected the livelihoods of 6,623 farmers.[29] However, this did not only occur in the Upper West Region, interviews with community members in the Walewale District of the Northern Region in October 2022, corroborated the impact of the flooding on crops, animals, and access to clean drinking water; posing additional challenges to the safety and health of community members.[30] Consequently, the irregular rainfall patterns in northern Ghana have had a pronounced adverse impact on the subsistence of smallholder farmers.

Droughts

Like flooding, drought is one of the key manifestations of climate change in Ghana. Drought, as defined by the United Nations (UN), is "the naturally occurring phenomenon that exists when precipitation has been significantly below normal recorded levels, causing serious hydrological imbalances that adversely affect land resource production systems."[31] In the existing literature, the occurrence of drought is classified into four; namely—meteorological drought, hydrological drought, agricultural drought, and socio-economic drought.[32] Even so, given that the northern regions of Ghana mainly depend on agriculture, this paper focuses on understanding 'agricultural drought' and its linkage to climate change.

Historically, Ghana has experienced major drought situations countrywide in 1983, 1992, and 2001.[33] These had disproportionate negative consequences in the northern parts of the country—shortage of water, bush fires etc.— compared to the southern regions due to mean monthly precipitation generally falling below 900 millimetres.[34] Environmental officials in Tamale attribute the recurring nature of drought in the region to high temperatures, which are also related to

[22]Smith, D. (2015). Death Toll Rises in Accra Floods and Petrol Station Fire. June 05. *The Guardian*. Retrieved from https://www.theguardian.com/world/2015/jun/05/death-toll-accra-floods-petrol-station-fire
[23]Okyere, C. Y., Yacouba, Y., & Gilgenbach, D. (2013). The Problem of Annual Occurrences of Floods in Accra: An Integration of Hydrological, Economic and Political Perspectives. Theoretical and Empirical Researches in Urban Management, 8(2), 45-79.
[24]Davies, R. (2018). Ghana – Dozens Killed by Flooding in Northern Regions. September 21. Floodlist. Retrieved from https://floodlist.com/africa/ghana-floods-northern-regions-september-2018.
[25]Ibid.
[26]Lente, I., Heve, W. K., Owusu-Twum, M. Y., Gordon, C., Opoku, P., Nukpezah, D., & Klutse, N. A. B. (2023). Nature of Climate Change-Induced Risks in Semi-Arid Northwestern Ghana: Gauged Observations, Perceptions of Smallholder Farmers, and Perspectives for Livelihood Adaptation. Information Development, 0(0).
[27]Derbile, E. K., File, D.J.M., & Dongzagla, A. (2016). The Double Tragedy of Agriculture Vulnerability to Climate Variability in Africa: How Vulnerable is Smallholder Agriculture to Rainfall Variability in Ghana? Jàmbá: Journal of Disaster Risk Studies, 8(3), 1-9.
[28]Ibid.
[29]See Oppong-Ansah, A. (2021). COP26: How Northern Ghana Farmers Are Battling Drought and Floods from Climate Change. November 06. The Scotsman. Retrieved from https://www.scotsman.com/news/politics/cop26-how-northern-ghana-farmers-are-battling-climate-change-3446801
[30]Interview with Twenty-One-Year-Old Male-Kata-Banawa Community. October, 2022.
[31]United Nations. (1994). *United Nations Convention to Combat Desertification in Those Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa.* October 17. Paris: United Nations.
[32]See American Meteorological Society. (2004). Statement on Meteorological Drought. *Bulletin of the American Meteorological Society*. 85, 771–773. Available at https://www.ametsoc.org/index.cfm/ams/about-ams/ams-statements/archive-statements-of-the-ams/meteorological-drought/
[33]Armah, F. A., Odoi, J. O., Yengoh, G. T., Obiri, S., Yawson, D. O., & Afrifa, E. K. (2011). Food security and climate change in drought-sensitive savanna zones of Ghana. *Mitigation and adaptation strategies for global change, 16*, 291-306.
[34]Ibid.

the unimodal nature of rainfall distribution patterns.[35] In Yendi and the adjoining villages, for instance, this pattern has negative implications on food security and livestock rearing.[36] During a commemoration of World Environment Day in Bolgatanga in June 2022, the Upper East Regional Director of the Environmental Protection Agency (EPA), highlighted the nexus between climate change and drought.[37] He argued that drought, which is a consequent of climate change, remained a major threat to livelihoods in northern Ghana. He further reiterated that population and livestock pressure, unpredictable rainfall patterns, and inappropriate farming practices that encourage erosion and impoverish soils, compound the effects of drought.[38] Sharing his thoughts during the same commemoration, Honourable Stephen Yakubu, the Upper East Regional Minister, emphasised the gravity of annual bushfires, which is an offshoot of drought and climate change, to environmental destruction; particularly, in the Upper East Region.[39]

In addition to this, small-scale mining activities, especially the unregulated 'Galamsey,'[40] is having devastating effects on the environment, with potential consequences on creating drought conditions. Focus group discussions (FGD) with the EPA officer in Bolgatanga revealed that small-scale gold mining is particularly prevalent in areas such as Accra site, Kejetia, Obuasi, Gbami, and Shega in the Talensi District, Kongo, Nangode, and Pelungu in the Nabdam District, and Shegu and Sapelega in the Bolgatanga Municipality. Although small-scale gold mining provides sources of income to many people within the various districts, it has resulted in environmental degradation and water pollution with implications for accelerating dry conditions.[41]

Linking Climate Change to Conflicts and Displacements

The linkages between climate change, farmer-herder conflicts, and population displacements in the northern parts of Ghana and the consequences of climate change on these phenomena and on human security, when examined, projected the subsequent issues.

Conflicts

Across the five regions in northern Ghana, conflicts between the indigenes including Dagomba, Konkomba, Mamprusi, Basare, Chokosi, and the Fulbe (Fulani) is a recurring issue that poses a challenge to farming activities, community cohesion, and peaceful coexistence. The movement of Fulbe cattle herders across different regions within northern Ghana in search of pasture aggravates the persistent nature of the conflict. An agricultural extension officer in Yendi affirmed this perspective; emphasising that the movement of cattle herders and the accompanying destruction of vegetation cover, are common during the dry season. In areas like Yendi and Gushiegu, cattle herders migrate to greener regions such as East Gonja; resulting in the destruction of vegetation cover with implications for farming and livelihood sources.[42]

Yet, scholarly works trace this menace largely to the effects of climate change in Sahelian states—Mali, Niger, and Burkina Faso—which have resulted in the movement of cattle herders to other West African countries, including Ghana.[43] Indeed, this movement dates back to the twentieth century and according to a recent study by Alhassan and Asante, the immediate factor that triggers the movement is increasing desertification, which has had significant implications on shortages of water and fodder for the cattle.[44] Thus, when cattle herders arrive in the northern part of Ghana, they negotiate with local chiefs and community leaders for settlement. In some towns and communities, the cattle herders co-exist peacefully with community members and farmers, even though in other areas such as Gushiegu, Karaga, Yendi, and Adibo in the Northern Region, there are occasional conflicts between them due to competition for grazing lands and water points.

This, in the view of one respondent is the result of

[35]Interview with Programme Officers, EPA-Tamale. October, 2022.
[36]Director, NADMO. Yendi. 2022. Op. cit.
[37]See GNA. (2022). Drought Said to be Major Threat to Livelihoods in Northern Ghana. June 19. Ghana Business News. Retrieved from https://www.ghanabusinessnews.com/2022/06/19/drought-said-to-be-major-threat-to-livelihoods-in-northern-ghana/
[38]Ibid.
[39]Ibid.
[40]A local lingo for unregulated small-scale artisanal gold mining.
[41]Interview with Director and Project Officers, Changing Lives in Innovative Partnerships (CLIP). October, 2022.
[42]Interview with Agricultural Extension Officer-Yendi. October, 2022.
[43]Tonah (2005). Op. cit.
[44]Alhassan & Asante (2022). Op. cit.

weak local governance structures. In other countries such as Togo, governmental policy exists to regulate the entry of the cattle, which minimises the effects of the movements on the destruction of agricultural produce. Yet in Ghana, ineffective local governance structures have turned waterbodies into sources of conflicts between farmers and Fulani herders in many parts of the northern regions. This is because rivers, which serve as the sources of drinking water for most communities, are the same sources to which the herdsmen send their cattle to drink.[45] For instance, in Zamashegu, a farming community in Gusheigu District, there was reprisal attack by the Konkombas on the Fulanis because of the pollution of water bodies by the cattle of the Fulanis. The communities complain that anytime the cattle go to the rivers to drink, the excreta—faeces and urine—pollute the water; making it unsafe for human consumption.[46] Conflicts arising from these issues have adversely affected food and cattle production across several regions.[47] A study by the United States Agency for International Development (USAID), in the three traditional northern regions,[48] highlighted the disproportionate negative impacts of conflicts on agriculture. In the Upper East and Upper West regions, farmer-herder relations were identified as the sixth biggest barrier to agricultural development, whereas it ranked as the second biggest barrier in the Northern Region. Moreover, cutting of trees by migrant Fulani herders and movement across districts and regions, have not only destroyed farming produce, but also vegetative covers; exacerbating drought conditions.[49] This finding corresponds to Tonah's study, which puts forward that cutting down of trees, especially those of economic value, to feed cattle during the peak dry season, is a major challenge across many regions in the northern part of the country.[50]

Displacements

Climate change has also been responsible for involuntary movement of some communities in the northern regions.[51] Population displacements, also termed environmentally-induced migration or forced migration, often arise from difficult environmental exigencies or conflicts.[52] One noticeable effect of climate change on population displacements. is in the area of recurring flooding in the northern regions of Ghana. Indeed, while unpredictable heavy downpours and desertification contribute to the occasional flooding, a single most devastating event is the annual opening of the Bagre Dam in neighbouring Burkina Faso. Besides its effects on agricultural activities, massive population displacements occur almost every other year in many parts of northern Ghana. Specifically, in communities such as Kata-Banawa, Gaagbini, and Diani in the Walewale District, the effect of the 2021 flooding devastated most households; particularly, those living in mud and thatched houses. The impact on the people in terms of shelter and livelihood sources has been telling; ritually, compelling community members to move in search of temporary shelter and food for survival.[53] From the interviews, it became clear that although some are able to access temporary shelter in neighbouring communities, most are compelled to seek refuge in classrooms and mosques.[54] Although NADMO and non-governmental organisations (NGO) support the people with humanitarian relief items, including food, mattresses, and medicines, they are inadequate to make them adapt to the challenges. To address the challenges, NADMO and the District Assembly urge community members to relocate to save themselves from the perennial flooding. Whereas they are not sure of how to start lives in different environments, most of them are also tied to the lands as a genealogical inheritance that need to be kept and tilled. Around Tamale and Yendi, drought

[45]Tonah, S. (2006). Migration and Farmer-Herder Conflicts in Ghana's Volta Basin. Canadian Journal of African Studies, 40(1), 152–178.
[46]Ibid.
[47]Aning, K., Aubyn, F., & Adomako, M. (2017). Herder-Farmer Conflicts in West Africa: A Challenge for Regional Security: A Ghana Case Study. ECOWAS Report.
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.
[48]These are the Northern, Upper East, and Upper West regions which together constituted the northern portion of Ghana until additional regions were created in 2018.
[49]Interview with EPA-Yendi. October, 2022.
[50]Tonah, S. (2002). Fulani Pastoralists, Indigenous Farmers and the Contest for Land in Northern Ghana. Africa Spectrum 37 (1), 43-59.
[51]Kälin, W. (2010). Conceptualising Climate-Induced Displacement. In J. McAdam ed., *Climate Change and Displacement: Multidisciplinary Perspectives*. (pp. 81-103). Oxford & Portland: Hart Publishing
[52]van der Geest, K., & de Jeu, R. (2008). Ghana. October. *Forced Migration Review.* (31), 16. Retrieved from https://www.fmreview.org/sites/fmr/files/FMRdownloads/en/FMRpdfs/FMR31/FMR31.pdf
[53]Interview with Farmer-Kata-Banawa Community. October, 2022.
[54]Interview with Resident of Kata-Banawa Community. October, 2022.

conditions in 2022 and 2021 led to the migration of farmers to the adjoining communities where the effect of drought had been minimal.

In addition, contestation between farmers and cattle herders due to the effect of climate change has also resulted in the latter migrating from certain parts of the northern regions to the southern regions where the effect of climate change is nominal. For example, scarcity of grazing lands and water for the cattle around Adibo in the Yendi District, and Gushiegu in the Gushiegu District has pushed some Fulani herders to resettle in East Gonja District in the Savannah Region, while others moved southwards to the Brong Ahafo Region and to Agogo in the Ashanti Region. Some scholars, however, have argued that it is simplistic to attribute the movements largely to the impact of climate change. Factors such as the following: agricultural expansion as a result of population growth; land overuse; a lack of ranches/kraals to keep the cattle; a dearth of clearly demarcated lands purposely for farming activities, for cattle rearing, or for grazing purposes; and the absence of dams and boreholes for the animals to drink, contribute to these movements.[55] Others associate the movements to a lack of proper local governance structures to ensure peaceful co-existence between farmers and herders.[56]

Effects on Human Security

Through interviews carried-out, it has become evident that climate change affects various dimensions of human security.[57] A 2022 study by Alhassan and Asante supports this assertion by highlighting an incident in farming community in Gusheigu District—where attacks on the Fulani ethnic group has created challenges for peaceful co-existence.[58] For example, in January 2019, the Dagomba hosts burned Fulani homesteads in Kpatinga near Gusheigu. This particular attack resulted in human deaths, as well as loss of cattle, farmlands/crops and other properties occur, leading to reciprocal attacks.[59]

The reciprocal attacks by these two groups have alarmingly led to increased militarisation in some communities; further triggering forced displacements and police deployments[60]. Herders who choose to remain in such communities and perceive threats to their personal security resort to acquiring and employing small arms and light weapons (SALW) as a defence mechanism against potential acts of violence.[61] Overall, the security of several communities in Gushiegu, Karaga, Yendi, and Buipe has been negatively impacted. Over time, conflicts between farmers and herders have disproportionately and detrimentally affected the full elements of human security in Ghana. For example, from 2000 to 2017, more than 200 people, including herders and farmers, were reported to have lost their lives.[62] In several instances, the deployment of a joint police-military task force known as 'Operation Cowleg' has instilled fear in certain communities. Furthermore, agricultural activities, crucial for livelihood sources, have been affected by conflicts between farmers and herdsmen across various regions.[63]

Though literature on the health implications of climate change is scarce, the economic implications are widely felt and often discussed by residents. For instance, the killing of twenty-six head of cattle bears significance; given that the average price of a cow or a bull ranges between USD 300 and USD 900.[64] Moreover, associated with the destruction of crops, is the increasing practice of tree-felling and charcoal production as a part of short-term adaptation strategies.[65] This activity is particularly prominent in the northern region as indicated by an empirical study conducted by USAID. Returning to Tonah's findings on tree-felling, particularly ones with economic value, to feed livestock during peak dry season, he asserts that pastoralists are often accused of this practice.[66] Consequently, this has led to the gradual deterioration of vegetation and the environment. Tonah further highlights that the loss of tree cover and the subsequent challenge of soil erosion can be attributed to the destruction of vegetation and the

[55]Aning, Aubyn & Adomako (2017). Op. cit.
[56]Ibid.
[57]Interview with EPA-Yendi. October, 2022.
[58]Alhassan and Asante (2022). Op Cit.
[59]Ibid
[60]Ibid
[61]Aning, Aubyn & Adomako (2017). Op. cit.
[62]Ibid.
[63]Moritz, M. (2006). Changing Contexts and Dynamics of Farmer-Herder Conflicts Across West Africa. Canadian Journal of African Studies, 40(1), 1-40.; Dary, James & Mohammed (2017). Op. cit.
[64]Aning, Aubyn & Adomako (2017). Op. cit.
[65]Antwi-Agyei & Nyantakyi-Frimpong. (2021). Op. cit.
[66]Tonah, S. (2005). *Fulani in Ghana: Migration History, Integration and Resistance. Legon-Accra: University of Ghana.*

environment.[67] Agriculture serves as the primary source of livelihood for inhabitants in the northern regions of Ghana, where crop destruction, tree-felling, and charcoal production have become significant factors in the spread of soil erosion.[68] The struggle for land between farmers and herders due to climate change, has had implications for vegetation cover in northern Ghana.

The conflicts arising from confrontations between local farmers and Fulani herders, primarily stem from competition over natural resources with accompanying destruction of agricultural produce, water sources, and the environment. In the northern parts of Ghana, the escalating population growth in the regions has resulted in conflicts due to the limited availability of fertile land. The Saboba District in the Northern Region serves as an empirical case where the demand for fertile land exceeds the available land. Fertile lands located near major water bodies, essential for irrigation, are scarce. The struggle for such areas, often escalates into conflicts, which could worsen if not appropriately managed. Residents who possess land adjacent to major water bodies often face challenges with Fulani herders who migrate from Niger and other landlocked countries in the West African sub-region; particularly, during the dry season.

Further, drought-induced crop losses have led to low yields during the dry season. In recent times, climate change in the northern part of Ghana has resulted in food shortages due to reduced production caused by the emergence of pests and diseases. These challenges persist alongside limited access to clean and potable water. Farmers have been unable to store grains without insect infestation and they have been forced to rely on continuous spraying for the past five years as pests, like armyworms, and diseases have become a part of their lives. Additionally, annual vaccination against cerebrospinal meningitis (CSM) is administered to prevent illnesses caused by the bacterium Neisseria meningitidis.[69]

Existing Responses and Coping Mechanisms

In an effort to address the impact of climate change on human security in northern Ghana, community-based afforestation has gained increasing prominence as an innovative approach for forest protection, sustainable forest management, and livelihood enhancement.[70] Concurrently, smallholder farmers in the region are diversifying their crop choices to safeguard against potential crop failures resulting from unpredictable rainfall patterns and elevated temperatures. Commonly adopted crops in these diversified farming systems encompass corn, millet, sorghum, groundnuts, and bambara beans.[71] This diversification strategy is thought to serve multiple purposes, including the improvement of soil fertility, accomplished through practices like growing cowpeas to introduce nitrogen into the soil.[72] The majority of farmers have embraced crop diversification not only to enhance productivity but also to fortify their resilience in the face of climate change. This strategy helps to boost crop yields, nutritional outcomes, income, and food security at the household, district, and regional levels.[73] Furthermore, evidence from the field indicates a shift among smallholder farmers who are increasingly transitioning from agriculture to non-farm employment opportunities, including trade and mining, as an adaptive response.[74]

The Government also extends some form of assistance to communities affected by natural disasters such as flooding. Additionally, the Government of Ghana initiated a 'One Village, One Dam' (1V1D) policy in 2017. As part of the policy, small earth dams were constructed in constituencies across the five northern regions.[75] The primary goal of these dams are to ensure stable water supply for irrigation purposes; thereby, supporting dry season farming and livestock rearing. This initiative aims to alleviate the impact of climate change by boosting agricultural productivity, generating employment opportunities, and enhancing food security in the regions. Nonetheless, despite these efforts, concerns persist among various stakeholders, including farmers, local communities, irrigation experts, and academia, regarding the effectiveness of the dams in achieving their intended objectives. A recent report from the Northern Patriots in Research and Advocacy (NORPRA), indicates that many of these dams have

[67]Interview with Programme Officers, EPA-Bolgatanga, October, 2022.
[68]Programme Officers, EPA–Tamale. 2022.
[69]Tom-Dery, D., Frolich, S. K., & Frey, E. (2014). Problems in Afforestation of Rural Areas of Northern Ghana–Community Viewpoint. Journal of Horticulture and Forestry, 6(2), 22-30.
[70]Antwi-Agyei & Nyantakyi-Frimpong (2021). Op. cit.
[71]Ibid.
[72]Ibid.
[73]Interview with Official, CLIP -Tamale. October, 2022.
[74]Ghana News Agency. (2020). One-Village, One-Dam: 437 Small Earth Dams at Various Stages of Completion. July 8. Ghana News Agency. Retrieved from https://gna.org.gh/2020/07/one-village-one-dam-437-small-earth-dams-at-various-stages-of-completion/
[75]NORPRA. (2023). Ghana's Oil Money on Dried Dams. Report See also, Apubeo, A. A.. (2023). 1V1D: Government Spent Averagely GH¢670,000.00 on Each Dams – Research. June 2. Ghana News Agency. Retrieved from https://gna.org.gh/2023/06/1v1d-government-spent-averagely-gh%E2%82%B5670000-00-on-each-dam-research/#:~:text=The%20research%20showed%20that%20averagely,in%20the%20contract%20award%20letters.

failed to facilitate dry season farming as originally envisioned, with a significant number of them drying up completely.[76] The report also brings to the fore issues surrounding the inadequate implementation of the 1V1D policy; citing a lack of comprehensive stakeholder consultations and engagement as contributing factors to these challenges.

In response to conflicts between farmers and herders, a range of strategies has been implemented at various levels; encompassing community, district, regional, and national initiatives. At the national level, security agencies have been deployed to manage communal conflicts and disputes arising between farmers and Fulani herders. Notably, the 'Operation Cowleg' joint police-military operation is conducted by the National Security Council (NSC), Regional Security Councils (REGSEC), and District Security Councils (DISEC) during periods of heightened tensions or clashes between herders and farmers. These deployments serve to prevent the escalation of conflicts and restore order in affected communities. Whereas these response measures have provided temporary relief by reducing communal tensions, there is a recognised need for further actions to address the underlying issues in a sustainable manner. According to the Economic Community of West African States (ECOWAS) Protocol on Transhumance of 1998, one crucial obligation of states is the establishment of grazing corridors to facilitate the movement of herds across different territories. These corridors are designated areas designed to ensure a secure passage for herders and their livestock; granting them access to suitable grazing lands and water sources along their routes. Interviews carried-out in the northern regions revealed that a number of communities have implemented this provision. The allocation of grazing lands and water sources to herders through these corridors, holds significant potential for addressing tensions and conflicts in communities in northern Ghana and other regions affected by farmer-herder conflicts. Firstly, it helps alleviate competition for limited resources between farmers and herders. To explain, by designating specific areas for grazing, herders can access suitable pasture and water without encroaching on farmlands; thereby, reducing the likelihood of conflicts arising from resource scarcity. Secondly, it promotes improved land and resource management. To elaborate, concentrating herding activities within designated areas enables communities to implement sustainable practices like rotational grazing and water conservation; ensuring the long-term viability of these critical resources.

Conclusion

This paper has brought to the forefront the intricate relationship between climate change and communal conflicts, with a specific focus on the circumstances prevailing in northern Ghana. The discernible linkage between climate-induced displacements and conflicts has far-reaching implications for various facets of human security; encompassing physical security, economic security, food security, health security, environmental security, community security, and political security. Even though climate change in neighbouring West African and Sahelian countries is frequently cited as a contributing factor, it is crucial to acknowledge that similar environmental conditions within northern Ghana have also played a pivotal role in the migration of pastoralists towards the southern regions of the country. Several factors have converged to exacerbate these recurrent climate-induced threats including unsustainable farming practices and increased competition among farmers and herders for less and less land resources. The ramifications of these threats have been deeply detrimental to human security; entailing loss of life, devastation of crops and water sources, and environmental degradation, with an associated sense of community insecurity.

Recommendations

To facilitate an effective and comprehensive national response to climate change and its accompanying threats, the Government of Ghana should take into consideration these policy recommendations.

1. Prioritise efforts by the Government to reduce vulnerability, enhance risk management, and enable long-term adaptation to climate change. It is crucial to address the grievances of the most vulnerable populations and to include

[76]ECOWAS, 1998: Decision A/DEC.5/10/98. Relating to the regulations on transhumance between ECOWAS Member States. Abuja.

[78]Interview with Director and Project Officers, Changing Lives in Innovative Partnerships (CLIP). October, 2022.

them in decision-making processes related to adaptation.
2. Strengthen early warning strategies and programmes to control flooding and manage recurring displacements. Proactive measures should be taken to anticipate and respond to climate-related disasters; ensuring the safety and well-being of affected communities.
3. Establish cross-border mechanisms to regulate the movements of herdsmen during the dry season and mitigate the occurrence of communal conflicts. Collaborative efforts with neighbouring countries can help manage the flow of herders and reduce tensions over land and resources.
4. Improve storage facilities and road networks to facilitate smooth food transportation and mitigate the risk of food shortages. Enhancing infrastructure will ensure efficient distribution and access to food; particularly, during times of climate-related disruptions.

By implementing these policy recommendations, the Government of Ghana can address the challenges posed by climate-induced conflicts, reduce vulnerability, and promote sustainable development in the face of climate change. These recommendations require a comprehensive and coordinated approach involving various stakeholders, including government agencies, local communities, traditional leaders, security forces, and international partners, to achieve lasting solutions and enhance human security in northern Ghana.

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