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RESEARCH ARTICLE



# 'These days, things have changed': historicizing current dynamics of climate-related migration in the savannah zone of Ghana

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## ABSTRACT

While climate-related mobility has been part of life in Africa for centuries, existing literature on migration in the context of climate change generally lacks a historical perspective. This paper historicises climate-related migration in the Northern Savannah Zone of Ghana, with specific focus on the Upper West Region, drawing on climate data, a survey of 403 households, and interviews and focus group discussions with farmers. It demonstrates that migration and mobility in the region are rooted in historical patterns established and reinforced through colonial and post-colonial governance. These patterns reflect inequalities created by past and present development policies as well as environmental factors. While environmental change intensifies existing migration patterns, it is difficult to isolate these effects from the economic, social, and political factors which also contribute to migration flows in the Savannah zone. We therefore conclude that migration flows are co-constituted by past and present governance practices, disparities, development policies, and social transformation as well as environmental factors. Analysis and policy narratives that attribute recent migration flows to climate change only are simplistic and blur the effects of past and present structural inequalities and political engagement.

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Climate change; Ghana; governance; history; migration; im/mobility

## 1. Introduction

Migration constitutes an established livelihood strategy in many of the world's dry regions to deal with environmental challenges and change (Hunter, 2005; McLeman & Smit, 2006). It has also been recognized as a climate change adaptation strategy (Black et al., 2011; van der Geest et al., 2023). However, with arid and semi-arid zones of sub-Saharan Africa and Asia being affected by rising temperatures and decreased precipitation (IPCC, 2018), there is political and public concern about increasing migration towards urban centres and – especially in Western countries – to the global north as a response to these challenges. Attention to climate change and human migration is thus growing (IPCC, 2018; Mbiyozo, 2020).

The relationship between climate change and social change is complex, however. Current literature contests notions of climate change as a foremost driver of social change, with a pertinent critique of 'climatism' for ignoring the significance of contextual and historical factors. Indeed, 'climate change isn't everything' a recent book argues (Hulme, 2023). Such a critique applies to the implications of climate change for migration as well, disputing alarmist scenarios of the early 2000s that predicted masses of poor climate refugees heading towards northern countries (see e.g. Boas et al., 2022; Radel et al., 2018; Wiegel et al., 2019). Subsequent literature argued for 'migration as adaptation', emphasizing the agency of migrants and migration as a potential solution, facilitating access to alternate livelihood strategies (see Black et al., 2011;

van der Geest et al., 2023). More recently, over a decade's research now highlights the complexity of climate-related movements, including the significance of political and socio-economic drivers of migration and the difficulty of isolating these from environmental factors (Black et al., 2011; Carr, 2005; Foresight, 2011; van der Geest et al., 2023).

Yet, a number of studies indicate that climate change does play a significant role in shaping migration patterns in the dry regions of Africa – with the important insight that related migration tends to be local or (relatively) short-distance within the region and neighbouring countries (Dreier & Sow, 2015; Mbiyozo, 2020; Teye & Nikoi, 2022). Agrarian households, in particular, have increasingly been moving to urban centres and wetter rural areas (Afifi et al., 2014; Zickgraf et al., 2016). Still, the question remains if climate change – including the intensification of existing environmental challenges – leads to qualitatively different migration than established migration practices in and from such areas, and, hence, the degree to which current migration patterns can be attributed to climate change. This is the central research question we explore in this article.

We explore this question in the context of dryland agricultural settings in West Africa. More specifically, we focus on the Upper West Region in the Savannah zone in northern Ghana, selected due to its dry and increasingly variable climatology, persistently high poverty levels (GSS, 2018), and dependency on rain-fed agriculture as the main livelihood. Furthermore, the Upper West region is the most dominant migrant-sending

region in Ghana. In other words, climate change is likely to impact livelihoods, but does it also shape migration?

Answering this question requires attention to broader political, socio-economic, and environmental factors, as increasingly emphasized in climate-related migration and mobility literatures, as well as a historical perspective. Indeed, analyzing *change* – whether regarding climatic conditions, mobility patterns or, as here, the interrelationship – presupposes an understanding of how these phenomena have emerged and developed over time. Otherwise, we can only provide an ahistorical snapshot of current affairs (cf. Morrissey, 2012), unable to gauge whether they are entirely novel, reflect shifts in well-established practices, or are business as usual. We therefore employ a political ecology approach, which is well suited to a historical analysis of socio-environmental change with attention to diverse political and socio-economic factors (see e.g. Lindegaard, 2020; Ribot, 2014;). This is supported by climate-related migration and mobility literatures. Together, this approach allows us to shed further light on the role of political and socio-economic drivers of migration in climate-affected areas over time (cf. Black et al., 2011; Boas et al., 2022; Carr, 2008). More specifically, we use this approach to focus on the role of political and governance factors in shaping climate-related migration. This, paired with our historical perspective, offers a novel contribution to growing debates on the relevance of politics, power, and governance for climate-related migration (see e.g. Boas et al., 2022).<sup>1</sup>

The paper is organized around the following sub-questions: (a) how has migration from the Upper West Region emerged and developed over time?; (b) what are the long-term changes in rainfall and temperature regimes in this region?; (c) to what extent are current migration patterns in the Upper West region rooted in historical antecedents and/or can be attributed to climate change?

To answer these questions, we draw upon a range of sources, data, and methods. We start by presenting our conceptual framework (section 2), and study sites and methodology (section 3) before moving on to the main analysis. This consists of an examination of migration from the early twentieth century to the present, drawing on a literature review and qualitative interviews (section 4). Exploration of links between current migration patterns and climate change then follows, based on climatological data in the Upper West region from the last 50 years as well as a household survey, focus group discussions, and semi-structured interviews (section 5). Finally, we discuss our results and conclude (section 6).

Our overall analysis presents two main arguments: first, current migratory patterns are embedded in colonial and (post)colonial governance practices and interventions, and, second, climate variability and change are increasingly important in migration decisions but cannot be solely attributed to those. Rather, climate change – and environmental factors more generally – act as an added stressor to already changing migratory patterns. These findings suggest the need for increased focus on the role of historical and contemporary governance practices in shaping migration in and from climate change-affected areas. This is both to better understand – rather than presuppose – drivers of migration and to support

more nuanced research and policy responses on climate-related migration.

## 2. Conceptual and methodological approach

To examine the role of climate change in shaping migration, we draw on a political ecology approach supported by climate mobility literature. We use political ecology to shed light on the current and historical factors shaping climate-related migration, drawing on political ecology's strengths in linking environmental and political factors with differentiated vulnerabilities within a population. As a field, it grew out of the political economy and ecology approaches, combining the two (Bryant, 1992; Bryant & Bailey, 1997). It further links these factors to differentiated vulnerability and outcomes for different groups within a population, with vulnerability understood as 'a social-historical product' (Ribot, 2014, p. 669). Political ecology has therefore been increasingly applied to understanding political and historical dimensions of vulnerability and adaptation to climate change (Lindegaard, 2020; Radel et al., 2018; Taylor, 2015). It has also been used within migration literature to analyze how inequalities shape internal (Carr, 2008) and international (Ribot et al., 2020) migration patterns, and the relationship between extractive development policies and different types of migration (Barney, 2012).

For the purposes of this article, political ecology casts attention to (1) interactions between structural factors, political interventions, and ecological conditions across temporal and spatial scales and (2) how these contribute to particular socio-ecological conditions, differentiated vulnerabilities, and adaptive responses. Specifically, we draw on political ecology to structure and focus our analysis, which is divided into two sections: Section 3 offers an analysis of the political ecology of climate-related migration from a historical perspective. It provides a historical account of shifting environmental, socio-political, and migration dynamics in the case area. Section 4 examines climate change and contemporary migration patterns, considering these on the basis of the previous historical analysis. It provides an analysis of climate data from the last 50 years, documenting climate changes, and couples this with an analysis of contemporary migration patterns and perspectives.

To operationalize our analysis of climate-related migration, we draw on migration and mobility literature, particularly finding inspiration in recent scholarship on 'climate mobilities' (Boas et al., 2022; Wiegel et al., 2019). Drawing on the mobilities literature (e.g. Sheller & Urry, 2006), this scholarship considers mobility as neither novel nor exceptional and pays attention to how mobility practices related to climate change are 'interrelated, shaped by and reinforcing unequal power relations' (Boas et al., 2022, p. 3368). This complements political ecology's attention to historical and political factors and allows particular insight into how these have shaped the development and practice of 'climate mobilities' including migration. In addition, climate mobilities literature also attends to differentiation within a population, and how this is shaped by structural factors, with a valuable addition of considering personal factors. When analyzing the differentiability of mobilities, authors point to 'why people

have uneven capabilities and aspirations for im/mobility practices, grounded in both personal and structural factors' (Wiegel et al., 2019, p. 4).

While drawing on climate mobilities literature, we focus in this article on climate-related migration specifically. We use the term migration to indicate that we examine mobility practices involving movement outside the community and household for a shorter or longer time, rather than the full spectrum of mobilities, such as localized, frequent movements to markets, farmland, schools, or water sources for instance. In terming it 'climate-related', we wish to accentuate that the link between migration and climate change needs to be investigated rather than assumed. As Boas et al. observe, migration in relation to climate change often erroneously 'tends to be interpreted as representing one-off, long-distance and cross-border movements of large groups of people' (2022, p. 3368). We agree that such representations are misleading. Indeed, as will become clear, the kinds of mobility we refer to in this article may be circular and recurrent rather than one-off and one-directional, the time span varies from short-term to permanent, and migration predominantly takes place within Ghana.

Methodologically, we triangulate secondary and primary data on climatic developments, household practices, and individual and community perspectives on perceptions of migration and climate change. Secondary data consists of findings from a literature review of, primarily, geographical and sociological studies of north–south migration in Ghana from a historical perspective. Likewise, we analyze climatological data on rainfall and temperature data from weather monitoring stations in the Upper West capital of Wa from 1970 to 2020, provided by the Ghana Meteorological Agency (GMA).

Located in the Guinea and Sudan Savannah ecoregions that stretch across West Africa, the Upper West region experiences a single rainy season with mean annual rainfall between 840 and 1400 mm, though this can vary considerably between years (Owusu & Waylen, 2009). We particularly zoom in on the Jirapa and Wa West districts (see Figure 1), selected to represent different levels of economic development and resource endowment, with the Jirapa district relatively more urbanized and with more irrigation for farming than the Wa West District. Rain-fed agriculture, with its susceptibility to temperatures and rainfall (Owusu & Waylen, 2009; Yaro et al., 2015), remains the main economic activity in these areas, with the implication that climate change is likely to impact livelihoods. Out-migration is common as well (GSS, 2018), making these localities relevant sites for analysis of the relationship between climate change and migration, with a view to local variation as well.

Primary data was generated through a sequential explanatory mixed methods design (Ivankova et al., 2006), which entails the collection and analysis of first quantitative and subsequently qualitative data. The research was carried out in eight enumeration areas in the Jirapa and Wa West districts and commenced with a small exploratory study with interviews and focus group discussions undertaken in 2019 to support the formulation of questions for the main study. The **household survey** was conducted in 2021 and covered 403 households<sup>2</sup> by a team of Ghanaian enumerators. A Yamane

sample size determination method (1967) and a stratified sampling technique with household listing, with migration status – i.e. one or more household members not living in the household – were used as the criteria for classification, distinguishing between internal migrants, international migrants, or no migrants. The survey was based on a structured questionnaire with variables including demographic characteristics of respondents, economic activities, adaptation to climate change, perceptions of governance issues, and migration. The analysis in this paper largely involves bivariate analysis of the relationship between background variables, such as district, and migration.

After the collection and analysis of the survey data, research assistants and Ghana team members conducted **interviews** with 29 household representatives (14 males and 15 females) purposively selected based on the survey data to include households with or without migrants, respectively. Interviews were also conducted with 12 key informants (ten male and two female assembly members and agricultural extension officers) in 2021. These interviews sought to obtain comprehensive qualitative information on perceptions of climate change, livelihoods, climate adaptation strategies, governance issues, and migration.

Finally, **focus group discussions** were used at both the exploratory and main data collection stages. During the exploratory stage, the Ghana team organized three focus group discussions to obtain information on adaptation to climate change, livelihoods, and migration, followed by 14 additional focus group discussions after the survey. Separate discussions were held with women, men, and youth in groups of 6–12 persons to ensure participation (see Teye et al., 2021). Both interviews and focus group discussions were recorded, transcribed, and analyzed thematically, with identification, review, and naming of codes and themes (see Nowell et al., 2017). Perceptions of change – e.g. narratives of historical transformation of the weather, agricultural practices, or migration – were central elements in individual interviews and focus group discussions alike where the former highlighted individual perceptions and the latter revolved around major environmental and socio-economic issues. Quotations from this material provide depth and rich illustrations of the major analytical findings in the paper as well as serve as a means of honing the insights and experiences of our respondents.

We combine this new data with the rich existing literature on migration from the northern savannah zone (e.g. Abdul-Korah, 2011; Awumbila & Ardayfio-Schandorf, 2008; Lattorf et al., 2018; Teye et al., 2017). By linking these sources, we provide additional insights to the few studies that have systematically examined linkages between migration and climate change from a historical perspective (for an exception, see van der Geest, 2011) – offering insights not only into Northern Ghana but also to understandings of climate-related migration more broadly.

### 3. The political ecology of climate-related migration from a historical perspective

We now turn to the analysis of how environmental factors have interacted with political and socio-economic factors to

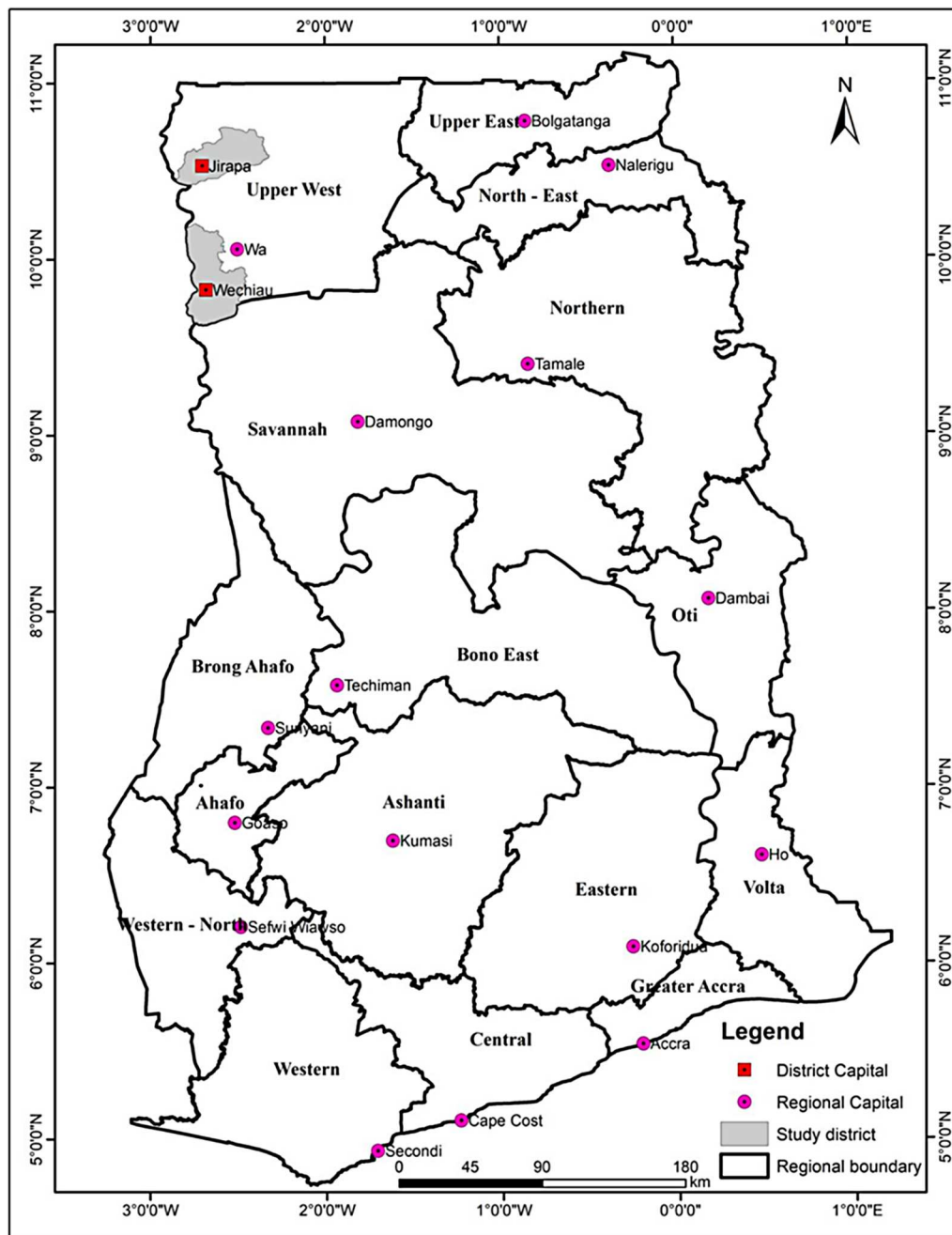


**Figure 1.** Map of Ghana showing study districts. Source: Authors own construct.

shape migratory patterns in four historical periods in Ghana, differentiated by major political changes and regimes. Based on the literature review and historical narratives from the qualitative material, this section examines the emergence and development of north–south migration patterns from the Savannah zone where (the area that became) the Upper West region is included.

### 3.1. Colonial labour extraction (1906–1957)

Environmental conditions in the Savannah zone of Ghana have historically been less favourable for crop production, compared with regions in the forest zone in the central part of the country, and men in the region were known to migrate

in search of fertile lands for agrarian livelihoods, even before the colonial era (Bening, 1975). Migration was also spurred by conflict and slave raids (Cleveland, 1991).

Migration patterns changed dramatically when the region was colonized by the British at the beginning of the twentieth century, with the name of the Gold Coast. To deal with the shortage of labour in the southern part of the colony where the colonial capital was located, the colonial administration designated the northern Savannah zone as a labour reserve. From about 1906 to 1927, the colonial government recruited labour from the region for the mines, railway and road construction, and plantations in the south (Bening, 1975; Lentz, 2006). Furthermore, labour quotas were imposed on kings and chiefs to supply strong men periodically to various

colonial installations and production centres there. Indeed, the colonial government's report of 1914 stressed that the remarkable growth in the cocoa industry – which contributed massively to the colonial government's prosperity – hinged on labour flows from the north (Songsore & Denkabe, 1995).

In addition to labour extraction, the colonial government engaged in a deliberate policy of depriving northern Ghana of crucial development because of the perception that this zone did not have lucrative natural resources. Other reasons for deprivation were related to environmental factors, especially poor soils and harsh climate. Consistent with the argument of Boone (2003) that colonial policies in Africa did not favour areas with less natural resource endowments, the colonial agricultural policies in Ghana only focused on cocoa and oil palm which were key export commodities (Amanor et al., 2020).

Climate stress and poor harvest also contributed to out-migration in the early colonial period, in addition to forced labour. During periods of drought and famine, many people from the northern territories migrated seasonally to the south to labour in the mines and plantations for in-kind food and wages to help their families survive (Songsore & Denkabe, 1995). For instance, towards the end of 1922, serious famine brought about by drought and crop failure resulted in massive out-migration, as captured below:

Reports reaching the Chief Commissioner spoke of a growing threat of famine in north Mamprusi, Builsa and Zuarungu districts where villagers were reported to be eating grass weed. Due to the famine many young men between the ages of fifteen and thirty-five were forced to migrate in search of work in the mines (Anarfi and Kwankye, 2003:11).

As a centre-periphery relationship emerged between the northern and the southern parts of the colony, labour migration from the region increased, also after the forced labour regime was over in 1927. The news of a booming cocoa industry with many farm job opportunities in the south attracted people from the northern regions and initiated a largely seasonal migration pattern that continued to boost the production of cocoa (Amin, 1974; Songsore & Denkabe, 1995; Yaro, 2004). Likewise, the more favourable conditions for growing crops shaped migratory patterns during colonialism, highlighting the importance of environmental dimensions as well (van der Geest et al., 2010).

### 3.2. Economic crisis and fluctuating migration flows (1957–1983)

In the early post-colonial era, worsening inequalities further spurred migration from the Upper West region and other parts of northern Ghana, especially in times of climate stresses and shocks (van der Geest, 2011; Yaro, 2004). Some seasonal migrants began to settle more permanently in the forest zone in the Brong Ahafo and Ashanti regions to start their own farms. Migration from the region to the south increased steadily until 1970, with environmental change, especially declining rainfall, vegetation loss, and declining soil quality, as a significant driver (van der Geest et al., 2010). As shown in the statement below by a key informant, these factors were exacerbated by unbalanced development policies:

Unreliable rainfall and poor soils were the reasons why migration started in this region. However, the failure of the governments to address these problems worsened the situation. Although Nkrumah [the first president of Ghana] tried to establish factories in all regions, the regions along the coast benefited more as they already had better infrastructure. So more people moved to the coastal towns to work.

The period 1970–1984, however, saw a sharp decline in out-migration from north to the south (van der Geest et al., 2010). This period witnessed widespread droughts, economic crisis, political instability, and high food prices all over the country. The droughts and bush fires in 1978, 1979, 1982, and 1983 effectively crippled the struggling Ghanaian economy (Songsore & Denkabe, 1995). Agricultural opportunities were lacking in the south of the country (Teye & Nikoi, 2022), and potential migrants lacked the capital to migrate beyond known places. In some cases, economic hardships led to forced return migration to rural regions including the Upper West region. This was the case of a 78-year-old respondent who reported that he returned to Jirapa in 1983 from the port city of Tema, located next to the capital of Accra. He stated:

I came back from Tema to settle here during the 1983 [economic] crisis because I lost my job at CMB [Cocoa Marketing Board] and I was struggling to survive in Accra. I couldn't pay rent, so I decided to come home. Some of my friends who were also labourers in other parts of Ghana also came home. Because we came back home with nothing, many of those living here were no more motivated to migrate to Accra.

For this man and many others, the economic decline of labour markets and the agricultural sector in Ghana and neighbouring West African countries caused widespread unemployment in the 1970s and 1980s meant that internal – and more broadly regional – migration destinations no longer offered livelihood opportunities. The large-scale expulsion of Ghanaian labour migrants from Nigeria in 1983 (and again in 1985) further strained the economy (Bob-Milliar & Bob-Milliar, 2013; Kleit, 2017). Other respondents corroborated the fact that migration from the region declined during the economic crisis but attributed it to a lack of financial resources to fund migration.

This situation demonstrates that environmental disasters have differentiated effects. While migration increased following the drought and ensuing famine in 1922, as mentioned in section 3.1, it decreased during the political and economic crises of the 1970s and 1980s, due to the absence of livelihood opportunities in major urban centres and other established migration destinations as well as lack of funds for potential migration. Hence, socio-economic disasters alone do not result in increased migration (Black et al., 2011), accentuating that it is pertinent to incorporate other factors in the analysis.

### 3.3. Deepening spatial inequalities and diversification of migration (1984–2010)

From 1984 and onwards, we see a mega-trend of diversification of migrants, types of migration, and destinations. Following increasing rainfall and an improved economy in the southern part of Ghana, migration from the Upper West region was on the rise again. In 1984, the Economic Recovery

Program (ERP) and the Structural Adjustment Programs (SAP), prescribed by the World Bank and the International Monetary Fund, were implemented, boosting cash crop production in southern and central parts of Ghana.

As was the case in the colonial era, the efforts by the government and its development partners to support cash crop production reinforced spatial inequalities, as only southern and central Ghana possesses ecological conditions suitable for most export tree crops, including cocoa (Boafo-Arthur, 1999). Likewise, these areas have rich mineral resources. Industrialization, which sought to add value to Ghana's primary products through food processing, also largely benefited southern towns only, as did heavy investments made in the mining sector and the construction of roads and other infrastructure (Songsore & Denkabe, 1995). A government official highlighted these issues when contemplating the current north-south disparities:

I think the PNDC government could have used the Structural Adjustment Programme to promote economic development in the north. That would have reduced migration from the Upper West which is now the poorest region in Ghana.

As reflected in this quote, the expected trickle-down effects of REP and SAP, expected to benefit the whole country in terms of employment for labour, did not materialize (Canagarajah et al., 2001; Yaro, 2004). Rather, spatial inequalities were cemented and deepened. As a result, labour migration from the northern Savannah continued and diversified with increasing participation of women, youth, and children. Whereas many men from northern Ghana still preferred rural destinations in the forest zone where they worked on farms (Yaro, 2004), women and youth started moving to urban destinations where they often found work in the informal sector (Anarfi & Appiah, 2009), especially women and young girls working as head porters (locally referred to as *kayayei*). This trend is also reflected in the 2000 and 2010 censuses that indicate a continued increase in women migrants from the Upper West region and northern savannah zone more generally.

### 3.4. Continuities and social transformations (2010–present)

Today, as in the colonial and post-colonial periods, migration is a dominant livelihood strategy in the Savanna Zone (Yaro, 2004), with the Upper West being the most dominant migrant-sending region in Ghana. Our survey results show that about 65% of households in Wa West and 66.5% of their counterparts in the Jirapa district have at least one member that has migrated either temporarily or permanently in the last ten years. The profile of migrants evidences some changes though. While migrants used to be largely adult men (van der Geest, 2011), over 70% of current migrants are younger adults (18–35 years old), with about 10% under 18 years, as shown in Table 1.

Female migration is also prominent. Survey data shows that of the 271 persons who migrated from the surveyed households in the Wa West district in the last 10 years, 64 (24%) were females while the number was 72 women out of 232 migrants (31%) in the Jirapa case. The importance of female migration was well noted by research participants in focus

**Table 1.** Distribution of migrants from 403 selected households in the Upper West region by Age.

| Age in Years | Number | %    |
|--------------|--------|------|
| Less than 18 | 59     | 10.3 |
| 18–25        | 211    | 36.7 |
| 26–35        | 202    | 35.1 |
| 36–45        | 69     | 12   |
| 46–60        | 28     | 4.9  |
| Above 60     | 6      | 1    |
| Total        | 575    | 100  |

Source: GCM Household Survey (2021, see Footnote 1).

group discussions. An 80-year-old elderly woman put it this way:

Earlier, it was the men who used to travel, but nowadays poverty and hardship is affecting everybody. Now, some of the women also travel. The youth are even mostly migrating today. This time, the women find different job opportunities than the men when they travel to the south.

The underpinning social transformations and changing gender relations related to these changes in migratory patterns were also discussed. A 27-year-old man whose wife had migrated to Accra explained how migration decisions, economic conditions, and gender relations may interact:

When she [my wife] said she wanted to go to Accra to join her sister to work there, I was not happy about it. I tried to convince her to stay and take care of the children here. She told me that she would only stay if I can give her money to start a business. But I don't have that money she requested. If I had money, I could have controlled her movement. We are men but without money, so it is the women who decide where they want to stay.

A 70-year-old woman further highlighted how gender relations that prescribe male authority over women changes, when men cannot provide, and women engage in migration:

More women are now migrating because of economic hardship. It is the man in the family that is responsible to provide for his wife and children; and here is the case when he has nothing to offer. When the woman realizes that her husband is broke and cannot provide for her, she will have to devise a way of fulfilling her needs and that of her kids. That has always led to their migration. The man cannot stop the woman from migrating because he is unable to provide for her.

Such quotations illustrate changing norms of women's migration to the south to work, reflecting increased female autonomy and socio-economic change (Darkwah et al., 2019; Setrana & Kleist, 2022; Teye et al., 2017). Care must be taken, however, in emphasizing the feminization of migration as men still dominate migration from the Upper West region, as we have seen. Rather, the articulations above reflect transformations in gender relations and relative changes in

**Table 2.** Destination of the migrants from the Upper West region by gender (percent).

| Destination of the migrant                    | Male | Female | Total |
|-----------------------------------------------|------|--------|-------|
| In a different community within this district | 3.0  | 16.9   | 6.3   |
| In another district in the same region        | 17.5 | 30.2   | 20.5  |
| In another region in Ghana                    | 78.4 | 52.9   | 72.4  |
| International (Africa)                        | 0.5  | 0.0    | 0.4   |
| International (Europe)                        | 0.2  | 0.0    | 0.2   |
| International (Americas)                      | 0.5  | 0.0    | 0.4   |
| Total                                         | 100  | 100    | 100   |

Source: GCM Household Survey (2021).

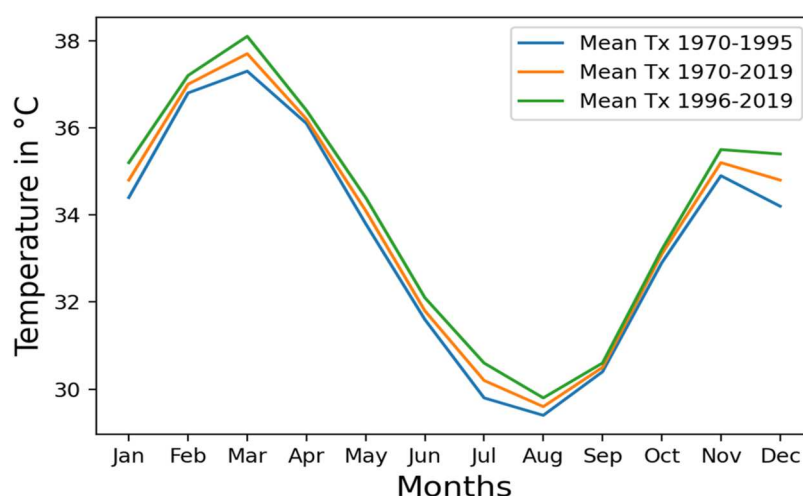


**Figure 2.** Mean monthly maximum temperature for Wa. Source: Authors' construct based on data from the Ghana Meteorological Agency.

migratory patterns. This is also reflected in Table 2 which demonstrates that while the majority (72%) of both men and women have moved to another region in Ghana, men (still) tend to move farther than women, with inter-regional migrants more likely to be men and the very few international migrants all males.

The table thus indicates that alarmist media and policy narratives of an exodus of climate-related migrants from Africa to Europe have no empirical evidence in our case (cf. Awumbila et al., 2014). While it is straightforward to dismiss such perceptions, what about the types of contemporary migration that actually take place? To answer that question, we first examine the extent to which climate change has taken place in the study sites and then turn to how research participants perceive climate change in the area and its impact on migration.

#### 4. Climate change and contemporary migration patterns

When it comes to measurable climatology in the Upper West, the picture is clear: the Upper West region has been experiencing increased temperatures and irregular rainfall over the last 50 years (Teye et al., 2021). Both the maximum temperature

(Figure 2) and the mean minimum temperature (Figure 3) for Wa have increased for all months (though less significantly during September and October) during the last two decades (1996–2019). In addition, the mean maximum temperature for the last two decades is higher than the long-term average (1970–2019) for all months.

There is also a significant deviation of annual rainfall values from the long-term mean of 1009.9 mm. As shown in Figure 4, the rainfall data for Wa shows an extended period of rainfall deficit from 1980 to 1990. Again, the rainfall distribution from the year 2010 has mainly been below the long-term mean. Earlier publications by climate scientists focused more on declining rainfall (see Ghana Environmental Protection Agency, 2012; Owusu & Waylen, 2009), while our analysis shows increasing – but irregular – annual rainfall in the last few years (e.g. 2018 and 2019).

##### 4.1. 'People migrate from this community for many reasons'

One thing is to document climate change and climate variability, another is to assess its implications. To assess the role of climate change in shaping migration patterns, the household

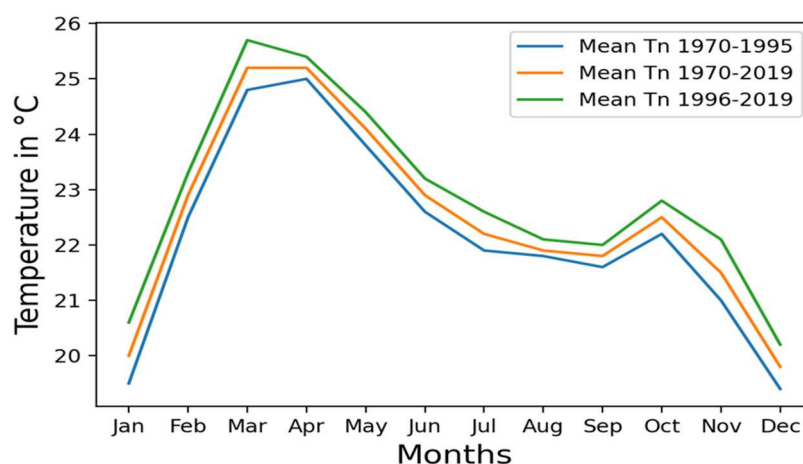


**Figure 3.** Mean monthly minimum temperature (Tn) for Wa. Source: Authors' construct based on data from the Ghana Meteorological Agency.

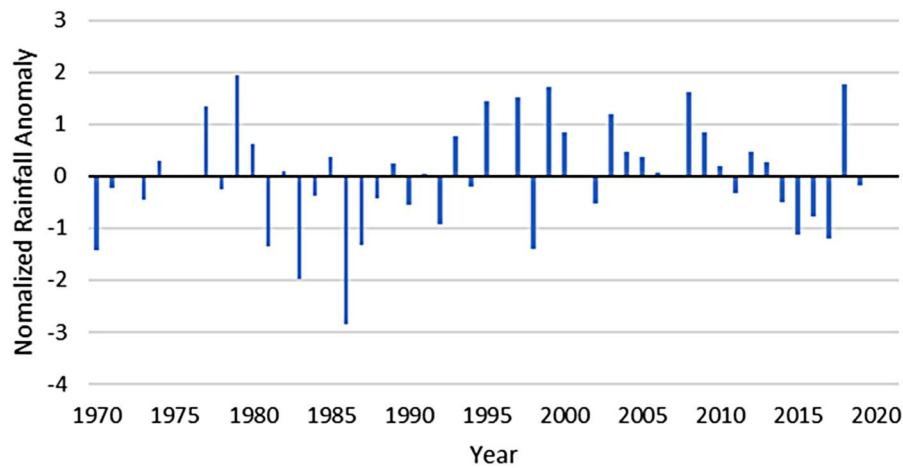


**Figure 4.** Normalized rainfall anomaly for Wa (1970–2019). Source: Authors' construct based on data from the Ghana Meteorological Agency.

survey therefore included questions about reasons for household members' migration, as shown in Table 3. While care must be taken in interpreting these responses, as some migrants may not fully inform relatives about their migration, the results indicate that a majority of both male and female migrants have left their community to 'hustle' (colloquial term to look for opportunities) or to pursue better employment or educational opportunities elsewhere. This is consistent with earlier studies indicating that economic factors are the dominant drivers of migration in the Upper West region (see Awumbila, 2006; Teye et al., 2017). We further see that marriage is an important reason for women's migration, demonstrating the continued importance of socio-cultural practices from a gender perspective.

Despite the prevalence of climate change in migration discussions as well as the observable changes in weather patterns, it is striking that only 2.5% of the surveyed household representatives – and only men – mentioned drought as a reason for migration. Lack of farming land generated a slightly higher but still relatively small response. This indicates that climate change may constitute an indirect or predisposing driver that 'contribute[s] to the creation of a context in which migration is more likely' (van Hear et al., 2018, p. 931). For instance, people reporting failing production as a reason for migration may be affected by climate change. Unreliable rainfall and inadequate irrigation facilities also make farming less profitable in the region (Mendes et al., 2014), cementing and

aggravating poverty. Indeed, the incidence of poverty in the Upper West region has declined only slowly from 88.4% in 1991/92 to 70.9% in 2016/17 (GSS, 2018) and remains the highest in Ghana.

While survey results thus were relatively vague in terms of directly attributing climate change as a reason for migration, focus group participants repeatedly described changes in temperature and rainfall patterns and their effect on agricultural production and livelihoods. 'These days, things have changed', stated a 55-year-old male farmer, and continued:

The rainfall pattern is not good. In the past, when we were returning from 'jonga' [dry-season migration], after casual labour in March to April, we were always late [to join the farming]. By then all our peers at home might have finished planting but now it is not like that. Now one can come around the 6th month [June] but people are still planting.

While a two–three-month delay in rainfall may mean that seasonal migrants can catch up on planting, fluctuating rainfall disturbs crop production and livelihoods, with widespread repercussions. A 28-year-old female focus group participant stated the challenges eloquently:

The rain doesn't come at the time that we need it. So, we delay in our farming season. When it starts falling too, it falls excessively which again destroys the crops.... We are standing in front of two major problems now, including lack of food and lack of accommodation. The excessive rain has collapsed our houses. Another issue is that nowadays we are forced by hardships to move to the south in order to look for food and come back to feed our children.

As these two quotations illustrate, research participants experience rainfall patterns as characterized by delay, unpredictability, and severity, resulting in changing planting and harvesting patterns. Furthermore, the destruction of crops and housing leads to food insecurity. In the last quotation, such conditions are directly related to migration, but, as a 62-year-old farmer observed:

People migrate from this community for many reasons. We can say poverty is the main reason, but some people migrate just to know the city, and some go to join their husbands. Some of the young people also want to enjoy the city life. Also, people migrate because of poor harvest caused by poor soils and especially the

**Table 3.** Main reasons for migration from the Upper West.

| Reasons for Migration           | Male Percent | Female Percent | All Percent | Frequency |
|---------------------------------|--------------|----------------|-------------|-----------|
| Education                       | 10.5         | 18.4           | 12.4        | 71        |
| Marriage                        | 0.0          | 23.5           | 5.6         | 32        |
| Employment opportunity          | 24.2         | 18.4           | 22.8        | 131       |
| Hustling/look for opportunities | 49.2         | 33.8           | 45.6        | 262       |
| Lack of farming land            | 3.9          | 0.7            | 3.1         | 18        |
| Failing production              | 3.0          | 0.7            | 2.4         | 14        |
| Lack of work here               | 20.3         | 10.3           | 17.9        | 103       |
| Floods                          | 0.2          | 0.0            | 0.2         | 1         |
| Drought                         | 2.5          | 0.0            | 1.9         | 11        |
| Other                           | 20.7         | 13.2           | 19.0        | 109       |
| Total                           | 134.4        | 119.1          | 130.8       | 752       |

Source: GCM Household Survey (2021).

rains. These days the rainfall has been changing and bringing more short spells and making it difficult to farm. So young people who want money will migrate when there is low income here from farms.

While social relations and curiosity about city life are important factors, poverty and lack of jobs are clearly identified as key reasons for migrating. Likewise, the pursuit of education – another potentially important factor in improving one's life and future – stands out as well, especially for women. As documented in the previous section, these drivers have been produced through many decades of skewed development policies by colonial and subsequently post-colonial governments, continuously shaping north–south migration. Again, we see how migration serves as a livelihood during challenging times that may be intensified by climate change, emphasizing the point that environmental factors may strengthen existing migration patterns as well as shape new ones – insofar as economic opportunities and other factors are in place.

## 5. Discussion and conclusions

This paper set out to explore migration from dryland areas that are affected by climate change and variability and from where there are established migratory practices and livelihoods, with the Upper West region in Ghana as a case study. It thereby contributes to the overall literature on the causal relationship between climate change and migration and its intricacies, examining whether climate-related migration can clearly be identified and is qualitatively different from other types of migration.

Taking a political ecology approach, we have incorporated a historical perspective, paying attention to political, economic, and socio-cultural dimensions and, thereby, the (re-)production of structural inequalities. Likewise, we have analyzed meteorological data in a long-term perspective to assess whether and how climate change occurs in the studied area. This analysis as well as quantitative and qualitative data all demonstrate the pertinence of changed weather patterns, in particular long-term changes in temperature and rainfall. Furthermore, the repercussions for farming and the links to migration were highlighted in individual and focus group discussions. Or, in other words: what we can term climate-related migration from the Upper West region does occur but cannot be identified as a singular form of migration. Below, we present five analytical implications of this.

First, our historical analysis shows that contemporary migration from the Upper West region and its modes, destinations, and underpinning conditions to a large degree follow migratory patterns established during colonial and post-colonial regimes. Recruitment policies and unbalanced economic policies adopted in the colonial era established, cemented, and deepened structural inequalities between the northern and southern parts of Ghana that still exist today, laying the foundation for current south-bound migratory patterns. At the same time, the failure on the part of successive post-independence governments to promote balanced development is among the key reasons for the increasing outward mobility from places experiencing climate change and variability.

Thus, our findings accentuate the complexity of the relationship between climate change and migration.

Second, we find an interesting contrast between the reasons given for migration decisions in the household survey where climate change is less significant than economic and employment opportunities, followed by marriage for women, and education for both men and women. In the interviews, changed weather patterns – particularly fluctuation and delay in rainfall – were consistently emphasized as respondents highlighted historical change and its repercussions. We propose that this is an expression of climate change as a predisposing driver (van Hear et al., 2018); that is, as an underlying condition that indirectly shapes the likelihood of migration through its derived consequences, especially rain-fed farming. Likewise, perceptions of better opportunities elsewhere – including employment but also of city life and non-farming livelihoods – are more significant than environmental challenges that may be experienced as business as usual, even if they are intensifying. In other words, we cannot presuppose that climate change is the most important challenge for people living in climate change-affected areas.

Third, we have shown that severe socio-natural disasters do not automatically increase migration, as is often predicted. Rather, they have differing effects, pending on socio-economic conditions of migrants and more generally of their settlement and home areas. There is thus no mono-causal relationship between disasters and migration. While drought, floods, or other expressions of climate change may spur out-migration, maybe even significantly so, the drought and bushfires of the 1980s did not lead to an increase in migration from the Upper West region, on the contrary. This demonstrates the pertinence of economic, social, and political factors, not least in relation to livelihood-related migration, where the existence of actual economic opportunities is central and where the presence of family in one's area of origin offers a sense of reciprocity and security (cf. Geschiere & Gugler, 1998; Kleist, 2017). We should add here that devastating disasters or conflicts that make an area uninhabitable may change such dynamics, but this is not the focus of this paper. Or, in other words, migration is multi-dimensional and can rarely be attributed to just one factor (cf. UNDP, 2019).

Fourth, we highlight the importance of including socio-cultural transformations in the analysis, particularly in relation to gender and age. It is striking that especially male respondents articulate women's independent migration as a loss of masculine authority, caused by economic distress and reflecting wider societal development. Feminization of migration – understood as a rising percentage rather than a majority of female migrants – is indeed a major trend in Ghana and West Africa more generally (Setrana & Kleist, 2022). Male-dominated seasonal migration was the dominant form of mobility during colonization and until around the turn of the millennium, when more women, youth, and even children migrated to urban centres in southern Ghana to work in the informal sector. Rural areas in the forest zone are still important destinations for seasonal farm work though.

Fifth and finally, we conclude that climate change *intensifies* migratory patterns and the reliance on migration as a livelihood strategy for poor rural populations (cf. Radel et al., 2018). Our

analysis demonstrates that migration as a phenomenon is constituted by colonial and post-colonial governance practices and continuous structural inequalities. Attributing migration to climate change only – or, for that matter, to the whims of the youth longing for the city lights – without understanding its political and historical dimension would paint a skewed picture as well as depoliticize climate-related migration by overlooking past and present political responsibilities.

## Notes

1. This article draws on research from the Governing Climate Mobility (GCM) program, a collaborative research program conducted by researchers in Ghana, Ethiopia and Denmark. It is part of a special section on the role of governance in shaping climate-related mobility.
2. The final sample of 403 households is due to technicalities during the survey. Whereas 430 households were originally selected, 27 households either refused to participate or did not qualify.

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No potential conflict of interest was reported by the authors.

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## References

- Abdul-Korah, G. B. (2011). 'Now if you have only sons you are dead': Migration, gender and family economy in twentieth century Northwestern Ghana. *Journal of Asian and African Studies*, 46(6), 390–403. <https://doi.org/10.1177/0021909611400016>
- Affi, T., Liwenga, E., & Kwezi, L. (2014). Rainfall-induced crop failure, food insecurity and out-migration in same-Kilimanjaro. *Tanzania. Climate and Development*, 6(1), 53–60. <https://doi.org/10.1080/17565529.2013.826128>
- Amanor, K. S., Yaro, J. A., & Teye, J. K. (2020). Long-term change and agricultural commercialisation in Ghanaian cocoa. *Working paper 31*. Future Agricultures Consortium.
- Amin, S. (1974). *Modern migration in western Africa*. Oxford University Press.
- Anarfi, J. K., & Appiah, M. (2009). The phenomenon of independent child migration in Ghana in the context of a globalised world. In J.K. Anarfi & S.O. Kwankye (Eds.), *Independent migration of children in Ghana* (pp. 45–70). Sundel Services.
- Awumbila, M. (2006). Gender equality and poverty in Ghana: Implications for poverty reduction strategies. *GeoJournal*, 67(2), 149–161. <https://doi.org/10.1007/s10708-007-9042-7>
- Awumbila, M., & Ardayfio-Schandorf, E. (2008). Gendered poverty, migration and livelihood strategies of female porters in Accra, Ghana. *Norwegian Journal of Geography*, 62(3), 171–179.
- Awumbila, M., Owusu, G., & Teye, J. K. (2014). Can rural-urban migration into slums reduce poverty? Evidence from Ghana. *Migrating out of Poverty (MOP) Working Paper 13*. University of Sussex.
- Barney, K. (2012). Land, livelihoods, and remittances: A political ecology of youth Out-migration across the Lao–Thai Mekong border. *Critical Asian Studies*, 44(1), 57–83. <https://doi.org/10.1080/14672715.2012.644887>
- Bening, R. B. (1975). Colonial development policy in northern Ghana, 1898–1950. *Bulletin of the Ghana Geographical Association*, (17), 65–79.
- Black, R., Bennett, S. R., Thomas, S. M., & Beddington, J. R. (2011). Migration as adaptation. *Nature*, 478(7370), 447–449. <https://doi.org/10.1038/478477a>
- Boafo-Arthur, K. (1999). Ghana: Structural adjustment, democratization, and the politics of continuity. *African Studies Review*, 42(2), 41–72. <https://doi.org/10.2307/525364>
- Boas, I., Wiegel, H., Farbotko, C., Warner, J., & Sheller, M. (2022). Climate mobilities: Migration, im/mobilities and mobility regimes in a changing climate. *Journal of Ethnic and Migration Studies*, 48(14), 3365–3379. <https://doi.org/10.1080/1369183X.2022.2066264>
- Bob-Milliar, G. M., & Bob-Milliar, G. K. (2013). The politics of trans-saharan transit migration in the Maghreb: Ghanaian migrants in Libya, c.1980–2012. *African Review of Economics and Finance*, 5(1), 60–73.
- Boone, C. (2003). *Political topographies of the African state: Territorial authority and institutional choice*. Cambridge University Press.
- Bryant, R. L. (1992). Political ecology: An emerging research agenda in third-world studies. *Political Geography*, 11(1), 12–36. [https://doi.org/10.1016/0962-6298\(92\)90017-N](https://doi.org/10.1016/0962-6298(92)90017-N)
- Bryant, R. L., & Bailey, S. (1997). Introduction. In Sinead Bailey & Raymond Bryant (Eds.), *Third world political ecology* (pp. 1–9). Routledge.
- Canagarajah, S., Newman, C., & Bhattamishra, R. (2001). Non-farm income, gender, and inequality: Evidence from rural Ghana and Uganda. *Food Policy*, 26(4), 405–420. [https://doi.org/10.1016/S0306-9192\(01\)00011-2](https://doi.org/10.1016/S0306-9192(01)00011-2)
- Carr, E. R. (2005). Placing the environment in migration: Environment, economy, and power in Ghana's central region. *Environment and*

- Planning A: *Economy and Space*, 37(5), 925–946. <https://doi.org/10.1068/a3754>
- Carr, E. R. (2008). Between structure and agency: Livelihoods and adaptation in Ghana's central region. *Global Environmental Change*, 18(4), 689–699. <https://doi.org/10.1016/j.gloenvcha.2008.06.004>
- Cleveland, D. A. (1991). Migration in West Africa: A savanna village perspective. *Africa*, 61(2), 222–246. <https://doi.org/10.2307/1160616>
- Darkwah, A., Thorsen, D., Boateng, D. A., & Teye, J. K. (2019). Good for parents but bad for wives: Migration as a contested model of success in contemporary Ghana. *Migrating out of Poverty Working Papers*, 2019 (61), 1–33.
- Dreier, V., & Sow, P. (2015). Bialaba migrants from the northern of Benin to Nigeria, in search of productive land—Insights for living with climate change. *Sustainability*, 7(3), 1–29. <https://doi.org/10.3390/su7033175>
- Foresight. (2011). *Final project report: Migration and global environmental change*. The Government office for Science.
- Geschiere, P., & Gugler, J. (1998). Introduction: The urban–rural connection: Changing issues of belonging and identification. *Africa*, 68(3), 309–319. <https://doi.org/10.2307/1161251>
- Ghana Environmental Protection Agency. (2012). *Climate Change Impact: Why Must Ghana Worry?*. Policy Advice Series.
- Ghana Statistical Service (GSS). (2018). *Ghana Living Standards Survey Round 7 (GLSS7): Main Report*. Ghana Statistical Service.
- Hulme, M. (2023). *Climate change isn't everything: Liberating climate politics from alarmism*. Polity Books.
- Hunter, L. (2005). Migration and environmental hazards. *Population and Environment*, 26(4), 273–302. <https://doi.org/10.1007/s11111-005-3343-x>
- IPCC. (2018). *Climate change 2018. Global warming at 1.5 C. Summary for policy makers*. Cambridge University Press.
- Ivankova, N. V., Creswell, J. W., & Stick, S. L. (2006). Using mixed-methods sequential explanatory design: From theory to practice. *Field Methods*, 18(1), 3–20. <https://doi.org/10.1177/1525822X05282260>
- Kleist, N. (2017). Disrupted migration projects: The moral economy of involuntary return to Ghana from Libya. *Africa*, 87(2), 322–342. <https://doi.org/10.1017/S000197201600098X>
- Lattof, S. R., Coast, E., Leone, T., & Nyarko, P. (2018). Contemporary female migration in Ghana: Analyses of the 2000 and 2010 censuses. *Demographic Research*, 39, 1181–1226. <https://doi.org/10.4054/DemRes.2018.39.44>
- Lentz, C. (2006). *Ethnicity and the making of history in northern Ghana*. Edinburgh University Press.
- Lindegaard, L. S. (2020). A historical, scaled approach to climate change adaptation: The case of Vietnam in. *Journal of Political Ecology*, 27(1), 105–124. <https://doi.org/10.2458/v27i1.22049>
- Mbiyozo, A. (2020). *Migration: A critical climate change resilience strategy*. Institute for Security Studies Policy Brief, 151(Nov 2020).
- McLeman, R., & Smit, B. (2006). Migration as an adaptation to climate change. *Climatic Change*, 76(1–2), 31–53. <https://doi.org/10.1007/s10584-005-9000-7>
- Mendes, M. D., Paglietti, L., Jackson, D., & Altozano, G. A. (2014). *Ghana: Irrigation market brief*. FAO investment centre: Country highlights. Food and Agricultural Organization.
- Morrissey, J. (2012). Rethinking the 'debate on environmental refugees': From 'maximalists and minimalists' to 'proponents and critics'. *Journal of Political Ecology*, 19(1), 36–49. <https://doi.org/10.2458/v19i1.21712>
- Nowell, L. S., Norris, J. M., White, D. E., & Moules, N. J. (2017). Thematic analysis: Striving to meet the trustworthiness criteria. *International Journal of Qualitative Methods*, 16(1), 1609406917733847. <https://doi.org/10.1177/1609406917733847>
- Owusu, K., & Waylen, P. (2009). Trends in spatio-temporal variability in annual rainfall in Ghana (1951–2000). *Weather*, 64(5), 115–120. <https://doi.org/10.1002/wea.255>
- Radel, C., Schmook, B., Lindsey, C., & Mardero, S. (2018). Toward a political ecology of migration: Land, labor migration, and climate change in northwestern Nicaragua. *World Development*, 108, 263–273. <https://doi.org/10.1016/j.worlddev.2017.04.023>
- Ribot, J. (2014). Cause and response: Vulnerability and climate in the Anthropocene. *Journal of Peasant Studies*, 41(5), 667–705. <https://doi.org/10.1080/03066150.2014.894911>
- Ribot, J., Faye, P., & Turner, M. D. (2020). Climate of anxiety in the Sahel: Emigration in xenophobic times. *Public Culture*, 32(1), 45–75. <https://doi.org/10.1215/08992363-7816293>
- Setrana, M. B., & Kleist, N. (2022). Gendered dynamics in West African migration. In J. Teye (Ed.), *Migration in West Africa. IMISCOE regional reader* (pp. 57–76). Springer.
- Sheller, M., & Urry, J. (2006). The new mobility paradigm. *Environment and Planning*, 38(2), 207–226. <https://doi.org/10.1068/a37268>
- Songsore, J., & Denkabe, A. (1995). *Challenging rural poverty in Northern Ghana: The case of the upper west region*. The University of Trondheim, Centre for Environment and Development, SMU.
- Taylor, M. (2015). *The political ecology of climate change adaptation: Livelihoods, agrarian change and the conflicts of development*. Routledge.
- Teye, J. K., Awumbila, M., & Darkwah, A. (2017). Gendered dynamics of remitting and remittance use in Northern Ghana. *Migration out of Poverty Working Papers*, 48, 1–36.
- Teye, J. K., Jarawura, F., Lindegaard, L. S., Kleist, N., Ladekjær Gravesen, M., Mantey, P., & Quaye, D. (2021). *Climate mobility: Scoping study of two localities in Ghana* (No. 2021: 10). DIIS Working Paper.
- Teye, J. K., & Nikoi, E. (2022). Climate-induced migration in West Africa. In J. K. Teye (Ed.), *Migration in West Africa: IMISCOE regional reader* (pp. 71–98). Springer.
- UNDP. (2019). *Scaling Fences: Voices of Irregular African Migrants to Europe*. United Nations Development Programme.
- van der Geest, K. (2011). North-South migration in Ghana: What role for the environment. *International Migration*, 49(s1), e69–e94. <https://doi.org/10.1111/j.1468-2435.2010.00645.x>
- van der Geest, K., de Sherbinin, A., Gemenne, F., & Warner, K. (2023). Climate migration research and policy connections: Progress since the foresight report. *Frontiers in Climate*, 5, 1231679. <https://doi.org/10.3389/fclim.2023.1231679>
- van der Geest, K., Vrieling, A., & Dietz, T. (2010). Migration and environment in Ghana: A cross-district analysis of human mobility and vegetation dynamics. *Environment and Urbanization*, 22(1), 107–123. <https://doi.org/10.1177/0956247809362842>
- van Hear, N., Bakewell, O., & Long, K. (2018). Push-pull plus: Reconsidering the drivers of migration. *Journal of Ethnic and Migration Studies*, 44(6), 927–944. <https://doi.org/10.1080/1369183X.2017.1384135>
- Wiegel, H., Boas, I., & Warner, J. (2019). A mobilities perspective on migration in the context of environmental change. *Wiley Interdisciplinary Reviews: Climate Change*, 10(6), e610; 1–9. <https://doi.org/10.1002/wcc.610>
- Yamane, T. (1967). *Statistics, An introductory analysis*, 2nd Ed. Harper and Row.
- Yaro, J. A. (2004). *Combating food insecurity in northern Ghana. Food insecurity and rural livelihood strategies in kajelo, China and korania* [Volume 44 of Occasional Paper]. Department of Sociology and Human Geography, University of Oslo.
- Yaro, J. A., Teye, J., & Bawakyillenuo, S. (2015). Local institutions and adaptive capacity to climate change/variability in the northern savannah of Ghana. *Climate and Development*, 7(3), 235–245. <https://doi.org/10.1080/17565529.2014.951018>
- Zickgraf, C., Vigil, S., de Longueville, F., Ozer, P., & Gemenne, F. (2016). *The Impact of Vulnerability and Resilience to Environmental Changes on Mobility Patterns in West Africa*. KNOMAD Working Paper. Washington D.C.: World Bank.