Palacký University Olomouc

University of Clermont Auvergne

University of Pavia

MASTER THESIS

Climate Change as a Driver of Translocality: A Case Study in Ghana

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GLODEP 2023

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GLODEP 2021-2023

Declaration

The data presented in this thesis was obtained by the Mitra|WA Consortium in the Eastern and Northern Regions of Ghana. Data analysis and interpretation are entirely my own work.

I am aware of and understand the university's policy on plagiarism and I certify that this thesis is my own work, except where indicated by referencing, and the work presented in it has not been submitted in support of another degree or qualification from this or any other university or institute of learning.

Date: 22-05-2023 Álvaro Pantaleón Osuna

Thesis assignment

UNIVERZITA PALACKÉHO V OLOMOUCI

Přírodovědecká fakulta

Akademický rok: 2022/2023

ZADÁNÍ DIPLOMOVÉ PRÁCE

(projektu, uměleckého díla, uměleckého výkonu)

Jméno a příjmení:	**Álvaro PANTALEÓN**
Osobní číslo:	**R210655**
Studijní program:	**N0588A330004 Global Development Policy**
Téma práce:	**Climate Change as a Driver of Translocality: A Case Study on Ghana**
Zadávající katedra:	**Katedra rozvojových a environmentálních studií**

Zásady pro vypracování

The United Nations predicts that by 2050 there could be 86 million internally displaced climate refugees in sub-Saharan Africa. As a consequence, exponential growth in large cities and the emergence of new megacities are expected in a continent characterized by the stress of its infrastructures.

The aim of this thesis is to analyze whether climate change is currently a real driver of translocality in the rural environment of Ghana and what is the response in terms of displacements given by those affected. This will be done mainly through quantitative methods using the dataset provided by the MiTraWa consortium collected both in the rural environment and the migrants' place of destination.

Rozsah pracovní zprávy:	**10-15 000 words**
Rozsah grafických prací:	**as needed**
Forma zpracování diplomové práce:	**tištěná/elektronická**
Jazyk zpracování:	**Angličtina**

Seznam doporučené literatury:

Depaul, M. (2012). Climate Change, Migration, and Megacities: Addressing the Dual Stresses of Mass Urbanization and Climate Vulnerability. In Paterson Review of International Affairs (Vol.12).

Intermediary Cities and Climate Change. (2022). OECD. https://doi.org/10.1787/23508323-en
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Vedoucí diplomové práce: **Lucie Macková, M.A., Ph.D.**
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Datum zadání diplomové práce: **27. ledna 2023**
Termín odevzdání diplomové práce: **31. května 2023**

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děkan

doc. Mgr. Zdeněk Opršal, Ph.D.
vedoucí katedry

V Olomouci dne 27. ledna 2023

Acknowledgments

I have to thank first and foremost Prof. Dr. Malte Steinbrink, who introduced me to the translocality approach and with whom I would have loved to share and discuss the results of this thesis. I also want to express my gratitude to the Mitra|WA consortium for providing me with all their resources to carry out this research. I would like to particularly acknowledge the work of Dr. Stefanie Wehner, who has listened to me, supported me, helped me, and guided me from beginning to end, and along with Dr. Christian Ungruhe, gave me the warmest welcome and stay at the University of Passau.

I cannot overlook the crucial role that Lucie Macková played in this research. I am very grateful for the trust she placed in me, her remarkable dedication as a supervisor, and how satisfying it is to work with her.

Finally, I would like to express my gratitude to my parents for all they have sacrificed for my education; to my grandmother, for living my absence as a continuous countdown until we meet again; to Daniel, for enduring the distance with generosity, for his patience and unwavering support; to Pablo and Adrián, for celebrating each of my successes and supporting me through my failures; and to Afnan, Monica, and Shreya, for their indispensable and selfless help throughout this experience.

Thesis supervisor: Lucie Macková Álvaro Pantaleón Osuna

Climate Change as a Driver of Translocality: A Case Study in Ghana

Abstract

Climate change has been singled out by high-profile publications and media as the sole factor responsible for future mass migrations from Africa to European borders. In response to the deterministic and generalizing nature of these estimates and predictions, this research studies the link that migrants establish between the environmental changes they experience and migration as a climate adaptation strategy. Furthermore, the overlaps between the profile and migratory behavior of those who manifest a greater presence of climate change in their migratory processes and their counterparts are analyzed. The quantitative analysis of the data collected by the Mitra|WA project in the Eastern Region and Northern Region of Ghana in 2022 demonstrates that climate change does not unilaterally drive migration; rather itemerges as a novel reality in which households continue to organize themselves translocally. This research provides an opportunity to redirect future research towards the factors that determine the agency of individuals in response to climate hazards and invites us to abandon the sedentism bias that considers migration in West Africa as an exceptional behavior.

Key Words

Environmental changes · Adaptation strategies · Climate-induced migration · Drivers of migration · Translocality

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List of abbreviations

AoD	Area of destination
AoO	Area of origin
ECOWAS	Economic Community of West African States
ER	Eastern Region
GSS	Ghana Statistical Service
HH	Household
NR	Northern Region
SPSS	Statistical Package for the Social Sciences

1. Introduction

1.1 Background

Climate change-migration nexus has gained significant attention, particularly since 2010, coinciding with an increase in high-profile publications (Boas, 2015), as well as an accumulation of empirical evidence in academic literature (Piguet, Kaenzig, & Guélat, 2018; Hoffmann et al., 2020). The media and political discourse have echoed predictions of possible mass migrations to the Global North, attributing climate change as the sole reason for these displacements. However, these claims have been questioned and refuted as their dissemination permeated the collective imagination.

The first estimates and predictions of the number of people displaced by climate date back to 1985, when the scholar Hassan El-Hannawi estimated 30 million were displaced at that time which could increase to 50 million by 2010 (UNEP, 1985). These figures are based on the projection of climate risks in a region, assuming deterministically that all inhabitants will migrate, ignoring the possible immobility of the agents, and disregarding other adaptation strategies.

These figures were followed by the oft-cited projection of 200 million by 2050 (Myers 1993, 2002; Myers and Kent 1995), but both had a common characteristic: a methodology deemed weak or lacking (Kolmannskog, 2008; Gemenne, 2011). Their uncritical repetition has disguised them as scientific truths or empirical evidence that we find not only in the media, but also in official communications and research reports such as UNU-EHS (Renaud et al., 2007), Stern Review on the Economics of Climate Change (Stern, 2007), or the Geneva-based Global Humanitarian Forum (Global Humanitarian Forum, 2009). The last predictions indicate that, by the year 2050, approximately 143 million individuals from Sub-Saharan Africa, Latin America, and South Asia will migrate due to climate-related factors (Rigaud et al., 2018). Sub-Saharian Africa is expected to witness the displacement of over 85 million people, which accounts for the 4% of its total population, as a consequence of increased flooding, drought, high temperatures, and erratic rainfall patterns (Rigaud et al., 2018).

The lack of agreement on terminology and definitions within the conceptual framework presented by each author exacerbates these criticisms, resulting in an inability to compare findings (Biermann & Boas, 2010). These disparities are linked to a range of factors, including (1) the nature of the environmental phenomenon (whether triggered by climate change or not); (2) the differentiation between migratory flow and stock; (3) the temporal scale (permanent, temporary, or circular); (4) the level of the agency involved (fromvoluntary to forced migration), and the distance that must be covered for someone to be considered a migrant (Gemenne, 2011). However, the most significant difference is betweenthe maximalist scholars (Suhrke, 1994), who contend that climate change is the primary driver of migration; and the minimalists, who argue that migration is a multi-causal decision (Dun & Gemenne, 2008).

Despite these inconsistencies, these discourses project in society a security crisis feeling that sometimes reaches pre-apocalyptic undertones. These fears have begun to define the lines of migration policies in the Global North, which uses climate migrations as a justification to preventively reinforce its borders (Zanker et al., 2020): while the European Union (EU) aims to "protect itself to keep those people in their places and minimize migration" (Trombetta, 2014), the United States Department of Defense blames these potential migration flows for generating insecurity in destination countries (United States Department of Defense, 2015). On the other hand, the United Nations Framework Convention on Climate Change (UNFCCC) explicitly specifies the need to "avoid, minimize and address climate displacement"; and, in turn, the UN Security Councilwarns about massive climate migration and the consequent risk of aggravating conflicts (Boas, 2015).

In response to this speech, this research proposes an analysis of migration trends in one of the most mobile regions in the world, West Africa (Romankiewicz & Doevenspeck, 2015). As only a few researchers have examined climate-related migration in the sub-region there is still a limited understanding of the dynamicsof climate-induced migration in West Africa and how migration is employed to cope with climate change and variability (Van der Geest, 2011; Zickgraf et al., 2016),

1.2 Purpose of study

The main objective of this research was to ascertain whether the singularity of climate-induced migrations can turn predictions of mass migrations into a reality. To accomplish this, three questions were posed: (1) How do the respondents perceive the effects of environmental changes on agricultural activity? (2) What is the linkage that interviewees establish between climate risks and migration as an adaptive response? (3) What differences characterize the profile and migratory behavior of climate-induced migrants compared to other migratory movements?

In order to achieve this, the main challenges faced by the agricultural sector were identified, along with the most common climate risks, the strategies employed by the interviewees to adapt to them, and the role of temporary and permanent migrations in this regard. Due to the difficulties in establishing a direct link between environmental changes and migration based on the respondents' answers, the influence of climate change on the migratory process of absent household members was traced by computing four variables. This enabled an analysis of the profile and migratory behavior of migrants whose migration process has been most influenced by climate change compared to others.

This research contributes to the existing literature through a perspective that avoids being deterministic in the relationship between climate change and migratory flows, taking into consideration the multi-causality of decision-making, the structural factors that contribute to agricultural underproductivity, and a translocal livelihood approach (see chapter 2.3) that avoids falling into the "container bias" of conventional spatial concepts and the “sedentism bias”.

With this purpose in mind, the research utilized the database of the Mitra|WA project in the Northern Region and Eastern Region of Ghana. The project employs a translocal livelihood and mobility approach at the household level to gain a deeper understanding of the drivers, practices, structures, and processes of rural-urban and cross-border migration, as well as the interconnectedness and dynamics between areas of origin and destination. The differences in climate and soil quality for crops allowed us to determine if a greater impact of climate change translates into increased mobility.

The research is composed of a total of six chapters divided into different sub-chapters. In the first chapter, Introduction, the dominant narratives on climate migrations are presented. The chapter explains the purpose of the study, its contribution to the current body of research, the main objectives, research questions, and an overview of forthcoming chapters. In the Literature Review chapter, the contribution of the major research conducted on the nexus between climate change and migrations in West Africa is analyzed, with special attention to the literature on Ghana. The third chapter, Study Area and Research Methods, provides all crucial information about the research context and describes how the quantitative analysis of the data was conducted. The fourth chapter, titled Results, presents the main findings of the research in the form of frequency tables, means, and two-way tables, which are subjected to Pearson's Chi-square and Cramer's V tests. These results are discussed and compared with the most relevant recent findings in the fifth chapter: Discussion. This chapter also includes the main limitations of the research and recommendations for future investigations. Finally, in the sixth chapter, Conclusions and Policy Recommendations, the main findings of the research are summarized, along with their contribution to the existing literature, and a series of policy recommendations are suggested.

2 Literature review

2.1 Migration patterns in West Africa

Despite the prophecy of massive migratory flows towards the Global North, migratory movements in most of the African continent tend to occur at the regional level. The exception is found in the Maghreb countries, where extra-continental migrations occur more frequently (Flahaux & De Haas, 2016). Conversely, in West Africa, 72% of mobility takes place within the territory of member countries. In fact, the region is characterized as a particularly mobile territory, with intra-regional mobility being six times higher than intra-European mobility (Olsen, 2011).

Migratory movements in West Africa typically occur in a coast-bound manner, from Sahelian countries such as Burkina Faso, Mali, or Niger, to mineral-rich countries with more productive agriculture, such as Ghana (Flahaux & De Haas, 2016). These current migration patterns in the region are deeply rooted in historical antecedents (Awumbila et al. 2019; Teye

et al., 2015). Even in the precolonial era, population movements in search of fertile land for cultivation were common, and trading in various commodities gave rise to the trans-Saharan trade routes (Adepoju, 2003; Manuh, 2005). Most of these population movements were not considered cross-border migrations since the sub-region was viewed as a borderless area where goods and people moved freely (Adepoju, 2003; Manuh, 2005). Colonial economic and recruitment policies further stimulated labor migration from countries in the northern savannah zone to countries in the south. Currently, these intra-regional migratory flows are facilitated by the Protocol on Free Movement of Persons, Right of Residence and Establishment adopted in 1979 by the Economic Community of West African States (ECOWAS), consisting of 15 out of the 16 countries in the region (Teye, 2022).

When migrations occur to highly desired extra-continental countries such as those in Europe or the United States, they are usually executed by highly skilled migrants (Teye, 2022). However, due to the increasingly restrictive migration policies imposed by countries in the Organization for Economic Cooperation and Development (OECD), there has been a diversification of destinations for West African migrants (Flahaux & De Haas, 2016).

In the African continent, there has been an observed increase in migration flows to oil-rich countries in Central Africa, such as Equatorial Guinea or Gabon, as well as to South Africa (Bakewell & De Haas, 2007). Additionally, there has been a recent upward shift towards Gulf countries, particularly Saudi Arabia, United Arab Emirates, Qatar, and Kuwait (Teye, 2022). These migrations to the Middle East are often mediated by private recruitment agencies and intermediaries seeking employees for the construction and domestic service sectors (Awumbila et al., 2019). However, the poor working conditions and abuse suffered by individuals in these destinations have become notorious, leading some countries like Nigeria or Ghana to ban these recruitment systems (Bisong, 2021).

Far from invading the Global North, levels of extra-continental migrations in Africa are lower than intra-regional migrations and are also lower than international standards (Flahaux & De Haas, 2016). When climate factors are included in the equation, the findings in the literature seem to not contradict these data.

2.2 Migration as an adaptation strategy

Despite its minimal anthropogenic contribution to the acceleration of climate change, West Africa is expected to be particularly affected by environmental changes (Ezeife, 2014). Its geographical position and limited adaptive capacity make it a highly vulnerable region to the effects and variability of climate change (Stanturf et al., 2011; IOM, 2021).

According to previous studies, the impacts can be more pronounced in households whose main economic activity is linked to the agricultural sector, especially when it comes to rain-fed crops (Jarawura & Smith, 2015; Teye et al., 2015; Cattaneo & Peri, 2016; Kubik & Maurel 2016). Some studies, such as Cattaneo & Massetti (2015), find a relationship between a scenario of 23ºC in the dry season and the adoption of migration as an adaptation strategy for households involved in agricultural production. However, no significant impact is detected in non-farm households. This finding is particularly significant considering that in Ghana, for example, according to the Ghana Statistical Service (2021), agriculture employs 41% of the population and accounts for 19.1% of the country's GDP.

Climate-induced migrations in West Africa are often characterized by short-distance and short-duration movements (Findley, 1994; Henry, Schoumaker, & Beauchemin, 2004; Grolle, 2015; De Longueville et al., 2019), with permanent migrations being an uncommon strategy for dealing with climate change (Dreier & Sow, 2015; Jarawura, 2013). For instance, in the Upper West Region of Ghana, households with limited capacity for economic diversification adopt migration as a livelihood strategy during the dry season, moving to other areas with agricultural or mining activities and later returning to their place of origin (Rademacher-Schulz et al., 2014).

However, not all individuals affected by environmental changes make the decision to migrate. Despite the fact that situations of immobility have not received much attention from researchers for a long time, there is a growing interest in studying those who choose to stay and understanding the reasons behind their decision, even when their livelihoods are severely impacted by climate change (Walker, 2021). Recent empirical evidence collected in the literature indicates that Sub-Saharan Africans prefer to implement in-situ adaptation strategies that allow them to avoid the migration process (Cai et al., 2011; Setrana,

2021). At times, situations arise where households must organize themselves translocally, with at least one member residing in a different destination than the area of origin, so that others can remain in the rural environment. Those who stay in the area of origin are referred to as "immobiles" or "stayers" (Carling, 2002; Mata-Codesal, 2018).

The strategies adopted in rural settings to adapt to climate change may involve modifications of economic, social, or natural structures (Afriyie et al., 2018), such as the implementation of irrigation systems in areas affected by decreasing and fluctuating rainfall. However, not all individuals who choose to stay do so as a result of successfully adopting adaptation strategies. The most vulnerable profiles, such as the very poor, the elderly, or women, may aspire to escape environmental stress but lack the resources to actualize their intentions. These populations are referred to as "trapped" populations (Foresight, 2011; Schraven et al., 2020). Nevertheless, in-situ adaptation strategies may deteriorate over time due to prolonged exposure to environmental stress, leading to a willingness to migrate, regardless of its feasibility (Meze-Hausken, 2000).

2.3 Conceptual framework

In this research, the term "climate-induced migrant / environmental-induced migrant" is used according to the definition stated by the International Organization for Migration (IOM, 2007), which considers them as "persons or groups of persons who, for compelling reasons of sudden or progressive changes in the environment that adversely affect their lives or living conditions, are obliged to leave their habitual homes, or choose to do so, either temporarily or permanently, and who move either within their country or abroad." Therefore, the use of the term "climate refugee," coined by El-Hinnawi in 1985, is avoided as it is inconsistent with the definition of "refugee" as defined in the Refugee Statute of the 1951 Geneva Convention, which does not include the climate variable.

On the other hand, the term "adaptation strategy" is used to refer to adjustments in natural or human systems in response to current or expected climatic stimuli or their consequences (IPCC, 2001), whether implemented at an individual/household or governmental level (Smit & Wandel, 2006). Migration enables households to modify their exposure to climate and environmental stressors, diversify their income sources when on-site adaptation is either

impossible or undesirable, and contributes to their resilience strategy (Bendandi & Venier, 2017; Mbiyozo, 2020). However, migration as a response to environmental changes does not occur homogeneously but responds to a multi-causal influence.

To address climate-induced migrations from a multi-causal perspective, the research uses the Foresight Framework (2011) classification as a reference, thus avoiding deterministic links between migration and environmental changes. This framework establishes that migratory responses are influenced by the convergence of factors at three levels: the macro level, the micro level, and the meso level.

At the macro level, we find five groups: (1) political factors (discrimination and persecution of individuals, freedom enjoyed, conflict and insecurity, political incentives, or coercion);

(2) economic factors (labor opportunities, income, wages, producer and consumer prices);

(3) demographic factors (population size, density, structure, disease prevalence); (4) social factors (education-seeking, family/kin obligations); and (5) environmental factors (exposure to hazards, land productivity, habitability, food, energy, and water access).

On the other hand, at the micro level, we have the specific characteristics of the household or individual, such as age, sex, level of education, or marital status. Both levels are influenced by the meso level, which includes factors that facilitate or hinder migration processes, such as technology, displacement costs, social networks, or the political framework. When these factors converge, certain profiles in the same context are more likely to migrate than others. Failure to consider these interactions could result in a spurious relationship between environmental change and migration (Abu, Codjoe, & Sward, 2014).

Despite many papers establishing the link between environmental changes and migration decisions, the research by Borderon et al. (2018) indicates that among the empirical studies reviewed in their systematic review, none of the papers mentioned environmental change as the sole driver of migration. A driver is understood as an external structural force that leads to the initiation and perpetuation of migration. These drivers can function as push agents, inciting departure from the place of origin, or as pull agents, attracting migrants to a host area (Massey et al., 1999; Van Hear, 2012).

Migration in West Africa is influenced by various drivers categorized into four distinct categories, as identified by Van Hear (2012). These categories encompass different factors that contribute to the migration phenomenon in the region:

(1) Predisposing or underlying factors/drivers. These factors create an unfavorable socio-economic context that increases the likelihood of out-migration. Examples include globalization, unequal trade terms, and demographic transformations. For instance, historical economic policies, such as the establishment of plantations in southern areas at the expense of northern communities, have influenced north-south migration in West Africa (Teye et al., 2019). Another contributing factor is the movement of surplus labor from West Africa to Europe, driven by declining fertility in Europe and high fertility rates in Africa, creating a demand for labor in Europe.

(2) Proximate factors/drivers of migration. These factors directly cause migration and are a result of the underlying predisposing factors. In migrant-sending areas, macroeconomic challenges, security issues, and environmental changes can drive migration (Van Hear, 2012). In migrant destination areas, opportunities arise due to economic growth and peaceful communities, attracting migrants.

(3) Precipitating drivers of migration: These are the conditions that actually trigger the decision to migrate. In West Africa, these conditions often relate to the economic sphere, including high unemployment, low incomes, poverty, and low agricultural product prices (Van Hear, 2012). Other precipitating factors include inadequate access to healthcare, education, and other social welfare services. In some countries like Mali, Niger, and Nigeria, security problems caused by groups like Boko Haram contribute to out-migration (UNHCR, 2020).

(4) Mediating drivers of migration: These factors either facilitate or constrain migration. They include the presence and quality of transportation, improved communication networks, social networks, and the availability of resources necessary for migration. While earlier literature on the migration industry emphasized the exploitative aspects of migration brokers and intermediaries, recent studies have shown instances where these actors assist potential migrants in realizing their migration aspirations (Deshingkar et al., 2019).

Finally, this research avoids assuming sedentarism as the norm and migration as an exceptional situation in the African context. Instead, the analysis was conducted from a translocal perspective, acknowledging it as the reality for the majority of households in Sub-Saharan Africa (Steinbrink & Niedenführ, 2020). According to these authors, translocal households are a coordinated group whose members organize their activities of consumption, reproduction, and resource use. Their structure and organization create different relationships of dependency among the members in different locations, combining the opportunities offered by each of them to meet the needs and ensure the subsistence of the group.

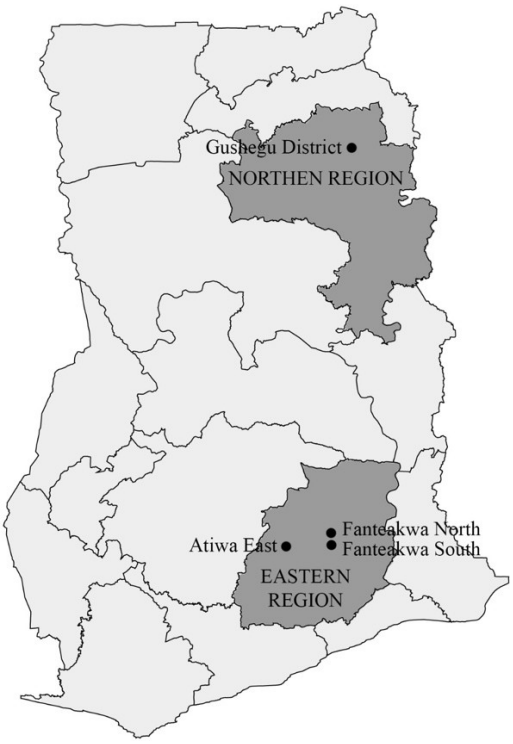
Therefore, translocal households are characterized by living in different places and organizing their lives together. There is no complete detachment from the area of origin, but it does not imply the need for all members to cohabit under the same roof permanently. Similar to the migration system approach applied by Kritz et al. (1992), translocality refers to the dynamics, linkages, and interdependencies of the multidimensional social space connecting migrants' areas of origin and destination (Greiner, 2011).

3 Study area and research methods

3.1 Study site description

The research was conducted in a total of five municipalities belonging to three districts in the Eastern Region of Ghana, and another five municipalities belonging to a single district in the Northern Region of the country. The districts in the Eastern Region were Atiwa East, where the municipality of Frimposo was analyzed; Fanteakwa North, where the analysis focused on the municipalities of Feyiase and Besebuom; and Fanteakwa South, whose municipalities of Dadetsunya and Olantan were studied. In the Northern Region, the municipalities of Bulugu, Gaa, Limo, Pumu no. 1, and Zinindo, all belonging to the Gushegu district., were examined. These municipalities were referred to as Area of Origin (AoO) of respondents and migrants.

FIGURE 1. Location of the municipalities in the Eastern Region and Northern Region



Source: Author's own elaboration

These municipalities were selected based on five criteria:

- Only rural areas and peripheral communities were selected.
- Only sites located at a minimum distance of 1.5 hours from a rural/economic center were chosen.
- Only sites located in migration corridors were selected.
- Only communities within areas affected by climate change were selected.
- Safety aspects were considered to ensure safe working conditions for the enumerator teams.

A detailed description of the districts is provided in chapters 3.1.1 and 3.1.2.

3.1.1 Area of Origin (AoO): Eastern Region (Atiwa East, Fanteakwa North, and Fanteakwa South)

Atiwa East, Fanteakwa North, and Fanteakwa South are located in the central zone of the Eastern region, bordering Lake Volta and Kwahu South to the North; Upper Manya Krobo

and Yili Krobo Municipal districts to the East; Abuakwa North Municipal, Kwahu West Municipal, and Atiwa West districts to the South; and Kwahu South and Kwahu East districts to the West. According to the database of the Ghana Statistical Service (GSS) (2021), the combined population of the three districts amounts to a total of 176,268 individuals, spread over an area of 1,496.1km^2 (Table 1). Nearly 60% of the population falls within the working age range (15-64), and the majority reside in rural areas. Across the three districts, the literacy rate exceeds 70.5%.

TABLE 1. Characteristics of the surveyed districts in the Eastern Region

	Atiwa East	**Fanteakwa North**	**Fanteakwa South**
Population	64,647 inhabitants	56,987 inhabitants	54,634 inhabitants
Territory	490.1 km^2	648.4 km^2	357.6 km^2
Population Density	131.9/ km^2	87.89/ km^2	152.8/ km^2
Annual Population Change (2010-2021)	2.5%	-0.39%	0.98%
Age Groups	0-14: 35.8% 15-64: 58.4% >65:	0-14: 35.2% 15-64: 59% >65:	0-14: 32.5% 15-64: 61% >65:
Urbanization	Rural: 60.5% Urban: 39.5%	Rural: 59.5% Urban: 40.5%	Rural: 55.8% Urban: 44.2%
Literacy	80.5%	70.5%	82.5%

Source: GSS (2021)

The urban conurbation in the closest proximity to the study area, with a population exceeding 100,000 inhabitants, is the city of Kofuridua, the regional capital. It is situated at a distance of 60km from the nearest municipality within the investigated territory (Dadetsunya),

resulting in a travel time of approximately 70 minutes. Communication between these localities relies heavily on a road network that is inadequately maintained.

The study area exhibits a bimodal rainfall pattern, characterized by a short dry season between November and February. Historically, the highest rainfall levels are observed in June. However, in the past decade, alterations in the rainfall pattern have led to increased unpredictability (Wehner et al., 2023).

Farming serves as the predominant economic activity within the study area (Table 2). Noteworthy cash crops cultivated in the region include cocoa, oil palm, and rubber. Additionally, significant food crops produced consist of plantains, maize, cassava, cocoyam, rice, and various vegetables, with tomatoes being particularly prominent (Narh, 2023).

TABLE 2.Characteristics of the surveyed villages in the Easter Region

	Households	Inhabitants	Primary School	Secondary School	Economy	Infrastructure
Frimponso (Atiwa East)	112	800	In village	7km away	Agriculture based on maize, cassava, vegetables, and cocoa. Few off-fam jobs like petty trading and hunting.	Road recently reshaped. Good telecommunication network. Access to a borehole.
Dadetsunya (Fanteakwa South)	150	750	In village	10km away	Agriculture based on maize, cassava, yam, vegetables. Few off-fam jobs like gari making, petty trading.	Road recently reshaped. Good telecommunication network. Access to a borehole.
Olantan (Fanteakwa South)	97	650	In village	15km away	Agriculture based on maize, cassava, yam, vegetables, and cocoa. Few off-fam jobs like	Road in poor conditions. Poor telecommunication network. Borehole constructed (not

					gari making, petty trading.	fitted with pump yet).
Besebuom (Fanteakwa North)	159	800	In village	20km away	Agriculture based on maize, cassava, yam, vegetables. Few off-fam jobs like gari making, petty trading	Third class road. Road in poor conditions. Good telecommunication network. Access to a borehole.
Feyiase (Fanteakwa North)	160	900	In village	22km away	Agriculture based on maize, cassava, yam, vegetables, and cocoa. Few off-fam jobs like gari making, petty trading	Third class road. Road in poor conditions. Good telecommunication network. Access to a borehole.

Source: Wehner et al. (2023)

3.1.2 Area of Origin (AoO): Northern Region (Gushegu District)

Gushegu (or Gushiegu) Municipal District is located in the northwestern zone of the Northern Region of Ghana. This research area shares borders with the North East Region to the North, Saboba District to the East, Mion and Nanton to the South, and Karaga to the West. The district's population reaches 153,965 individuals spread over an area of 2,837 km2 (54.56/km2), with 76.4% of them residing in rural areas (GSS, 2021). According to the same source, 49.6% of the population is under the age of 14, surpassing the working-age population (47.8%). Only 21.8% of the population is literate.

Infrastructure within the district remains largely underdeveloped (Table 3). Numerous roads are in a dilapidated state, educational institutions beyond the primary level are scarce, and adequate healthcare facilities are scattered and often inaccessible to a significant portion of the population (Wehner et al., 2023).

Employment opportunities and the presence of other economic activities in Gushegu are limited. The primary activity is labor-intensive subsistence farming, particularly cultivating crops such as soybeans, maize, and groundnuts. This activity is highly threatened by the

impact of climate change, as this district is among the top five regions that have experienced an increase in the duration of dry periods in the last 30 years. Normally, the rainy season occurs between May and October. However, the farming period is diminishing due to reduced rainfall, while heavy downpours that damage crops are becoming more frequent (Ungruhe et al., 2022).

TABLE 3. Characteristics of the surveyed villages in the Northern Region

	Households	Inhabitants	Primary School	Secondary School	Economy	Infrastructure
Zinindo	260	2.800	In village	33km away	Agriculture based on soybeans, maize, millet, and yam. Few off-fam jobs.	HH connected to pipe water. No all-weather road. Transmission pole in town.
Ga/Gaa	150	1.500	In village	14km away	Agriculture based on soybeans, maize, millet, and yam. Few off-fam jobs.	HH connected to pipe water. No all-weather road. Transmission pole in town.
Bulugu	100	1.300	In village	25km away	Agriculture based on soybeans, maize, millet, and yam. Few off-fam jobs.	HH connected to pipe water. No all-weather road. Transmission pole in town.
Limo	140	1.500	In village	28km away	Agriculture based on soybeans, maize, millet, and yam. Few off-fam jobs.	HH connected to pipe water. No all-weather road. Transmission pole in town. Transmission pole in town.
Pumo No. 1	70	1.000	In village	40km away	Agriculture based on soybeans, maize, millet, and yam. Few off-fam jobs.	HH connected to pipe water. No all-weather road. Transmission pole in town. Limited reception.

Source: Wehner et al. (2023)

3.2 Study population

In each of the 10 municipalities comprising the studied population, between 52 and 67 households were interviewed, resulting in a total of 286 households interviewed in each region. The breakdown of the total interviews in each municipality is as follows:

- In the Eastern Region, interviews were conducted in Frimponso (58) in the Atiwa East district; Feyiase (53) and Besebuom (55) in Fanteakwa North; and Dadetsunya (53) and Olatan (67) in Fanteakwa South.
- In the Northern Region, interviews were conducted in the municipalities of Bulugu (52), Gaa (53), Limo (65), Pumu no. 1 (54), and Zinindo (62), all belonging to the Gushegu district.

In each municipality, a listing exercise was conducted to determine the number of migrant and non-migrant households. A Stratified Sampling Technique was used to select 286 migrant and non-migrant households for the questionnaire survey, utilizing Computer Assisted Personal Interviewing (CAPI). 75% of the selected households had one or more members residing outside the AoO.

A Multistage Sampling Technique was employed throughout the analysis. In the first phase of the research, in order to capture the experiences of migrants with environmental changes and the strategies employed, only those who had been sensitive to such changes over the last 10 years were considered, resulting in a sample of 274 households in the Eastern Region and 281 households in the Northern Region.

In the second phase of the research, the micro-level profile and migratory behavior of a total of 376 migrants from the Eastern Region and 367 from the Northern Region were analyzed. Finally, only those belonging to the Eastern Region were considered for the comparative analysis between a subset of the sample and the remaining households. The analysis compared migrants whose migration process has been more influenced by environmental changes with the rest of the sample. The objective was to identify differences between both groups that could define climate-influenced migrations as an independent category with distinct patterns.

The determination of subgroup members was based on the computation of four requirements derived from four variables: (1) perception of environmental changes over the past 10 years;

(2) identification of at least one change in environmental conditions as a negative factor in agriculture; (3) recognition of environmental change as a challenge for agriculture; and (4) selection of changes in agricultural conditions, either individually or in combination with other categories, as a reason for migration. Furthermore, the main challenges presented to the respondents in relation to agriculture were divided into "environmental challenges" and "non-environmental challenges,". A Pearson's Chi-square test was conducted, revealing a significant association between the categorical variables "environmental challenges" and "reason of migration". Consequently, a sample of 35 participants classified as climate-induced migrants and a sample of 341 participants classified as non-climate-induced migrants were obtained. The same procedure in the Northern Region resulted in an excessively small sample of climate-induced migrants (n=5), rendering a robust analysis unfeasible.

3.3 Methodology

3.3.1 Data collection

The database from the first phase of the "Migration and Translocality in West Africa (Mitra|WA)" project, which employed a multi-local survey approach following a translocal methodology, was utilized for this research. It consisted of three interlinkable tables via a primary key (Household-ID), provided in a simple table format (*.csv). The first two tables pertain to the Area of Origin (AoO) and are divided into the "Household Module" and the "Migrant Module". A third table will contain information on migrant individuals in the Area of Destination (AoD) (available May 2023).

Quantitative survey techniques were utilized to collect data from 572 households and their prospective migrant members in the AoO by well-trained and experienced enumerators from the Center for Migration Studies (University of Ghana), using Census and Survey Processing System (CSPro) Software. The two distinct questionnaires were devised by project members from the University of Passau, taking inspiration from prior migration studies such as Mignex (Aligning Migration Management and the Migration-Development Nexus) (Hagen-Zanke

et al., 2020); and were thoroughly reviewed by the other five teams of the Mitra|WA consortium (Université Joseph Ki-Zerbo, Ouagadougou (Burkina Faso); University of Ghana, Accra (Ghana); Kwame Nkruma University of Technology, Kumasi (Ghana); University of Ibadan, Ibadan (Nigeria); TU Dortmund, Dortmund (Germany)). Data on the socio-demographic characteristics and economic activities of all household members aged 10 years and above, as well as changes in land use, climate change sensibility and strategies, and migration history of the household were collected in the "AoO Household Module questionnaire". The "AoO Migrant Module questionnaire" collected information on the profile of the migrant, their migration experience, and the translocal interactions Data analysis

Data extracted from the surveys were analyzed using Statistical Package for Social Sciences (SPSS). Challenges for agriculture, environmental changes, and adaptation strategies were presented as means, frequency tables, and two-way tables comparing the Eastern Region and the Northern Region. AoO_Household_Module.csv file and AoO_Migrant_Module.csv file were merged to identify the two subgroups of migrants. Pearson's Chi-square tests were also used to compare the categorical variables of the subgroups. Their coefficient of association was measured by Cramer's test. Questionnaires were analyzed at a 95% confidence interval (a= .05).

4 Results

4.1 Households' perception of environmental changes and their adaptive responses

Individuals who perceived environmental changes during the past 10 years were identified through the "AoO Household Module questionnaire". The results indicated that the vast majority of respondents were sensitive to these variations in both Eastern (95.8%) and Northern Region (98.3%). The experience with these environmental changes (chapter 4.1.1) and the strategies adopted to adapt or mitigate their effects (chapter 4.1.2) were analyzed in the affected households.

4.1.1 Challenges and threats to agriculture

A total of 555 respondents from the Eastern Region (ER) (n=274) and the Northern Region (NR) (n=281) were able to identify the factors they considered as major challenges for agriculture in a multiple-choice question. The results reveal that the variables causing the greatest concern among participants are the increase in input prices (77.4% ER; 80.4% NR) and the presence of pests and diseases (69.3% ER; 56.2% NR). The third most selected challenge was "changes in environmental conditions" (58% ER; 40.9% NR). However, land degradation seems to generate less concern in the studied population compared to low market prices in the Eastern Region (65.0%) (Table 4).

TABLE 4. Main challenges in agriculture identified by the interviewed households

	Eastern Region	Northern Region	Total
Low Market Prices	178 (65.0%)	68 (24.2%)	44,3%
Market Access	66 (24.1%)	71 (25.5%)	24,7%
Storage Facilities	101 (36.9%)	28 (10.0%)	23,2%
Land Degradation	31 (11.3%)	70 (24.9%)	18,2%
Access to Credit	52 (19.0%)	85 (30.2%)	24,7%
Increasing prices input	212 (77.4%)	226 (80.4%)	78,9%
Access to land	38 (13.9%)	41 (14.6%)	14,2%
Pests and Diseases	190 (69.3%)	158 (56.2%)	62,7%
Other	13 (4.7%)	2 (0.7%)	2,7%
Change in Env. Cond.	159 (58%)	115 (40.9%)	49,4%
Transportation network	95 (34.7%	33 (11.7%)	23,1%

Households	274	281	555

Source: AoO Household Module Database (2022)

In the Eastern Region, challenges such as storage facilities (36.9%) and transportation networks (34.7%) stood out, whereas respondents from the Northern Region placed greater emphasis on access to credit (30.2%). Other structural factors, such as market access or access to land, were also highlighted to a lesser degree in both regions.

In order to delve into the experience of the participants with environmental changes, respondents were asked about the phenomena they had perceived to a greater extent and assessed their potential impact on agriculture. The most selected factors were pests and diseases, soil fertility decline, and changes in precipitation patterns (Table 5).

TABLE 5. Perceived environmental changes by the interviewed households

	Eastern Region	**Northern Region**	**Total**
Rainfall variability	251 (95.6%)	245 (87.19%)	89,37%
More rain	68 (24.82%)	131 (46.62%)	35,86%
Less rain	243 (88.69%)	268 (95.37%)	92,07%
Droughts	69 (25.18%)	173 (61.57%)	43,60%
Stronger winds	223 (81.39%)	235 (83.63%)	82,52%
Increase in air temperature	225 (82.12%)	230 (81.85%)	81,98%
Flooding	8 (2.93%)	143 (50.89%)	27,21%
Water pollution	4 (1.46%)	54 (19.22%)	10,45%
Loss of forests	174 (63.5%)	152 (54.09%)	58,74%
Loss of biodiversity	146 (53.28%)	166 (59.07%)	56,22%

Soil fertility decreases	233 (85.04%)	271 (96.44%)	90,81%
Desertification / loss of farming land	103 (37.49%)	201 (71.53%)	54,77%
Pests and diseases	261 (95.26%)	273 (97.15%)	96,22%
Other	2 (0.73%)	0 (0.0%)	0,36%

Source: AoO Household Module Database (2022).

Consistent with the major challenges for agriculture, pests and diseases prevail as the most perceived environmental change among participating households (95.3% ER; 97.2% NR). Soil fertility decrease was also frequently mentioned in the questionnaire, especially in the Northern region (96.44%). Both regions coincide in the perception of strong winds and an increase in air temperature, with 80% of respondents highlighting these factors. Although to a lesser extent, data demonstrates a certain sensitivity towards the loss of biodiversity and forests.

In terms of precipitation patterns, high values were reported in both regions regarding the decrease in precipitation (88.7% ER; 94.4% NR) and rainfall variability (91.61% ER; 87.19% NR). However, respondents from the Northern Region appear to experience droughts and floods more frequently, which is barely noticeable compared to their counterparts in the Eastern Region. Although with a smaller difference, residents of the Northern Region are also more aware of desertification or the loss of farming land.

The experienced environmental changes were classified by the respondents based on their impact on agricultural activity. The majority of respondents (96.4%) considered the factors they had previously identified as detrimental. Once the main challenges for agriculture, the most frequent environmental changes, and their potential impact on the primary economic activity were identified, the climate adaptation strategies implemented by the interviewees were analyzed.

4.1.2 Implemented strategies for environmental changes adaptation

Data have revealed significant disparities in the adaptation plans across each region. The Northern Region exhibited a higher implementation rate, encompassing 74.4% of households, whereas, in the Eastern Region, only 47.5% of households had adopted any measures. Moreover, not only did the Northern Region surpass the Eastern Region in terms of the number of households, but it also excelled in the rate of strategies implemented, with an average of 2.34 strategies per household compared to 1.65 in the Eastern Region.

In both regions, the dominant approach remained the utilization of pesticides and fertilizers, particularly prevalent in the Eastern Region where 93.1% of households employed this technique (Table 6), constituting 56.3% of the overall strategy aggregate in the region. This implied that merely 43.7% of the strategies endeavored to address other climate-related needs and threats.

TABLE 6. Adaptation strategies implemented by the interviewed households (only households with at least one strategy included)

	Eastern	Northern	Total
Increase Irrigation	1 (0.8%)	32 (15.3%)	9,7%
Change from crop to livestock	8 (6.2%)	17 (8.1%)	7,4%
Change from livestock to crops	0 (0.0%)	14 (6.7%)	4,1%
Reduce number of livestock	0 (0.0%)	21 (10.0%)	6,2%
Water harvesting techniques	3 (2.3%)	26 (12.4%)	8,6%
Plant different crops	32 (24.6%)	109 (52.2%)	41,6%
Change planting date	25 (19.2%)	71 (34.0%)	28,3%
Adapt pestic/fertilizer application	121 (93.1%)	127 (60.8%)	73,2%
Adapt tillage practices	2 (1.5%)	11 (5.3%)	3,8%

Soil erosion prevention programmes	4 (3.1%)	16 (7.7%)	5,9%
Insurance	4 (3.1%)	16 (7.7%)	5,9%
Seasonal migration to urban areas	0 (0.0%)	8 (3.8%)	2,4%
Seasonal migration to other rural areas	0 (0.0%)	1 (0.5%)	0,3%
Permanent migration by some household members	0 (0.0%)	3 (1.4%)	0,9%
Non-timber forest products NTFPs	2 (1.5%)	2 (1.0%)	1,2%
Find off farm job	11 (8.5%)	2 (1.0%)	3,8%
Others	2 (1.5%)	14 (6.7%)	4,7%

Source: AoO Household Module Database (2022).

Other frequent initiatives included the planting of alternative crops (24.6% ER; 52.2% NR) and changes in planting dates (19.2% ER; 34.0% NR). While the rest of the techniques applied in the Eastern Region presented low significant values, households in the Northern Region presented a wide range of strategies, from the installation of irrigation systems (15.3%) to water harvesting methods (12.4%). There are values ranging from 5-10% implementation in in-situ techniques such as the change from crop to livestock, change from livestock to crop, reduction of the number of livestock, soil erosion prevention programs, insurance, or the adaptation of tillage practices.

Finally, among the strategies less identified by respondents as responses to environmental changes, are all options related to mobility. Although some cases of temporary migrations to urban (8) or rural (1) areas and permanent migrations (3) are recorded in the Northern Region, none of the interviewees in the Eastern region indicated resorting to displacement as a response to climate change. Finding off-farm work is registered, although this measure does not necessarily imply migratory movements.

4.2 Analysis of climate change-induced migrants and their migratory behavior

In the Eastern Region, a total of 211 households reported being translocally organized, representing 77% of the total population studied. In the case of the Northern Region, this figure rises to 213, accounting for 75.8% of the total sample. After merging the AoO Household Module Database with the AoO Migrant Module Database, a total of 376 migrants belonging to households that had experienced environmental changes over the last 10 years were identified in the Eastern Region. In the case of the Northern Region, there were 367 cases.

To determine which characteristics of the migrant profile could determine their reason for migration, a Pearson's Chi-square test was conducted among the variables sex, age, marital status, education, and occupation before migrating. The same process was carried out to ascertain whether the reason for migration had any relationship with the destination and the migrant's new occupation. Only the occupation before migration ($p < 0.001$), occupation after migration ($p = 0.003$), and sex ($p = 0.003$) yielded significant results. However, in the two cases related to occupations, more than 20% of the cells had estimated values below 5, rendering the test invalid. This was not the case for the sex variable, although the Cramer's coefficient showed a very low value (0.153).

A comparative analysis was carried out within a subset of the sample, considering migrants whose migration process had been more influenced by climate change. This was based on the four previously mentioned criteria: (1) perception of environmental changes over the past 10 years; (2) identification of at least one change in environmental conditions as a negative factor in agriculture; (3) recognition of environmental change as a challenge for agriculture; and (4) selection of changes in agricultural conditions, either individually or in combination with other categories, as a reason for migration.

A Pearson's Chi-square test was conducted to examine the relationship between "environmental challenges" and migration reasons. The result showed a significant relationship ($p < 0.001$), but with a moderate association according to the Cramer's coefficient (0.299). Data showed that, while in the Eastern Region, 58% of the surveyed

households identified "changes in environmental conditions" as a challenge for agriculture, among those who migrated due to agricultural conditions, the percentage increased to 89.7%.

Consequently, a sample of 35 participants classified as climate-induced migrants and a sample of 341 participants classified as non-climate-induced migrants were obtained. The same procedure in the Northern Region resulted in an excessively small sample of climate-induced migrants (n=5), rendering a robust analysis unfeasible.

The migrants were compared based on their gender and age (chapter 4.2.1), highest level of education (chapter 4.2.2), marital status (chapter 4.2.3), and main occupation in the Area of Origin (AoO) (chapter 4.2.4). Their migration behavior was analyzed in terms of their destination (chapter 4.3.1), new main occupation in the Area of Destination (AoD) (chapter 4.3.2), and duration of absence (chapter 4.3.3).

4.2.1 Age and sex of the migrants

Men account for 54.5% of the sample of non-climate-induced migrants, while women represent 45.5%. Female migrations generally occur at younger ages, outnumbering male migrations, but once adulthood is reached, their presence in the migration process diminishes.

On the other hand, men in this sample have an average age of 34.8 years, while women have an average age of 31.8 years. The majority of absent household members fall within the age range of 20-39 years, accounting for 63.3% of the participants. The second most frequent age group is those aged 40-49 years, representing 17.9% of the total sample. The results show that migrations between the ages of 10-20 years are rare and predominantly female. These migrations generally involve young students seeking to continue their education in other destinations.

In the case of climate-induced migrants, migration is predominantly male, accounting for 82.86% of this sample. Unlike non-climate-induced migrants, there are no records ofmigrants under the age of 20. This contributes to a slightly higher average age (39 years for men and 38.17 years for women). However, both samples agree that the most common age range among migrants is 20-39 years (54.3% for climate-induced migrants), followed by 40-

49 years (25.7%). Similarly, female representation in the migration process is inversely related to the age of the subject.

4.2.2 Highest level of formal education

In the non-climate-induced sample, the most common level of formal education completed is junior secondary (56.5% for men; 46.5% for women), followed by senior education (19.4% for both sexes). Data reveal clear evidence of patterns in schooling, where women are more present in the lower educational levels, such as non-formal education or primary, and only 3.2% reach tertiary education. This figure is three times higher in the case of men (10.8%).

In the case of the climate-induced migrants, junior secondary is also the most frequent level of education completed (54.3%). However, the results indicate a higher representation of migrants who have only completed primary studies (25.7%) than those who have reached senior secondary education (11.4%). Only one subject in the sample completed tertiary education.

4.2.3 Marital status of the migrant

For the analysis of the marital status of migrants, only those over 18 years old were considered. This criterion did not generate changes in the climate-induced sample but reduced the non-climate-induced (n=327) for this particular analysis.

The analysis results reveal that the predominant marital status in the non-climate-induced sample is monogamous marriage, comprising 44.6% of the overall sample (39.9% male; 50.7% female). Following this, the second prevalent category is the unmarried status (30.3% male; 25.7% female), which accounts for a total of 33.3% of the sample. Migrants living together represent 17.1% of the sample, with very similar results in both sexes. There is a higher number of migrant widows (5) compared to the absence of male representation, and the opposite occurs in the category of polygamously married. Data for separated and divorced migrants represent residual values below 1.5% of the sample.

Regarding the climate-induced migrants, common patterns with the compared sample were identified. Monogamous married migrants similarly represented the majority of the sample

(71.4%), followed by "not married" (17.9%). The rest of the categories (polygamously married, living together, widowed, separated) reflect only specific situations.

4.2.4 Main occupation in the AoO

The majority of the non-climate-induced migrants (46%) were employed in the agriculture, forestry, and fishing sector before their migration. In the male section of the sample, the proportion of employment in this sector is even higher (53.2%). However, this was not the main previous occupation for women (37.4%). In their case, a higher proportion of the sample indicated that their main activity was education (40%) (Table 7).

TABLE 7. Main occupation of non-climate-induced migrants in the AoO

	Male	Female	Total
Accommodation and food service activities	0 (0.0%)	2 (1.3%)	2 (0.6%)
Agriculture, forestry, and fishing	99 (53.2%)	58 (37.4%)	157 (46.0%)
Construction	1 (0.5%)	0 (0.0%)	1 (0.3%)
Education	61 (32.8%)	62 (40.0%)	123 (36.1%)
Human health and social work activities	1 (0.5%)	0 (0.0%)	1 (0.3%)
Other service activities	10 (5.4%)	6 (3.9%)	16 (4.7%)
Public administration and defense	0 (0.0%)	1 (0.6%)	1 (0.3%)
Unemployed	8 (4.3%)	9 (5.8%)	17 (5.0%)
Wholesale and retail trade	6 (3.2%)	17 (11.0%)	23 (6.7%)
Total	186 (100%)	155 (100%)	341 (100%)

Source: AoO Migrant Module Database (2022).

Women are also more prominent in the wholesale and retail trade sector (11% compared to 3.2%) and other service activities. Sectors such as accommodation and food services, construction, human health and social work activities, and public administration and defense present values lower than 1% of the sample. It is important to note that 5% of the sample was unemployed.

In the case of climate-induced migrants, due to the nature of migration, the main occupation is again in agriculture, forestry, and fishing (94.3%), with individual representations in wholesale and retail trade and other service activities.

TABLE 8. Main occupation of climate-induced migrants in the AoO

	Male	Female	Total
Agriculture, forestry, and fishing	28 (96.6%)	5 (83.3%)	33 (94.3%)
Other service activities	1 (3.4%)	0 (0.0%)	1 (2.9%)
Wholesale and retail trade	0 (0.0%)	1 (16.7%)	1 (2.9%)
Total	29 (100%)	6 (100%)	35 (100%)

Source: AoO Migrant Module Database (2022).

4.2.5 Destinations of the migrants

The mobility data of non-climate-induced migrants revealed the existence of both national (96.8%) and international (3.2%) migrations. The most frequent destinations within the country were the Eastern region (45.2% male; 59.4% female) and Greater Accra (36% male; 27.1% female), although migrations to most regions of the country were identified, including Central Ghana, Ashanti, Western Ghana, and to a lesser extent, Bono East, and Northern Ghana. Additionally, one case was recorded in the East Upper region and one in the Volta region.

TABLE 9. Destinations of non-climate-induced migrants

	Male	Female	Total
Ahafo Region	0 (0.0%)	1 (0.6%)	1 (0.3%)
Ashanti Region	7 (3.8%)	6 (3.9%)	13 (3.8%)
Bono East	1 (0.5%)	2 (1.3%)	3 (0.9%)
Central Region	9 (4.8%)	7 (4.5%)	16 (4.7%)
Eastern Region	84 (45.2%)	92 (59.4%)	176 (51.6%)
Greater Accra	67 (36%)	42 (27.1%)	109 (32%)
Northern Eastern	2 (1.1%)	1 (0.6%)	3 (0.9%)
Upper East	1 (0.5%)	0 (0.0%)	1 (0.3%)
Volta Region	1 (0.5%)	0 (0.0%)	1 (0.3%)
Western Region	7 (3.8%)	0 (0.0%)	7 (2.1%)
International destination	7 (3.8%)	4 (2.6%)	11 (3.2%)
Total	186 (100%)	155 (100%)	341 (100%)

Source: AoO Migrant Module Database (2022).

On the other hand, migrants who crossed the country's borders chose the West Africa region (Ivory Coast, Nigeria, and Togo) as their destination on four occasions, three cases to North Africa and the Middle East region (Israel, Qatar, and UAE), and four cases to Global North countries (Italy and the United States).

In contrast, climate-induced migrant's movements took place within the Eastern region (48.6%) and Greater Accra (40%). Except for two movements to the Northern region, the rest of the migrations reached neighboring regions such as Ashanti and Bono East. No evidence of international migrations was found in this sample.

TABLE 10. Destinations of climate-induced migrants

	Male	Female	Total
Ashanti Region	1 (3.4%)	0 (0.0%)	1 (2.9%)
Bono East	1 (3.4%)	0 (0.0%)	1 (2.9%)
Eastern Region	13 (44.8%)	4 (66.7%)	17 (48.6%)
Greater Accra	12 (41.4%)	2 (33.3%)	14 (40%)
Northen Region	2 (6.9%)	0 (0.0%)	2 (5.7%)
Total	29 (100%)	6 (100%)	35 (100%)

Source: AoO Migrant Module Database (2022).

4.2.6 New occupation in the AoD

The main occupation of non-climate-induced migrants in their destination remained agriculture, forestry, and fishing (25.2%), albeit with less representation. The gender difference in this sector was accentuated, with a higher prevalence among men than women. Education remained popular among women, but it was no longer their primary activity. Instead, other service activities (19.4%) and wholesale and retail trade (39.4%) are their most common occupations. The female representation in both sectors was higher than the male representation and became exclusive in the accommodation and food service sector.

TABLE 11. Main occupation of the non-climate-induced migrants in the AoD

	Male	Female	Total
Accommodation and food service activities	0 (0.0%)	7 (4.5%)	7 (2.1%)
Administrative and support service activities	6 (3.2%)	0 (0.0%)	6 (1.8%)
Agriculture, forestry, and fishing	58 (31.2%)	28 (18.1%)	86 (25.2%)

Construction	21 (11.3%)	0 (0.0%)	21 (6.2%)
Education	19 (10.2%)	22 (14.2%)	41 (12%)
Electricity, gas, steam and air conditioning	19 (10.2%)	0 (0.0%)	19 (5.6%)
Human health and social work activities	2 (1.1%)	3 (1.9%)	5 (1.5%)
Mining and quarrying	1 (0.5%)	0 (0.0%)	1 (0.3%)
Other service activities	27 (14.5%)	30 (19.4%)	57 (16.7%)
Public administration and defence	3 (1.6%)	2 (1.3%)	5 (1.5%)
Transportation and storage	19 (10.2%)	0 (0.0%)	19 (5.6%)
Unemployed	1 (0.5%)	2 (1.3%)	3 (0.9%)
Wholesale and retail trade	10 (5.4%)	61 (39.4%)	71 (20.8%)
Total	186 (100%)	155 (100%)	341 (100%)

Source: AoO Migrant Module Database (2022).

On the other hand, the main occupations of men were diversified, especially in sectors dominated by men such as construction, electricity, gas, steam, and air conditioning supply, transportation and storage, and administrative and support service activities. Some categories such as health and social work activities, mining and quarrying, and public administration and defense showed values lower than 2% of the sample. Furthermore, the unemployment rate among migrants was reduced to 0.9%.

The main occupation for climate-induced migrants continued to be agriculture, forestry, and fishing (37.1%), although this sector was exclusively male-dominated. Likewise, male participants in the sample who changed their sector did so mostly to sectors where women were not represented, such as construction, mining and quarrying, transportation and storage, or electricity, gas, steam, and air conditioning supply. On the other hand, the activities of women in the sample were limited to other service activities and, primarily, wholesale and retail trade.

TABLE 12. Main occupation of the climate-induced migrants in the AoD

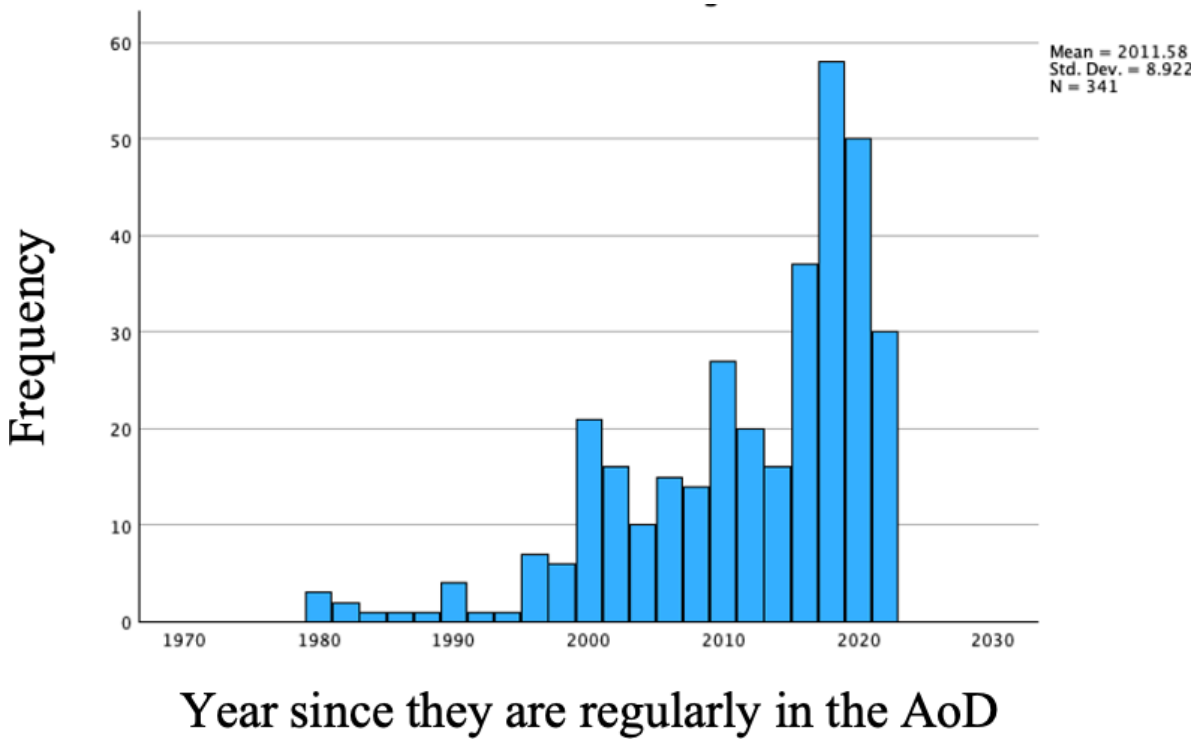
	Male	Female	Total
Agriculture, forestry and fishing	13 (44.8%)	0 (0.0%)	13 (37.1%)
Construction	3 (10.3%)	0 (0.0%)	3 (8.6%)
Electricity, gas, steam and air conditioning	1 (3.4%)	0 (0.0%)	1 (2.9%)
Mining and quarrying	3 (10.3%)	0 (0.0%)	3 (8.6%)
Other service activities	2 (6.9%)	1 (16.7%)	3 (8.6%)
Transportation and storage	3 (10.3%)	0 (0.0%)	3 (8.6%)
Wholesale and retail trade	4 (13.8%)	5 (83.3%)	9 (25.7%)
Total	29 (100%)	6 (100%)	35 (100%)

Source: AoO Migrant Module Database (2022).

4.2.7 Duration of migration

The chronologies of the migratory stock revealed a significant increase in migratory flows recorded by the non-climate-induced movers during the period from 2010 to 2021, with a more pronounced rise from 2015 onwards. Within this time frame, 68.3% of the movements of migrants who, as of August 2022, were still living in areas different from their places of origin occurred. The average duration of these absences was estimated to be 10.3 years, dating back to the first migratory movements in 1980.

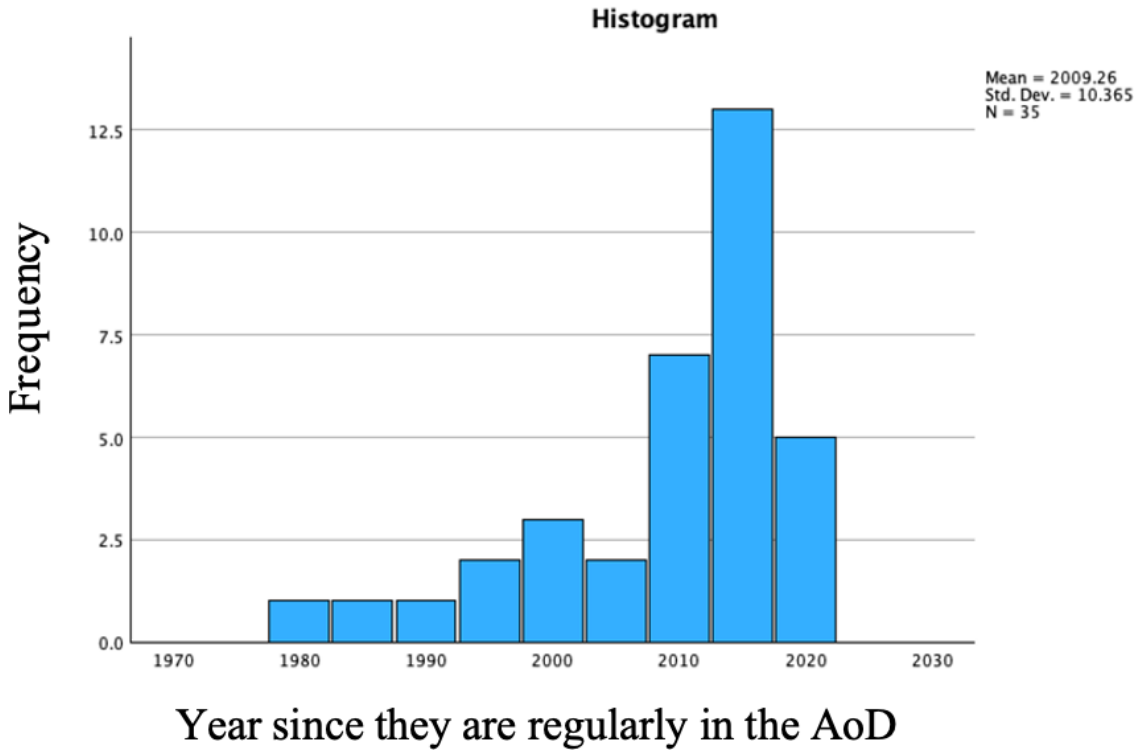
FIGURE 2. Time in AoD of non-climate-induced migration



Source: AoO Migrant Module Database (2022).

Similarly, climate-induced migrations data placed 65.7% of non-returning migrants within the same period from 2010 to 2021. Since the first migratory movements in 1980, there was an estimated average duration of 12.85 years for these absences. It is worth noting that, at the time of data collection in August 2022, no movement in response to changes in agricultural or farming conditions during the year 2022 had been observed.

FIGURE 3. Time in AoD of climate-induced migration



Source: AoO Migrant Module Database (2022).

5 Discussion

The results expose the main challenges faced by the interviewees in agriculture, their perception of environmental changes, the strategies implemented for adaptation, and the differences in the profile and migration patterns of those who are more sensitive to these changes. While it is evident that the vast majority were sensitive to climate change, there is also a lack of connection between environmental changes and the adaptation strategies that involve mobility. Climate-influenced migrations occur infrequently and almost always in combination with other reasons. However, the profile of climate-influenced migrants does not differ from that of non-climate-influenced migrants, as does their behavior.

5.1 Households' perception of environmental changes and their adaptive responses

In the first part of the analysis, almost all the surveyed households in both regions reported perceiving environmental changes over the last 10 years, with the result being even more pronounced in the Northern region. Among the most identified events are pests and diseases,

soil fertility decline, decreased precipitation, and increased rainfall variability. The respondents also mentioned the perception of stronger winds and rising air temperatures. The results also helped identify the peculiarities of the regions. In the Northern Region, for example, there is greater concern regarding droughts and floods. The data obtained in this region, which, along with the Upper West and Upper East regions, has been more extensively researched, are consistent with what other authors have presented in previous studies (Kumasi et al., 2017; Dumenu & Obeng, 2015; Benneh, 2009; Assan et al., 2019).

Although 96.4% of the identified environmental changes were considered negative for agriculture, other non-climatic factors received more attention from the study population. This includes input prices or low market prices, that determine production and employment in the sector (Bateman et al, 1990). The results suggest that while migration may occur due to changes in agricultural productivity, the situation may be influenced by other economic and political variables that can act independently of climate change.

The adaptive responses in each region were markedly different. In the Northern Region, a wider range of measures was implemented, more frequently, and reaching a greater number of households. While in the Eastern Region, adaptive strategies were primarily centered around the use of pesticides and fertilizers, in the Northern Region, alternative approaches such as planting alternative crops and modifying planting practices were adopted. Other studies conducted in the northern part of the country (Aniah et al., 2019; Kumasi et al., 2017) have also identified the cultivation of early maturing and drought-tolerant crops, as well as adjustments in planting and harvesting schedules, as common strategies.

Other measures implemented in the Northern Region are irrigation systems or water harvesting methods. However, these techniques are less popular due to their cost and the requirement of proximity to dams in the case of irrigation. In the very dry Upper West region of Ghana, only 0.8% of the surveyed households used irrigation in 2019 (Teye, 2022). As an alternative, some farmers use diesel pumps or rely on small dug-outs with canals to cultivate crops, but these options are also economically unaffordable for the majority of farmers (Teye and Owusu, 2015).

The search for off-farm occupations was also mentioned as a measure to adapt to climate

change, although this does not explicitly imply displacements. Some authors highlighted the adoption of these decisions as a strategy to reduce or diversify household risk (Antwi-Agyei et al., 2012; Paavola, 2018). However, others argue that in-situ adaptation strategies are sensitive to the passage of time: at the beginning of a drought, better-off households suffer less and migrate less, but if the drought persists, outmigration then becomes a strategy for everybody (Meze-Hausken, 2000).

In the results of this research, after the respondents were exposed to the most frequent environmental changes, their impact on agriculture, and other major risks for agriculture, only 11 individuals from the Northern region identified migration as an adaptation strategy to climate change. In the case of the Eastern region, no subjects were found to associate mobility with environmental changes. This finding is, however, consistent with the findings of Kassim et al. (2021) in the northern area of the country, which indicates that migration was the least popular adaptation strategy used by farmers. Vinke et al. (2020) also state that if in-situ adaptation strategies are successful, people are less likely to migrate.

While some authors find a connection between environmental changes and migratory motivations (Bakaki, 2021; Jesse et al., 2018; Grolle, 2015; Van Der Geest, 2011; Henry, Schoumaker, & Beauchemin, 2004; Findley, 1994), others consider it challenging to trace such a relationship. Abu, Codjoe, and Sward (2014) indicate that in Ghana, once socio-demographic factors are controlled for, there is no significant association between any of the climate-related stressors and the intention of migration. On the other hand, Romankiewicz and Doevenspeck (2015) also indicated that the environmental driver of migration can be captured if prompted by the interviewers, but if explicit questions about the possible linkages between environment and migration are avoided, environmental stress is not mentioned by the participants as a key driver of migration. Authors such as Azumah and Ahmed (2023) find negative relationships between migration and rising temperatures, or as Gray (2011) found, depending on contextual factors in their study with contrasting results in Kenya and Uganda.

5.2 Analysis of climate change-induced migrants and their migratory behavior

In the second part of the analysis, the profile and migratory behavior of the migrants were

analyzed. The results of the Chi-square test indicate that out of the variables examined (sex, age, marital status, education, and occupation before migrating), only the occupation before migration, occupation after migration, and sex showed statistically significant associations with the reason for migration. The p-values for these variables were less than 0.05, indicating a significant relationship.

However, it is important to note that the validity of the test results is compromised in cases related to occupations. This is because more than 20% of the cells in those variables had estimated values below 5, which violates the assumptions of the chi-square test. Therefore, the results regarding the occupation variables should be interpreted with caution.

On the other hand, the sex variable did not suffer from this issue, and the test results for sex were considered valid. However, Cramer's coefficient, which measures the strength of association, was very low (0.153), suggesting a weak relationship between sex and the reason for migration.

The strongest association was found between “environmental changes as a challenge” and the reason of migration. The p-value of less than 0.001 suggests that there is a strong statistical association between these variables. Furthermore, Cramer's coefficient of 0.299 indicates a moderate association, suggesting that, while there is a relationship between the two variables,it may not be the sole determining factor for migration reasons. However, a two-way table showed a clear trend where a higher proportion of individuals who migrated due to agricultural conditions also identified environmental challenges as a significant factor.

It was surprising how when applying the aforementioned four criteria, climate-induced migrants were more frequently found in the Eastern Region, which has more balanced climatic conditions and higher soil quality, than in the Northern Region. The interpretation we can draw from these findings is that, despite climate change being a reality negatively affecting the livelihoods of households, especially those dependent on agriculture in the northern part of the country, there are other structural factors recognized by the interviewees as more influential in the migration process. It is noteworthy that, despite the Eastern Region being more favorable for agricultural activity, there are still significant displacements due to changes in agricultural conditions. Furthermore, the fact that these displacements mostly

occur within the region could confirm that, despite the context, the West African region is an inherently mobile society.

5.2.1 Profile of the migrants

The results revealed similar migration profiles and patterns. Although it appears that sex and main occupations are characteristic of climate-induced migrants, the reason could lie in the fact that the selection criteria bias the sample towards agriculture-related occupations. Therefore, due to the generally higher presence of men in agricultural activities in the country (Azumah & Ahmed, 2023; Assan, 2018) it is likely that this sub-group includes more farmers and, consequently, more men.

Migrants from both samples coincide in the most frequent age range for migration (20-39 years old). However, the average age is lower for non-climate-induced migrants. This could be attributed to the fact that, once again, due to the selection criteria of the climate-induced sub-group, migrations for educational purposes, which tend to occur at a younger age, are included exclusively in the non-climate-induced migrants. However, some authors point to age as a determining factor in experiencing environmental changes. Deressa et al. (2011) argue in their study in Ethiopia that women between the ages of 31 and 50 are more sensitive to temperature and precipitation variations than other age groups. This finding is consistent with the fact that no climate-induced migrants under the age of 20 were found in this study. It would be advisable to investigate whether occupation determines the age of the group or, as argued by Deressa et al., it is the age that determines the perception of environmental changes and, therefore, the inclusion or exclusion from the sub-group.

Other authors also argue that men are more prone to migrate in response to environmental pressure than women (Afriyie, Ganle, & Santos, 2018; Hamza, Faskaoui, & Fermin, 2009; Heaney & Winter, 2016). However, Steinbrink & Niedenführ, 2020 relate the predominantly male migration phenomenon to the fact that men tend to migrate in an initial expansion phase, and only after migration has consolidated, do women migrate in the maturation phase as labor migration or partner migration. Nevertheless, some authors point out that there is a growing movement of women migrating for education (as shown in the results of this research), work, or other purposes (Awumbila & Torvikeh, 2018).

The data also indicates that the majority of migrants in both samples and both sexes are monogamous married individuals, followed by unmarried individuals. Contrary to these findings, Lawson (2020) noted that marriage restricted the mobility of women. The author found that some married women, even if their husbands could not provide all the basic goods for the household, were not allowed to migrate under any circumstances and preferred to stay and work on the farms.

Regarding education levels, in both samples, the majority of individuals have obtained a junior education as their highest formal education. However, it seems that subjects non-climate-induced migrants generally have a higher level of education compared to the climate-induced ones. Again, the fact that educational migration is present in only one sample may influence this result. If we isolate educational migrations, the level of education between the two samples balances out. In this aspect, it is also noteworthy that despite adult women having a considerably lower level of completed formal education than men, young women are currently the ones who migrate the most for education.

Therefore, regarding the profile of migrants in both samples, there are many similarities and some differences mainly determined by the occupations associated with the nature of the samples. This does not allow defining "climate migrants" as individuals with distinctive characteristics that noticeably differentiate them from other types of migrants, such as labor migrants. Hugo (2011) supports this argument by considering the environment as a 'proximate' cause of migration, making it difficult to differentiate between 'environmental migrants' and others except at the extreme or forced end of the continuum. On the other hand, the debates about the climate/environment-migration nexus are not so much about whether environmental factors play a role in migration, but rather about the magnitude of their influences (Black et al., 2011; Zickgraf et al., 2016).

5.2.2 Migration patterns

Migration results presented similar patterns between the two analyzed populations. Both samples show clear preferences for two regions in their movements: the Eastern region and Greater Accra. 51.6% of the non-climate-related migrants remained in the region, as did 48.7% of the climate-related ones, who largely maintained their occupation in agriculture.

This makes sense considering that the region, along with Afaho, Ashanti, Bono, and Bono East, has the most fertile soils and regular rainfall in the country, making them suitable for crops like cocoa.

A Pearson's Chi-square test was conducted to examine the relationship between "environmental challenges" and migration reasons. The result showed a significant relationship ($p < 0.001$), but with a moderate association according to the Cramer's coefficient (0.299). However, while in the Eastern Region, 58% of the surveyed households identified "changes in environmental conditions" as a challenge for agriculture, among those who migrated due to agricultural conditions, the percentage increased to 89.7%.

Greater Accra emerged as the second most popular destination among migrants. Within the city, migrants have access to a wider range of employment sectors, reducing their dependence on agricultural production and diversifying household risk. The allure of alternative activities and the potential for improved working conditions can serve as pivotal pull factors. Perkins (2010) contends that the decision to migrate for climatic reasons is influenced by perceived better socioeconomic conditions, opportunities at the destination, level of deprivation at the origin, and the presence of social networks, among other factors. Additionally, Henry, Boyle & Lambin (2003) highlight the significance of environmental conditions at the destination as pull factors in migratory flows.

Furthermore, the influence of pull factors on push factors can be observed in Ghana during the severe droughts of the 1980s. Despite the gravity of the situation, it was not until the 1990s, when economic conditions improved in the South, that people from the northern Savannah zone migrated in masse to the South (Gravesen et al., 2020).

The main difference between the samples is that climate-induced migrations do not cross borders. Migrations only occasionally occur to regions other than neighboring ones, while in non-climate-induced sample, 3.2% of migrations are international. Some authors suggest that climate change could be a barrier to movements and limit international migrations, which are also more costly. For example, Henry et al. (2004) notes an inverse relationship between droughts and international or long-term migrations, which are essentially more costly due to the longer distances, border controls, and immigration restrictions. De Longueville et al.

(2019) also identify a relationship between unfavorable rainfall patterns and an increase in short migrations, accompanied by a decrease in long migrations. Although this seems to be coherent with this research, it is also remarkable that in a region as presumably mobile as West Africa, there are so few regional displacements, despite political mechanisms that facilitate movements, such as ECOWAS' free movement protocol.

In both samples, the migration processes enable migrants to access job opportunities that were not available in their AoO. The greater occupational diversity results in a decrease in participation in the agriculture, forestry, and fishing sector once the individual reaches the AoD, reducing it to almost half of the number of individuals in the area of origin. In contrast, alternative occupations emerge that were not previously recorded before the displacement. Some of these occupations include administrative and support service activities, electricity, gas, steam, and air conditioning supply, mining and quarrying, and transportation and storage. In all these activities, along with construction, male presence is dominant.

On the other hand, women who leave agricultural activities tend to enter wholesale and retail trade, other service activities, and to a lesser extent, accommodation and food service activities. The case of wholesale and retail trade is particularly noteworthy as it is the sector that experiences the most growth and surpasses education as the primary occupation among women. Surprisingly, the mining sector has little representation in the region, despite its national significance and the presence of several mines, especially gold, copper, and nickel mines. The unemployment rate of non-climate-related migrants decreases from 5% to 0.9%, which is remarkably low considering that the national average is 4.7% (2021, World Bank).

Climate-related migrants experience even greater diversification due to higher participation in the agriculture, forestry, and fishing sector. After the migration process, this sector is reduced to less than half of its size in the AoO. However, how the occupations of the migrants' transition to other sectors is very similar to that of the other sample: men occupy positions in construction, electricity, gas, steam and air conditioning supply, mining and quarrying, and transportation and storage, while women are mainly engaged in wholesale and retail trade.

In both samples, migrations appear to have a permanent nature, particularly for the non-climate-related migrants, whose average duration of absences over time was 25% longer.

Although some authors argue that permanent migrations is an uncommon strategy in West Africa for dealing with climate change (Dreier & Sow, 2015; Jarawura, 2013), this finding is consistent with the study by Suckall et al. (2015) on the relationship between climate change and urbanization in Malawi, which found that 52.1% of the rural population who migrated to cities had stayed there for more than 10 years.

The chronology of displacements represents the stock of migrants residing in areas other than their place of origin in August 2022. This means that, although there may have been more intense migration flows in different periods, the data only capture those migrants who have not returned. In combination with a longitudinal study, a more rigorous determination of migration flows could be obtained and the effect of phenomena such as remigration[1] on the number of migrants could be observed.

Since the data were collected during the rainy season, they may also be insensitive to seasonal migration, which tends to occur mainly during the dry season. Although, indeed, Rademacher-Schulz et al. (2014) found in their study in northern Ghana from 2011, in addition to the expected migration flow during the dry season, two peaks of migration during the rainy season correlated with food insecurity situations in households.

5.3 Limitations and future research

During the data analysis and research process, various limitations were encountered. The main limitation lies in the difficulty of determining which migrants can be considered climate-related migrants, despite the growing attention to the nexus between migration and climate change. This is partly due to the lack of a universally agreed-upon definition that facilitates the production of reliable and usable data. For future research, it would be advisable to develop a reference framework that allows for consistent comparison of research findings.

Furthermore, it proved challenging to find high-quality data provided by official organizations on various topics. At times, this gap can be compensated for through specific investigations, but methodological divergences come into play. The informality of economic

[1] In their book "Africa on the Move" (2020), Steinbrink and Niedenführ define remigration as the return of migrants to their area of origin in response to events such as long periods of unemployment, disability or illness, or the end of their working lives.

activities also hampers the use of reliable data. In the research, it was not possible to utilize any variables associated with household incomes, which would have been enlightening for analytical purposes, due to respondents' lack of knowledge or refusal to provide responses and the lack of official information.

For future investigations, it would be interesting to conduct a longitudinal study incorporating time series data to obtain more information about long-term migration flows and not solely capture the migratory stock. This would also help determine if the use of in-situ adaptation strategies reduces the flow of climate-related migrations. To achieve this, additional knowledge about the implementation dates of measures in households and the time required to perceive their effects would be necessary. Additionally, since the data was collected during the rainy season, the study may not be able to reflect the peculiarities of seasonal migration flows.

Moreover, it would be advisable, especially for policymakers, to explore the reasons why the implementation of measures in the Eastern Region was not as successful as in the Northern Region. It would be worthwhile to investigate the factors contributing to these differences: whether it is due to lesser need, limited access to climate information, as indicated by Antwi-Agyei (2021), or the absence of programs such as the United Nations Development Programme (UNDP) Adaptation Fund Project or the European Union (EU) Resilience Against Climate Change in Ghana Project, which primarily focus on the northernregions of the country (Antwi-Agyei, 2014).

Finally, it was not possible to establish a strong association between the variables of interest. While some variables related to environmental challenges did prove significant, the Cramer's coefficient yielded a very low value.

6 Conclusions and policy recommendations

The primary aim of this research was to determine whether the singularity of climate-induced migrations can transform predictions of mass migrations into reality. To achieve this, three questions were posed and satisfactorily answered: (1) How do respondents perceive the effects of environmental changes on agricultural activity? (2) What linkage do interviewees establish between climate risks and migration as an adaptive response? (3) What differences

characterize the profile and migratory behavior of climate-induced migrants compared to other migratory movements?

Firstly, the research demonstrated that the majority of respondents identified environmental changes during the last decade, associating them with a negative impact on agricultural activity, which is the country's primary occupation. However, the interviewees do not consider climate change as the sole responsibility for the challenges faced by the sector; they also identified a series of factors stemming from structural needs. The increasing focus on climate change and the catastrophic predictions surrounding it can lead to neglecting other structural deficiencies that affect production and over which greater influence can be exerted. Therefore, governments must differentiate between problems that, despite having local impact, require global solutions and problems whose solutions are within their management reach.

The implementation of measures to adapt to these environmental changes seems to fall short in addressing the major challenges. There is extensive use of fertilizers but limited utilization of irrigation systems. One of the key findings of this research is that among all the adaptation strategies proposed for climate change, those related to mobility were barely recognized by the survey respondents. This suggests that the link individuals establish between climate change and migration is more ambiguous than expected. Only by tracing migrants through a computation of variables could climate-induced migrants more influenced by climate change in the migration process be identified. However, even this group did not stand out for establishing a more direct relationship between environmental changes and migration, as it always appeared in combination with other factors such as work.

Nevertheless, when comparing the group identified as climate-induced migrants to the rest of the sample, no particularly remarkable profiles or behaviors were identified. This result seems to contradict the alarmist messages of massive migrations to the Global North, and it is particularly intriguing that climate-induced migrants tend to relocate shorter distances. The findings of this research suggest that the impact of climate change in Ghana is unlikely to systematically generate massive extracontinental migrations. This is because, as highlighted in the research, there are other factors influencing migratory processes related to demographic, social, economic, and political reasons, as well as specific characteristics of

migrants and elements that facilitate or hinder migration. It is true that climate change can lead to situations of insecurity and instability, which can even escalate into conflicts, for example, over access to water bodies. However, the movements of individuals can be limited as their vulnerability and poverty levels increase.

In both cases, we can confirm that the migratory process results in a disconnection from the agricultural sector, leading to a diversification of migrants' professions in the destination area, especially when they move to large cities. The main problem with these urban-rural migrations is the stressful situation faced by infrastructure in cities like Accra, which also faces significant climate risks and frequent flooding. To prevent excessive urban growth in the country, which is not necessarily associated with the level of economic development, policies should be implemented to promote occupation diversification in rural areas. This would enable inhabitants of these territories to reduce their dependency on the agricultural sector, diversify their risks, and potentially reduce the flow of migrations to large cities that cannot adequately accommodate so many new citizens. However, this does not mean the intention is to halt internal mobility within the country, which has historically been significant, especially towards areas with mining activities and fertile plantations. Instead, it would serve as an alternative to open pathways to intermediate-sized populations and divert the constant flow to major cities.

It is necessary to provide the most vulnerable sectors of society with all the necessary information to confront environmental changes and enhance the resilience of their crops, thus reducing the risks posed by climate fluctuations. Education on climate change adaptation and mitigation is essential to address these new realities. This entails training and awareness programs on sustainable and climate-resilient agricultural practices, as well as the adoption of new technologies and techniques. Collaboration and coordination among public and private entities and organizations are necessary to avoid overlaps and ensure the broadest reach of these measures. Programs should be designed taking into account the heterogeneity, not only climatic but also cultural, of different communities, and consider the different vulnerabilities presented by social groups.

Efficient data collection systems need to be developed to support evidence-based policymaking. These analyses are necessary to thoroughly understand the threats and risks

individuals are exposed to and design solutions that provide effective and lasting responses.

Lastly, it is important to address both economic growth and social inclusion in Ghana's agricultural sector to improve its situation in the context of climate change. In addition to driving economic growth, it is essential to ensure that the benefits of such growth are equitable and reach all stakeholders involved in agriculture.

In summary, the main findings of this research are as follows:

- The impact of climate change in Ghana, which respondents are sensitive to, does not seem to trigger massive extra-continental migration flows. In fact, climate change acts as a barrier to large-scale displacements.

- Less than 2% of the total sample, including the Eastern and Northern Regions, identify temporary or permanent migration as climate adaptation strategies.

- Climate-induced migrations are difficult to trace and, when they occur, they are always intertwined with other factors.

- The profile and behaviors of climate-induced migrants in the research are similar enough to non-climate-induced migrants, suggesting that climate migrations should not be considered an independent phenomenon from other migrations.

- Climate change is the recent context in which migrations will continue to occur.

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