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Climate Change-Related Drivers of Migration in East Africa - An Integrative Review of the Literature

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Abstract

Despite the growing academic concern and policy interest in climate change drivers of migration, scientific evidence on the topic remains contested, with divergent claims of positive and negative contributions of climate change on human migration and displacement. This review seeks to assess the climate change-related drivers of migration with a focus on three East African countries: Tanzania, Kenya, and Uganda. They are among the most vulnerable countries in Africa, with one of the most mobile populations. The study used the available literature on climate change and migration as the data source. About 22 research articles on climate change and migration were sourced from the Web of Science and Scopus databases and critically reviewed. The review generally indicates that climate change effects such as frequent drought and flood disasters, livestock pests, and crop diseases influence migration and displacement in the region. On the other hand, rising sea levels pose imminent risks that can cause migration if adaptation measures are not taken. The review has also revealed that responses to drought or livestock and crop diseases, be it localized adjustment or out-migration, are determined by households' adaptive capacity. For rapid onset climate events such as floods, the most vulnerable are the less fortunate living in poorly constructed structures in flood-prone zones. This review proposes strengthening the climate policy framework by mainstreaming climate change migration in East African nations' adaptation plans. It also calls for promoting alternative livelihood activities as an adaptation strategy in areas prone to climate change to lessen human-forced migration and displacement.

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Keywords

Climate; Adaptation; Drought; Floods; Livestock pests and diseases; Sea-level rise

1. Introduction

Climate change drivers of migration are a contemporary economic, political, and security concern that has surfaced in academic and policy discourses in recent years. The growing number of research reports on climatic drivers of migration in various parts of the world reflects this. For instance, the World Bank Report 2018 cautions that climate change will primarily drive human migration in Africa and other developing regions (Rigaud et al., 2018). Similar warnings have also been echoed by the European Union, which considers climate change-driven migration a matter of national security (Parsons & Nielsen, 2020). Regarding displacement, the Stern review on the economics of climate change (Warner & Boas, 2019) claimed that climate change has already forced 24 million people to relocate. Other

scholars, such as Geisler and Currens (2017), have further projected that by 2050, up to 1 billion people will be displaced by the effects of climate change.

Such views on mass migration due to climate change are held mainly by climate activists who seek to amplify climate change risks to influence climate change policy (Risbey, 2008). In the views of the activists, the people compelled to migrate due to climate change are called environmental migrants or environmental refugees. Burrows and Kinney (2016) attempted to debunk the climate activist view by arguing that the estimated 1 billion climate migrants are uncertain and unrealistic due to a lack of data. Furthermore, emerging research indicates that the linkage between migration and climate change effects such as drought and floods is complex, indirect, and mediated by various social and economic drivers (Suckall et al., 2017; Smirnov et al., 2022). For example, it is argued that drought reduces the ability to migrate due to a lack of resources, forcing people to stay within their vulnerable environment (Foresight, 2011; de Haas, 2020). Moreover, research evidence by Findley (1994), citing an example of Mali, pointed out that when the country experienced a prolonged drought from 1983 to 1985, migration did not rise. Instead, there was a shift to short-cycle circulation where 'migrants' stayed in their destinations for a short period, with 64 percent adopting a circular migration pattern (Findley,1994).

Similarly, de Haas (2021) claimed that for smallholder farmers who rely on rain-fed agriculture, the effect of drought on migration is paradoxical. He further argues that drought decreases migration by eroding resources needed to move out for long distances. This claim is also echoed by Quiñones et al. (2021), who conducted a study in 115 countries and concluded that out-migration is reduced with increased drought. Empirical studies have also suggested that migration decisions hinge upon the severity of climate events and the ability of households to afford migration (Kaczan & Orgill-Meyer, 2019). For example, in rural farm economies, relatively well-off farmers are incentivized to migrate due to the decline in farm production due to drought (Cattaneo & Peri, 2016). Other studies, such as the one by Grey & Mueller (2012) in Ethiopia, have reported the opposite by suggesting that labor migration increases twice during intense drought. Many scholars have also suggested that climatic-related hazards can facilitate and limit households' migration capacity (Riosmena et al., 2018; Bohra-Mishra et al., 2017; Cataneo & Peri, 2016). Such varied contentions on the climate change migration nexus imply some lack of consensus among migration scholars because the subject is complex due to the heterogeneity of migration contexts.

African Countries contribute less to global climate change through the emission of greenhouse gases. Still, they are more vulnerable to climate change effects because of various factors, including their geographical location in the tropics, limited adaptive capacity due to poverty, and social vulnerability (Ibrahim & Menser, 2022; Coulibaly et al., 2020). For instance, Africa is warming at a more concerning rate than other regions, making it more susceptible to floods and drought (Aberman et al., 2015). Additionally, Africa's over-dependence on the natural environment for livelihood activities and low adaptive capacity motivate studying migration driven by climate change. With projections indicating that Africa will be one of the regions most affected by climatic hazards (Gemenne, 2011a), studying the climate change migration nexus becomes relevant.

Recent reviews of climate change and migration nexus have focused on a broader scope, notably, the whole world, the African continent or sub-Saharan Africa (Borderon et al., 2019; Hoffmann et al., 2020; Priovashini & Mallick, 2022). The reviews have also employed bibliometric and meta-analysis approaches to analyze the drivers of environmental migration, focusing on slow-onset climate impacts and fast-onset disasters. This review focuses on East Africa since not much attention has been given to this region by the previous reviews. The quest to conduct this review is also attributed to the fact that much human movement in the East Africa region happens in the form of nomadic pastoralism and seasonal migration. Furthermore, climate change stressors, such as changes in rainfall patterns, have also been endangering the resilience of the population in the region and have affected migration patterns (Rigaud et al., 2018).

This study uses an integrative review of literature methodology to examine how climate change affects migration in East Africa. This integrative study is entirely qualitative and is not meant to be a comprehensive evaluation of all papers that have been written (Snyder, 2019). Nonetheless, by fusing many points of view on the subject, it seeks to present an overview of the literature. Thus, this study aims to respond to the following query. What drivers related to

climate change have influenced migration in East Africa? It is crucial to comprehend the relationship between climate change and migration so that the region's nations can implement the appropriate policies and measures.

2. Climate change as a driver of migration: Theoretical foundation

This review is guided by theories explaining how climatic changes and associated hazards such as frequent drought, floods, and livestock diseases drive human migration. The theories include the push and pull, the social capital, and the adaptive capacity concept. The push and pull theory describes migration as a result of negative factors that push people towards areas with favorable climatic conditions or life opportunities. Rapid onset environmental factors such as floods and wildfires are push factors and are known to displace people globally (IDMC, 2018). Although the literature review does not pinpoint a specific theory of involuntary migration, push factors of this nature may be categorized under forced migration. The risk of loss of life and properties is higher than in the case of slow-onset hazards (Erdal & Oeppen, 2018). Chronic environmental stresses such as drought also act as a push factor, although less risky than rapid onset factors, while places with favorable environmental conditions are pull factors that attract migrants (Hunter & Simon, 2023). These push and pull factors have dominated much of the migration literature in explaining the drivers of migration. Environmentalists and climate activists have warned the world of the potential mass migration due to climate-related push factors. However, scholars on climate migration do not ascribe to environmental push factors as the only drivers without the interaction with social and economic factors.

On the other hand, the social capital theory claims that formal and informal relationships between family members and friends are essential in explaining migration drivers (Ryan, 2011). Through the networks of friends or relatives, potential migrants receive financial support and information on settlements and jobs. In this way, the network plays a risk-lowering function for migrants arriving at their destination (de Haas, 2010). For example, when confronted with climatic hazards such as drought, a potential migrant who decides to migrate to seek alternative income elsewhere will more likely choose destinations where there are family members or friends. The social network is also believed to set the stage for the subsequent migration of family members. As a result, migration becomes self-perpetuating, even after the original causes of migration no longer hold.

The adaptive capacity of a household is another crucial concept in understanding the climatic drivers of migration. It is the ability to adjust to climate change, moderate potential damages, or cope with the consequences (IPCC, 2017). The ability to make adjustments or cope with the consequences is determined by many factors depending on the nature of climatic hazards. However, much of the adaptive capacity literature mentions resources such as financial, technology, health, and information as higher-order factors determining the capacity to deal with the effects of climate change (Siders,2019). Such resources explain why some individuals can adapt more quickly and mitigate the damages caused by climate change than others (Adger et al., 2019). The resources crucial for adaptive capacity amid climatic change are linked with migration in two ways. First, those with financial resources and relevant technology may not migrate due to hazards such as drought since the resources enable them to make crucial adjustments needed to continue their livelihood activities. Similarly, financial resources are crucial for those who aspire to migrate, without which they may remain trapped.

3. Research Approach and Search Strategy

The migration drivers related to climate change are examined in this literature-based research work. There are numerous methods for carrying out literature-based investigations, and they can be divided into three major groups: systematic reviews, semi-systematic reviews, and integrative reviews (Snyder, 2019). This paper employed an integrative review approach since it aligns with the nature of the topic of this study. An integrative review is a relevant approach for studying emerging topics in which some significant propositions remain contradictory (Torraco, 2005). Climate change migration nexus is one such topic. For instance, various competing strands of knowledge exist regarding whether and to what extent climate change influences migration. Different from the systematic review approach, an integrative review's goal is not to cover all articles that have been published, but rather, the focus is to provide an overview of the knowledge base, critically review, and potentially re-conceptualize the theoretical foundation of the phenomenon under study (Torraco, 2005; Snyder,2019).

The search for data was conducted through the Web of Science (WoS) and Scopus databases to obtain journal articles relevant to climate change and migration. These are two important academic databases in terms of the accuracy of their journal classification system (Wang & Waltman, 2016). A search strategy was conducted using boolean operators and search strings including "climate change*" AND "migrat*" AND "Tanzania*", "climate chang*" AND "migrat*" AND "Kenya*", "climate chang*" AND "migrat*" AND "uganda*". The short form "migrat" was used to capture all relevant derivatives of the noun migration, including terms such as migrants, migratory, or migrating. The short form for change, "chang" was also used for the same purpose to capture related derivatives such as change, changing, and changes. The search process also involved skimming through the list of references in journal articles to identify links to other papers relevant for inclusion in the literature.

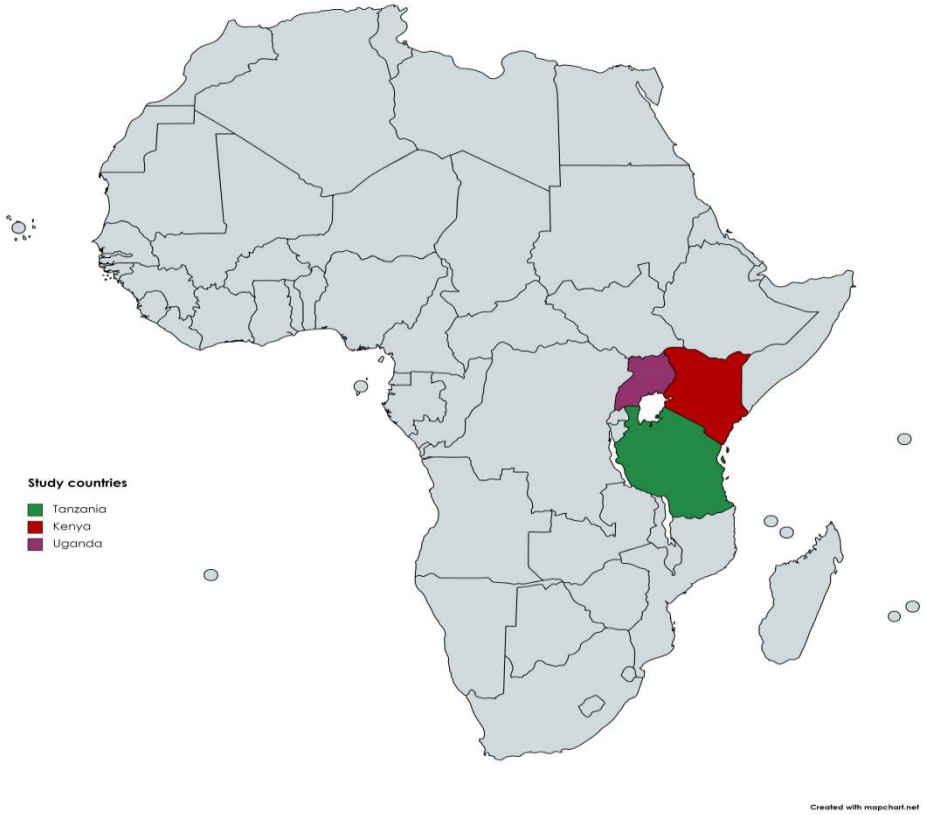

Figure 1: Geographical location of study countries

3.1. Inclusion and exclusion criteria

The following criteria guided the selection of relevant literature for this review: Peer-reviewed papers written in English, papers that study climate change and migration nexus in East African countries, and papers published from 2000 to 2022. The first search produced 217 articles. Further steps in sorting the articles for inclusion and exclusion (See Table 1), including reading full-text articles for relevancy, finally produced 22 articles. Exclusion criteria include papers written in languages other than English, studies on climatic drivers of migration before 2000, and papers on non-climatic drivers. After a thorough inclusion and exclusion exercise, 23 articles, summarised in Table 2, were selected for the study.

Table 1: Search terms and inclusion criteria used

Search terms used	"climate chang*" AND "migrat*" AND "Tanzania*"	"climate change*" AND "migrate*" AND "Kenya*"	"climate change*" AND "migrate*" AND "Uganda*"	Total number of articles
Initial search results	74	119	24	217

Period: (2000-2022)	74	117	24	214
Doc type: Articles and reviews	71	117	23	212
Topics relevant to climate and migration	32	50	14	97
Language: English	33	50	14	97
Relevant abstract	9	9	4	22

Table 2: Summary of papers included in the review

No.	Authors name and year of publication	Title	Study country
1	Call and Gray (2020)	Climate anomalies, land degradation and rural out-migration in Uganda	Uganda
2	Oyebola et al. (2021)	Potential adaptation strategies for climate change impact among flood-prone fish farmers in climate hotspot Uganda.	
3	Lwasa et al. (2017)	Weather forecasts for pastoralism in a changing climate: Navigating the data space in North Eastern Uganda.	
4	Mubangizi et al (2018)	Smallholder farmers' perception and adaptation to rainfall variability in Mt. Elgon region, eastern Uganda	
5	Ocello et al. (2015)	Environmental aspects of internal migration in Tanzania	Tanzania
6	Afifi et al. (2014)	Rainfall-induced crop failure, food insecurity and out-migration in Same-Kilimanjaro, Tanzania.	
7	Afifi et al. (2016)	Human mobility in response to rainfall variability: opportunities for migration as an adaptation strategy in eight case countries	
8	Kubik and Maurel (2016)	Weather Shocks, Agricultural Production and Migration: Evidence from Tanzania	
9	Paavola, J (2008)	Livelihoods, vulnerability, and adaptation to climate change in Morogoro, Tanzania	
10	Nassor B and Makame M (2021)	Assessing community adaptation strategies to floods in flood-prone areas of the urban district, Zanzibar, Tanzania	
11	Myers et al. (2020)	Trends in urban planning, climate adaptation and resilience in Zanzibar, Tanzania.	
12	Kebede A.S and Nicholls R.J (2012)	Exposure and vulnerability to climate extremes: population and asset exposure to coastal flooding in Dar es Salaam, Tanzania	
13	Munishi, E.J (2013)	Rural-urban migration of the Maasai nomadic pastoralist youth and resilience in Tanzania: Case studies in Ngorongoro District, Arusha Region and Dar es Salaam City.	

14	Huho et al. (2011)	Living with drought: the case of Maasai pastoralist in Kenya	Kenya
15	Awuor et al. (2008)	Climate change and coastal cities: the case of Mombasa Kenya	
16	Smucker and Wisner (2008)	Changing household responses to drought in Tharaka, Kenya: vulnerability, persistence and challenge	
17	Wafula et al. (2022)	Factors influencing migration and settlement of pastoralists in Nairobi City, Kenya.	
18	Ogalleh et al. (2012)	Local perceptions and responses to climate change and variability: The case of Laikipia District, Kenya.	
19	Mburu et al. (2015)	Climate change adaptation strategies by small-scale farmers in Yatta District, Kenya	
20	Oyieke (2000)	Implications of accelerated sea-level rise (ASLR) for Kenya	
21	Nguimalet (2018)	Comparison of community-based adaptation strategies for droughts and floods in Kenya and the Central African Republic	
22	Fortnam M (2021)	Multiple impact pathways of the 2015–2016 El Niño in coastal Kenya.	

3.2. Analysis

The thematic analysis method extracted information from the articles summarised in Table 2. The method allows for identifying, analyzing, describing, and reporting themes (Braun & Clarke, 2006). Based on the qualitative nature of this study, theme identification was made inductively as they emerged from the selected articles. The process of analysis was guided by steps suggested by Renner and Powell (2003), as presented in Table 3.

Table 3: Thematic analysis process

Steps	Activity conducted
Step 1: Familiarization with the data	Selected articles (Table 2) were thoroughly read to understand the climate change and migration nexus.
Step 2: Coding the data	Text corresponding to climate change and migration was coded and recorded in a notebook.
Step 3: Searching for themes	Similar codes were grouped into themes. Six candidate themes, namely floods, drought, heatwaves, wildfires, salinization, sea level rise, and livestock and crop diseases were identified from the articles.
Step 4: Reviewing themes	Themes with diverse data are dropped. Those with data that form a coherent pattern are retained as main analytical themes: floods, drought, rising sea levels, livestock, and crop diseases.
Step 5: Defining and naming themes	A story each theme tells was identified and a detailed account and evidence of the presence of the themes (drought, floods, livestock and crop diseases, and sea level rise) and their relation with migration are presented.

The end product of the thematic analysis process in Table 3 is four major themes: drought, floods, livestock and crop diseases, and rising sea levels. The themes are presented in the next section as the study's primary results.

4. Findings

4.1. Drought

Frequent drought is linked to migration in East African countries because of the damage it causes to crops and livestock. Migrants driven by climate change effects seek to find areas suitable for farming and livestock keeping or venture into non-farming livelihood opportunities elsewhere (Gray & Mueller, 2013). Several empirical studies in the region have demonstrated the ways drought drives migration.

Studies by Smucker and Wisner (2008) and Wafula et al. (2022) in the five eastern provinces of Kenya revealed that drought-affected households resort to temporary migration to cities in search of casual labor. Similarly, Ogalleh et al. (2012) and Mburu et al. (2015) also reported migration in search of employment and wage work as an essential coping and adaptation strategy following drought. In Tanzania, repeated drought spells in the northeastern and northwestern parts of the country lead to the out-migration of farmers and livestock keepers (Afifi et al., 2016; Afifi et al., 2014; Paavola, 2008). They mostly migrate to other rural areas where farming conditions are favorable. To further exemplify how climate change effects are linked to migration, Kubik and Maurel (2016) indicate that as small as one percent of drought-induced crop failure increases the possibility of migration by about ten percent in the next season.

In Uganda, farming households also engage in temporary labor migration during the short period of drought. However, after long periods of drought, households lose the ability to send temporary labor migrants (Call and Gray, 2020). For the pastoralists in the region, their mobility patterns have changed due to repeated drought spells. In Uganda, the Karamoja pastoralists are reported to migrate much longer distances (Lwasa et al., 2017). Some return to their places of origin with their livestock, while others do not. In Tanzania and Kenya, the pastoralist migratory behavior and distance are also influenced by drought severity. In Kenya, for example, while the average migratory distance during moderate drought is about 22km, the distance increases to 46 during severe drought. A similar pattern of increasing migration distance is observed in Tanzania, where distances increase from 9 to 12 km during severe drought (Huho et al., 2011).

4.2. Livestock pests and crop diseases

Concerns about pests and diseases associated with climate change exist in East Africa. Diseases such as East Coast Fever (ECF), Foot and Mouth Disease (FMD), and Rift Valley Fever (RVF) are known to weaken the health and productivity of livestock, and that is anticipated to influence migration to new areas (Wafula et al., 2022). Although crop pests and diseases are not new, their effects have been much more significant in recent years. Jagnani (2020) argues that episodes of above-average temperatures due to climate change are linked to fungal diseases such as grey leaf and pests such as stem borer. These diseases have been causing a considerable loss in maize yield, creating conditions for farmers to seek alternative means of livelihood elsewhere.

Wafula et al. (2022) further claim that pastoralists exposed to pests and diseases are more likely to migrate permanently to other areas to evade the diseases. However, those who previously faced pests and diseases were unlikely to migrate because they had already developed some capacity based on indigenous technical knowledge (ITK) to deal with the diseases (Wafula et al., 2022).

In Tanzania, claims of crop pests and livestock diseases driving and inhibiting migration exist. For instance, Ocello (2015) asserts that the prevalence of crop diseases or crop pests negatively affects the likelihood of migration. On the contrary, Pirani et al. (2019) argued that crop diseases or pests are critical in determining internal migration in Tanzania and that the chance of migrating increases when many households are affected. Munishi (2013) observes that the decline in livestock-based livelihood among pastoralists due to livestock diseases and death drives Maasai youth to seek wage work in urban areas. Moreover, pastoralists' cultural norms trigger migration as it is believed that the death of many livestock due to epidemics signals that they should move to another area (Awinia, 2020).

4.3. Sea level rise and coastal erosion

Coastal zones are often studied as destination points of migrants from the hinterland and rarely as points of origin (Zickgraf, 2022). This is because coastal areas are usually more urbanized with economic incentives that pull migrants

from the countryside. However, increased urbanization has put the most vulnerable people's livelihoods and the environment at risk due to the effects of climate change, such as rising sea levels, coastal erosion, and flooding (Nyadzi et al., 2020).

The East African coastal zones of Tanzania, Kenya, and Zanzibar islands face climate change risks. Mombasa City, for example, is already affected by extreme climatic events such as floods and strong winds (Awuor, 2008). Such events are projected to increase in intensity and frequency. The author further argues that rising sea levels and frequent flooding will render many areas inhabitable and unsuitable for agricultural production due to salinization. In extreme cases, this can disrupt essential services and infrastructure and impede economic activities. In the face of deteriorating infrastructure and declining opportunities, people may migrate inland. According to Oyieke (2000), a 0.3m increase in sea level rise will submerge 17% of Mombasa County if adaptation measures are not taken. The inundation will damage homes and businesses, driving people to escape the dangers and move to safer areas.

Flood risks in Tanzania's mainland coast and the islands are also high and might worsen in the future, given the rising sea level (Nassor & Makame, 2021). In Dar es Salaam, about 8% of the city lies within the Low Elevation Coastal Zone (LECZ), which exposes its inhabitants to coastal flooding. Under the sea level rise scenario, the number of people potentially exposed to flooding is set to increase, given rapid population growth (Kabede & Nicholls, 2011). In Zanzibar, the more vulnerable are in low-lying basins periodically inundated by runoff from the surrounding areas. Such areas were initially waterlogged but have been informally developed and flooded whenever it rains. This leads to the seasonal displacement of affected households (Nassor & Makame, 2021; Myers et al., 2020).

4.4. Floods and weather-related disasters

Floods induced by excessive rainfall are also recurrent in East Africa, often affecting the inhabitants of low-lying areas and those near rivers or lakes. Literature on flood risk in developing countries indicates that the number of people exposed to flood risk has been growing (Jongman et al., 2012), with sub-Saharan Africa leading for the percentage of the exposed population relative to other continents. In the East African region, the frequency of climate-induced floods has been increasing and is associated with most displacements (IPCC, 2007; Kassegn & Endris, 2021). This is because of low adaptive capacity, where displacement occurs even with low flood exposure (Kakinuma, 2020).

In Uganda, the severe effects of floods in the eastern and northern parts of the country have destroyed infrastructure and displaced about 300,000 people (Oyebola et al., 2021). The frequency of floods is projected to increase in such areas because of climate change. In areas near Mount Elgon, there have been more than five episodes of floods coupled with land and mudslides (Mubangizi et al., 2018). Migration as a response is attributed to the destructive nature of such events, with many farmers considering temporary migration. In contrast, a few considered the possibility of permanent migration out of the flood-prone areas.

In Kenya, displacement due to floods has also been observed. Episodes of heavy rains have forced thousands to flee their homes (Morel, 2011; Nguimalet, 2018) following floods in the eastern and western parts of the county. Fortnam et al. (2021) argue that most of those affected by the El Niño floods during 2006 -2007 had their houses constructed of mud. Such poorly constructed homes are occupied mainly by the socially and economically vulnerable population (Fortnam, 2021). In Tanzania, displacements due to extreme events such as floods have also been occurring. For instance, flooding in 2018 and 2020 damaged homes and displaced 29,000 and 57,000 people, respectively (Diwakar & Lacroix, 2021; Rigaud, 2018).

5. Discussion

5.1. Drought

This review has yielded mixed results regarding drought as a driver of migration. Drought drives migration to cities for wage work. However, not all drought victims respond by migrating for alternative livelihoods. Household economic and social factors and adaptive capacity cause such differences. For instance, household migration implies a limited capacity to deal with drought. Moreover, most household economies are less diversified, with little or no alternative source of income apart from rainfall-dependent livelihood activities. This is a typical situation among

households in rural East Africa and other rural areas across Sub-Saharan Africa (SSA). In Ethiopia and Sudan, for instance, it is reported that prolonged droughts lead to crop failure and food insecurity, triggering households to send some members to cities to look for temporary work (Hermans & Grabe, 2019); Elasha & Sanjak, 2006). These claims are supported by Adaawen et al. (2019), who note that although rural societies in SSA have long adapted to droughts, the growing climate change impacts on food security and water, combined with population growth and natural resource scarcity, contribute to the increase in the number of internally displaced persons (IDPs) and migration in general.

On the other hand, drought can deter migration, especially when it strikes for an extended period. This is because households' capacity to afford migration is reduced due to a lack of financial resources amid drought-induced crop failure. This has also been reported in Burkina Faso and South Africa, where incidences of inter-district migration are reduced following drought (Henry et al., 2004; Mastrorillo et al., 2016). Reduced inter-district migration implies that long-distance forms, such as inter-regional, are even less likely to happen since they require more resources. However, for pastoralists, migration distance is influenced by the severity of drought. When drought is severe, they will migrate to faraway places more likely to have water and pasture. In East African countries, the average migration distance increases by about 40 kilometers during severe drought.

Conversely, migration is viewed in the context of social capital in that besides being influenced by other resources such as finance, the magnitude of the increase in migration is dependent on migrant recipients' characteristics and the strength of their ties to sources/areas of origin (Garip, 2008; Entwisle et al., 2021). In other words, the likelihood of migration is determined by the level of available social capital resources and access to them - the higher the level of social capital resources and access to such resources, the higher the probability of migration. This viewpoint is supported by Coleman (1987), who describes social capital as a resource for action embodied in relations among persons. When a migrant leaves the household and village of origin, there tends to be an addition of a new tie to the destination, leading to an increase in the flow of information and other resources, including sending remittances back home or to other members of the household and village (Warner & Afifi, 2013; Entwisle et al., 2021).

The question of resources for migration emerging in this study aligns with the theoretical claim that the adaptive capacity of a household determines migration (De Haas, 2021). Therefore, those who can migrate amid drought have financial resources for logistical and settling costs. On the other hand, those who stay may also have some resources that enable them to adapt and survive. In other words, they tend to have relatively better livelihoods and available adaptive responses in situ (Thiede and Gray (2017). However, not all who stay can meaningfully adapt to drought. Arguably, for some, cultural and spiritual connections to the homeland may also explain why they are immobile amid severe drought or other environmental challenges (Blondin, 2021). Other scholars link this phenomenon with the notion of place attachment or rather the personal, intimate feeling of being at home as individuals have a 'desire for attachments' be it to people, places, or modes of beings' (Antonsich, 2010; Yuval-Davis, 2006; Arhin-Sam (2019). From a different viewpoint, discussing drought-induced migration in the context of pastoral societies, Wafula et al. (2022) note that, to a greater extent, pastoral communities rely on kinship ties and networks to make migration decisions. To underscore this observation in their study in the City of Nairobi, Wafula et al. (2022) conclude that the presence of relatives significantly influences migration to the city. Relatives often support migrants by assisting with the costs associated with settling. The social capital theory used in this review has also echoed relatives' role in facilitating migration. Most of these migrants are temporary migrants who move towards urban areas temporarily. Subsequently, they return home after it rains and the pasture has regenerated (Wafula et al., 2022). Of interest, however, is the argument that migration has become an important aspect of the pastoral community members and the Maasai economy in particular, as it has created opportunities for many to profit by engaging in alternative livelihood activities such as selling honey, belts, wallet, and sandals (McCabe et al., 2015).

Migration distance in the search for water and feed for livestock is also reported to have been increasing (Kimaro et al., 2018). More than that, long distance is preferred over short distance because of the belief that nearby places would also be affected by the changes that triggered migration in the first place. Therefore, distant areas are considered safe. With the projected increase in climate change effects, long-distance migration is expected to continue with potential effects en route and at the destination. Most movements are temporary since most migrants return home when it rains,

as expounded by Entwisle et al. (2021), that the timing and amount of rainfall affect crop yields. On the other hand, crop yields affect household assets, and in turn, household assets, along with the characteristics of household members, influence the out- and return migration (Entwisle et al., 2021). This may suggest that migration is just a means to get resources to support farming activities with no intention of migrating permanently. It is along the same line of thinking that Warner and Afifi (2013) argue that migration is used as a risk management or livelihood strategy when migrants face rainfall variability and food insecurity. Nevertheless, the extent to which migration improves the adaptive capacity of the involved households depends on their vulnerability and sensitivity to climatic factors and drought in particular (Warmer & Afifi, 2013). This is mainly because household sensitivity to rainfall variability affects food and livelihood security outcomes and migration choices and patterns (Warmer & Afifi, 2013).) Other factors, such as the age of migrants and their education level, also determine the length of stay. For example, more educated young people are more likely to stay permanently than middle-aged or older people.

5.2. Livestock pests and crop diseases

Crops and livestock diseases have positive and negative effects on migration, depending on household circumstances. Pastoralists with a low adaptive technical and financial capacity to treat their livestock will see pests as threats and likely migrate to pest-free areas or cities for alternative livelihood activities. As highlighted in the theoretical section of this review, adaptive capacity is an essential element that determines whether one should migrate or stay amid climatic hazards or livestock diseases. However, the result has also suggested that pastoralists with previous experience in dealing with diseases are unlikely to migrate because they have developed the capacity to deal with them using Indigenous Technical Knowledge (ITK). Although ITK has been used in many places to fight pests and diseases (Majhi, 2008), it is less effective than modern medicines since it merely evolves from experience. The use of ITK also implies that modern and effective pesticides are not accessible and affordable.

Disease control under climate change is also more complicated. Reports of relatively new pests unrecognized by farmers and extension agents have been observed to cause massive crop destruction. Managing such emerging diseases requires a scientific approach and modern medicine. Furthermore, the prolonged life span of some pests is also a concern. Andrew and Hill (2017) report that destructive worms around Lake Victoria in Kenya and Uganda observed during the growing season were unusually seen in late cultivars, implying that they are practically around throughout the growing season. Such year-round pests require a more reliable supply of modern pesticides to control. Short of this, crop failure and livestock death will prevail, prompting a desire for migration to seek alternative means of livelihood elsewhere.

5.3. Sea level rise and coastal erosion

Coastal zones in East Africa face risks that can push their dwellers to retreat from settlements near the coast or migrate further inland. Sea level rise and coastal flooding may be minor things to worry about now, but the risks are genuine as they threaten the built structures and livelihood of vast portions of the coastal population**.** For example, Rigaud et al. (2018) argue that the rising sea level, compounded by storm surges in Mombasa, will submerge a significant part of the city and could lead to out-migration as early as 2030. To control this, participatory planned relocation from the low-lying zone is proposed as a long-term solution. According to Yoo et al. (2022), relocating is the best option compared to expensive engineering solutions such as building seawalls, bulkheads, and revetments.

However, relocation operations are to be done carefully since they have limitations. On the Ivory Coast, the city of GrandLahou was relocated inland to a distance of 15 km to avoid the damage caused by the rising sea level. However, the project was only partially successful as some residents returned to the barrier beach to continue with traditional livelihood activities such as fishing (Alves et al., 2020). This implies that relocation can be a sustainable adaptation only if opportunities for alternative means of livelihood are available in the new location.

The review has also found that rising sea levels and related seawater intrusion contribute to soil salinity and make agriculture unsustainable. Elsewhere in Africa, studies by Eswar et al. (2021) in Senegal and Steyl and Denis (2010) in Mozambique have demonstrated how salinity intrusion is linked to the disruption of livelihood activities and drives migration inland. For example, seawater intrusion in Mozambique has caused salinity to go as far as 82 km inland.

Crop production is potentially unsustainable within the 82km perimeter, leading to migration considerations to non-saline soils. Similarly, in Benin, where tomatoes are produced along the coast, increased soil salinity has caused tomato producers to move from their fields close to the sea to faraway fields (Ezin et al., 2012). Salinization has not only been a problem in coastal zones. In Ethiopia, increased length of dry periods and reduction in rainfall amounts are also believed to contribute to salinity development (Asad et al., 2019). The result of increased salinization has been repeated yield loss, leading farmers to abandon their land and migrate to cities for non-farming livelihood activities (Asad et al., 2019).

However, other scholars have reported opposing observations regarding migration and its linkage with slow-onset events such as salinity intrusion. Borderon et al. (2019) argue that such long-term events are unlikely to lead to migration since individuals prefer localized adaptation instead of uncertain and costly migration. Such differences in responses to slow-onset events may be because of variations in adaptive capacity, social networks of migrants, and the level of natural resource dependence for livelihood.

5.4. Floods and weather-related disasters

The most vulnerable people occasionally displaced by floods are low-income people who live in unsafe zones in low-lying areas near rivers, lakes, and oceans. Such areas are prone to flood during heavy rainfall and storm surges. Quite often, such areas are informally developed with poor housing and infrastructures for accommodating stormwater. Observations in East Africa are similar to that of Kakinuma (2020), who asserted that flood-induced displacements in poor settlements with poor drainage systems are typical in low-income countries and happen even with low flood exposure, implying high vulnerability.

To reflect on how infrastructure makes a difference regarding exposure to floods and displacement, Kakinuma (2020) observes that in developed countries such as the Netherlands, no flood-induced displacement has been recorded despite high exposure to floods. The opposite is true for developing countries, where moderate flood exposure results in displacement, especially in cities (Agbola et al., 2012). Studies in South Africa (Ziervogel et al., 2016) and Ghana (Amoako & Inkoom, 2018) have also revealed that incidences of floods lead to displacement, mostly in informal settlements with poor drainage systems.

Occupying flood-prone areas is contributed by poverty and lack of alternative means of livelihood. For example, in the Zambezi River basin, about 80,000 displaced people by 2002, 2007, and 2008 floods had returned to the low-lying areas (Stal, 2011). The fact that river basin areas are the most fertile land influences return to such areas. Therefore, farmers with no alternative means of livelihood are bound to return to continue farming. This also implies over-dependence on naturally fertile lands since making other lands productive using modern methods is expensive and impossible for most farmers.

6. Conclusion and Recommendations

The overarching aim of this review was to investigate how climate change has influenced migration in the East African countries of Tanzania, Kenya, and Uganda. The reality that climate change has severely affected many areas in the region, and of which most people have a low adaptive capacity, has prompted the quest for this review. The review has found that climate change effects such as drought, livestock, and crop diseases have been contributing to the migration of farmers and livestock keepers. However, such climate change effects have been impacting farmers and livestock keepers' by destroying their means of livelihood. As a result, farmers have been responding by migrating to areas with favorable farming conditions or seeking other sources of income in urban areas.

The review has also found that rapid onset floods have displaced the most vulnerable, who often live in poorly constructed structures in low-elevation areas. Other climate change effects, such as rising sea levels, and the associated impacts, such as salinization, have also been putting risks to many residents of low-lying coastal areas and could potentially cause relocation to safer zones inland. The review has further revealed that migrating in response to climate change effects is mediated by factors such as household adaptive capacity and social networks. This study generally points out that climate change effects, if not well managed and considering the low adaptive capacity of most people in East African countries, can cause displacements and endless migration to cities or rural areas. This

review recommends the following. First is lessening the need for migration by promoting alternative non-farm livelihood activities through vocational skills training. This can potentially help to reduce the direct impact of climate change on the livelihood of farmers and livestock keepers. Alternative livelihood could also enhance adaptive capacity through the generated non-farm income. Second, when migration is the only reasonable option, such as during climate change-induced disasters, strengthening climate change adaptation policy by incorporating mobility options in National Adaptation is essential. This will help ensure that migration in response to climate change is well governed and coordinated.

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References

Adaawen, S., Rademacher-Schulz, C., Schraven, B., & Segadlo, N. (2019). Drought, migration, and conflict in sub-Saharan Africa: What are the links and policy options? *Current Directions in Water Scarcity Research*, *2*, 15-31.

Adger, W. N., Dessai, S., Goulden, M., Hulme, M., Lorenzoni, I., Nelson, D. R., ... & Wreford, A. (2019). Are there social limits to adaptation to climate change?. *Climatic change*, *93*, 335-354.

Afifi, T., Liwenga, E., & Kwezi, L. (2014). Rainfall-induced crop failure, food insecurity and out-migration in Same-Kilimanjaro, Tanzania. *Climate and Development*, *6*(1), 53-60.

Agbola, B. S., Ajayi, O., Taiwo, O. J., & Wahab, B. W. (2012). The August 2011 flood in Ibadan, Nigeria: Anthropogenic causes and consequences. *International Journal of Disaster Risk Science*, *3*(4), 207-217.

Alves, B., Angnuureng, D. B., Morand, P., & Almar, R. (2020). A review on coastal erosion and flooding risks and best management practices in West Africa: what has been done and should be done. *Journal of Coastal Conservation*, *24*, 1-22.

Amoako, C., & Inkoom, D. K. B. (2018). The production of flood vulnerability in Accra, Ghana: Re-thinking flooding and informal urbanisation. *Urban Studies*, *55*(13), 2903-2922.

Andrew, N. R., & Hill, S. J. (2017). Effect of climate change on insect pest management. *Environmental pest management: challenges for agronomists, ecologists, economists and policymakers*, *197*, 195-223.

Antonsich, M. (2010). Meanings of place and aspects of the Self: An interdisciplinary and empirical account. *GeoJournal*, *75*(1), 119-132.

Arhin-Sam, K. (2019). *Return Migration, Reintegration and Sense of Belonging*. Nomos Verlagsgesellschaft mbH & Co. KG.

Asad, S. Q., Mulugeta, M., Ashenafi, W. D., Birhanu, H., Getinet, B., Abeba, T., & Tesfaye, M. E. (2019). Improving agricultural productivity on salt-affected soils in Ethiopia: Farmersâ€™ perceptions and proposals. *African Journal of Agricultural Research*, *14*(21), 897-906.

Awinia, C. S. (2020). The sociology of intra-African pastoralist migration: The case of Tanzania. *Frontiers in Sociology*, *5*, 518797.

Awuor, C. B., Orindi, V. A., & Ochieng Adwera, A. (2008). Climate change and coastal cities: the case of Mombasa, Kenya. *Environment and urbanization*, *20*(1), 231-242.

Blondin, S. (2021). Staying despite disaster risks: Place attachment, voluntary immobility and adaptation in Tajikistan's Pamir Mountains. *Geoforum*, *126*, 290-301.

Bohra-Mishra, P., Oppenheimer, M., Cai, R., Feng, S., & Licker, R. (2017). Climate variability and migration in the Philippines. *Population and Environment*, *38*(3), 286–308

Borderon, M., Sakdapolrak, P., Muttarak, R., Kebede, E., Pagogna, R., & Sporer, E. (2019). Migration influenced by environmental change in Africa. *Demographic Research*, *41*, 491-544.

Burrows, K., & Kinney, P. L. (2016). Exploring the climate change, migration and conflict nexus. *International journal of environmental research and public health*, *13*(4), 443.

Call, M., & Gray, C. (2020). Climate anomalies, land degradation, and rural out-migration in Uganda. *Population and Environment*, *41*, 507-528.

Caroline Zickgraf (2022) Relational (im)mobilities: a case study of Senegalese coastal fishing populations, Journal of Ethnic and Migration Studies, 48:14, 3450-3467, DOI: 10.1080/1369183X.2022.206626

Cattaneo, C., & Peri, G. (2016). The migration response to increasing temperatures. *Journal of development economics*, *122*, 127-146.

Coleman, J. S. (1987). The creation and destruction of social capital: implications for the law. *Notre Dame JL Ethics & Pub. Pol'y*, *3*, 375.

Coulibaly, T., Islam, M., & Managi, S. (2020). The impacts of climate change and natural disasters on agriculture in African countries. *Economics of Disasters and Climate Change*, *4*(2), 347-364.

Cyriaque-Rufin Nguimalet (2018) Comparison of community-based adaptation strategies for droughts and floods in Kenya and the Central African Republic, Water International, 43:2, 183-204, DOI: 10.1080/02508060.2017.1393713

De Haas, H. (2010). The internal dynamics of migration processes: A theoretical inquiry. *Journal of ethnic and migration studies*, *36*(10), 1587-1617.

De Haas, H. (2021). A theory of migration: the aspirations-capabilities framework. *Comparative Migration Studies*, *9*(1), 1-35.

Entwisle, B., Verdery, A., & Williams, N. (2020). Climate change and migration: New insights from a dynamic model of out-migration and return migration. *American Journal of Sociology*, *125*(6), 1469-1512.

Eswar, D., Karuppusamy, R., & Chellamuthu, S. (2021). Drivers of soil salinity and their correlation with climate change. *Current Opinion in Environmental Sustainability*, *50*, 310-318.

Ezin, V., Yabi, I., & Ahanchede, A. (2012). Impact of salinity on the production of tomato along the coastal areas of Benin Republic. *African Journal of Environmental Science and Technology*, *6*(4), 214-223.

Findley, S. E. (1994). Does drought increase migration? A study of migration from rural Mali during the 1983–1985 drought. *International migration review*, *28*(3), 539-553.

Fortnam, M., Atkins, M., Brown, K., Chaigneau, T., Frouws, A., Gwaro, K., ... & Sheen, K. (2021). Multiple impact pathways of the 2015–2016 El Niño in coastal Kenya. *Ambio*, *50*, 174-189.

Garip, F. (2008). Social capital and migration: How do similar resources lead to divergent outcomes?. *Demography*, *45*, 591-617.

Geisler, C., & Currens, B. (2017). Impediments to inland resettlement under conditions of accelerated sea-level rise. *Land Use Policy*, *66*, 322-330.

Gemenne, F. (2011a). Why the numbers don't add up: A review of estimates and predictions of people displaced by environmental changes. *Global Environmental Change*, *21*, S41-S49.

Gray, C., & Mueller, V. (2012). Drought and population mobility in rural Ethiopia. *World development*, *40*(1), 134-145.

Henry, S., Boyle, P., & Lambin, E. F. (2004). Modelling inter-provincial migration in Burkina Faso, West Africa: the role of socio-demographic and environmental factors. *Applied Geography*, *23*(2-3), 115-136.

Hoffmann, R., Dimitrova, A., Muttarak, R., Crespo Cuaresma, J., & Peisker, J. (2020). A meta-analysis of country-level studies on environmental change and migration. *Nature Climate Change*, *10*(10), 904-912.

Huho, J. M., Ngaira, J. K., & Ogindo, H. O. (2011). Living with drought: the case of the Maasai pastoralists of northern Kenya. *Educational Research*, *2*(1), 779-789.

Hunter, L. M., & Simon, D. H. (2023). Time to mainstream the environment into migration theory? *International Migration Review*, *57*(1), 5-35.

Ibrahim, B., & Mensah, H. (2022). Rethinking climate migration in sub-Saharan Africa from the perspective of tripartite drivers of climate change. *SN Social Sciences*, *2*(6), 1-24.

IDMC (2018). No matter of choice: Displacement in a changing climate. Geneva Switzerland, Internal displacement Monitoring center (IDMC)

Intergovernmental Panel On Climate Change (IPCC). 2017.IPCC Fifth Assessment Report (AR5) Observed Climate Change Impacts Database, Version 2.01. Palisades, New York: NASA Socioeconomic Data and Applications Centre (SEDAC). http://doi.org/10.7929/h4ft8j0x

Jagnani, M., Barrett, C. B., Liu, Y., & You, L. (2021). Within-season producer response to warmer temperatures: Defensive investments by Kenyan farmers. *The Economic Journal*, *131*(633), 392-419.

Jongman, B., Ward, P. J., & Aerts, J. C. (2012). Global exposure to river and coastal flooding: Long term trends and changes. *Global Environmental Change*, *22*(4), 823-835.

Kakinuma, K., Puma, M. J., Hirabayashi, Y., Tanoue, M., Baptista, E. A., & Kanae, S. (2020). Flood-induced population displacements in the world. *Environmental Research Letters*, *15*(12), 124029.

Kassegn, A., & Endris, E. (2021). Review on socio-economic impacts of 'Triple Threats' of COVID-19, desert locusts, and floods in East Africa: Evidence from Ethiopia. *Cogent Social Sciences*, *7*(1), 1885122.

Kebede, A. S., & Nicholls, R. J. (2012). Exposure and vulnerability to climate extremes: population and asset exposure to coastal flooding in Dar es Salaam, Tanzania. *Regional Environmental Change*, *12*, 81-94.

Kimaro, E. G., Mor, S. M., & Toribio, J. A. L. (2018). Climate change perception and impacts on cattle production in pastoral communities of northern Tanzania. *Pastoralism*, *8*, 1-16.

Lwasa, S., Buyinza, A., & Nabaasa, B. (2017). Weather forecasts for pastoralism in a changing climate: Navigating the data space in North Eastern Uganda. *Data Science Journal*, *16*.

Majhi, S. K. (2008). Indigenous technical knowledge for control of insect pest and livestock disorders.

Mallick, B., & Schanze, J. (2020). Trapped or voluntary? Non-migration despite climate risks. *Sustainability*, *12*(11), 4718.

Marta Bivand Erdal & Ceri Oeppen (2018) Forced to leave? The discursive and analytical significance of describing migration as forced and voluntary, Journal of Ethnic and Migration Studies, 44:6, 981-998, DOI: 10.1080/1369183X.2017.1384149

Mastrorillo, M., Licker, R., Bohra-Mishra, P., Fagiolo, G., Estes, L. D., & Oppenheimer, M. (2016). The influence of climate variability on internal migration flows in South Africa. *Global Environmental Change*, *39*, 155-169.

Mburu, B. K., Kung'u, J. B., & Muriuki, J. N. (2015). Climate change adaptation strategies by small-scale farmers in Yatta District, Kenya. *African Journal of Environmental Science and Technology*, *9*(9), 712-722.

Mubangizi, N., Kyazze, F. B., & Mukwaya, P. I. (2018). Smallholder Farmers'perception and Adaptation to Rainfall Variability in Mt. Elgon Region, Eastern Uganda. *International Journal of Agricultural Extension*, *5*(3), 103-117.

Munishi, E. J. (2013). Rural-urban migration of the Maasai nomadic pastoralist youth and resilience in Tanzania: Case studies in Ngorongoro District, Arusha Region and Dar es Salaam City. Institut für Umweltsozialwissenschaften und Geographie.

Myers, G., Walz, J., & Jumbe, A. (2020). Trends in urban planning, climate adaptation and resilience in Zanzibar, Tanzania. *Town and Regional Planning*, *77*, 57-70.

Nassor, B. S., & Makame, M. O. (2021). Assessing community adaptation strategies to floods in flood-prone areas of urban district, Zanzibar, Tanzania. *Journal of Sustainable Development*, *14*(3).

Nguimalet, C. R. (2018). Comparison of community-based adaptation strategies for droughts and floods in Kenya and the Central African Republic. *Water International*, *43*(2), 183-204.

Nyadzi, E., Bessah, E., & Kranjac-Berisavljevic, G. (2020). Taking stock of climate change induced sea level rise across the West African Coast. *Environmental Claims Journal*, *33*(1), 77-90.

Ocello, C., Petrucci, A., Testa, M. R., & Vignoli, D. (2015). Environmental aspects of internal migration in Tanzania. *Population and Environment*, *37*(1), 99-108.

Ogalleh, S. A., Vogl, C. R., Eitzinger, J., & Hauser, M. (2012). Local perceptions and responses toclimate change and variabi lity: The case of Laikipia District, Kenya. *Sustainability*, *4*(12), 3302-3325.

Oyebola, O. O., Efitre, J., Musinguzi, L., & Falaye, A. E. (2021). Potential adaptation strategies for climate change impact among flood-prone fish farmers in climate hotspot Uganda. *Environment, Development and Sustainability*, *23*, 12761-12790.

Oyieke H (2000) Implications of accelerated sea-level rise (ASLR) for Kenya. In: A.C. de la 08/01/2010 39 Vega-Leinert, R.J. Nicholls, A. Nasser Hassan and M. El-Raey (Editors), Proceedings of the SURVAS Expert Workshop on "African Vulnerability and Adaptation to Impacts of Accelerated Sea-Level Rise (ASLR)" (p 55). Cairo, Egypt

Paavola, J. (2008). Livelihoods, vulnerability and adaptation to climate change in Morogoro, Tanzania. *Environmental Science & Policy*, *11*(7), 642-654.

Parsons, L., & Nielsen, J. Ø. (2020). The subjective climate migrant: Climate perceptions, their determinants, and relationship to migration in Cambodia. *Annals of the American Association of Geographers*, *111*(4), 971-988.

Pirani, E., Marino, M. F., & Petrucci, A. (2019). Correlates of Inter-Districts Migrations in Tanzania. A Gravity-Type Modeling Approach. *Statistica*, *79*(2), 201-221.

Priovashini, C., & Mallick, B. (2022). A bibliometric review on the drivers of environmental migration. *Ambio*, *51*(1), 241-252.

Quiñones, E. J., Liebenehm, S., & Sharma, R. (2021). Left home high and dry-reduced migration in response to repeated droughts in Thailand and Vietnam. *Population and Environment*, *42*, 579-621.

Renner, M., & Taylor-Powell, E. (2003). Analyzing qualitative data. Programme Development & Evaluation, University of Wisconsin-Extension Cooperative Extension, 1-10.

Rigaud, K. K., de Sherbinin, A., Jones, B., Adamo, S., Maleki, D., Abu-Ata, N. E., ... & Mills, B. (2018). Groundswell Africa: internal climate migration in the Lake Victoria basin countries. Washington, DC: The World Bank

Riosmena, F., Nawrotzki, R., & Hunter, L. (2018). Climate migration at the height and end of the great Mexican emigration era. *Population and Development Review*, *44*(3), 455–488

Risbey, J. S. (2008). The new climate discourse: Alarmist or alarming?. *Global environmental change*, *18*(1), 26-37.

Ryan, L. (2011). Migrants' social networks and weak ties: accessing resources and constructing relationships post-migration. *The Sociological Review*, *59*(4), 707-724.

Siders, A. R. (2019). Adaptive capacity to climate change: A synthesis of concepts, methods, and findings in a fragmented field. *Wiley Interdisciplinary Reviews: Climate Change*, *10*(3), e573.

Smirnov, O., Lahav, G., Orbell, J., Zhang, M., & Xiao, T. (2022). Climate Change, Drought, and Potential Environmental Migration Flows Under Different Policy Scenarios. *International Migration Review*, 01979183221079850.

Smucker, T. A., & Wisner, B. (2008). Changing household responses to drought in Tharaka, Kenya: vulnerability, persistence and challenge. *Disasters*, *32*(2), 190-215.

Snyder, Hannah (2019). Literature review as a research methodology; an overview and guideline. Journal of business research.

Stal, M. (2011). Flooding and relocation: The Zambezi river valley in Mozambique. *InternationalMigration*, *49*, e125-e145.

Steyl, G., & Dennis, I. (2010). Review of coastal-area aquifers in Africa. *Hydrogeology Journal*, *18*(1), 217-225.

Suckall, N., Fraser, E., & Forster, P. (2017). Reduced migration under climate change: Evidence from Malawi using an aspirations and capabilities framework. *Climate and Development*, *9*(4), 298-312.

Tamer Afifi, Andrea Milan, Benjamin Etzold, Benjamin Schraven, Christina Rademacher-Schulz, Patrick Sakdapolrak, Alexander Reif, Kees van der Geest & Koko Warner (2016) Human mobility in response to rainfall variability: opportunities for migration as a successful adaptation strategy in eight case studies, Migration and Development, 5:2, 254-274, DOI: 10.1080/21632324.2015.1022974

Thiede, B. C., & Gray, C. L. (2017). Heterogeneous climate effects on human migration in Indonesia. *Population and Environment*, *39*, 147-172.

Torraco, R. J. (2005). Writing integrative literature reviews: Guidelines and examples. *Human resource development review*, *4*(3), 356-367.

Virginia Braun & Victoria Clarke (2006): Using thematic analysis in psychology, Qualitative Research in Psychology, 3:2, 77-101

Wafula, W. M., Wasonga, O. V., Koech, O. K., & Kibet, S. (2022). Factors influencing migration and settlement of pastoralists in Nairobi City, Kenya. *Pastoralism*, *12*, 1-14.

Wang, Q., & Waltman, L. (2016). Large-scale analysis of the accuracy of the journal classification systems of Web of Science and Scopus. *Journal of informetrics*, *10*(2), 347-364.

Warner, J., & Boas, I. (2019). Securitisation of climate change: How invoking global dangers for instrumental ends can backfire. *Environment and Planning C: Politics and Space*, *37*(8), 1471-1488.

Yoo, J., Sinha, V., & Mendelsohn, R. (2022). Can seawalls help American cities adapt to coastal flooding?. *International Journal of Climate Change Strategies and Management*, (ahead-of-print).

Yuval-Davis, N. (2006). Belonging and the politics of belonging. *Patterns of prejudice*, *40*(3), 197-214.

Zaneta Kubik & Mathilde Maurel (2016): Weather Shocks, Agricultural Production and Migration: Evidence from Tanzania, The Journal of Development Studies, DOI: 10.1080/00220388.2015.1107049

Ziervogel, G., Waddell, J., Smit, W., & Taylor, A. (2016). Flooding in Cape Town's informal settlements: barriers to collaborative urban risk governance. *South African Geographical Journal= Suid-Afrikaanse Geografiese Tydskrif*, *98*(1), 1-2