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REVIEW

A review of drivers of environmental non-migration decisions in Africa

Roland Azibo Balgah[1] · **Jude Ndzifon Kimengsi**[2,3]

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Abstract
In spite of growing scholarship on environmentally induced non-migration research in Africa, comprehensive empirical evidence of non-migration drivers is extremely difficult to find. We review 77 rigorously selected empirical articles on the drivers of environmental non-migration. A variety of relevant keywords was applied to search, identify, and select key publications from ScienceDirect, Web of Knowledge, Google Scholar, and the Climig databases. Content analysis and inter-rater reliability (IRR) analysis were used to summarize the literature and identify key drivers of environmental non-migration decisions across all retained articles. The study structure was informed by the Foresight (2011a) conceptual framework. A growth in the non-migration literature across the time period was observed. Social factors, particularly place-based attachment and family/cultural obligations, was identified as the most important driver of non-migration (IRR score = 0.67). Environmental factors were ranked second, particularly the ability of the affected to develop coping capacity through experiential learning even in contexts marred by resource scarcity and widespread poverty. Given the limited literature on environmental non-migration decisions, we recommend increased non-migration research across Africa to better inform policy decisions. This is particularly important as climate-related disasters surge. Frequent reviews on diverse aspects of non-migration studies are recommended to redefine future research and non-migration policy considerations in Africa.

Keywords Environmental non-migration · Non-migration drivers · Content analysis · Inter-rater reliability · Africa

Introduction

Migration is a complex phenomenon, intertwined with a multiplicity of economic, social, and security outcomes, which have themselves become increasingly complex with globalization (IOM 2020). As a concept, migration encompasses a wide variety of movements and engages people with multiple experiences and backgrounds. Migration can be voluntary — when people decide to migrate, or forced by existing circumstances, such as extreme weather events (Mallick and Schanze 2020; Wiegel et al. 2021). The decision to migrate (or not) is influenced by social (e.g., place-based attachment: the bond between people and places), political (e.g., democratic institutions), economic (current or discounted income), demographic (e.g., age structure), and environmental factors (e.g., hazard frequency) (Foresight 2011a; Adams 2016; IOM 2020; Biswas and Mallick 2021; Khalil and Jacobs 2021). By offering life-improving opportunities as a livelihood strategy, migration can provide an exit for populations exposed to crises, conflicts, and environmental hazards (Sly and Wrigley 1986; Naudé 2008; Sheffran et al. 2019; IOM 2020).

In addition to the rich migration-environment literature (Hunter 2005; Abu et al. 2014; Cattaneo and Peri 2016), there has been increasing recognition that some populations exposed to environmentally hazardous conditions do not move (Bhusal et al. 2021; Wiegel et al. 2021). Emerging

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✉ Roland Azibo Balgah
balgahroland@gmail.com

✉ Jude Ndzifon Kimengsi
jude_ndzifon.kimengsi@tu-dresden.de

[1] College of Technology, The University of Bamenda, Bamenda, Cameroon

[2] Faculty of Environmental Sciences, Technische Universität Dresden, Dresden, Germany

[3] Department of Geography, The University of Bamenda, Bamenda, Cameroon

scholarship on non-migration reveals that staying can be voluntary, as opposed to only involuntary as a result of the incapacity to move (Mallick and Shanze 2020; Bhusal et al. 2021). This article contributes to environmental non-migration scholarship by reviewing literature specifically on the drivers of environmental non-migration decisions in Africa.

Background and study motivation

Environmental migration has accompanied the global surge in environmental hazards in the last three decades, often pushing affected population to move to new places (Idemudia and Boehnke 2020). Research suggests that the rising frequency of extreme climate-induced events is contributing to increasing migration (Afifi 2011; Bhattacharyya and Wer 2012; UNDESA 2016, 2017). For instance, it was predicted that climate change alone accounts for up to 25 million environmental migrants (Ionesco et al. 2017). The United Nations Environment Programme equally predicted that 50 million persons were displaced in 2010 due to environmental hazards. Estimates further hold that by 2050, over 700 million environmental migrants will be registered, that is, out of every 11 people, 1 person will be displaced due to environmental hazards (Christian Aid 2007). The latter statistic provided the motivation for the geographic focus of this study, especially since Africa is also projected to supply the highest percentage of environmental migrants in the future (Black et al. 2011; Borderon et al. 2019).

Migration research has typically focused on movement as a key livelihood strategy (Idemudia and Boehnke 2020). However, intensifying climate-induced disasters — particularly in Africa — has extended migration research into its role in adaptation to environmental challenges and its related livelihood outcomes (Hunter 2005; Mallick and Vogt 2012; Balgah and Kimengsi 2019; Mpandeli et al. 2020). Recent scholarship has also explored decisions to not migrate (Biswas and Mallick 2021; Bhusal et al. 2021). While migration research is not new to Africa,[1] this shift in contemporary research towards non-migration intentions, drivers, decisions of environmental migrants[2] is very contemporary (Doevenspeck 2011; Graham 2020). Such a topical emphasis is justified for several reasons. First, surging extreme events in Africa can yield substantial increases in actual and potential environmental migrants (Boko et al. 2007; Marchiori et al. 2012; IOM 2020). Between 75 and 250 million residents are estimated to be exposed to water stressors (e.g., droughts and floods) in Africa alone in the twenty-first century, an increase from 130,000 between 1960 and 2000 (Boko et al. 2007; Marchiori et al. 2012). Second, the potential for non-migration is intensified as environmental challenges further impoverish poor households — creating poverty traps by pushimg them deeper into poverty — while also pushing non-poor into poverty (Carter and Barrett 2006). Third, weak formal institutions challenge disaster risk reduction efforts (Balgah 2011; Borderon et al. 2019; Balgah and Kimengsi 2022) .

Environmental non-migration

To avoid a conceptual muddle, it is necessary to differentiate environmental migration from non-migration. Environmental non-migration defines situations where residents do not move from their areas of habitation despite the occurrence of environmentally stressing events, such as floods, droughts, and earthquakes (Renaud et al. 2007; Foresight 2011b). An environmental migrant is a person who, mainly due to sudden or slow developing environmental changes adversely affecting living conditions, leaves their habitual residence either voluntarily or because no other option remains (IOM 2014). Environmental migration is, therefore, an effort to adapt to environmental challenges and/or escape from environmental threats (Biswas and Mallick 2021). Yet, not every affected person migrates when extreme weather-related events occur (Buchenrieder et al. 2017; Khan et al. 2018), and, as a result, it is necessary to also examine environmental non-migration. Understanding how and why decisions to migrate or not are made can inform the policy processes to ensure successful outcomes linked to non-migration.

Initially, the concept of environmental non-migration was used to describe the involuntary immobility of those without the means to move, and especially in contexts characterized by slow — or rapid-onset environmental hazards and disasters. In this way, environmental non-migration was linked to the concept of trapped populations (Ayeb-Karlsson et al. 2018; Wiegel et al. 2021). It soon became clear, however, that staying is not always involuntary and that some populations may even stay when negative effects of environmental hazards are imminent (Adams 2016; Mallick and Schanze 2020). This called for an expansion of the non-migration concept to include persons voluntarily (or involuntarily) living in places that are vulnerable to environmental change (Mallick et al. 2020). The concept of being trapped describes the inability to move away from risk-prone environmental areas, as a consequences of inadequate capacity and resources (Foresight

[1] The origins of African migration have often been linked to the transatlantic slave trade, during which Africans were, mobilized, dubbed or forced, and then transported to the 'new world' (The Americas and Europe) to provide labor needed for economic development. An estimated 80.000 Africans per annum were forcefully migrated under such circumstances in the late eighteenth century (Castles et al. 2013).

[2] In the context of this paper, an environmental migrant is defined as one who leaves his or her place of habitual residence (voluntarily or forcefully), as a consequence of environmentally stressing events, such as floods, droughts, and earthquakes (Renauld et al. 2007; Foresight 2011b).

2011a). As such, the notion of trapped populations recognizes the existence of complex human–environment interactions that may render impoverished people "trapped" and increasingly vulnerable to environmental threats and yet less able to move away from them (Foresight 2011a; Ayeb-Karlsson et al. 2018). However, non-migration decisions not only are the outcomes of being trapped but also can be influenced by social factors such as place-based attachment (Mallick and Schanze 2020), demographic factors such as the size of the affected population (Foresight 2011a), political decisions such as government barriers to migration (Adams 2016), and economic factors such as income at the time when an environmentally damaging event takes place (Black et al. 2011), or discounted benefits of migration (Mellander et al. 2011) . As such, non-migration cannot be simply equated to immobility. To emphasize this, Mallick and Schanze 2020) suggest dimensions of particular relevance to environmental non-migration research: (1) *voluntary non-migration*: when people do not migrate due to high levels of aspirations and capabilities to stay in their places of origin; (2) *involuntary non-migration*: when people exhibit low aspirations to stay — they are trapped and cannot migrate mainly due to their incapability to move. Considering such perspectives in environmental non-migration research can provide novel insights into what drives non-migration decisions across space and time and why not everyone moves under conditions of high environmental risks.

Interest in environmental non-migration research has stimulated an evolving literature on the topic (Schewel 2019; Bhusal et al. 2021). Expanding empirical studies contends that environmental non-migration decisions are driven by a variety of factors. These include perceived risk (Buchenrieder et al. 2021; Wiegel et al. 2021), the scale of impact on livelihoods (Faye 2021), and household coping capacity (McLeman 2018). Also important are place-based attachments[3] (Adams 2016; Mallick et al. 2020), family obligation (Jónsson 2010), and personal preferences (Carling 2002). Local interpretations of environmental hazards (Wiegel et al. 2021) also influence non-migration decisions as do elements of the socio-political, economic, and institutional environments (Bhusal et al. 2021). Yet, emerging African scholarship on environmental non-migration (e.g., Sly and Wrigley 1986; Henry et al. 2003; Jónsson 2010; Mpandeli et al. 2020) is still to gain significant science and policy relevance (Borderon et al. 2019). To aid in moving this body of work forward, we review literature to identify and summarize the state-of-the-art on the drivers of environmental non-migration. We do so as a contribution to framing forward-looking migration and non-migration research and policy agendas for Africa.

The next section presents and succintly discusses neoclassical migration theory as we lean heavily on this work within our interpretation. We then present the Foresight conceptual framework adopted in the paper. Methodological issues are elaborated next before presenting and discussing the results. Our concluding section explores how to advance future non-migration research in Africa, highly vulnerable to environmental change effects. The relevance of a holistic approach to researching on environmental non-migration drivers is highlighted; and the usefulness of the Foresight framework for analyzing non-migration decisions even beyond the African continent is contemplated.

Neoclassical migration theory revisited

Neoclassical thinking has occupied a central position in migration theorizing due to its logical plausibility that humans are rational and self-interested. This is quite an attractive proposition in explaining migration decisions. According to the neoclassical perspective, in order to maximize utility or expected benefits, individuals are likely to relocate especially if discounted migration benefits outweigh costs (Tiebout 1956; Sell and Dejong 1978). As examples, regions with higher real wage differentials tend to have positive net migration, while lower-waged ones are often characterized by out-migration (Sly and Wrigley 1986; Mellander et al. 2011). The dichotomy between individual and bounded rationality — the achievement of goals as constrained by existing individual and collective resources respectively (Dandy et al. 2019) — stimulated an expansion within the perspective. On the one hand, micro-economic theorists have often opined that migration is an individual choice, with decisions motivated by the possibility of maximizing personal gains, however defined (Tiebout 1956; Massey et al. 1993). On the other hand, new household economists — while accepting the rationality paradigm, argue that migration (as well as non-migration) decisions go beyond individual motivations to include the intention to create (or conserve) benefits for broader economic units, such as the family or household (Stark and Bloom 1985; Bakewell and Jonsson 2013).[4] Whatever the unit of analysis, rationality

[3] Place-based attachment is an emotional tie to the place, which enhances people's affection for the place. This can be strong enough to influence their decisions not to migrate, in spite of a current or expected extreme environmental event (Adams 2016).

[4] Some scholars have seriously questioned the validity of (micro) migration theories which seem to assume that all forms of migrations are mere products of consciously made decisions. Some important influencing factors include the propensity to out-migrate and/or return, legal status at entry, and migration routes (Beauchemin et al. 2020) For further discussions, see for instance Sell (1983), Sly and Wregler (1986), Mellander et al. (2011), and Beauchemin et al. (2020).

provides a strong theoretical ground for migration decisions. This supports Ravenstein's initial (1889) opinion that migration decisions are influenced by economic motives. Yet we argue below that, in spite of its attractiveness, neoclassical theories have failed to provide explanations for all decisions to migrate or not. For instance, despite imminent economic risks and suffering, many people voluntarily stay in areas affected by environmental hazards.

Why will people deliberately stay in areas affected by, or prone to, environmental hazards? Some scholars see such populations as "trapped," given their vulnerability and limited capacity to move away from the threat (Ayeb-Karlsson et al. 2018; Nawrotzki and DeWaard 2018). Skeptics go beyond such generalizations, to opine that the plethora of non-migration drivers transcend economic gain and inherent capacities, to include subjective, socio-cognitive, and endogenous factors such as risk perception, place-based attachment, information assymetry, and informal, community-based safety nets (Whisler et al. 2008; Black et al. 2011; Mellander et al. 2011; Buchenrieder et al. 2021; Wiegel et al. 2021). Also, being left behind can be a deliberate decision to facilitate others' migration, while ensuring that stayers engage in certain activities (e.g., caring for other family members or carrying out investments) on behalf of the migrated (Jónsson 2010). Such conceptualization legitimizes research that holistically considers the multiplicity of factors that may influence non-migration decisions (Ayeb-Karlsson et al. 2018). We draw on the Foresight (2011a) multi-dimensional framework to systematically analyze the multiplicity of factors that shape environmental non-migration decisions on the African continent.

Conceptual framework: Leaning on Foresight (2011a)

The decision of individuals to migrate or not is the outcome of a complex interaction of a series of economic and non-economic factors (Sell 1983; Boswell 2007; Ayeb-Karlsson et al. 2018). An effective conceptual framework for analyzing environmental non-migrants' decisions should be able to provide explanations for such decisions (Boswell 2007). According to the Foresight (2011a) report, an effective policy-oriented framework should meet at least the following two criteria:

i Identifying the underlying causes of migration
The resilience and usefulness of migration frameworks lies in their ability to comprehensively capture the drivers of migration and non-migration, not just the symptoms. This is valid also for the decision to migrate or not, due to environmental disasters.

ii Broad perspective
In practice, migrating or not is an outcome of the interaction of economic, political, social, demographic, and environmental factors. As such, concepts such as place, trapped, movers, stayers, and even environmental disasters are just "building blocks" on which migration decisions are made. Therefore, decisions to migrate or not are based on the cumulative and intersecting influence of multifaceted factors (Beauchemin et al. 2020), even if it remains a logical assumption that rising environmental degradation increases the pressure to migrate (Meze-Hausken 2000; Vag 2009). The conceptual strength of the Foresight (2011a) lies in the premise that migration decisions (to move or not) are outcomes of interaction between multiple drivers, whose understanding may improve knowledge on how decisions to migrate or not are made. In addition, the Foresight (2011a) framework has been lauded for its capacity to model population movements influenced by global environmental changes, and to inform policy decisions needed to build resilience towards environmental hazards (Ayeb-Karlsson et al. 2018).

We adopt this conceptual framework (Fig. 1) which elaborates a variety of migration drivers needed to better understand (non)-migration decisions in Africa, especially given the continent's high vulnerability to climate change and other environmental hazards (Balgah and Kimengsi 2019) . As emphasized by Black et al. (2011), the migration intentions of those affected by environmental hazards are mediated by political factors (e.g., government policy incentives, state intervention), demographic factors (e.g., population size and disease prevalence), economic factors (e.g., employment opportunities and income), social factors (e.g., family/social obligations and informal safety nets), and environmental factors (e.g., hazard exposure, hazard experience, and ecosystem services). Based on the robustness of this conceptualization, we use these factor categories to categorize and rate the importance of drivers of environmental non-migration decisions across the selected literature in Africa. The sub-categories are explained in more detail below.

Methodology

Identification and selection of review papers

We review the growing literature on environmental non-migration in Africa, with a thrust on non-migration drivers. Reviews like this can provide summative evidence on non-migration studies in the continent, with conclusions that

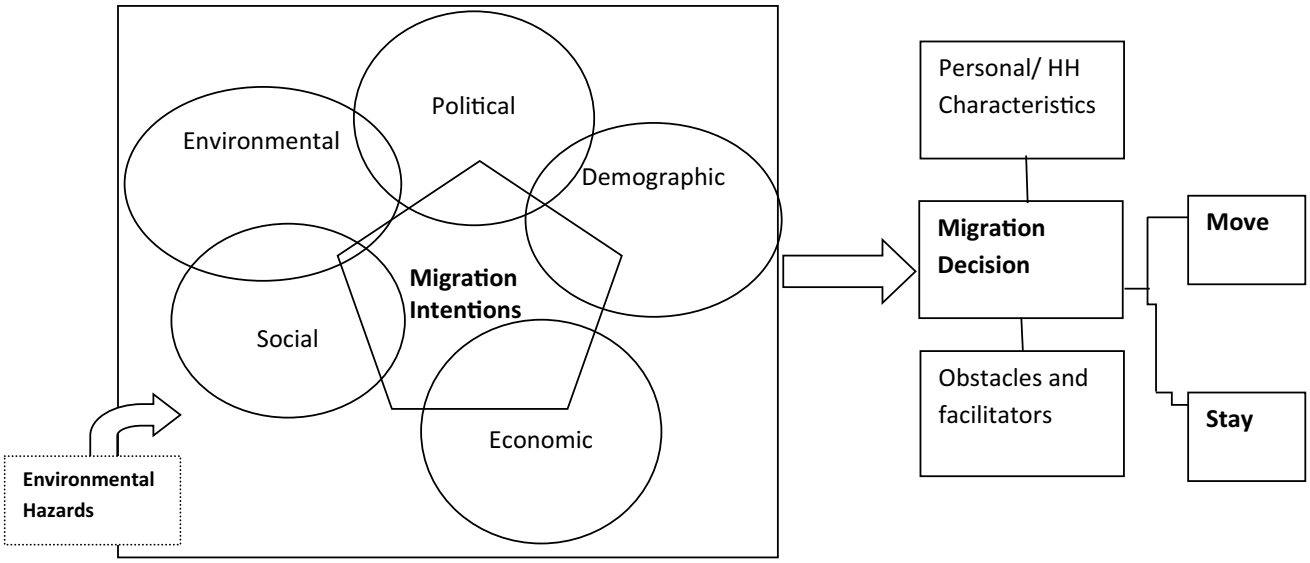

Fig. 1 Non-migration decision making in the context of environmental change. Source: adapted from Foresight (2011a) and Black et al (2011). Note: HH, household

can inform furture research and policy agendas (Borderon et al. 2019).[5] In the first step, keywords (e.g., Environmental Change, OR Non-migration, Stayers, OR Voluntary Non-migration, OR Resilient Communities, Trapped Populations, OR Immobile, OR Non-migration Determinants, OR Non-migration Drivers, OR Migration Issues, AND environmental non-migration, AND Sub-Saharan Africa (SSA)/Africa) were used to identify and select key publications from Science Direct, Web of Knowledge, and Google Scholar, and the Climig-database.[6] The search process ensured that only articles published in peer-reviewed scientific journals were identified. Each term was used individually, and in combination with SSA or Africa. Over 500 hits were obtained. A process to identify only migration and non-migration journal articles written on Africa, African regions, and/or countries reduced the number of items to 222. This sample constituted only articles that explicitly mentioned SSA, Africa, or an African country in the title, abstract, introduction, or methodology section. We then checked for duplicates, which reduced the articles to 106. At this stage, 35 articles that explicitly mentioned non-migration either in the title or abstract or introduction were immediately retained, while 17 articles focusing purely on migration studies were removed. The remaining 54 articles were read by both authors, and 50 articles which explicitly mentioned non-migration at least once were additionally retained. In a final step, we scanned through the 85 retained papers to identify only empirically oriented non-migration research (that is, articles which contained quantitative and qualitative empirical results of primary or secondary data on environmental non-migration), to increase the chances of identifying non-migration drivers. This left us with the 77 articles (43 country-specific case studies and 26 multiple country cases that used primary data, and 8 regional articles based on secondary data) which were used in the review. Overall, 35 (45.45%) of the retained articles applied quantitative methods, 31 (40.26%) qualitative methods, and 11 (14.29%) mixed methods (specific details are provided in Annex I). The literature search was completed in February 2020.

Data coding and analysis

We employed the deductive approach (Chandra and Shang 2019) to code the data; the selection of themes was informed by the Foresight (2011a) framework (Table 1) and previous migration-based reviews in Africa (see Epule et al. 2015; Borderon et al. 2019). Content analyses were performed for each driver category in the famework. All retained articles were reviewed twice by each author to reduce coding and misinterpretation errors (Janson and Olsson 2001). Predesigned sheets were used in the review process and articles were numbered and studied independently by both authors in

[5] See also Epule et al. (2015) for a critical review on perspectives on the trends, causes, challenges, and way forward of Environmental Refugees in Sub-Saharan Africa; and Borderon et al. (2019) on the influence of environmental change on migration. These reviews however do not explicitly examine the drivers of environmental non-migration.

[6] We remain grateful to Marion Borderon, of the Department of Geography and Regional Research, University of Vienna, Austria, for generously sharing her papers retrieved from "climig database" with us.

Table 1 Key drivers of non-migration decisions and their subcategories

Key driver	Subcategories
1. Political	- Availability (or not) of state support - Political will/stability - Ethnic tensions/civil conflicts - Clear hazard management policies - Disaster relief - Democracy
2. Demographic	- Population size/growth - Age/age dynamics - House ownership - Access and control of resources
3. Economic	- Income at the time of hazard - Financial impact of hazard - Value of crops and livestock - Market opportunities - Credit possibilities
4. Social	- Place-based attachment - Social obligations - Cultural values - Informal insurance/safety net - Hazard experience - Hazard perception
5. Environment-related	- Hazard threat and frequency - Environmental impact of hazard - Livelihood effects - Hazard experience - Vulnerability/coping capacity - Ecosystem services

Adapted from Black et al. (2011) and Foresight (2011a)

alphabetical order (Annex 1). The data initially recorded in Microsoft Word was exported to Microsoft Excel 10 where descriptive statistical analysis was performed. Key results are presented and discussed subsequently in this article.

Inter-rater reliability (IRR) analysis was performed using the predesigned variable categories and sub-categories, again based on the Foresight (2011a) framework. This approach was used to identify the strongest determinants for environmental non-migration decisions across the retained sources. IRR demonstrates the degree of agreement or correlation of specific variables among two or more raters (Gwet 2014) and represents the degree of homogeneity or consensus with respect to each driver across all the retained case studies (Quarfoot and Levine 2016). The choice of IRR for the review is threefold. First, IRR scores from at least two raters are more reliable than those of a single rater (Johnson et al. 2001). Second, its application in the climate change/non-migration literature is limited in application, although commonly applied in the medical and social sciences.[7] Third, it can be easily estimated as the frequency/percentage of the categorical (nominal and ordinal) drivers in the selected case studies that are consistently agreed upon (or not) with respect to their influence on non-migration decisions.[8]

Using three or more raters can lead to more robust results compared to only two raters, especially when measured variables are interval and ratio-scaled (Gwet 2014; Quarfoot and Levine 2016). However, there is no advantage when nominal and ordinal data with no missing scores are evaluated by only two raters (Janson and Olsson 2001). In addition, emerging discrepancies are better managed by the two raters as compared to multiple raters (Johnson et al. 2001). We opted for the two-rater approach given that the study made use of only nominal and ordinal variables. The decision was further motivated by the facts that (1) the scoring sheets were developed by both raters (thereby minimizing interpretation discrepancies) and (2) their different scholarly backgrounds (Development Studies and Geography respectively) already offered two relevant perspectives for the review.

In practice, each major driver category (e.g., political, economic) had a binary connotation with the value 1 as long as any of the subcategories (clear disaster management policy, disaster relief, etc.) was identified as a key driver in the empirical case study, and 0 otherwise.[9] A driver category was considered important as long as at least one of the subcategories was reported in the rating process as significant in influencing non-migration intentions and/or decisions in any retained article. A template designed in Microsoft Word was used to facilitate the process of data acquisition and eventual analysis.

Drivers were scored (1 if present, 0 if absent) across all 77 reviewed papers by each of the two raters, at the end of which the mean scores per rater (computed by dividing the total scores for each variable category by 77 — the total number of articles) were combined and averaged again. Following Hallgren (2012), Cohen's kappa was computed for each driver sub-category (e.g., placed-based attachement and social obligations) and averaged to generate to single IRR index for each driver category (in this example, social drivers). The choice of applying the kappa statistic was based on its proven relaiblity when (1) dealing with categorical data and (2) only two raters are involved, as was the case in this study (Johnson et al. 2001; Hallgren 2012). Other statistical approaches (e.g., product moment correlation,

[7] See for instance Soberg et al. (2008) for its application on people with injuries, and Hermasson et al. (2006) on myoelectric control in children and adults, and Webster et al. (2006) on risk factors among sex offenders.

[8] More detailed explanations (also on controversies) surrounding IRR can be found for instance in Gwet (2014), and Quarfoot and Levine (2016).

[9] We recognize that such an approach does not give the proportional weights of each factor. Nevertheless, our intention here was to observe the general trends in the major determinants and not in the subcategories. To further avoid confusion, the value "1" was given to a factor only once, even if the case study contained many subcategories as drivers.

Table 2 IRR analysis of retained literature of non-migration drivers

Key drivers	IRR mean score (Cohen's Kappa)
1. Social	0.67
2. Environment-related	0.56
3. Demographic	0.48
4. Economic	0.27
5. Political	0.26

IRR, inter-rater reliability

used for the IRR analysis. For convenience, each mean index was rounded up to two decimal places, as presented in Table 2. The higher the index, the more frequently it was found as a driver of non-migration decisions in the sample (Quarfoot and Levine 2016) . According to Soberg et al. (2008), whenever the IRR approach is used, mean scores less than 0.2. are considered poor: 0.21–0.40 fair, 0.41–0.60 moderate, 0.61–0.80 good, and 0.81–1.00 excellent, in terms of explanatory power across the sample. The data recorded was analyzed using Microsoft Excel, version 10. A logical summary of the key research steps and processes is presented in Fig. 2. Results of descriptive statistics and the IRR analyses are presented and discussed in the next section.

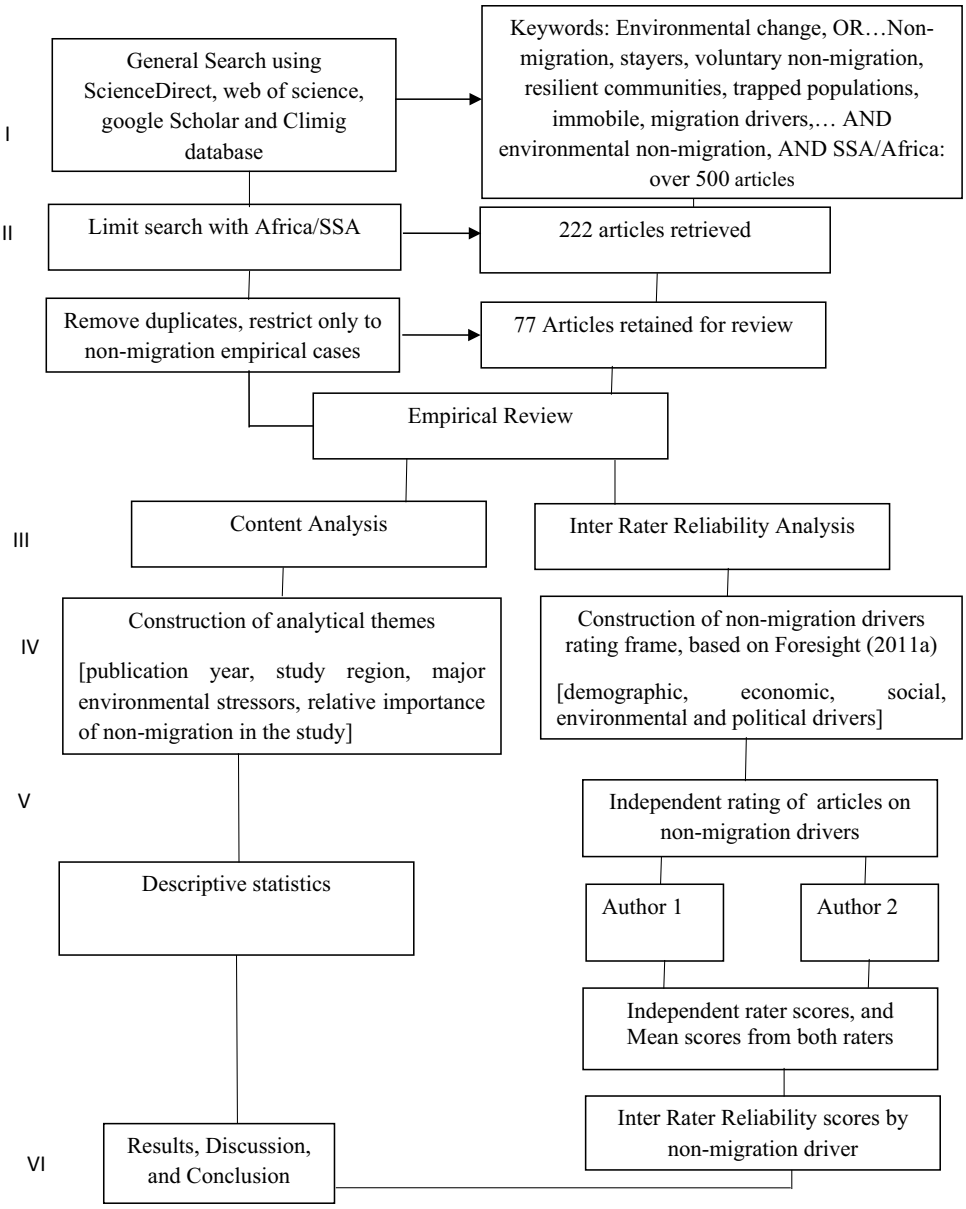

Fig. 2 Flow diagram with key research steps. Note: SSA = Sub-Saharan Africa. Note: I, identification of papers; II, article selection procedures; III, adopted analytical approaches; IV, variable categories; V, data coding and analysis steps; and VI, outputs

and interclass correlation coefficients) take precedence over the kappa statistic only when 3 or more raters are involved (Norman and Streiner 1966) . The newly computed indices were then

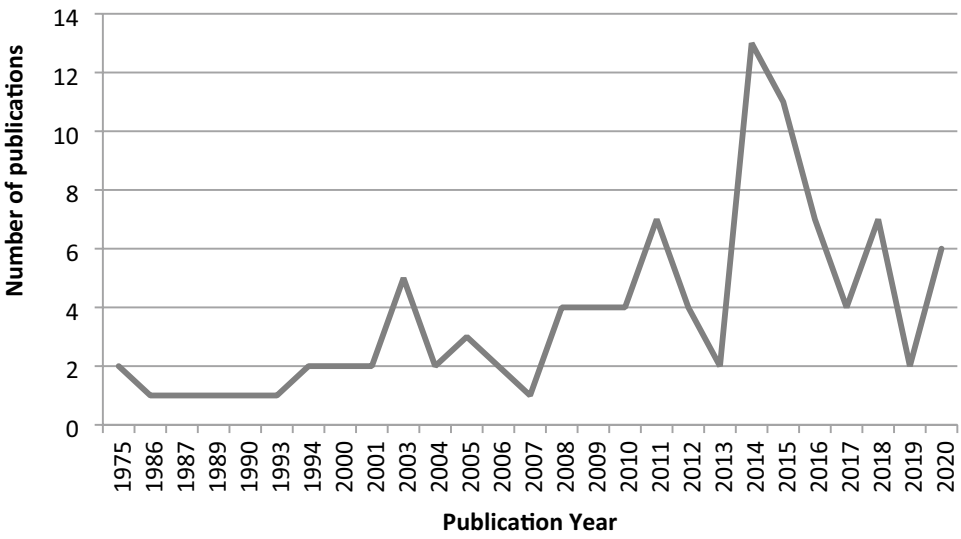

Fig. 3 African migration literature between 1975 and 2020

Results

Descriptive statistics

African non-migration literature according to year of publication

Examining the temporal pattern of non-migration coverage offers an indication of the salience of the topic to the research community. To this end, Fig. 3 presents the African non-migration literature across time. Non-migration literature in Africa has been evolving over the last 4 decades, first peaking between 2000 and 2002 and then 2010 to 2012, with the the highest peak between 2013 and 2017 (Fig. 3). The first and second peaks coincide with major recorded environmental hazards in the continent including the Mozambique floods of 2000 and drought-related famine in Somalia between 2010 and 2012, respectively. The third peak coincides with the 2015 World Conference on disaster risk reduction (DRR) in Sendai Japan, whose outcome, the Sendai Framework for DRR (2015–2030), emphasized a research agenda targeting inclusiveness, preparedness, and (environmental) disaster response strategies (Balgah and Kimengsi 2022). Overall, 60% of the identified publications were realized between 2011 and 2020, indicating a significant upward trend in coverage of non-migration in relation to environmental pressure.

Distribution of studies by country or region

An analysis of the distribution of empirical case studies by country or region of study from the retained publications indicate that the highest concentration (26 papers: above one-third) of the case studies analyzed different environmental hazards across many countries (hereinafter referred to as "multiple" case studies). As far as individual (country) case studies are concerned, Ghana and Ethiopia both occupy the first position with 8 cases each, followed by Tanzania and Burkina Faso with 6 and 4 cases respectively. Of all these countries, only Ethiopia appears among the top three countries in Africa with sufficiently reported natural hazards. None of the other top countries is considered to be especially disaster-prone (that is, Kenya and South Africa).[10] This incongruence further justifies the need for a broader non-migration empirical research agenda in Africa that increasingly focuses on countries hardest hit by climate-induced disasters.

Description of major types of stressors in the African-based literature

On the stressors linked to environmental non-migration, the analysis reveals the dominance of the diverse stressor discourse in the literature focusing on Africa with almost 73% of retained articles reporting different stressors, such as droughts and economic deprivation in Burkina Faso (Hampshire 2002) and Ethiopia (Gray and Mueller 2012), floods and gender inequality in Ghana (Afriyie et al. 2018), land degradation, political failure, and cultural diversity in Benin (Doevenspeck 2011), rainfall variability and household demography in Tanzania (Afifi et al. 2014), floods, place-based attachment, and risk perceptions in Cameroon (Buchenrieder et al. 2021), and climate-related forest

[10] According to webprevention.net, Kenya, South Africa, Ethiopia, and Ghana are the four countries with highest reported natural hazards in Africa (www.preventweb.net, accessed on 15 June 2019). Worldatlas.com classifies Somalia and Zimbabwe as particularly vulnerable to deaths and destruction from natural hazards in Africa (www.worldatlas.com, accessed on 15 June 2019).

degradation and socio-demographic factors in Ghana (Abu et al. 2014). The recurrence of multiple stressors close to 75% of the articles validates the multifaceted nature and complexity of decisions to migrate or not in Africa even under conditions characterized by environmental disasters.

Relative importance of non-migration

The review sought to determine if "non-migration" was explicitly mentioned in the title of the paper, the abstract, or the introductory sections, in an attempt to estimate the importance of the non-migration discourse in the African-focused literature. We assume here that mentioning non-migration already in the title or abstract is an indicator that an article was prepared with a strong focus on non-migration. This was found in 46% of the reviewed papers, suggesting a weak representation of non-migration literature. It therefore supports the fact that non-migration research is still in the early stages in Africa, with a cautious but rather optimistic movement towards including non-migration within a much older migration scholarship. The bulk of the literature mentioning "non-migration" (over 70%) was from the period 2011–2020.

Inter-rater reliability analysis of non-migration drivers

The IRR results reveal that social factors (particularly place-based attachment social/family obligations and cultural values) were the most important drivers of environmental non-migration in Africa (IRR score = 0.67). This was particularly evident in Ethiopia and Cameroon. Buchenrieder et al. (2021), for instance, report that the decision of floods victims in northwest Cameroon to stay in their communities was strongly explained by their unwillingness to be separated from their dead relatives. This was in spite of psychosocial trauma emanating from the floods. In West Africa (Ghana), the 1970–1980s drought which depicted environmental deterioration did not significantly trigger migration (Foresight 2011b) due to satisfaction with local politics, and optimism towards economic development (Carr 2005). Non-migration decisions in Africa are therefore increasingly shaped by social factors such as place-based attachment, which are themselves influenced by existing and anticipated political and economic environments.

Environmental factors, such as disaster frequency and coping capacity, were the second major drivers of non-migration decision across the case studies (IRR score = 0.56), as exemplified by the study of Findley (1994) on multiple droughts in Mali. This is closely followed by demographic characteristics which appear as the third most important driver of environmental non-migration decisions (0.48). These include age, household size as reported by Ezra (2001), and Abu et al. (2014) for northern Afifi et al. (2014) for Tanzania; household heads' intentions and perceptions reported by Buchenrieder et al. (2021); employment of household head (Ezra 2001); and gender and literacy rates as observed by Boyle (1994) in Burkina Faso. Additionally, economic motives such as income at the time of disaster, financial impact of the environmental event, crop and livestock value, and market and credit opportunities were rated as 0.27 (Table 2). Economic interest is reported by Dreie and Sow (2015) as a key driver to migrate or not from northern Benin to Nigeria. The least common driver was the political environment (0.26) which was reflected by the (non) availability of state support, political will/stability, ethnic tensions/civil conflicts, clear hazard management policies, disaster relief, and democracy. Dovenspeck (2011) reports that the political environment was an important determinant for migration decisions in rural Benin.

Discussion

Environmental non-migration literature trends in Africa

The literature on environmental non-migration in Africa is growing, with the greatest bulk registered in the decade 2011 to 2020. This is not surprising, considering that the effects of environmental change in the continent were highest during this decade, which coincided with the elaboration of the current global framework for disaster risk reduction (Balgah and Kimengsi 2022). Rising publication interest on this subject could also be explained by lower than expected outmigration, which was logically expected to accompany the growing climatic and environmental disasters across the continent (Borderon et al. 2019). The rising number of studies is probably also a cumulative outcome of growing numbers of climate and non-migration datasets, and increasing analytical capacity across Africa (e.g., Borderon et al. 2019; Idemudia and Boehnke 2020).

For instance, in North-Western Burkina Faso, Vinke et al. (2021) established that not all people migrate in the face of climate-induced disasters; most women formed part of the non-migrant population under such climatic caprices.

The decision to not migrate is triggered by the perception of community members that migration has negative consequences for their socio-economic situation and their health (Epule et al. 2015; Vinke et al. 2021). This evidence further shows that non-migration may become a feasible and increasingly contemplated option in many parts of Africa, especially if the trend of environmental disasters increase (Vinke et al. 2021). Additionally, climate-induced non-migration is shaped by the climate literacy levels of community members (Helbling et al. 2021).

Regional variations in the studies on environmental non-migration

On the spatial distribution of the literature, it is observed that more than one-third of the literature emanates from multiple case studies. This result suggests the increasing recognition of multi-scale and multi-country dimensions in the appreciation of environmental disasters. Put succinctly, scholars are increasingly recognizing the fact that environmental disasters need to be better understood at multiple scales — this will further inform non-migration decisions. Our results corroborate the findings of a recent study carried out by Helbling et al. (2021) using a dataset of 37,000 individuals across 30 African countries, which concluded with the need for multi-scale studies on environmental non-migration. Such studies can improve environmental monitoring systems and broaden understanding of the complex effects of environmental change on non-migration decisions across Africa (Afolayan and Adelekan 1999). In addition, the results that environmental non-migration studies have been prioritized in East and West African countries. For instance, Ghana, Ethiopia, Tanzania, and Burkina Faso account for 26 of the 77 cases. This corroborates the findings of Ihinegbu (2021) who reported that close to 60% of the growing literature on climate and environmental disasters emanate from these sub-regions, 30% in East Africa, and 27% in West Africa. Surprisingly, the countries classified as disaster-prone (Kenya and South Africa) did not feature on the top list of published literature. While this evidence shows a stark contrast with the results of Ihinegbu (2021) who reported that close to 40% of the literature on climate and environmental disasters emanate from South Africa, it further suggests that despite rising environmental disasters, the Southern African region is found to be wanting in terms of the number of studies on environmental non-migration. Clear reasons for this discrepancy requires further research.

Description of major types of stressors in the African-based literature

The growing literature on environmental migration suggests that multiple environmental stressors tend to shape people or household's decision to migrate or not (Khan et al. 2018; Mallick et al. 2020; Buchenrieder et al. 2021). These multiple interlinked forces include climate change effects such as droughts, floods, and land degradation with social, economic, and demographic variables. However, single case studies focusing on hydro-meteorological factors such as droughts, floods, and rainfall unreliability were also identified. These results reiterate the context-specificity of weather-related stressors, which in addition to their frequency and impacts can affect non-migration decisions differently across space and time. In fact, droughts and floods remain the most frequent environmental disasters across Africa. These results therefore reflect contextual reality. That almost three-quarters of all the empirical studies mentioned multiple stressors is an indication of the complexity that abounds climate change and non-migration decisions in Africa (Boko et al. 2007). In this light, Perch-Nielsen et al. (2008) conclude that while there is a connection between environmental disasters and the decision to (not) migrate, this connection is by no means deterministic; it rather depends on other vulnerability-linked factors of the population in question, as well as the characteristics of the region in question. The findings suggest the need for non-migration research to consider holistic analytical approaches including both climate change–related and other forces in play that might influence the decision to migrate or not, even in areas suffering from negative environmental change effects, as recently attoned by Khalil and Jacobs (2021).

Relative importance of non-migration

The analysis showed that less than 50% of the literature made explicit use of the term non-migration either in the title, abstract, or introduction. This further corroborates the fact that non-migration in the environmental literature is quite nascent in the African setting. Going by recent studies, it could be deduced that this scenario does not only apply to Africa. For instance, in the Himalayan Region, Bhusal et al. (2021) contend that questions on environmental non-migration aspirations in this disaster-prone region account only for a negligible number of studies. This view is further shared by Ahsan et al. (2022) who report on the dearth of literature on environmental non-migration, even in a highly disaster-prone setting such as Bangladesh. Thus, while Africa is not completely left out of the discourse on environmental non-migration, research acceptance and implementation are largely contemporary. Comparatively, Africa could be doing well in terms of embracing non-migration research. Additionally, the bulk of the literature (two-thirds) which mentions non-migration came from multiple cases. On the whole, the growing non-migration research in Africa is expected, given that (1) it is highly vulnerable to environmental hazards (Epule et al. 2015; Borderon 2019; Mpandeli et al. 2020), and (2) the decision to stay may increasingly become important in reducing the surging rate of out-migration being observed across the continent (De Haas 2008; Bauchemin et al. 2020).

Inter-rater reliability analysis of non-migration drivers

Based on the IRR results, we conclude that place-based attachment, social/family obligations, and cultural values, as social drivers, significantly drive environmental

non-migration in Africa (IRR score = 0.67). This showed strong evidence in East Africa, as reported for example by Tegegne (2016) for Ethiopia and Central Africa as revealed by Buchenrieder et al. (2021) in Cameroon. This result aligns with previous contentions that environmental non-migration is strongly influenced by place-based attachment (Adams 2016; Mallick and Schanze 2020; Khalil and Jacobs 2021).

Environmental forces represent the second major drivers of the decision not to migrate across the African case studies (IRR score = 0.48). This can be explained by the fact that most people affected by environmental hazards live in vulnerable and high-risk areas, where extreme events are frequent and repetitive (Askman et al. 2018). Constant exposure induces coping capacity, which renders voluntary relocation less attractive, especially when collective action and community solidarity are central components of hazard management (Balgah et al. 2015; Bhusal et al. 2021), or when innovative, adaptive, and coping strategies (e.g., constructing high foundations in flood areas) are developed by affected populations (Buchenrieder et al. 2021). Thus, while those highly affected by environmental hazards live in areas characterized by resource scarcity and rampant poverty (Boko et al. 2007; Carter and Barrett 2006; Borderon 2019), their perceptions and endogenous coping capacities developed through multiple hazard experiences can positively influence their decision to stay. This partly explains why demographic characteristics only surface as the third most important driver of non-migration decisions (0.48).

Economic motivation was reported to have minimal effects on non-migration decisions in the reviewed papers (IRR = 0.27), questioning the relevance of the neoclassical migration theory in environmental non-migration research beyond conserving previously accrued economic benefits (Bakewell and Jonsson 2013), which is very unlikely when extreme environmental events occur. Environmental victims are likely to stay put, only if their discounted economic benefits of staying after extreme events outweigh those from migrating. This result, while supporting the neoclassical theories of migration (Tiebout 1956; Bakewell and Jonsson 2013), reflects the low tendency for the poor to migrate, especially under conditions of uncertainty. For such vulnerable households, it might be a rational decision to stay put in their habitual residential communities for the sake of sustaining their fragile livelihoods, based on experiential knowledge and community survival strategies (such as solidarity and reciprocity), than to engage in migration processes with uncertain outcomes (Buchenrieder et al. 2017).

The least relevant driver for non-migration from the retained studies was the political environment (IRR = 0.26). On the political environment, it can be understood that there is a general lack of confidence in political (hazard management) institutions, due to the perpetuation of bad governance practices in many African countries, such as corruption, elite capture, and the politicization of disaster relief (Makara 2018; Balgah and Kimengsi 2022). In such political contexts, affected populations are likely to sideline state support from environmental hazard management package, albeit ready to grasp any sporadic support from state-led disaster management institutions (Buchenrieder et al. 2017; 2021). Given the intimate relationship between political stability and sustained socio-economic growth (Amin 2000), it is only logical that the absence of one affects the other on non-migration decisions. Scientific evidence suggests that governments with strong political institutions, active democracies, and vibrant economies are more benevolent in supporting climate coping, adaptation, and resilience activities, and therefore the decision not to migrate (Rogerson 2016; Grasham et al. 2019; Graham 2020). Jacobs and Munis (2020) report in a recent study based on conjoint experiments that federal politics strongly influenced attachment to place in some federal states in the USA. The results of this study suggest similar trends, as non-migration decisions in moderate democracies like Ghana were not affected by the political environment (Abu et al. 2014), compared for example with Benin (Doevenspeck 2011). Improving the political (and consequently the economic) environment is likely to positively influence non-migration decisions in Africa (Scheffran et al. 2019), at least through functioning state-led climate change/disaster management institutions, and climate insurance markets.

Conclusion

Contemporary research interest on environmental non-migration in Africa is rising. To provide a comprehensive knowledge base to advance a future research agenda, this study reviewed the current status of environmental non-migration studies in the continent. This has led to a number of conclusions. First, in spite of growing interest on non-migration research, few studies explicitly address environmental non-migration. This can been understood as part of the transition from a dominant migration research to an emerging non-migration agenda. As a consequence, we urge scholars to increasingly engage these questions since increasing weather-related extreme events continue to perpetuate poverty in Africa, bringing non-migration issues to the frontline. Research is particularly needed in hardest hit countries in order to generate findings of immediate contextual relevance. Regular reviews, such as provided here, are also necessary to inform environmental non-migration policy beyond single countries.

Secondly, social drivers such as place-based attachment, social/family obligations, and cultural values are critical determinants of environmental non-migration decisions in Africa. The social environment therefore lends itself as fertile ground for context-specific, in-depth non-migration research. Environmental drivers were of second importance. Constant exposure to environmental hazards is likely to induce livelihood diversification (Biswas and Mallick 2021), adaptation, and resilience capacities (Bhusal et al. 2021), thereby rendering voluntary relocation less attractive, even for resource-poor households.

Third, economic and political drivers had the least influence on non-migration decisions, defying the contentions held in the neoclassical migration theory. This, we attribute to the generally low economic development and weak policy environment in many African countries, which render state and market institutions for environmentally related disaster management ineffective (Balgah and Kimengsi 2022). However, given the intimate relationship between politics, the economy, and social development (Huggins and Thompson 2015), it seems incumbent for political institutions to be put right, to enhance and sustain economic growth, reduce the impacts of climate-induced events, and promote social development in climate-vulnerable environments.

Finally, this review reiterates the role of place-based attachment in influencing non-migration decisions (Adams 2016; Khalil and Jacobs 2021), moderated by existing (political and economic) coping capacity (van der Geest 2011a, b; McLeman 2018; Bhusal et al. 2021). Similar findings have been reported from empirical case studies out of the continent (see for instance the works of Khan et al. (2018) in Bangladesh; and Bhusal et al. (2021) in Nepal). Therefore, and in spite of the differences in the strength of different drivers in explaining non-migration decisions in Africa, the results signal complex linkages between social, environmental political, demographic, and economic drivers of non-migration. The decision to move or stay due to environmental change is neither simple nor linear, as it is mediated by complex interaction of many factors (Dandy et al. 2019). This complexity needs to be explored in future non-migration research in and beyond Africa. The study results suggest a high relevance of the Foresight (2011a) framework for analyzing complex environmental non-migration decisions. Further application of this framework is encouraged to enhance its analytical capacity across space and time.

We acknowledge that it is impossible to completely analyze the entire African environmental cum climate change non-migration literature with a single review. In addition, the article selection process was limited to articles published and indexed in the selected databases, on which the literature search was done. An analysis of dominant methodological approaches applied was not done. Further research should (i) expand the literature base to include papers which are published in other languages (apart from the English language) on the subject, (ii) comprehensively review applied methodological approaches with an explicit objective of identifying those relevant for the study of non-migration issues focusing on Africa, and (iii) apply more qualitative approaches (e.g., key informant interviews and focused group discussions) with political and economic actors, in a bid to better capture perspectives on non-migration decisions from different stakeholders. A broader focus on climate change can provide insights on the state-of-the art in Africa beyond environmental issues. Meanwhile, climate adaptation and resilience building efforts should continuously be promoted across Africa, given the ever growing capacity of environmental disasters to stimulate forced migration, or to trap populations, across the continent. Disaggregating and analyzing case studies according to methods applied (that is, either qualitative, quantitative, or mixed) can provide novel insights on the role of methods on knowledge generation, precision, and accuracy (Perch-Nielson et al. 2008) , with potential to better guide methodological choices in the growing research on non-migration in Africa. The science and policy implications of informed knowledge generation on environmental disasters and non-migration decisions for sustained growth and stable livelihoods across Africa that is highly exposed to environmental risks therefore cannot be overemphasized.

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References

Abu M, Codjoe SNA, Sward J (2014) Climate change and internal migration intentions in the forest-savannah transition zone of Ghana. Popul Environ 35(4):341–364. https://doi.org/10.1007/s11111-013-0191-y

Adaawen SA (2015) Narratives of migration-complex answers of a society in transformation, Ghana. [Doctoral thesis]. Bonn: Rheinische Friedrich-Wilhelms-Universität Bonn. https://bonndoc.ulb.uni-bonn.de/xmlui/handle/20.500.11811/6768

Adams H (2016) Why populations persist: mobility, place attachment and climate change. Popul Environ 37:429–448. https://doi.org/10.1007/s11111-015-0246-3

Adoho F, Wodon Q (2014) Do changes in weather patterns and the environment lead to migration? In: Wodon Q Liverani A Joseph G Bougnoux N (eds) Climate change and migration: evidence from the Middle East and North Africa. World Bank, Washington D.C. 145–162. https://openknowledge.worldbank.org/bitstream/handle/10986/18929/893710PUB0978000Box385270B00PUBLIC0.pdf

Afifi T (2009) Egyptian water and soil: a cause for migration and security threats? In: Rubio JL, Safriel U, Daussa R, Blum W, Pedrazzini F (eds) Water scarcity, land degradation and desertification in the mediterranean region. NATO science for peace and security series C: environmental security. Springer, Dordrecht, pp 131–143. https://link.springer.com/chapter/10.1007/978-90-481-2526-5_12

Afifi T (2011) Economic or environmental migration? The push factors in Niger. Int Migr 49(1):95–124. https://doi.org/10.1111/j.1468-2435.2010.00644.x

Afifi T, Sakdapolrak P, Warner K (2012) Climate change, vulnerability and human mobility: perspectives of refugees from the east and horn of Africa. United Nations University, Institute for Environment and Human Security (UNU-EHS), Bonn

Afifi T, Liwenga E, Kwezi L (2014) Rainfall-induced crop failure, food insecurity and out-migration in Same-Kilimanjaro. Tanzania Clim Dev 6(1):53–60. https://doi.org/10.1080/17565529.2013.826128

Afolayan A, Adelekan I (1999) The role of climatic variations on migration and human health in Africa. The Environ 18:213–218. https://doi.org/10.1023/A:1006581002775

Afriyie K, Ganle JK, Santos E (2018) 'The floods came and we lost everything': weather extremes and households' asset vulnerability and adaptation in rural Ghana. Clim Dev 10(3):259–274. https://doi.org/10.1080/17565529.2017.1291403

Ahsan MN, Khatun F, Kumar P, Dasgupta R, Johnson BA, et al. (2022) Promise, premise, and reality: the case of voluntary environmental non-migration despite climate risks in coastal Bangladesh. Reg Environ Chang 22(1):1–15. https://doi.org/10.1007/s10113-021-01864-1

Amin S (2000) The Political Economy of the 20th Century. Monthly Rev 52(2):1–17

Askman J, Nilsson O, Becker P (2018) Why people live in flood-prone areas in Akuressa, Sri Lanka. Int Journ Disast Risk Sci 9:143–156. https://doi.org/10.1007/s13753-018-0167-8

Ayeb-Karlsson S Smith CD Kniveton D (2018) A discursive review of the textual use of trapped in environmental migration studies: the conceptual birth and troubled teenage years of trapped populations. Ambio 47:557–573. https://doi.org/10.1007/s13280-017-1007-6

Bakewell O Jonsson G (2013) Theory and study of migration in Africa. Journ Intercult Stud 34(5):477–485. https://doi.org/10.1080/07256868.2013.827830

Balgah RA (2011) Managing risks and shocks. Informal response dynamics and the role of nonprofit organization. Verlag Grauer, Stuttgart

Balgah RA Buchenrieder G Mbue IM (2015) When nature frowns: a comprehensive impact assessment of the 2012 Babessi floods on people's livelihoods in rural Cameroon. Jàmbá: Journ Disast Risk Stud 7(1): 197 8. https://doi.org/10.4102/jamba. v7i1.197

Balgah RA, Kimengsi JN (2019) Can policy deviance reduce poverty? A critical analysis of self-return migration in Cameroon. Int Soc Sci Journ 68:1–17. https://doi.org/10.1111/issj.12212

Balgah RA, Kimengsi JN (eds) (2022) Disaster risk management in Sub-Saharan Africa: policies, institutions and processes. Emerald Publishing, p 56. ISBN: 978–1–80262–818–0. https://www.emerald.com/insight/content/doi/10.1108/978-1-80262-817-320221011/full/html

Barrios S, Bertinelli L, Strobl E (2006) Climatic change and rural–urban migration: The case of sub-Saharan Africa. Journ Urban Econ 60(3):357–371. https://doi.org/10.1016/j.jue.2006.04.005

Beauchemin C, Flahaux M-L, Schoumaker B (2020) Three sub-Saharan migration systems in times of policy restriction. Compar Migr Stud 8(19):1–27. https://doi.org/10.1186/s40878-020-0174-y

Bhattacharyya A, Wer M (2012) Climate change, migration, and conflict in South Asia. In: Rising tensions and policy options across the subcontinent. Center for American Progress, Heinrich Boell Foundation, Berlin

Bhusal P, Kimengsi JN, Awasthi KR (2021) What drives environmental (Non-) migration around the Himalayan Region? Evidence from Rural Nepal. World Dev Perspect 23:100350. https://doi.org/10.1016/j.wdp.2021.10035

Biswas B, Mallick B (2021) Livelihood diversifcation as key to long-term non-migration: evidence from coastal Bangladesh. Environ, Dev Sustain 23:8924–8948. https://doi.org/10.1007/s10668-020-01005-4

Black R, Adger WN, Arnell NW, Dercon S, Geddes A, Thomas D (2011) The effect of environmental change on human migration. Glob Environ Chang 21(Supplement 1): S3–S11. https://doi.org/10.1016/j.gloenvcha.2011.10.001

Bleibaum F (2009) Senegal Case study report. UNU-EHS, Bonn, Environmental change and forced migration scenarios (EACH-FOR) Project

Boko M, Niang I, Nyong A, Vogel C, Githeko A et al. (2007) Africa. In Parry, ML Canziani OF, Palutikof JP, van der Linden PJ, Hanson, CE (Eds) Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge University Press, Cambridge UK, pp 433–467. https://www.ipcc.ch/site/assets/uploads/2018/03/ar4_wg2_full_report.pdf

Borderon M, Sakdapolrak P, Muttarak R, Kebede E, Pagogna R, et al. (2019) Migration influenced by environmental change in Africa: a systematic review of empirical evidence. Demogr Res 41(18):491–544. https://doi.org/10.4054/DemRes.2019.41.18

Boswell C (2007) Theorizing migration policy: is there a third way? Int Migr Rev 41(1):75–100. https://doi.org/10.1111/j.1747-7379.2007.00057.x

Boyle P (1994) Metropolitan out-migration in England and Wales, 1980–81. Urban Stud 31:1707–1722. https://doi.org/10.1080/00420989420081591

Buchenrieder G, Mack C, Balgah RA (2017) Human security and the relocation of internally displaced environmental refugees in Cameroon. Refug Surv Quart 36(3):20–47. https://doi.org/10.1093/rsq/hdx005

Buchenrieder G, Brandl J, Balgah RA (2021) The perception of flood risks: a case study of Babessi in rural Cameroon. Int

Journ Disast Risk Sci 12:458–478. https://doi.org/10.1007/s13753-021-00345-7
Carling J (2002) Migration in the age of involuntary immobility: theoretical reflections and Cape Verdean experiences. Journ Ethnic Migr Stud 28(1):5–42. https://doi.org/10.1080/1369183012010391 2
Carr ER (2005) Placing the environment in migration: environment, economy, and power in Ghana's central region. Environ Plan a: Econ Space 37(5):925–946. https://doi.org/10.1068/a3754
Carter MR, Barrett CB (2006) The economics of poverty traps and persistent poverty: An asset based approach. The Journ Dev Stud 42(2):178–199. https://doi.org/10.1080/00220380500405261
Castles S, de Haas H, Miller MJ (2013) The age of migration, 5th edn. The Guilford Press, New York
Cattaneo C, Massetti E (2015) Migration and climate change in rural Africa. Center for Economic Studies and Ifo Institute (CESifo), Munich. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2576196
Cattaneo C, Peri G (2016) The migration response to increasing temperatures. Journ Dev Econ 122:127–146. https://doi.org/10.1016/j.jdeveco.2016.05.004
Chandra Y, Shang L (2019) Inductive coding. In: Chandra Y Shang L (eds) Qualitative research using R: a systematic approach. Springer, Singapore, pp 91–106. https://link.springer.com/book/10.1007/978-981-13-3170-1
Christian Aid (2007) Human tide: the real migration crisis. https://www.christianaid.org.uk/sites/default/files/2017-08/human-tide-the-real-migration-crisis-may-2007.pdf
Dandy J, Horwitz P, Campbell R, Drake D, Leviston Z (2019) Leaving home: place attachment and decisions to move in the face of environmental change. Reg Environ Chang 19:615–620. https://doi.org/10.1007/s10113-019-01463-1
De Haas H (2008) The Myth of Invasion: the inconvenient realities of African migration to Europe. Third World Quart 29(7):1305–1322. https://doi.org/10.1080/01436590802386435
Doevenspeck M (2011) The thin line between choice and flight: environment and migration in rural Benin. Int Migr 49:50–68. https://doi.org/10.1111/j.1468-2435.2010.00632.x
Dreie V, Sow P (2015) Bialaba migrants from the northern of Benin to Nigeria, in search of productive land—insights for living with climate change. Sustain 7(3):3175–3203. https://doi.org/10.3390/su7033175
Epule ET, Peng C, Lepage L (2015) Environmental refugees in sub-Saharan Africa: a review of perspectives on the trends, causes, challenges and way forward. GeoJourn 80:79–92. https://doi.org/10.1007/s10708-014-9528-z
Ezra M (2001) Demographic responses to environmental stress in the drought- and famine-prone areas of northern Ethiopia. Int Journ Popul Geogr 7(4):259–279. https://doi.org/10.1002/ijpg.226
Ezra M, Kiros G (2006) Rural out-migration in the drought prone areas of Ethiopia: a multilevel analysis. Int Migr Rev 35(3):749–771. https://doi.org/10.1111/j.1747-7379.2001.tb00039.x
Faye M (2021) A forced migration from Myanmar to Bangladesh and beyond: humanitarian response to Rohingya refugee crisis. Int Journ Hum Act 6(13):1–7. https://doi.org/10.1186/s41018-021-00098-4
Findley SE (1994) Does drought increase migration? A study of migration from rural Mali during the 1983–1985 drought. Int Migrat review 28(3):539–553. https://doi.org/10.1177/019791839402800306
Florida R (2002) The Rise of the Creative Class. Basic Books, New York
Foresight (2011a) Highlights of 2011. Government Office for Science, London, UK. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/276519/12-p91-foresight-annual-review-2011.pdf
Foresight (2011b) Migration and global environmental change: future challenges and opportunities. The Government Office for Science, London, UK, p 234. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/287717/11-1116-migration-and-global-environmental-change.pdf
Gottlieb PD, Joseph G (2006) College-to-work migration of technology graduates and holders of doctorates within the United States. Journ Reg Sci 46(4):627–649. https://doi.org/10.1111/j.1467-9787.2006.00471.x
Graham C (2020) Climate-induced population displacement in sub-Saharan Africa: a review of resilience-building strategies. Geoforum 117:300–303. https://doi.org/10.1016/j.geoforum.2020.07.004
Grant A Burger N Wodon Q (2014) Climate induced migration in the MENA region: results from qualitative fieldwork. MPRA Paper 56936 Munich, Germany.
Grasham CF, Korzenevica M, Charles KJ (2019) On considering climate resilience in urban water security A review of the vulnerability of the urban poor in sub-Saharan Africa. Wiley Interdis Rev Water 6(3):1344. https://doi.org/10.1002/wat2.1344
Gray CL (2011) Soil quality and human migration in Kenya and Uganda. Glob Environ Chang 21(2):421–430. https://doi.org/10.1016/j.gloenvcha.2011.02.004
Gray C, Mueller V (2012) Drought and population mobility in rural Ethiopia. World Dev 40(1):134–145. https://doi.org/10.1016/j.worlddev.2011.05.023
Grolle J (2015) Historical case studies of famines and migrations in the West African Sahel and their possible relevance now and in the future. Popul Environ 37(2):181–206. https://doi.org/10.1007/s11111-015-0237-4
Gwet KL (2014) Handbook on inter-rater reliability, 4th Edition. The definitive guide to measuring the extent of agreement among multiple raters. Advanced Analytics LLC, Gaithesburg MD. ISBN: 9780970806284. https://books.google.de/books?id=fac9BQAAQBAJ
Hallgren KA (2012) Computing inter-rater reliability for observational data: an overview and tutorial. Tutor Quant Methods Psychol 8(1):23–34. https://doi.org/10.20982/tqmp.08.1.p023
Hampshire K (2002) Fulani on the move: seasonal economic migration in the sahel as a social process. Journ Dev Stud 38(5):15–36. https://doi.org/10.1080/00220380412331322491
Hamza MA, Faskaoui BE, Fermin A (2009) Morocco case study report. In: Migration and environmental change in Morocco: the case of rural oasis villages in the Middle Drâa Valley. Erasmus University Rotterdam (EUR). EACH-FOR - Environmental Change and Forced Migration Scenarios, Rotterdam. https://maithamza.files.wordpress.com/2010/12/migration-and-environmental-change-in-morocco-the-case-ait-hamza-mohamed.pdf
Haug R (2002) Forced migration, processes of return and livelihood construction among pastoralists in northern Sudan. Disasters 26(1):70–84. https://doi.org/10.1111/1467-7717.00192
Heaney AK, Winter SJ (2016) Climate-driven migration: an exploratory case study of Maasai health perceptions and help-seeking behaviors. Int Journ Pub Health 61(6):641–649. https://doi.org/10.1007/s00038-015-0759-7
Helbling M, Auer D, Meierrieks D, Mistry M, Schaub M (2021) Climate change literacy and migration potential: micro-level evidence from Africa. Climatic Chang 169(9): (2021). https://doi.org/10.1007/s10584-021-03241-7
Henry S, Boyle P, Lambin EF (2003) Modelling inter-provincial migration in Burkina Faso, West Africa: The role of socio-demographic and environmental factors. Appl Geogr 23(2–3):115–136. https://doi.org/10.1016/j.apgeog.2002.08.001
Henry S, Piché V, Ouédraogo D, Lambin EF (2004a) Descriptive analysis of the individual migratory pathways according to

environmental typologies. Popul Environ 25(5):397–422. https://doi.org/10.1023/B:POEN.0000036929.19001.a4
Henry S, Schoumaker B, Beauchemin C (2004b) The impact of rainfall on the first out-migration: a multi-level event-history analysis in Burkina Faso. Popul Environ 25(5):423–460. https://doi.org/10.1023/B:POEN.0000036928.17696.e8
Hermasson LM, Bodin L, Eliasson A-C (2006) Intra-and inter-rater reliability of the assessment of capacity for myoelectric control. Journ Rehab Med 38:118–123. https://doi.org/10.1080/16501970500312222
Huggins R, Thompson P (2015) Culture and place based development: a socio-economic analysis. Reg Stud 49(1):130–159. https://doi.org/10.1080/00343404.2014.889817
Hummel D (2016) Climate change, land degradation and migration in Mali and Senegal – some policy implications. Migr Dev 5(2):211–233. https://doi.org/10.1080/21632324.2015.1022972
Hunter LM (2005) Migration and environmental hazards. Popul Environ 26(4):273–302. https://doi.org/10.1007/s11111-005-3343-x
Hunter LM, Leyk S, Maclaurin GJ, Nawrotzki R, Twine W, et al. (2017) Variation by geographic scale in the migration-environment association Evidence from rural South Africa. Comparat Popul Stud 42:117–148. https://doi.org/10.12765/CPoS-2017-11
Idemudia E, Boehnke K (2020) Psychological experiences of African migrants in six European countries. In: A mixed method study. Social Indicators Series. Springer Nature, Cham Switzerland. https://library.oapen.org/handle/20.500.12657/41291
Ihinegbu C (2021) Conceptualization and management of disasters and climate change events in Africa: a review. SN Appl Sci 3:848. https://doi.org/10.1007/s42452-021-04829-5
International Organization for Migration (IOM) (2014) Fatal journeys. Tracking lives lost during migration. International organization for Migration, Grand-Saconnex, p 216. https://doi.org/10.18356/c7231504-en
International Organization for Migration (IOM) (2020) World migration report. International Organization for Migration, Geneva. https://publications.iom.int/system/files/pdf/wmr_2020.pdf
Ionesco D, Mokhnacheva D, Gemenne F (2017) The Atlas of environmental migration. Routledge, London. https://www.routledge.com/The-Atlas-of-Environmental-Migration/Ionesco-Mokhnacheva-Gemenne/p/book/9781138022065
Jacobs NF, Munis BK (2020) Staying in place: federalism and the political economy of place attachment. Publius: The Journ Federal 50(4):544–565. https://doi.org/10.1093/publius/pjaa024
Janson H, Olsson U (2001) A measure of agreement for interval or nominal multivariate observations. Educat Psychol Measure 61:277–289. https://doi.org/10.1177/00131640121971239
Johnson RL, Penny J, Gordon B (2001) Score resolution and the interrater reliability of holistic scores in rating essays. Written Communicat 18(2):229–249. https://doi.org/10.1177/0741088301018002003
Jónsson G (2010) The environmental factor in migration dynamics - a review of African case studies. In: IMI Working papers 21. International Migration Institute, Oxford. https://ora.ox.ac.uk/objects/uuid:cece31bd-0118-4481-acc2-e9ca05f9a763
Khalil MB Jacobs BC (2021) Understanding place-based adaptation of women in a post-cyclone context through place attachment. Environ Dev 39 (100644). https://doi.org/10.1016/j.envdev.2021.100644
Khan MI, Kundu GK, Akter MS, Mallick BI, Islam M (2018) Climatic impacts and responses of migratory and non-migratory fishers of the Padma River Bangladesh. Soc Sci 7(25):2–19. https://doi.org/10.3390/socsci7120254
Konseiga A (2007) Household migration decisions as survival strategy: the case of Burkina Faso. Journ Afri Econ 16(2):198–233. https://doi.org/10.1093/jae/ejl025
Koubi V, Spilker G, Schaffer L, Böhmelt T (2016) The role of environmental perceptions in migration decision-making: evidence from both migrants and non-migrants in five developing countries. Popul Environ 38(2):134–163. https://doi.org/10.1007/s11111-016-0258-7
Kubik Z, Maurel M (2016) Weather shocks, agricultural production and migration: Evidence from Tanzania. The Journ Dev Stud 52(5):665–680. https://doi.org/10.1080/00220388.2015.1107049
Lee ES (1966) A theory of migration. Demogr 3(1):47–57. https://doi.org/10.2307/2060063
Lewick M (2011) On the variety of people's relationship with places. Environ Behav 43(5):676–709. https://doi.org/10.1177/0013916510364917
Leyk S, Maclaurin GJ, Hunter LM, Nawrotzki R, Twine W, et al. (2012) Spatially and temporally varying associations between temporary outmigration and natural resource availability in resource-dependent rural communities in South Africa: a modeling framework. Applied Geogr 34:559–568. https://doi.org/10.1016/j.apgeog.2012.02.009
Makara S (2018) Decentralisation and good governance in Africa: a critical review. Afri Journ POlit Sci Int Rel 12(2):22–32. https://doi.org/10.5897/AJPSIR2016.0973
Mallick B, Schanze J (2020) Trapped or voluntary? Non-migration despite climate risks sustain 12:4718. https://doi.org/10.3390/su12114718
Mallick B, Vogt J (2012) Cyclone, coastal livelihood and migration – empirical evidence from Bangladesh. Int Dev Plan Rev 34:217–240. https://doi.org/10.3828/idpr.2012.16
Mallick B, Sultana Z, Bennett CM (2020) How do sustainable livelihoods influence environmental (non-) migration aspirations? Applied Geogr 124:102328. https://doi.org/10.1016/j.apgeog.2020.102328
Marchiori L, Maystadt J-F, Schumacher I (2012) The impact of weather anomalies on migration in sub-Saharan Africa. Journ Environ Econ Manag 63(2):355–374. https://doi.org/10.1016/j.jeem.2012.02.001
Massey DS, Arango J, Hugo J, Kouaouci A, Pellegrino A, et al. (1993) Theories of international migration: a review and appraisal. Popul Dev Rev 19(3):431–466. https://doi.org/10.2307/2938462
McLeman R (2018) Thresholds in climate migration. Popul Environ 39(4):319–338. https://doi.org/10.1007/s11111-017-0290-2
Mellander C, Florida R, Stolarick K (2011) Here to stay – the effects of community satisfaction on the decision to stay. Spatial Econ Analy 6(1):5–24. https://doi.org/10.1080/17421772.2010.540031
Meze-Hausken E (2000) Migration caused by climate change: how vulnerable are people in dryland areas? A case-study in northern Ethiopia. Mitig Adapt Strateg Glob Chang 5(4):379–406. https://doi.org/10.1023/A:1026570529614
Morrissey J (2012) Contextualizing links between migration and environmental change in northern Ethiopia. In: Hastrup K, Olwig FK (eds) Climate change and human mobility: challenges to the social sciences. Cambridge University Press, Cambridge, pp 110–146. https://doi.org/10.1017/CBO9781139235815.009
Morrissey J (2013) Understanding the relationship between environmental change and migration: the development of an effects framework based on the case of northern Ethiopia. Glob Environ Chang 23(6):1501–1510. https://doi.org/10.1016/j.gloenvcha.2013.07.021
Mortimore M (1989) Adapting to drought: farmers, famines, and desertification in West Africa. Cambridge University Press, Cambridge and New York. https://doi.org/10.1017/CBO9780511720772
Morton JF, Solecki W, Dasgupta P, Dodman D, Rivera-Ferre, (2014) Cross-chapter box on urban–rural interactions—context for climate change vulnerability, impacts, and adaptation. In Field CB, Barros VR, Dokken DJ, Mach KJ, Mastrandrea MD, Bilir TE,

Chatterjee M, Ebi KL, Estrada YO, Genova RC, Girma B, Kissel ES, Levy AN, MacCracken S, Mastrandrea PR, White LL (eds) Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, pp 153–155. https://www.ipcc.ch/site/assets/uploads/2018/02/WGIIAR5-PartA_FINAL.pdf

Mpandeli S, Nhamo L, Hlahla S, Naidoo D, Liphadzi S, et al. (2020) Migration under climate change in Southern Africa: a nexus planning perspective. Sustain 12(4722):1–14. https://doi.org/10.3390/su12114722

Murray V, McBean G, Bhatt M, Borsch S, Cheong TS et al. (2012) Case studies. In Field CB, Barros V, Stocker TF, Qin D, Dokken DJ, Ebi KL, Mastrandrea MD, Mach KJ, Plattner GK, Allen SK, Tignor M, Midgley PM (eds) Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation. A Special Report of Working Groups I and II of the Intergovernmental Panel on Climate Change (IPCC). Cambridge University Press, Cambridge, UK, and New York, NY, USA, pp 487–542. https://www.ipcc.ch/report/managing-the-risks-of-extreme-events-and-disasters-to-advance-climate-change-adaptation/

Naudé W (2008) Conflict, disasters and no jobs: reasons for international migration from Sub-Saharan Africa UNU-WIDER, Helsinki. http://hdl.handle.net/10419/45125

Nawrotzki RJ, DeWaard J (2018) Putting trapped populations into place: climate change and inter-district migration flows in Zambia. Reg Environ Chang 18(2):533–546. https://doi.org/10.1007/s10113-017-1224-3

Neumann K, Sietz D, Hilderink H, Janssen P, Kok M, et al. (2015) Environmental drivers of human migration in drylands – a spatial picture. Appl Geogr 56:116–126. https://doi.org/10.1016/j.apgeog.2014.11.021

Nguyen M, Wodon Q (2014) Extreme weather events and migration the case of Morocco. Munich Personal RePEc Archive, Munich. https://mpra.ub.uni-muenchen.de/56938/

Norman GR, Streiner DL (1966) Biostatistics: the bare essentials. Hamilton, Ontario, BC Decker

Ocello C, Petrucci A, Testa MR, Vignoli D (2015) Environmental aspects of internal migration in Tanzania. Popul Environ 37(1):99–108. https://doi.org/10.1007/s11111-014-0229-9

Perch-Nielson SL, Michele BB, Imboden D (2008) Exploring the link between climate change and migration. Clim Chang 91:375–393. https://doi.org/10.1007/s10584-008-9416-y

Quarfoot D, Levine RA (2016) How robust are multiraterinterrater reliability indices to changes in frequency distribution? The Am Statist 70(4):373–384. https://doi.org/10.1080/00031305.2016.1141708

Rademacher-Schulz C, Schraven B, Mahama ES (2014) Time matters: shifting seasonal migration in Northern Ghana in response to rainfall variability and food insecurity. Clim Dev 6(1):46–52. https://doi.org/10.1080/17565529.2013.830955

Ratzel F (1903) *Politische geographie (political geography)*. Munich R Oldenbourg

Ravenstein, (1889) The laws of migration. Journ Royal Statist Society 52(2):241–301. https://doi.org/10.1111/j.2397-2335.1889.tb00043.x

Renaud F, Bogardi JJ, Dun O, Warner K (2007) Control, adapt or flee: how to face environmental migration? In: United Nations University Institute for Environment and Human Security (UNU-EHS) Interdisciplinary Security ConnecTions No 5/2007, Bonn. http://collections.unu.edu/view/UNU:1859

Rigaud KK, de Sherbinin A, Jones B, Bergmann J, Clement V, et al. (2018) Groundswell: preparing for internal climate migration. The World Bank, Washington D.C. https://openknowledge.worldbank.org/handle/10986/29461

Riosmena F, Nawrotzki R, Hunter L (2018) Climate migration at the height and end of the great Mexican emigration era. Popul Dev Rev 44(3):455–488. https://doi.org/10.1111/padr.12158

Rockenbauch T, Sakdapolrak P (2017) Social networks and the resilience of rural communities in the global south: a critical review and conceptual reflections. Ecol Society 22(1):1–33. https://doi.org/10.5751/ES-09009-220110

Rogerson CM (2016) Climate change, tourism and local development in South Africa. Local Econ 31(1–2):322–331. https://doi.org/10.1177/0269094215624354

Romankiewicz C, Doevenspeck M (2015) Climate and mobility in the West African Sahel: conceptualising the local dimensions of the environment and migration nexus. In: Greschke H, Tischler J (eds) Grounding global climate change. Springer Netherlands, Dordrecht, pp 79–100. https://link.springer.com/chapter/10.1007/978-94-017-9322-3_5

Scheffran J, Link P, Schilling J (2019) Climate and conflict in Africa. Oxford Res Encyclop Clim Sci. https://doi.org/10.1093/acrefore/9780190228620.013.557

Schewel K (2019) Understanding immobility: moving beyond the mobility bias in migration studies. Int Migr Rev 54(2):1–28. https://doi.org/10.1177/0197918319831952

Sell RR (1983) Analyzing migration decisions: the first step–whose decisions? Demogr 20:299–311. https://doi.org/10.2307/2061244

Sell RR, Dejong GF (1978) Toward a motivational theory of migration decision making. Journ Popul Behav Soc Environ Issues 1:313–335. https://doi.org/10.1007/BF00972555

Simatele D, Simatele M (2015) Migration as an adaptive strategy to climate variability: a study of the Tonga-speaking people of Southern Zambia. Disasters 39(4):762–781. https://doi.org/10.1111/disa.12124

Sly DF, Wrigley JM (1986) Migration decision making and migration behavior in rural Kenya. Popul Environ 8(1&2):78–97. https://doi.org/10.1007/BF01263018

Smith CD (2014) Modelling migration futures: development and testing of the Rainfalls Agent-Based Migration Model – Tanzania. Clim Dev 6(1):77–91. https://doi.org/10.1080/17565529.2013.872593

Soberg HL, Sandvik L, Ostensjo S (2008) Reliability and applicability of the ICF coding problems, resources and goals of persons with multiple injuries. Disab Rehab 30:98–106. https://doi.org/10.1080/09638280701216862

Sow P, Adaawen S, Scheffran J (2014) Migration, social demands and environmental change amongst the Frafra of northern Ghana and the Biali in northern Benin. Sustain 6(1):375–398. https://doi.org/10.1080/21632324.2015.1022968

Stark O Bloom DE (1985) The new economics of labor migration. *The Am Econ Rev* 75:173–178. http://www.jstor.org/stable/1805591

Suckall N, Fraser E, Forster P (2017) Reduced migration under climate change: evidence from Malawi using an aspirations and capabilities framework. Clim Dev 9(4):298–312. https://doi.org/10.1080/17565529.2016.1149441

Tacoli C (2009) Crises or Adaptation? Migration and Climate Change in the Context of High Mobil, Environ Urbanizat 21(2):513–525. https://doi.org/10.1080/17565529.2016.1149441

Tegegne AD, Penker M (2016) Determinants of rural out-migration in Ethiopia: who stays and who goes? Demogr Res 35(34):1011–1043. https://doi.org/10.4054/DemRes.2016.35.34

Tiebout CM (1956) A pure theory of local expenditures. Journ Polit Econ 64(2):416–424. https://doi.org/10.1086/257839

UNDESA (United Nations, Department of Economic and Social Affairs, Population Division) (2016) International migration report 2015: highlights (ST/ESA/SER.A/375). https://www.un.

org/en/development/desa/population/migration/publications/migrationreport/docs/MigrationReport2015_Highlights.pdf
UNDESA (United Nations, Department of Economic and Social Affairs, Population Division) (2017) International migration report 2017: highlights (ST/ESA/SER.A/404). https://www.un.org/en/development/desa/population/migration/publications/migrationreport/docs/MigrationReport2017_Highlights.pdf
Vag A (2009) Environmental change and forced migration scenarios, D.3.4. Synthesis report. ATLAS Innoglobe, Hungary, pp 81. https://rosamartinez.org/wp-content/uploads/2015/11/Migraciones-y-Cambio-Climatico_EACHFOR.pdf
van der Geest K (2011a) North-South migration in Ghana: what role for the environment? Int Migr 49:69–94. https://doi.org/10.1111/j.1468-2435.2010.00645.x
van der Geest K (2011b) The Dagara farmer at home and away: migration, environment and development in Ghana. [PhD thesis]. Leiden University African Studies Centre, Leiden. https://scholarlypublications.universiteitleiden.nl/handle/1887/17766
van der Geest K, Vrieling A, Dietz T (2010) Migration and environment in Ghana: a cross-district analysis of human mobility and vegetation dynamics. Environ Urbanizat 22(1):107–123. https://doi.org/10.1177/0956247809362842
van der Land V, Romankiewicz C, van der Geest K (2018) Environmental change and migration: A review of West African case studies. In: Mcleman R, Gemenne F (eds) Routledge handbook of environmental displacement and migration, Routledge, pp 163–177. https://collections.unu.edu/eserv/UNU:6480/Vanderland_etal_2018_MIG_ENV_WAFRICA_PREPRINT__META.pdf
Veronis L, McLeman RA (2014) Environmental influences on African migration to Canada: focus group findings from Ottawa-Gatineau. Popul Environ 36(2):234–251. https://doi.org/10.1007/s11111-014-0214-3
Vinke K, Rottmann S, Gornott C, Zabre P, Schwerdtle PN, et al. (2021) (2021) Is migration an effective adaptation to climate-related agricultural distress in sub-Saharan Africa? Popul Environ. https://doi.org/10.1007/s11111-021-00393-7
Webster SD, Mann RE, Carter AJ, Long J, Milner RJ, et al. (2006) Inter-rater reliability of dynamic risk assessment with sexual offenders. Pyschol, Crime Law 12(14):439–452. https://doi.org/10.1080/10683160500036889
Whisler RL, Waldorf BS, Mulligan GF, Plane DA (2008) Quality of life and the migration of the college-educated: a life course approach. Growth Chang 39(1):58–94. https://doi.org/10.1111/j.1468-2257.2007.00405.x
Wiegel H, Warner J, Boas I, Lamers M (2021) Safe from what? Understanding environmental non-migration in Chilean Patagonia through ontological security and risk perceptions. Reg Environ Chang 21(43):1–13. https://doi.org/10.1007/s10113-021-01765-3