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Contextualising environmental and climate change migration in Uganda

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ABSTRACT

The complex linkage between environment, climate change and migration is increasingly capturing global debate. Uganda faces widespread environmental degradation and high vulnerability to climate change impacts that cause livelihood hardships, inducing human mobility. However, the environment, climate change and migration nexus is not well understood and documented, although advocacy to address the livelihood challenges associated with environmental and climate-induced migrations is on the rise. This paper addresses this knowledge gap and presents findings from a review of literature, complemented by key informant interviews and group discussions conducted in the Karamoja, Mt. Elgon and Teso sub-regions of Uganda. The findings show that some socio-economic hardships that cause migrations like natural resources scarcities (water, pastures and fertile soils), hunger and food insecurity and conflicts are linked to slow-onset processes/events related to environmental degradation, rising temperatures and desertification, compounded by sudden-onset events/disasters including; drought, rainstorms, flooding and landslides, that threaten livelihood security and trigger voluntary and forced migrations. Migration also occurs as a coping strategy to environment and climate shocks and stresses. However, empirical research evidence on the numbers of people who have migrated because of environmental change or climate change is still lacking as more research focus has been on the socio-economic and political drivers of migration. Deeper empirical research that incorporates spatial analyses on how the environmental and climate parameters induce migrations is necessary to provide an evidence base to inform transformative policy processes and actions that address human mobility challenges and build resilient societies in Uganda.

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1. Introduction

Globally, migrations have been an integral part of human history and some of them driven by environmental change and climate stressors. The International Organization for Migration (IOM) defines environmental migration as human mobility driven by sudden or progressive changes in the environment that adversely affect people's living conditions that they are obliged to leave

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their habitual homes either voluntarily or involuntary within their countries or abroad either temporarily or permanently (IOM 2011). Climate migration refers to the relocation of people due to climate-related events, hazards and disasters, hence making climate migration a component of environmental migration. Schoonover et al. (2021) observe that environmental changes interact with climate change to threaten food, economic and livelihood security, causing migration, and the Inter-Governmental Panel on Climate Change (IPCC) fifth assessment report reveals that climate change is among the drivers of migration with climatic and environmentally induced migrations taking place within countries (IPCC 2014). The primacy of the environment, including climate, in sustaining livelihoods makes its degradation cause or exacerbate resource scarcity thereby threatening people's socio-economic welfare (Haynie et al. 2021) and triggering migration. Besides, Hunter et al. (2015), Mcleman (2017) and McLeman (2014) posit that relocating from challenging environmental conditions has for long been an adaptation strategy. Ultimately, environmental migration results from rapid-onset trigger events and catastrophes such as storms, floods, landslides and/or earthquakes cause displacements and relocations, or slow-onset processes like rising temperatures, land degradation and the long-term dry spells/drought effects on agriculture and livelihoods.

The World Economic Forum (2017) estimates that migrants account for one billion people, with many temporarily or permanently displaced by natural hazards and conflicts (Stapleton et al. 2017). The IPCC posits that human migration is the greatest single most impact of climate change (Dehcheshmeh and Ghaedi 2020), while the Internal Displacement Monitoring Centre (IDMC) estimates that 75% of the global displacement cases in 2020 (about 40.5 million people) are largely from weather-related events/disasters (IDMC 2021). Globally, interest in understanding the interaction between environmental degradation, climate change and migration is growing (Goodwin-Gill and McAdam 2017) and for Africa where exposures to climate risks are high and migrations have attracted international concern, it is a motivating research area. In Uganda, the climate is changing and environmental and climate-induced migrations have been reported (Population Secretariat (Government of Uganda) 2012). However, research evidence on the extent to which migrations are induced by environment and climate change is still lacking.

Climate change and forced migration (CCFM) studies have for over three decades been dominated by terminologies like "environment refugees', "climate refugees' or "climate migrants', but some lack critical analysis (Su 2014). Indeed, Baldwin et al. (2014) reveal that environmental or climate "refugees' remain a theoretical possibility but neither exists nor clearly defined. Although scholars disagree on the nexus between climate change, environment and migration, the IPCC and IOM have previously warned that human migration and displacement could be the gravest climate change effect, and it could escalate environmental migrations (IOM 1992). In other words, some studies (e.g. IOM 2018; Jha et al. 2018; Luetz and Merson 2019) consider migration both a consequence of climate change and an adaptation strategy, while others argue that environmental and climate changes are multiplier stressors that cause migration (Scheffran et al. 2012; UNFCCC 2015). In addition, the Collaborative Adaptation Research Initiative in Africa and Asia-(CARIAA 2019) and (Cattaneo et al. 2019) argue that migration is among the responses to climatic shocks and stresses, and hence the United Nations (UN) 2018 Global Compact for Safe, Orderly and Regular Migration highlights the utility of understanding environmental degradation in addressing migration (CARIAA 2019; United Nations 2018).

According to Suhrke (1994), the CCFM debate has traditionally been divided between minimalist and maximalist schools. The maximalists cast a direct causal link between environmental degradation and migration, and sometimes present alarming numbers about future climate migrants (Su 2014). The minimalists dispute such quantitative reasoning arguing that environment or climate change cannot singularly induce migration (Su 2014; Suhrke 1994). Existing evidence seems to indicate that minimalist arguments are more appreciated by scholars (Baldwin et al. 2014). But, the Foresight Report on Migration and Global Environment Change argues that the range and complexity of interactions between migration drivers rarely makes it possible to distinguish human mobility as arising from only environmental factors (Foresight 2011). Further,

CARIAA (2019) considers that only a weak linkage between climate change and migration exists, and with the exception of extreme conditions, environmental change alone does not cause migration, although some scholars postulate that slow-onset environmental changes cause migration (Black et al. 2011; Parnell and Walawege 2011). Stapleton et al. (2017) posit that environmental change and climate-related impacts make some areas less habitable and others more habitable, creating the potential for migration but, critiques argue that data and information on key drivers of environmental migration are lacking (Neumann and Hilderink 2015).

Understanding the linkage between migration and livelihoods is important in addressing environmental and climate-induced migrations. Households and individuals whose livelihoods heavily depend on nature may migrate to diversify livelihoods and income sources (Mcleman 2017). Based on the foregoing, this study draws from the Sustainable Livelihood Framework (SLF) developed by Chambers and Conway (1992) and the United Kingdom (UK) Department for International Development's (DFID 1999) as a basis for analysing the linkage between environment, livelihoods and migration in Uganda. The SLF suggests that degraded environments erode main livelihood assets that sustain households thereby increasing socio-economic vulnerabilities that influence migration decisions (DFID 1999). The SLF provides three factors that could affect household or individual livelihood opportunities and facilitate their migration decisions. These factors include; (i) livelihood assets that may be human or financial capital; (ii) vulnerability context that includes employment, conflict or environmental degradation; and (iii) structures and processes that include legal and policy frameworks (DFID 1999). The SLF argues that livelihood opportunities interact with three migration phases that include; (i) aspiration/s, (ii) decision to migrate and (iii) actual migration. In this paper, we focus on how, when and why household or individual livelihood opportunities interact with environmental and climate vulnerabilities within the migration phases. The main question we are answering is "how does environmental degradation induce livelihood vulnerabilities that facilitate households or individuals to cross each of the three migration thresholds?". According to Chambers and Conway (1992) and DFID (1999), "a livelihood is sustainable when it can cope with and recover from stresses and shocks … " and Fratzke and Salant (2018) observe that where environmental degradation, conflict or loss of key livelihood assets make livelihood strategies insufficient to meet household needs, migration may become an adaptation strategy. Some studies indicate that environmental degradation and environmental change like rising temperatures, drought and rainfall variability are more likely to prompt internal short-distance migration rather than international migration because households prefer to remain closer to their communities of origin, although the evidence remains somewhat inconclusive (Fratzke and Salant 2018; Gray and Wise 2016).

Further, evidences suggest that environmental degradation, compounded by climate change, undermines the ability of ecosystems to deliver provisioning and supporting ecosystems services, which erodes livelihoods, thereby driving mobility. Warner (2010) points to the increasing droughts, water shortage and declining land productivity for agriculture as underlying causes of human mobility. While there is significant potential for environmental change to cause migration, Crate and Nuttall (2016) argue that environmental change has to interact with the socio-economic, political and demographic drivers for migration to occur. Some studies also suggest that some households may prefer not to migrate due to sudden-onset disasters like floods, storms, landslides if opportunities for diversifying livelihoods or rebuilding the damaged infrastructures exist (Fratzke and Salant 2018; Rahman et al. 2015).

The arguments for and against the reality of environment and climate migrants notwithstanding, the debate on climate-induced migration continues in political and security arenas (Butros, Brodén Gyberg, and Kaijser 2021). The UN Security Council and General Assembly have discussed the crucial role of migration in the securitisation of climate change, and the 2013 Berlin speech by the former US President Barak Obama warned about "new waves of refugees" arising from climate change. The Cancun Adaptation Framework calls for measures to appropriately enhance understanding, co-ordination and co-operation on climate change-induced displacement, migration and planned

relocation. Furthermore, IPCC Fifth and Six Assessment Reports (IPCC 2014; 2021) present migration as a dominant theme resulting from climate change but also, an effective means for adaptation. Consequently, as climate-induced migration increasingly attracts the attention of different political, Civil Society Organisations (CSOs) and policy actors, evidence linking climate change, environmental change and migration with associated challenges and opportunities is also rising.

IOM considers environment and climate migrations as human mobility driven by sudden or progressive changes in the environment and climate that adversely affect people's living conditions, compelling them to either temporarily or permanently move within their countries or abroad (IOM 2011). Contextually, climate or environmental migrants can be regarded as individuals, households or groups of people who leave their homeland when climate risks and environmental shocks make them inhabitable (Kaczan and Orgill-Meyer 2020). However, climate or environmentally induced migrations are complex and multi-dimensional with environmental and climatic drivers of migration being visible and others invisible. Indeed, some of these drivers cause conflicts and people are forced to flee the conflict-stricken areas (Abdul-Ghani et al. 2019).

This article contextualises the nexus between climate change, environmental change and migration in different typologies including; seasonal or circular migration, displacement, transhumance and relocation induced by either slow or sudden processes/events. Disaster displacement is where people are forced or obliged to leave their homes or places of habitual residence due to a disaster or in order to avoid the impact of an immediate and foreseeable climate or environmental hazard and disaster (Bradley and Cohen 2010). Transhumance occurs in pastoral livestock production systems and is characterised by seasonal movement of herds and herders to access water and pasture, between complementary ecological areas within a country but also across borders between countries (Apolloni et al. 2019). Seasonal migration involves movement with each season and/or in response to labour, environmental and/or climate conditions (Warner 2010). Circular migration is the fluid movement of people between countries or within a country, including temporary or long-term movement that may be beneficial to all involved if it occurs voluntarily and is linked to the labour needs of areas of origin and destination (Locke et al. 2000). Finally, planned relocation is where persons or groups of persons move or are assisted to move away from their homes or places of temporary residence, are settled in a new location, and provided with the conditions for rebuilding their lives (Burson et al. 2018).

In Africa, examples of the climate-induced migration are not lacking. Droughts have led to outmigration in rural Ethiopia (Gray and Mueller 2011) and flooding and droughts in Namibia cause seasonal displacement and widespread rural-urban migration (Heita 2018). Further, torrential rains caused floods that displaced 230,000 people in Malawi (UNICEF 2015). Besides, the impacts of climate change are reportedly linked to rural–urban migration in Morocco with many people settling in slums of Casablanca and Rabat cities, and get exposed to new waves of urban climate vulnerabilities, most especially floods (IOM 2016).

2. Environment and climate migration in Uganda

In Uganda, environmental degradation and the impacts of climate change are serious challenges that are linked to forced migration, conflict and human insecurity (Population Secretariat (Government of Uganda) 2012). The widespread environmental degradation adversely affects the delivery of ecosystem services, productivity and quality of life of the population in the country. Climate change is already affecting Uganda and vulnerability to its impacts is high. Scientific evidence points to increased heat waves, rainfall variability, frequent and severe droughts, intensive rainfall, floods and landslides that are projected to increase in frequency, intensity and severity (MWE 2015 Sseviiri et al. 2022). Drought is particularly causing severe water stress and reduced agricultural productivity, with subsistence rainfed agricultural systems disproportionately affected. Uganda's cattle corridor region is the most vulnerable to more frequent and severe droughts that cause

water shortage and inadequate forage (Kiggundu et al. 2018), leading to seasonal migrations in search of water and pastures for their livestock.

Household livelihoods in Uganda are heavily dependent on natural resources, with land being the prime capital asset available for crop and livestock production, and the ecosystems (forests, wetlands, rangelands, etc.) for ecosystem services provisioning. Environmental degradation manifests through rising deforestation and forest degradation, wetland reclamation, biodiversity loss, soil erosion and infertility, desertification driven by population growth (including refugee influx), rapid urbanisation and consumptive use of natural resources (UNHCR and UNCDF 2018). Environmental degradation reduces ecosystems and livelihood resilience to climate variability and change. For example, severe droughts cause food, water and pasture shortages, especially in the Karamoja sub-region, leading to transhumance – a situation that is worsening in a changing climate. Besides, disasters cause environmental degradation in form of soil erosion, soil fertility and biodiversity losses (FAO 2015) that in turn stress people's livelihoods, thereby inducing migration. Generally, environmental degradation and climate change are a challenge to agricultural livelihoods (Cooper and Wheeler 2017) and yet future climate risks are expected to exacerbate livelihood vulnerability.

However, climate and environmental change-induced livelihood vulnerabilities are also shaped by socio-economic, political and environmental factors. With the multi-dimensional socio-economic, political and environmental shocks and stresses, communities in Uganda have historically adjusted livelihood, with migration among or as an adaptation strategy/ies. Scholars like Maharjan et al. (2020); Sunam et al. (2021) observe that migration is a major strategy for diversifying livelihoods and increasingly enables populations to meet non-nature dependent aspirations. Therefore, livelihood aspirations, assets and urgency define decision/s and ability/ies to relocate. But, migration implications can be two-fold, i.e. it may improve the well-being and reduce risk exposure, or could exacerbate vulnerability when migrants penetrate into precarious and irregular livelihoods (Chandrasekhar and Mitra 2019; Szabo et al. 2018). Further, migration can be costly, e.g. there are costs incurred during transit that put a burden to those left behind, and can also lead to the deterioration of social capital, community identities and spaces which in turn adversely affect livelihoods. Therefore, the choice to move is dependent human, financial and social resources as well as aspirations that trapped populations especially the poor are unable to meet.

The IOM (2015) recognises that environmental and climatic shocks and disasters are becoming major drivers of displacements and migration in Uganda. Landslide events occurrences in the Mt. Elgon region have increased for the last decade and caused displacements. Floods have also affected many areas causing displacements in various parts of the country, while frequent droughts, water shortage and food insecurity have caused outward migrations from Karamoja into neighbouring regions. Gray (2011) reveals that environmental migrants are increasing within major urban centers. Migration is a key livelihood strategy in low-income contexts and often identified as a significant approach to strengthen rural livelihoods and adapt to climate risks (Adger et al. 2015; Warner and Afifi 2014).

However, limited evidence constrains a deeper understanding of environment and climate change migrations in Uganda, yet migration is oversimplified to political and military contexts (Arpitha and Mishra 2019), and considered as an issue of competition and tensions linked to pervasive conflict, disease and resource scarcity (Blocher 2016; McLeman 2014). Consequently, few migration policy initiatives address the effect of environment and climate on livelihoods, human security and mobility (Laczko and Piguet 2014; Singh 2019). How climate and environment migration manifests in Uganda and its implication on livelihoods remains unexplored, and yet the limited existing evidence is scattered in different disciplines. This paper addresses the research gap by contributing to the literature on linkages between environment, climate change and migration in Uganda to inform migration and adaptation policies.

3. Materials and methods

The study was conducted using a desk review of literature, complemented by consultations conducted through group discussions and key informant interviews in three districts of Kotido, Bududa and Ngora districts randomly selected from the Karamoja, Mt. Elgon and Teso sub-regions of Uganda respectively. Based on the study findings, research gaps were analysed and documented to inform future studies and policy directions.

3.1. The study areas

The choice of the case study regions i.e. Karamoja, Mt. Elgon and Teso was informed by their high exposure to the effects of climate change and prevailing widespread environmental degradation that induce human mobility and displacement in the regions.

Karamoja is a semi-arid sub-region located in north-eastern Uganda, and is part of the "cattle corridor region".[1] Karamoja covers 27,000 km and is home to over 1.2 million people whose dominant economic and livelihood activities are pastoralism and agro-pastoralism (Uganda Investment Authority 2016). The region is characterised by environmental and climate extremes including desertification, ecosystem degradation, high temperatures, recurrent drought and unreliable rainfall. Food insecurity is very unprecedented and poverty levels in the region are the highest with 60.8% of the population living below the poverty line (UBOS 2016; 2017). Food insecurity, water and pasture shortages are the main drivers of human mobility in the region. Kotido district was randomly selected from the region for field visits and consultations.

The Mt. Elgon region is located in Eastern Uganda and is comprised of a large extinct volcano that straddles into Western Kenya. The region is made of five Bugisu districts and three districts of Sebei, is mountainous and densely populated with crop cultivation as the main activity in the agro-ecological zone of "*coffee-banana farming system*". The population density in the region has led to immense land shortage. According to UBOS (2016), the population density in the region is 952 persons/km^2 way above the national average of 124 persons/per km^2. Poverty levels are among the highest in the country with 40.9% of the population living below the poverty line (UBOS 2016; 2017). Additionally, the area is highly degraded by deforestation and protected areas or riverbanks encroachment. Intensive rainfall, flooding and landslides are common hazards that often cause the displacement of people. Bududa district was randomly selected from the region for field visits and consultations.

Teso sub-region lies in Eastern Uganda and is also part of the cattle corridor. The main climate hazards experienced are drought and flooding, and are directly linked to famine, displacements and loss of lives. Teso compose nine districts with a population of 1.8 million people. Teso is known for ox-traction with an economy based on subsistence agriculture and livestock rearing (UBOS 2016). Poverty levels in Teso are among the highest with 40.5% of the population living below the poverty line (UBOS 2017). Ngora district was randomly selected from the region for field visits and consultations.

3.2. Desk review of literature

To identify relevant literature, a search was conducted in Google, Google Scholar and Scopus databases using the key search words that included: "climate migration", "environmental migration", "climate refugees', "environmental refugees', "environmental migrants' and "climate migrants'. Other key words searched included "climate change", "environmental change", "migration", "displacement" and "human mobility". The review question was, "how do environmental and climate change relate with migration in Uganda"?. All the searches were conducted in isolation and combination using "AND", "OR" conjunctions. The search was expanded to include climate-related terms such as rainstorms, flooding, drought, landslides, heat waves and water scarcity. The databases and search engine were considered appropriate given their unrestricted access and the database

accessibility restrictions that constrained the inclusion of several databases while searching primary studies. Besides, a minimum of two databases are recommended for a comprehensive search of primary studies and other literature, and an excellent coverage to minimise bias and increase the validity of a systematic review (Higgins et al. 2019; Mamikutty et al. 2021). The literature search conducted is comprehensive enough to make credible conclusions that are collaborated with primary data from study areas.

The search considered literature published in English between 1990 and 2021, drawn from a diverse geographical location globally and specific focus was later put on Uganda. The documents reviewed were research articles, book chapters and grey literature. The initial search returned 6973 results but was then subjected to inclusion and exclusion criteria, through which 122 were selected from both Scopus and Google Scholar. From the 122 initially selected, 95 were excluded and 27 included based on their titles, abstracts, methodology and conclusions. The review expanded focus beyond the traditional scholarly publications to grey literature like government/organisational documents and reports, research reports, statistical reports, conference proceedings, working papers, policy statements and newsletters on migration, environment and climate change and the search returned 47 publications. The grey literature was searched through Google and institutional websites. In all, 74 publications were selected and considered for review.

Checklist items like author(s), publication date, abstract, summary and findings on migration, environment and climate change, study area, methods, publisher and digital object identifier (DOI) were used to create a profile of chosen publications. Each publication was independently assessed by the second and third authors, and if there was a reason to reject one, it was forwarded to the first author, whose decision was final. Quality appraisal of included literature was undertaken using the ten-item Critical Appraisal Skills Programme (CASP) as a tool commonly used in qualitative research (Long et al. 2020). The authors independently assessed the quality of each study and collectively reached a consensus following thorough discussions. However, there was no literature excluded on grounds around quality. All the different types of materials were then subjected to content analysis to identify perspectives and content on climate change and environmental migration.

3.3. Consultations

To reinforce findings from the literature, we conducted group discussions, expert interviews and key informant interviews (***See Annex 1 for guiding questions***) at national and local levels between April and June 2019. Three sub-regions purposively selected due to the prevalence of severe environmental degradation and their being climate change vulnerability hotspots. The landscapes are mainly affected by drought (i.e. Kotido district in Karamoja), flooding (Ngora district in Teso) and landslides (Bududa district in the Mt. Elgon region). While national level expert interviews were held with academics, researchers, policy makers, knowledge brokers in the fields of environment, climate change and migration, local level key informant interviews were conducted in selected districts.

Six national level key informants were interviewed, involving two policy makers from the Ministry of Water and Environment (MWE), two experts/researchers and two staff from IOM mission in Uganda. At the district level, 18 key informant interviews were carried (six per district), including district technical staff (population, environment and community development officers), one interviewee from a CSO in the district, as well as one adult male and a female migrant identified from a community where climate migration had occurred. Only two migrants were selected for consultation due to the limited reach of many migrants and their availability given that many had migrated outside the study districts. Further, one Focus Group Discussion (FGD) was conducted in each district, composing eight participants selected from a climate change and migration hotspot subcounty (i.e. Pengen in Kotido, Mukura in Ngora and Bushika in Bududa). The participants in the FGDs included an elderly man and woman, youth representative, a representative of a women

group, a local leader/politician, a migrant, the sub-county chief and a representative of an NGO operating in the selected sub-county. In all 24 persons participated in the FGDs out of which 50% were female.

The consultations sought to deepen understanding of whether and how environmental and climate change impacts affect livelihoods to the extent of driving migration and/or displacement of people. Through the interviews and group discussions, the environmental and climatic shocks and stresses affecting communities were identified and the ways through which they induce displacement and migrations established and documented and triangulated with the literature findings.

4. Results and discussions

4.1. Migration dimensions: trends and drivers

Migration has been an integral part of Uganda's history (Mukwaya et al. 2012) linked to political conflicts, population growth, urbanisation and environmental changes (Mubaya et al. 2015), and various forms of migration have occurred such as nomads, labour migrants, refugees and internal displacements (IOM 2015). Historically, migrations in Uganda were defined by expansionistic agendas and the desire to access resources that resulted into conflicts beyond territorial confinements of pre-colonial traditional chiefdoms and kingdoms. During the colonial and post-colonial periods, migration was mainly driven by the economic and labour opportunities in urbanised, mining and industrial areas of Kampala, Kasese and Jinja as well as job opportunities in commercial farms in Central Uganda. Migration during the colonial period was mainly associated with conflict and violence, but economically induced migrations begun in the 1950s and 1960s where labour migrants from the southwest (Kigezi) and northwest (West Nile) relocated to sugarcane plantations and private coffee farms in Central and Eastern Uganda, and to the Jinja industrial zone (Mukwaya et al. 2012). The rapid population growth and land shortage in western Uganda led to unprecedented land fragmentation and land degradation that made human mobility inevitable and the resettlement of people from the densely populated areas to less populated parts of western and central Uganda (Mukwaya et al. 2012). Post-independence civil wars are reported to have triggered migrations in Central and Northern Uganda. The 1981–1985 civil war displaced many people from the "Luweero Triangle" in Central Uganda (Ntozi et al. 2011), and in northern Uganda, up to 600,000 people migrated to towns during the 1990s and 2000s civil war caused by Lord's Resistance Army (LRA) insurgency. Besides, more than 2000 people have reportedly been displaced by the instabilities from cattle rustling and resource conflicts in the Karamoja sub-region (IOM 2015).

Migrations also resulted from ethnic cleansing, e.g. expulsion of Ugandans of Asian/Indian origin in 1970s (Flahaux and Haas 2016), and the hosting of refugees and asylum seekers displaced from neighbouring conflict-stricken countries of Rwanda, Burundi, DR Congo and South Sudan (The World Bank Group 2016). In addition, displacements caused by political unrests in northern Uganda in the 1990s and 2000s and the shrinking livelihood opportunities in different parts have driven rural-urban migrations and concentration of people in internally displaced persons (IDPs) camps in Gulu and Kasese. The indigenous Batwa communities were also evicted from Bwindi, Mgahinga and Echuya forest reserves in the 1990s. Elsewhere, youth unemployment is high across the country, forcing many young people to migrate to urban areas searching for jobs and income generating opportunities, and better social services and amenities (Twinomuhangi and Sseviiri 2020).

4.2. Framing environmental and climate change migration

4.2.1. Resource scarcity, environmental change and migration

The study findings revealed that the consumptive utilisation of natural resources causes severe environmental damage that reduces livelihood sustainability. Most households in the study areas depend on natural resources especially those engaged in agriculture, livestock production,

tourism, forestry and fishing. Such resources have been and continue to be severely degraded. Further, the increasing refugee influx in Uganda is escalating land, forest and wetland degradation and leading to competition and conflicts on access to farmland, water and cooking energy amongst refugee and host communities in West Nile and Western Uganda (UNHCR and UNCDF 2018; Lwasa et al. 2021). Interviews revealed depletion of forests and wetlands, soil erosion and declining soil fertility that are increasing livelihood hardships and increasing poverty. Barihaihi (2010) contends that people who can no longer secure livelihoods in their homelands, whether due to drought, soil erosion, desertification, deforestation and other environmental shocks seek sanctuary elsewhere. Furthermore, as environmental pressures increase, so do conflicts, and it is feared that migration and resource conflicts could become a leading cause of future wars and civil strife in Uganda. Approximately 83% of the interviewees indicated the prevalence of migration in Renden sub-county, Kotido district due to rising soil infertility, water and pasture shortage that compromise agro-pastoral livelihoods. The interviews and group discussions revealed that insecurity arising from cattle rustling along migratory routes is threatening the entire Karamoja region, with spillover land and resources conflict in the Teso and Acholi sub-regions. The Kotido community development officer revealed that;

> The districts in Karamoja have become resource conflict hotspots during drought. Some people are killed … …. the children who take care of the animals are abducted and some killed.

Literature depicts how environmental change drive migration in Uganda where environmental shocks and stresses including water scarcity, disease epidemics and natural hazards (droughts, floods and landslides) are major drivers of human mobility in Uganda (IOM 2015; Marchand et al. 2017). Further, soil degradation reduces agricultural livelihoods triggering rural-rural migrations and rural-urban migration (Gray 2011). The results showed that in the mid-nineteenth century, over-population, land shortage, land fragmentation and land degradation in the Kigezi sub-region (south-western Uganda) reportedly induced migrations of thousands of people in search for fertile arable land. Mugisha (2002) indicates that the 1943–1944 droughts, coupled with overcultivation, drastically reduced land productivity in the region, compelling the British colonial government to initiate the resettlement of the Bakiga (people from Kigezi) from the present-day Kabale, Kisoro, Rubanda and Rukiga districts, to the then less populated northern parts of Kigezi (current Kanungu and Rukungiri districts). With time, the land in the destination areas also became degraded resulting in gradual voluntary migrations into Ankole, Tooro and Bunyoro sub-regions between 1955 and 2000 in search for more vacant and productive land (Hartter et al. 2015). To date, the Bakiga comprise a significant proportion of the population of these sub-regions owing to their historical resettlement and voluntary migrations.

4.2.2. Climate change and gendered dimensions of mobility

The results reveal that most critical climate change stressors that drive human mobility are related to variations in rainfall patterns, increased frequency, and severity of drought, rising temperatures, which cause livelihood hardships by adversely affecting agricultural production, water availability, food security and general human well-being. Increased drought occurrences are causing a decline in agro-pastoralism as both men and women find it hard to continue grazing and tilling land respectively. Recently, male pastoralists are moving longer distances in search for water and pastures for their livestock, while women tend to relocate closer to wetland corridors that can sustain crop growth during dry periods. A combination of water shortage, crop failure/losses, shortage of pastures and livestock impoverishment were reported to be eroding livelihoods and human welfare in Karamoja through reduced food and water availability and incomes, and ill health with the worst hit being women and children. Indeed, climate-induced livelihood shocks are making it inevitable for more women, youth and children to migrate to centers, including Soroti, Gulu and Mbale cities, and to as far as Jinja and Kampala cities. Extreme temperatures have been associated with reduced work hours on farming, further reducing agricultural productivity and causing mobility to

towns in anticipation of non-farm livelihood opportunities (Antonelli et al. 2021). Floods, landslides, droughts, water stress and famine are reported to have resulted into forced migration in some parts of northern and eastern Uganda (Population Secretariat (GoU) 2012). Droughts and floods are also reported to be intensifying pressure on natural resources, disrupting agricultural production and threatening food security which then induce migration of humans and their livestock, most especially in the cattle corridor of Uganda (Akwango et al. 2016). The classic example is pastoral societies in Karamoja where droughts cause water and pasture shortages leading to migrations. The FGDs revealed that drought is the predominant cause of migration within the Kotido district as agro-pastoralists move to the greener belts of Lobonya and Moruititi to improve agricultural and livestock productivity.

Flooding in the different parts of Uganda causes population mobility, with the recent floods in western Uganda having displaced over 120,000 people, as many rivers burst their banks (Floodlist 2020). While intense rainfall events imply the availability of more water to harness, it sometimes leads to run-off and flooding that induce displacements. In the urban space, heavy storms damage housing, resulting in displacement. For rural contexts, heavy rainstorms and prolonged drought drastically affect agricultural productivity and some people (including children) are forced into temporally or permanent migration in search of better living alternatives most especially in urban areas.

> Children, and most especially girls, are migrating from rural Karamoja to urban centers towns as far as Soroti, Mbale and Kampala. The migrations are mainly driver by food shortage and hunger caused by drought and crop failure. Some of these child migrants are employed as domestic servants or maids, but others end up as street children in cities. **Extract from the group discussion in Kotido district.**

Climate change also exacerbates the degradation of biodiversity and fragile ecosystems like forests, wetlands and mountains. Call and Gray (2020) observe that climate anomalies are the primary contributor to environmental migration in Uganda with hot spells increasing temporary migration and long-term heat stress inducing permanent migration. Besides, this study found out that water logging often forces people especially youths and women to move to drier areas for resettlement. Droughts and longer dry spells often make some areas less productive which spurs migration and encroachment on fragile ecosystems for settlement and agriculture (Population Secretariat (GoU) 2013). Some migrations have been directly attributed to climate change, especially in the semi-arid lands which experience severe drought (Oucho 2015). For example, adverse weather patterns in the Eastern and Northern Uganda are reported to have caused the temporary displacement of 48,000 people and affected over 2,000,000 million persons between 2007 and 2010 (Abebe 2014). In addition, the 2006 and 2015 El-nino rains submerged 80% of the farmlands in Teso, Lango and Acholi sub-regions causing the displacement of over 2000 people (Inter-Agency Regional Analysts Network 2015). From 2017 to 2020, a total of 714,000 people were displaced by disasters (443,000 people) and conflicts/violence (271,000 people) across Uganda (IDMC 2021).

4.3. Case studies on environment and climate migration

Table 1 indicates main drivers, migration forms and social groups likely to migrate in the three study landscapes. Migrations were mainly internal, with both voluntary and forced migrations or displacement observed in all study areas. The migrants' destinations were observed to be within their origin district and sub-regions and to other areas within Uganda, more especially to neighbouring districts and sub-regions, and to urban areas. However, for the Karamoja region, and to a lesser extent Mt. Elgon, cross-border migration to and from Kenya reportedly occurs.

The main drivers of migration across the three study landscapes were climate hazards and disasters, desertification, environmental degradation, food insecurity and unemployment. Forced migration and displacements occurred significantly in Ngora (Teso) and Bududa (Mt. Elgon) districts as compared to Kotido (Karamoja). While in Ngora the main driver of displacement was flooding, in

Table 1. Drivers and forms of migration across the study landscapes drivers.

Main drivers of migration	Forms of mobility	Social groups likely to move	Destination areas
Kotido district sub-region			
• Drought induced water and pasture for livestock, • Drought induced crop failure and food insecurity • Desertification and land degradation erodes livelihoods resources, leading to resource scarcity and conflicts • Food insecurity and unemployment	• Transhumance in search of water and pastures for livestock • Labour migration • Seasonal/Circular migration	• Men and boys seasonally migrate with livestock in search of water and pastures • Unemployed youth (especially) young men seeking for employment in mines and urban areas • Women and girls who migrate within the region and urban areas seeking for food, jobs and livelihood • Children trafficked to urban areas, some end up as street children	• Within Kotido district and the wider Karamoja sub-region (Moroto, Napak, Nakapirpit, Nabilatuk districts) • The neighbouring Teso and Acholi sub-regions • Urban centres in Uganda, especially to Soroti, Mbale, Gulu and Kampala city • Cross -border migrations to Kenya (but Turkana pastoralists from north-western Kenya seasonally migrate to Karamoja in search of water and pastures).
Bududa district, Mt. Elgon sub-region			
• Floods and landslides that cause human displacement • Environmental degradation (especially declining soil fertility) that erodes main livelihood sources • Unemployment	• Forced migration or displacement • Seasonal/Circular migration • Planned relocation/ resettlement	• Men, women and children displaced by flooding and landslides. • Men, women and children who are resettled in Internally Displaced Camps (IDPs) or permanently resettled in Bulambuli and Kiryandongo districts. • Men and youth (boys and girls) seeking employment in urban areas.	• Within Bududa district and the wider Mt. Elgon region (Bulambuli, Sironko and Mable districts). • To neighbouring regions/ districts e.g. Kumi, Soroti, Pallisa, Katakwi districts. • Resettlement of displaced persons to Bulambuli and Kiryandongo districts. • Urban centres especially Mbale, Soroti, Jinja and Kampala. • Some cross-border migrations into Kenya also occur.
Ngora district, Teso sub-region			
• Flooding that causes displacement of people • Drought that causes water and pasture scarcity, crop failure and food insecurity • Desertification and environmental degradation (deforestation and declining soil fertility and desertification • Unemployment	• Forced migration or displacement • Transhumance • Seasonal/Circular migration • Resettlement of people affected by floods	• Men, women and children displaced by floods • Unemployed boys and girls relocating to urban centres looking for jobs and livelihood alternatives • Men who relocated to other districts and urban areas in search of employment • In-migrants into Teso sub-region (Ngora district) by of Karamojong pastoralists affected by drought searching for pastures and water • An influx of Bahima/Balalo pastoralists from western and central Uganda into Teso/Ngora searching for grazing lands.	• Within Ngora district and the wider Teso sub-region, especially to Kumi, Soroti, Katakwi, Amuria, Serere districts). • To neighbouring regions especially to Kumi, Pallisa and Napak districts • Temporary resettlement of displaced persons within Ngora district and the Teso sub-region. • Urban centres especially Soroti, Mbale, Iganga and Kampala city. • In-migrants into Teso sub-region by Karamajong and Bahima or Balalo pastoralists searching for water and pastures.

Bududa the main driver was landslides but flooding also caused some displacements. The persons displaced by flooding and landslides were resettled within their districts of origin and outside their districts.

Voluntary migrations were revealed in all the three districts. In Kotido (Karamoja) and Ngora (Teso), severe droughts caused water and pasture shortages and as an adaptation strategy, pastoralists engaged in transhumance mobility. However, transhumance movements were more frequent in the Kotido where the main economic activity is pastoralism than in Ngora where both cultivation and livestock rearing are major livelihood sources. Longer-term environmental changes caused by desertification and environmental degradation and compounded by the impacts of climate change were found to be the main causes land productivity (crop and livestock production) decline, that have overtime culminated in resource scarcity (of productive land, water and pastures), resource conflicts, food insecurity, unemployment and general livelihood hardships that gradually drive voluntarily migrations in the three areas. In Kotido and Ngora districts, desertification and declining soil fertility cause crop failure and food insecurity that have been gradual drivers of human mobility. In Bududa, land degradation, especially the declining soil fertility, has been a slow-onset driver of migration since the mid-twentieth century as households and individuals relocate looking for better livelihood opportunities, including better land and job opportunities.

The subsequent sections discuss the drivers, forms of migration and destination areas in detail.

4.3.1. Drought induced migrations in Kotido district, Karamoja

The main drivers of human mobility in Kotido district were drought and environmental degradation (see Table 1). Indeed, nowhere in Uganda have environmental and climate-induced migrations been pronounced than for the Karamoja sub-region, often described as one of the worlds' poorest places that have historically been chronically food insecure and relying largely on food relief (Gayfer et al. 2012). In Karamoja, desertification, widespread ecosystem degradation climate risk especially drought, water shortages, crop failure, chronic food insecurity and poverty are major challenges (Gayfer et al. 2012) that make communities unable to sustain livelihood. Apart from environmental degradation, dominance of nomadic pastoralism, cattle raids, resource conflicts and insecurity are other drivers of vulnerabilities (IOM 2015; Stites 2020) that cause migration. Human mobility in this region is likely to increase in the changing climate with average temperatures projected to increase by between +2.9°C and +4.9°C and annual rainfall projected to reduce by −133.5 and −159.2 mm, with a high likelihood of increased frequency and severity of extreme weather events expected (Baastel 2016).

Brown (2014) concurs with the findings from group discussions and key informants that recurrent droughts, natural resource conflicts and food insecurity compel some people to move to other regions as pastoral and agro-pastoral communities in Karamoja sub-region migrate with their livestock in search for water and pasture in the greener belts of the region (mostly river valleys and wetland areas) during dry seasons and droughts. And as the pastoralists and agro-pastoralists flock to the remaining few water sources, competition for these resources increases and often degenerates into violent conflicts and displacement. These migrations not only fuel grazing land and water conflicts among the pastoral and agro-pastoral communities in the Karamoja sub-region, but also neighbouring sub-regions (Teso, Acholi and Lango) as well as cross-border conflicts with the pastoralists from Kenya (Stites et al. 2007). The discussions conducted by the study also revealed that resource conflicts existed between the Pokot pastoralists from the Turkana area of Kenya and Karamojong communities as the former cross into Uganda with their livestock to find water points and grazing areas.

The drought and resource-driven migrations were largely seasonal or temporary in nature (up to 6 months), dominated by the men and boys (sons) while the women and girls are left behind, which causes family separations. The boys who migrate with their fathers often drop out of school, leaving domestic work and homesteads requisites to women and girls. 83% of the interviewees and 75% of FGD participants revealed this gendered pattern of climate and environment migrations and this is in agreement with studies of Adaawen et al. (2019), Egeru (2015), Gayfer et al. (2012) that link migrations in the region to food insecurity and intercommunity fights over natural resources that are linked to droughts.

A respondent from the MWE remarked;

> Extreme heat, drought and erratic rainfall are the most common and severe effects of climate variability in the Uganda, especially in the cattle corridor. When extreme heat and drought cause water shortage and crop failure, and livestock keepers migrate searching for pasture and water.

An elder and cultural leader from Kotido district also remarked:

> Drought causes crop failure that results in hunger and starvation, which forces some people (especially the youth and children) to migrate to other areas in search of food and other livelihood opportunities.

The Kotido Community Development Officer revealed that:

> There are high school dropouts during drought and prolonged dry periods because boys move far from their homes with livestock. Young girls face trafficking and child marriages as a way of getting survival income to support families … …

Hunger and food insecurity were found to be the primary drivers of migration in Karamoja as women, men and children move out of the region searching for livelihood security in the other productive regions of Uganda (IOM 2015; Stites 2020; Stites and Huisman 2010). Food insecurity driven migrations were dominated by women and children from Karamoja to neighbouring districts and major urban centers. Dimanin (2012) observed that most street beggars in Kampala (including children), are migrants from Karamoja driven by hunger and failed livelihoods following the collapse of social safety (Ayoo et al. 2013). According to Markandya et al. (2015), droughts have over the last two decades caused up to 50% crop losses for some households in the region, and for over five decades, World Food Program (WFP) provided food relief to over 90% of the Karamoja population (Gayfer et al. 2012). While CSOs have been recently supporting communities to engage in food production, many households remain food insecure mainly due to harsh climatic conditions that cause crop failure. Besides, the lack of gainful employment in Karamoja is driving young men and boys to migrate to gold mines and quarry sites in Kenya and South Sudan to seek livelihood sustenance alternatives, and this mobility has been on the rise in recent years (Ayoo et al. 2013), compared to the reported 65% in 2009 (Adger et al. 2009).

Nonetheless, for the Karamoja pastoralists, migration is a coping mechanism to the harsh environmental and climatic conditions as transhumance is central to their ecological and livelihood systems (Stites et al. 2007). Further, group discussions and interviews revealed that flood events and severe droughts force pastoralists to relocate to not only the neighbouring communities with in Karamoja but also to neighbouring sub-regions of Teso and Acholi, and even cross-border movements to Kenya.

> Most of the pastoralist migrants opt for Teso (Uganda) and north-western Kenya during prolonged drought seasons. In some cases, when flash floods occur and destroy housing, some households are forced to seek refuge in the towns of Kotido and Moroto. **Remarked by the Kotido District Environment officer.**

Social capital networks are reportedly critical for labour migration and survival of communities during periods of livelihood hardships. The key informants interviewed revealed that women and children migrants, heavily relied on established networks in urban areas and nearby districts. The migrants who had relocated to towns and outside Uganda (especially Kenya) and secured jobs were greatly contributing to the livelihoods of their households in areas of origin through remittances, which were either monetary, food or clothing. IOM (2015) is in agreement with this finding and observes that despite the distance, migrants maintain contact with family or relatives through regular mobile telecommunications and remittances. Moreover, UN-HABITAT (2012) argues that migrations foster local adaptation as households receive remittances (from migrant relatives) for livelihood improvement thereby preventing further migrations. This observation concurs with the study finding that migrant remittances supported households in responding to the effects of climate change and improving livelihoods through the acquisition of farm inputs to improve farming, acquiring assets for income generation (land, motorcycles,

etc.), starting businesses ventures, and meeting households needs like food, education and healthcare.

According to the World Bank (2017), remittances have over the past two decades been increasing steadily with Uganda being the sixth-highest recipient of remittances in Africa with over USD 1 billion. The challenge, however is that, a big proportion of remittances is for consumption, with some households receiving remittances in kind (clothing, footwear, vehicles and electronics) that may not necessarily sustain livelihoods. Besides, the rising number migrant workers and the remittance benefits has increased human trafficking and violation of migrant workers' rights due to the absence of adequate legal protection. Therefore, curbing the negative effects of remittances requires governance mechanisms that incentivise local investment for adaptation and sustainable livelihoods.

4.3.2. Landslide-driven migration in Mt. Elgon

The Mt. Elgon region is an important water tower that nourishes a vast array of rivers including the Nile and varied biodiversity hotspot (Sassen and Sheil 2013). However, ecosystem functionality and integrity of the region are highly compromised by widespread environmental degradation and the impacts of a changing climate. Land degradation is largely attributed to the high population densities that cause land shortage triggering widespread deforestation, riverbank degradation and encroachment on protected areas (Mt. Elgon National Park). Climate variability and change are additional challenges for the region, characterised by rising temperatures and extreme weather events especially rainstorms, flooding and landslides. The findings from interviews and group discussions in Bududa district revealed that up to 80% of the slopes are perceived to be unstable and highly susceptible to landslides and mudslide hazards, which heightens the likelihood of disaster displacement.

> The heavy rains that are occurring recently cause landslides … …. our communities are living in fear, distress, and panic. We are hoping that the government will relocate people and save them the distress. (**Observed by the Bushika sub-county chief in Bududa district**)

Environmental degradation is increasing the susceptibility of Elgon region to soil erosion, run-off, flooding and landslides that trigger displacements and migration (Masaba et al. 2017; Mugume et al. 2017; Namono et al. 2019). Between 1997 and 1999, landslides killed 48 people and displaced over 10,000 (Kitutu et al. 2004). The 2010 landslide triggered by heavy rains that lasted for over three months buried three villages, killed over 400 people and displaced 5000 people in Bududa district (Atuyambe et al. 2011; Mugagga et al. 2012). The displaced people were temporarily relocated to an IDP camp in Bulucheke, 7 km from the site of disaster (Atuyambe et al. 2011). The recent landslides that occurred in 2018 and 2019 claimed over 44 people and displaced about 200 (BBC 2018; Floodlist 2019). The projected change in climate will increase rainfall intensity, and with the absence of vegetation/forests, and prevalence of riverbank and upslope cultivation, more flooding and landslides will occur and cause more displacements in the future (Gorokhovich et al. 2013).

Responding to the landslide disasters, the government is applying resettlement/relocation as a risk mitigation strategy. The communities at high risk and displaced persons are being resettled in more stable and flat areas (Rukundo et al. 2016) including in Kiryandongo and Bulamburi districts. However, these areas are not appreciated since they are considered less fertile and occupied by herdsmen (Rukundo et al. 2015), and coupled with socio-cultural and economic factors, some resettled households have even relocated from resettlement areas back to their landslide-stricken communities/areas (Neema et al. 2018). But unlike the case of Bhola slum in Dhaka, Bangladesh where the community cannot go back to their area of origin (as it was devastated by a cyclone) which affects them mentally and psychologically (Ayeb-Karlsson 2021), the resettled people in Kilyandongo and Bulambuli are able to offset socio-economic hardships through maintaining identity, social ties, and are able to sustain their livelihoods through productive activities in their areas of origin while at the same time avoiding being trapped in vulnerable environments. The findings from

interviews and discussions revealed that some areas designated for resettlement are increasingly vulnerable to drought and flooding, and could further heighten environment and climate migrations or circular mobilities in Uganda. About 67% of the interviewees and 100% of FGD participants indicated that circular migrations are more common during the wet seasons as the resettled individuals return to their areas of origin to engage in crop farming and later in dry seasons to collect the harvests.

> The people displaced by landslides from Nametsi and Bufutsa (Bududa) were resettled in Kilyandongo and Bulambuli districts respectively. However, some of the resettled people return to their former homelands during the wet seasons to plant crops and also return to harvest them. **(Bududa Community Development Officer)**

4.3.3. Flooding and displacement in Teso

Teso region has an annual rainfall averaging between 1000 and 1350 mm but also experiences extreme temperatures of up to 35°C and 40°C (Egeru 2012) and drought occurrences. The relief slopes westwards and receives discharges from surrounding uplands and highlands in Sebei and Karamoja that cause flooding, submergence of farmlands and infrastructure accompanied with human death and displacement. Floods in Teso are said to have led to the displacement of 143,000 people following massive destruction of crops and crop failures, infrastructural breakdowns and contamination of water sources (Government of Uganda 2012; Mayega et al. 2015). The worst flooding incident was the 2007 heavy rains in Teso and surrounding regions that caused floods, and displacing over 50,000 households from their homes to other places that were relatively drier and safer for temporally settlements within makeshift camps (Friis-Hansen et al. 2013). And, when communities were recovering from the 2007 flooding, heavy rains re-occurred in November 2011, displacing many households in Teso, and damaged or washed away crop fields (Ntabadde 2011). In addition, the 2015–2016 El-nino rains also affected the livelihoods in Teso region and displaced many households (Ajayi and Mafongoya 2017).

The discussions and key informant interviews held in Ngora district further confirmed that while both droughts and floods are major climate threats, flood hazard mainly causes displacements and migrations as compared to drought. Besides, it was established that when droughts hit the neighbouring Karamoja, the pastoralists migrate with their cattle herds to the Teso searching for water and pastures, and often results into violent conflicts between the pastoralist migrants and host communities over pasture and water resources. Lately, the Balalo/Bahima pastoralists from western and central Uganda are also flocking in Teso sub-regions in search for grazing areas thereby occupying areas that were previously owned by flood victims.

> People displaced by flooding are provided temporary shelters until when water clears and they go back to their homes. However, some of those who have stayed longer from their homes return and find that their land has been occupied by other people, especially the Balalo pastoralists, which in leads to conflicts. Extract from the group discussions in Ngora district.

The environment officer of Ngora district revealed the existence of resource conflicts as follows;

> Many conflicts have risen over the use of wetlands due to struggle for grazing zones, watering points and tracks where livestock can pass to access watering points … … …. The wetland system extending from Aoja to Maito has been opened up for paddy rice cultivation, which has increased likelihood of conflicts … …. Claiming wetland ownership by some individuals some time results into conflicts among communities, which in turn worsens wetland management in many parts of the district.

5. Conclusions and research gaps

Significant research has been conducted to advance the understanding of the environmental and climate dimensions of migration over the last three decades, but questions still remain on how migration decisions are shaped by environmental change (Hunter et al. 2015). This study found

some evidence that associates both singular and the combined effect of environment and climate hazards, shocks and stresses to migration in Uganda. Both slow-onset processes, such as rising temperatures, desertification and environmental degradation, as well as sudden-onset events, such as storms, floods and landslides, have become more frequent and often result in livelihood hardships such as crop failure, loss of livestock, food insecurity, water scarcity, disease outbreaks and resource conflicts that can be linked to households and individuals' decisions to migrate temporarily or permanently, while others are displaced. However, subjectivities related to environmental and climate perceptions and how they influence migrations decisions still exist (Adaawen et al. 2019; Egeru 2015; Hunter et al. 2015). But with the majority of Uganda's population still dependent on natural resources, the widespread environmental degradation, compounded by the impacts of climate change are likely to induce more human mobilities that will further increase with projected changes in climate. The contemporary discourses continue struggling to better contextualise and conceptualise the climate-environmental change and migration due to the complexities of the migration – environment connections and inadequate empirical data and information about its scale and magnitude. Contradicting theories in the academia, policy and practice continue to derail comprehensive understanding of environment and climate-induced migration and policy response. While current research and policy tends to be skewed to political and violent conflict induced migrations (Arpitha and Mishra 2019), cases of migrations linked to slow-onset processes like drought or rainfall variability and sudden events like floods and landslides that cause resource conflicts and violence are known to occur in Uganda.

Currently, the existing knowledge on Uganda lacks extensive articulations of how migration is both a result of climate change and an adaptation strategy. Besides, the absence of a clear understanding of how migration decisions are induced by environmental change obscures disaggregation of socio-economic, political and environmental drivers of migration, and the ability to disaggregate the mobility into temporary and permanent migration (Call and Gray 2020). As global advocacy towards understanding and addressing climate or environmentally induced migration increasingly takes shape, empirical and in-depth research is therefore necessary to not only deepen understanding of the nexus between environmental and climate change migration, but also to provide the numbers of people who have migrated because of environmental and climate change risks. While addressing data demands across scales, socio-economic and environmentally disaggregated data is urgently required to offer entry points for longer-term development policy processes and transformative actions tackling the causes, effects and challenges of migration in the areas of origin and destination or relocation. Such knowledge easily provides forth and backward loops regarding environment and climate migration within contemporary scholarly, policy and practice debates globally.

Note

1. Uganda's cattle corridor is a broad zone stretching from southwestern to north-eastern Uganda, dominated by pastoral rangelands.

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References

Abdul-Ghani, Rashad, Mohammed AK. Mahdy, Samira MA. Al-Eryani, Florence Fouque, Audrey E. Lenhart, Abdulsamad Alkwri, Abdulsalam M. Al-Mikhlafi, André BB Wilke, Ahmed AQ Thabet, and John C. Beier. 2019. "Impact of Population Displacement and Forced Movements on the Transmission and Outbreaks of Aedes-Borne Viral Diseases: Dengue as a Model." *Acta Tropica* 197: 105066. doi:10.1016/j.actatropica.2019.105066

Abebe, Medhanit A. 2014. "Climate Change, Gender Inequality and Migration in East Africa." *Washington Journal of Environmental Law and Policy* 4 (1): 104–140. https://heinonline.org/hol-cgi-bin/get_pdf.cgi?handle=hein.journals/wshjoop4§ion=7..

Adaawen, Stephen, Christina Rademacher-Schulz, Benjamin Schraven, and Nadine Segadlo. 2019. "Drought, Migration, and Conflict in Sub-Saharan Africa: What Are the Links and Policy Options?" In *Current Directions in Water Scarcity Research*, edited by Everisto Mapedza, Daniel Tsegai, Michael Bruntrup, and Robert Mcleman, 15–31. Drought Challenges. Elsevier. doi:10.1016/B978-0-12-814820-4.00002-X.

Adger, W. Neil, Nigel W. Arnell, Richard Black, Stefan Dercon, Andrew Geddes, and David S. G. Thomas. 2015. "Focus on Environmental Risks and Migration: Causes and Consequences." *Environmental Research Letters* 10 (6), 060201. doi:10.1088/1748-9326/10/6/060201.

Adger, W. Neil, Irene Lorenzoni, and Karen L. O'Brien. 2009. *Adapting to Climate Change: Thresholds, Values, Governance*. Cambridge University Press, Cambridge, United Kingdom.

Ajayi, O. C., and P. L. Mafongoya. 2017. *Indigenous Knowledge Systems and Climate Change Management in Africa*. Wageningen, Netherlands: Technical Center for Agricultural and Rural Cooperation (CTA).

Akwango, Damalie Aliau, Bernard Obaa, Nelson Turyahabwe, Yona Baguma, and Anthony Egeru. 2016. "Agro-Pastoral Choice of Coping Strategies and Response to Drought in the Semi-Arid Areas of Uganda." *African Journal of Rural Development* 1 (3): 281–291. https://ageconsearch.umn.edu/record/263430/.

Antonelli, Chiara, Manuela Coromaldi, Shouro Dasgupta, Johannes Emmerling, and Soheil Shayegh. 2021. "Climate Impacts on Nutrition and Labor Supply Disentangled–an Analysis for Rural Areas of Uganda." *Environment and Development Economics* 26 (5–6): 512–537. doi:10.1017/S1355770X20000017

Apolloni, Andrea, Christian Corniaux, Caroline Coste, Renaud Lancelot, and Ibra Touré. 2019. "Livestock Mobility in West Africa and Sahel and Transboundary Animal Diseases." In *Transboundary Animal Diseases in Sahelian Africa and Connected Regions*, edited by Moustafa Kardjadj, Adama Diallo, and Renaud Lancelot, 31–52. Cham: Springer International Publishing. doi:10.1007/978-3-030-25385-1_3.

Arpitha, K. V., and Achyutananda Mishra. 2019. "Rights of Environmentally Displaced Persons: Need for a Legal Framework." *International Journal of Research and Analytical Reviews* 6 (1): 1–9. http://ijrar.com/upload_issue/ijrar_issue_20543257.pdf.

Atuyambe, Lynn M., Michael Ediau, Christopher G. Orach, Monica Musenero, and William Bazeyo. 2011. "Land Slide Disaster in Eastern Uganda: Rapid Assessment of Water, Sanitation and Hygiene Situation in Bulucheke Camp, Bududa District." *Environmental Health* 10 (1): 38. doi:10.1186/1476-069X-10-38

Ayeb-Karlsson, Sonja. 2021. "'When We Were Children We Had Dreams, Then We Came to Dhaka to Survive': Urban Stories Connecting Loss of Wellbeing, Displacement and (Im)Mobility." *Climate and Development* 13 (4): 348–359. doi:10.1080/17565529.2020.1777078.

Ayoo, Sandra, Robert Opio, and Oliver T. Kakisa. 2013. "Karamoja Situational Analysis." In *Northern Uganda Women's Empowerment Programme (NUWEP)*. Kampala: CARE International in Uganda. http://www.careevaluations.org/wp-content/uploads/evaluations/karamoja-situational-analysis-final-report-29-01-2013.pdf.

Baastel. 2016. *Cost Benefit Analysis (CBA) of Climate Change Adaptation and Prioritization in Agriculture, Environment and Water Sectors in Uganda: Final Vulnerability Assessment Report*. Uganda: Food and Agriculture Organisation (FAO), Kampala, Uganda.

Baldwin, Andrew, Chris Methmann, and Delf Rothe. 2014. "Securitizing 'Climate Refugees': The Futurology of Climate-Induced Migration." *Critical Studies on Security* 2 (2): 121–130. doi:10.1080/21624887.2014.943570.

Barihaihi, Margaret. 2010. *A Review of Uganda's Disaster Risk Reduction and Climate Change Adaptation Status*. Kampala, Uganda: Africa Climate Change Resilience Alliance (ACCRA).

BBC. 2018. "Dozens Die as Mud Destroys Uganda Villages." *BBC News*, October 12, sec. Africa. https://www.bbc.com/news/world-africa-45836381.

Black, Richard, W. Neil Adger, Nigel W. Arnell, Stefan Dercon, Andrew Geddes, and David Thomas. 2011. "The Effect of Environmental Change on Human Migration." *Global Environmental Change* 21: S3–11. doi:10.1016/j.gloenvcha.2011.10.001

Blocher, Julia. 2016. "Climate Change and Environment Related Migration in the European Union Policy: An Organizational Shift Towards Adaptation and Development." In *Organizational Perspectives on Environmental Migration*, edited by Kerstin Rosenow-Williams and François Gemenne, 38–56. London: Routledge.

Bradley, Megan, and Roberta Cohen. 2010. "Disasters and Displacement: Gaps in Protection." *Journal of International Humanitarian Legal Studies* 1 (1): 95–142. doi:10.1163/187815210X12766020139884.

Brown, Andrea M. 2014. "Uganda's Emerging Urban Policy Environment: Implications for Urban Food Security and Urban Migrants." *Urban Forum* 25 (2): 253–264. doi:10.1007/s12132-014-9224-6.

Burson, Bruce, Walter Kälin, Jane McAdam, and Sanjula Weerasinghe. 2018. "The Duty to Move People Out of Harm's Way in the Context of Climate Change and Disasters." *Refugee Survey Quarterly* 37 (4): 379–407. doi:10.1093/rsq/hdy015.

Butros, Deniz, Veronica Brodén Gyberg, and Anna Kaijser. 2021. "Solidarity Versus Security: Exploring Perspectives on Climate Induced Migration in UN and EU Policy." *Environmental Communication* 15 (6): 842–856. doi:10.1080/17524032.2021.1920446

Call, Maia, and Clark Gray. 2020. "Climate Anomalies, Land Degradation, and Rural out-Migration in Uganda." *Population and Environment* 41 (4): 507–528. doi:10.1007/s11111-020-00349-3.

CARIAA. 2019. "Novel Insights on Migration." Canada: Collaborative Adaptation Research Initiative in Africa and Asia (CARIAA), UK's Department for International Development and Canada's International Development Research Centre. https://idl-bnc-idrc.dspacedirect.org/bitstream/handle/10625/57502/IDL-57502.pdf?sequence=2&isAllowed=y.

Cattaneo, Cristina, Michel Beine, Christiane J. Fröhlich, Dominic Kniveton, Inmaculada Martinez-Zarzoso, Marina Mastrorillo, Katrin Millock, Etienne Piguet, and Benjamin Schraven. 2019. "Human Migration in the Era of Climate Change." *Review of Environmental Economics and Policy* 13 (2): 189–206. doi:10.1093/reep/rez008.

Chambers, Robert, and Gordon Conway. 1992. "Sustainable Rural Livelihoods: Practical Concepts for the 21st Century." Institute of Development Studies (UK). https://opendocs.ids.ac.uk/opendocs/handle/20.500.12413/775.

Chandrasekhar, S., and Arup Mitra. 2019. "Migration, Caste and Livelihood: Evidence from Indian City-Slums." *Urban Research & Practice* 12 (2): 156–172. doi:10.1080/17535069.2018.1426781

Cooper, Sarah Jane, and Tim Wheeler. 2017. "Rural Household Vulnerability to Climate Risk in Uganda." *Regional Environmental Change* 17 (3): 649–663. doi:10.1007/s10113-016-1049-5

Crate, Susan A., and Mark Nuttall. 2016. "Climate Change and Population Displacement: Disasters and Diasporas in the Twenty-First Century." In *Anthropology and Climate Change*, edited by Crate Susan A. and Nuttall Mark, 116–136. New York, United States of America (USA): Routledge.

Dehcheshmeh, Mostafa Mohammadi, and Sohrab Ghaedi. 2020. "Climate Change and Ecological Migration: A Study of Villages in the Province of Khuzestan, Iran." *Environmental Research, Engineering and Management* 76 (1): 6–19. doi:10.5755/j01.erem.76.1.24513.

DFID. 1999. "Sustainable Livelihoods Guidance Sheets." Department for International Development (DFID), London, UK. https://www.livelihoodscentre.org/documents/114097690/114438878/Sustainable+livelihoods+guidance+sheets.pdf.

Dimanin, Patrick. 2012. "Exploring Livelihoods of the Urban Poor in Kampala, Uganda: An Institutional, Community, and Household Contextual Analysis." United States of America: Action Against Hunger International. https://www.actionagainsthunger.org/sites/default/files/publications/Exploring_livelihoods_of_the_urban_poor_Kampala_District_Uganda_12.2012.pdf.

Egeru, Anthony. 2012. "Role of Indigenous Knowledge in Climate Change Adaptation: A Case Study of the Teso Sub-Region, Eastern Uganda." *Indian Journal of Traditional Knowledge* 11 (2): 217–224.

Egeru, Anthony. 2015. "'Mental Drought'Afflicts Uganda's Cattle Corridor." Uganda's Drylands, Research Gate. https://www.researchgate.net/profile/Anthony_Egeru2/publication/305392400_'Mental_drought'_afflicts_Uganda's_cattle_corridor/links/578cc66708ae254b1de8601a.pdf.

FAO. 2015. *The Impact of Disasters and Crises on Agriculture and Food Security*. Rome, Italy: Food and Agriculture Organisation (FAO). www.fao.org/publications.

Flahaux, Marie-Laurence, and Hein De Haas. 2016. "African Migration: Trends, Patterns, Drivers." *Comparative Migration Studies* 4 (1): 1–25. doi:10.1186/s40878-015-0015-6.

Floodlist. 2019. "Uganda – Deadly Floods and Landslides in Eastern Region (Updated) – FloodList." *FloodList News in Africa*. http://floodlist.com/africa/uganda-floods-bududa-sironko-december-2019.

Floodlist. 2020. "Uganda – Thousands Affected by Floods in Western Region – FloodList." *FloodList News in Africa*. http://floodlist.com/africa/uganda-thousands-affected-by-floods-in-western-region.

Foresight, U. K. 2011. Migration and Global Environmental Change: Final Project Report. The Government Office for Science, London. www.gov.uk/government/publications/migration-and-global-environmentalchange- future-challenges-and-opportunities.

Fratzke, S., and B. Salant. 2018. "Understanding the Impact of Livelihood Opportunities and Interventions on Migration Patterns." Rapid Evidence Assessment. Research and Evidence Division in the Department for International Development. https://assets.publishing.service.gov.uk/media/5a992b27ed915d57d4d0f2dc/Migration-Livelihoods1.pdf.

Friis-Hansen, Esbern, Bernard Bashaasha, and Charles Aben. 2013. "Decentralization and Implementation of Climate Change Policy in Uganda." Working Paper 2013:17. Danish Institute of International Affairs (DIIS) Working Paper. https://www.econstor.eu/handle/10419/122270.

Gayfer, Julian, Joseph Barnes, Mary Jennings, and Agnes Kayondo. 2012. *Formative Evaluation of World Food Programme's Livelihoods Programme, Karamoja, Uganda.* Sheffield, United Kingdom: Department for International Development. http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.392.7083&rep=rep1&type=pdf.

Goodwin-Gill, Guy, S, and Jane McAdam. 2017. "Climate Change, Disasters and Displacement." United Nations High Commissioner for Refugees (UNHCR). https://www.unhcr.org/596f25467.pdf.

Gorokhovich, Yuri, Shannon Doocy, Felix Walyawula, Andrew Muwanga, and Fernando Nardi. 2013. "Landslides in Bududa, Eastern Uganda: Preliminary Assessment and Proposed Solutions." In *Landslide Science and Practice: Volume 4: Global Environmental Change*, edited by Claudio Margottini, Paolo Canuti, and Kyoji Sassa, 145–149. Berlin, Heidelberg: Springer. doi:10.1007/978-3-642-31337-0_19.

Government of Uganda. 2012. "Humanitarian Profile – 2012 – Uganda." ReliefWeb. https://reliefweb.int/report/uganda/humanitarian-profile-2012.

Gray, Clark L. 2011. "Soil Quality and Human Migration in Kenya and Uganda." *Global Environmental Change, Special Issue on The Politics and Policy of Carbon Capture and Storage* 21 (2): 421–430. doi:10.1016/j.gloenvcha.2011.02.004.

Gray, Clark, and Valerie Mueller. 2011. "Drought and Human Migration in Rural Ethiopia." *World Development* 40 (1): 134–145. doi:10.1016/j.worlddev.2011.05.023

Gray, Clark, and Erika Wise. 2016. "Country-Specific Effects of Climate Variability on Human Migration." *Climatic Change* 135 (3): 555–568. doi:10.1007/s10584-015-1592-y.

Hartter, Joel, Sadie J. Ryan, Catrina A. MacKenzie, Abe Goldman, Nicholas Dowhaniuk, Michael Palace, Jeremy E. Diem, and Colin A. Chapman. 2015. "Now There Is No Land: A Story of Ethnic Migration in a Protected Area Landscape in Western Uganda" *Population and Environment* 36(4): 452–479. doi:10.1007/s11111-014-0227-y.

Haynie, Jeannette Gaudry, Jay Balagna, and Aaron Clark-Ginsberg. 2021. "Climate Change Migration: Developing a Security Strategy for All." *The RAND Blog* (blog). March 15. https://www.rand.org/blog/2021/03/climate-change-migration-developing-a-security-strategy.html.

Heita, Jonas. 2018. *Assessing the Evidence: Migration, Environment and Climate Change in Namibia*. Namibia: International Organization for Migration (IOM). https://environmentalmigration.iom.int/sites/default/files/publications/Assessing%20the%20Evidence_Namibia_EN.pdf.

Higgins, Julian PT, James Thomas, Jacqueline Chandler, Miranda Cumpston, Tianjing Li, Matthew J. Page, and Vivian A. Welch. 2019. *Cochrane Handbook for Systematic Reviews of Interventions*. Oxford, United Kingdom: John Wiley & Sons. doi:10.1002/9781119536604.

Hunter, Lori M., Jessie K. Luna, and Rachel M. Norton. 2015. "Environmental Dimensions of Migration." *Annual Review of Sociology* 41: 377–397. doi:10.1146/annurev-soc-073014-112223.

IDMC. 2021. *Global Report on Internal Displacement 2021.* Geneva, Switzerland: International Displacement Monitoring Centre (IDMC). https://www.internal-displacement.org/global-report/grid2021/.

Inter-Agency Regional Analysts Network. 2015. "2015/16 El Nino Event." Irish Institute for International Relations and Action Against Hunger. https://www.iris-france.org/wp-content/uploads/2017/01/IARAN-El-Nino-October-2015.pdf.

IOM. 1992. "Migration and the Environment." IOM and the Refugee Policy Group (RPG). https://www.google.com/search?rlz=1C1CHBF_enUG878UG878&sxsrf=ALeKk01nQjqiCovfHEBB1jsh6pBg-.

IOM. 2011. *Glossary on Migration*. 2nd ed. Geneva, Switzerland: International Organisation for Migration. https://publications.iom.int/system/files/pdf/iml25_1.pdf.

IOM. 2015. *Migration in Uganda: A Rapid Country Profile 2013.* Kampala, Uganda: IOM Mission to Uganda. https://publications.iom.int/system/files/pdf/mp_uganda_25feb2015_web.pdf.

IOM. 2016. *Assessing The Evidence: Migration, Environment and Climate Change in Morocco.* Geneva, Switzerland: IOM. https://publications.iom.int/system/files/pdf/assessing_the_evidence_morocco_en.pdf.

IOM. 2018. *Migration, Environment and Climate Change: Definitional Issues.* Geneva, Switzerland: International Organisation for Migration. https://www.iom.int/migration-and-climate-change.

IPCC. 2014. "Climate Change 2014 Impacts, Adaptation, and Vulnerability." In *Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*, edited by McCarthy James J., Canziani Osvaldo F., Leary Neil A., Dokken David J., and White Kasey S, Cambridge, United Kingdom and New York, NY, USA: Cambridge University Press, pp. 688.

IPCC. 2021. "AR6 Climate Change 2021: The Physical Science Basis." Working Group I Contribution to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change, World Meteorological Organization (WMO), United Nations Environment Programme (UNEP). https://www.ipcc.ch/report/ar6/wg1/.

Jha, Chandan Kumar, Vijaya Gupta, Utpal Chattopadhyay, and Binilkumar Amarayil Sreeraman. 2018. "Migration as Adaptation Strategy to Cope with Climate Change." *International Journal of Climate Change Strategies and Management* 10 (1): 1–21. doi:10.1108/IJCCSM-03-2017-0059/full/html.

Kaczan, David J., and Jennifer Orgill-Meyer. 2020. "The Impact of Climate Change on Migration: A Synthesis of Recent Empirical Insights." *Climatic Change* 158 (3): 281–300. doi:10.1007/s10584-019-02560-0

Kiggundu, Nicholas, Joshua Wanyama, David Mfitumukiza, Revocatus Twinomuhangi, Bernard Barasa, Abia Katimbo, and Florence Kyazze. 2018. "Rainwater Harvesting Knowledge and Practice for Agricultural Production in a Changing Climate: A Review from Uganda's Perspective." *Agricultural Engineering International: CIGR Journal* 20 (2): 19–36. https://cigrjournal.org/index.php/Ejounral/article/view/4682.

Kitutu, M., A. Muwanga, J. Poesen, and J. Deckers. 2004. "The Relationship Between Geology and Landslides in Manjiya County, South West of Mount Elgon, Eastern Uganda." Geoscience Africa 2004 conference.Abstract. 1:349–350.

Laczko, Frank, and Etienne Piguet. 2014. "Regional Perspectives on Migration, the Environment and Climate Change." In *People on the Move in a Changing Climate: The Regional Impact of Environmental Change on Migration*, edited by Etienne Piguet and Frank Laczko, 1–20. Global Migration Issues.Dordrecht: Springer Netherlands. doi:10.1007/978-94-007-6985-4_1.

Locke, Catherine, W. Neil Adger, and P. Mick Kelly. 2000. "Changing Places: Migration's Social and Environmental Consequences." *Environment: Science and Policy for Sustainable Development* 42 (7): 24–35. doi:10.1080/00139150009605748.

Long, Hannah A, David P. French, and Joanna M. Brooks. 2020. "Optimising the Value of the Critical Appraisal Skills Programme (CASP) Tool for Quality Appraisal in Qualitative Evidence Synthesis." *Research Methods in Medicine & Health Sciences* 1 (1): 31–42. doi:10.1177/2632084320947559.

Luetz, Johannes M., and John Merson. 2019. "Climate Change and Human Migration as Adaptation: Conceptual and Practical Challenges and Opportunities." *Climate Action.* Encyclopedia of the UN Sustainable Development Goals, 1–13. https://link.springer.com/referenceworkentry/10.1007/978-3-319-95885-9_46.

Lwasa, Shuaib, Teddy Kisembo, Kareem Buyana, Laura Petrella, Risper Talai, Bernard Heng, and Andrew Ondoo. 2021. *Economic Development Assessment in West Nile Region, Uganda.* Nairobi, Kenya: UN HABITAT. doi:10.13140/RG.2.2.33271.34724.

Maharjan, Amina, Ricardo Safra de Campos, Chandni Singh, Shouvik Das, Arjun Srinivas, Mohammad Rashed Alam Bhuiyan, Sultan Ishaq, Muhammad Awais Umar, Tanzina Dilshad, and Krity Shrestha. 2020. "Migration and Household Adaptation in Climate-Sensitive Hotspots in South Asia." *Current Climate Change Reports* 6 (1): 1–16. doi:10.1007/s40641-020-00153-z

Mamikutty, Rokiah, Ameera Syafiqah Aly, and Jamaludin Marhazlinda. 2021. "Databases Selection in a Systematic Review of the Association Between Anthropometric Measurements and Dental Caries among Children in Asia." *Children* 8 (7): 565. doi:10.3390/children8070565

Marchand, Katrin, Julia Reinold, and Raphael Dias e Silva. 2017. *Uganda Migration Profile: Study on Migration Routes in the East and Horn of Africa.* Maastricht, Netherlands: Maastricht Graduate School of Governance, Maastricht University.

Markandya, Anil, Courtenay Cabot-Venton, and Olivier Beucher. 2015. *Economic Assessment of the Impacts of Climate Change in Uganda*. Pretoria, South Africa: Climate Development and Knowledge Network (CDKN).

Masaba, Sowedi, David N. Mungai, Moses Isabirye, and Haroonah Nsubuga. 2017. "Implementation of Landslide Disaster Risk Reduction Policy in Uganda." *International Journal of Disaster Risk Reduction* 24: 326–331. doi:10.1016/j.ijdrr.2017.01.019

Mayega, Roy William, Nathan Tumuhamye, Lynn Atuyambe, Dorothy Okello, Grace Bua, Julius Ssentongo, and William Bazeyo. 2015. "Qualitative Assessment of Resilience to the Effects of Climate Variability in the Three Communities in Uganda." Eastern Africa Resilience Innovation Lab Makerere University, Kampala, Uganda.

McLeman, Robert A. 2014. *Climate and Human Migration: Past Experiences, Future Challenges*. New York, United States of America: Cambridge University Press.

Mcleman, Robert. 2017. "Migration and Land Degradation: Recent Experience and Future Trends." Global Land Outlook Working Paper. https://www.unccd.int/resources/publications/migration-and-land-degradation-recent-experience-and-future-trends.

Mubaya, C. P., P. Mutopo, and M. R. Ndebele-Murisa. 2015. *Local Governance, Climate Risk and Everyday Vulnerability in Dar Es Salaam*. Routledge: *Untamed Urbanisms*.

Mugagga, F., V. Kakembo, and M. Buyinza. 2012. "Land Use Changes on the Slopes of Mount Elgon and the Implications for the Occurrence of Landslides." *Catena* 90: 39–46. doi:10.1016/j.catena.2011.11.004

Mugisha, Samuel. 2002. "Root Causes of Land Cover/Use Change in Uganda: An Account of the Past 100 Years." Makerere University Institute of Environment and Natural Resources, International Livestock Research Institute and United Nations Environment Programme.

Mugume, Isaac, C. P. K. Basalirwa, Daniel Waiswa, and Triphonia Ngailo. 2017. "Spatial Variation of WRF Model Rainfall Prediction Over Uganda." *Journal of Environmental, Chemical, Ecological, Geological and Geophysical Engineering* 11 (7). https://www.researchgate.net/profile/Isaac-Mugume-3/publication/318360850_Spatial_Variation_of_WRF_Model_Rainfall_Prediction_over_Uganda/links/5965bc0a4585157fcc5e4fc3/Spatial-Variation-of-WRF-Model-Rainfall-Prediction-over-Uganda.pdf.

Mukwaya, Paul, Yazidhi Bamutaze, Samuel Mugarura, and Todd Benson. 2012. "Rural-Urban Transformation in Uganda." *Journal of African Development* 14 (2): 169–194. doi:10.5325/jafrideve.14.2.0169

MWE. 2015. "Economic Assessment of the Impacts of Climate Change in Uganda." Final Report. Kampala, Uganda: Ministry of Water and Environment. https://www.futurewater.eu/wp-content/uploads/2015/03/Impacts-of-CC-in-Uganda-Water_v3-clean-final.pdf.

Namono, Marrion, Isaac Mugume, Radu Negru, Godfrey Mujuni, Tao Sulin, Bob Nakileza, Sylvain Racaud, and Shuichi Oyama. 2019. "The Barriers to Landslide Responses Over the Mt. Elgon in Bududa District, Uganda." *Preprints*. doi:10.20944/preprints201909.0022.v1.

Neema, Stella, Grace Mongo Bua, Doreen Tuhebwe, Julius Ssentongo, Nathan Tumuhamye, Roy William Mayega, James Fishkin, Lynn M Atuyambe, and William Bazeyo. 2018 July. "Community Perspective on Policy Options for Resettlement Management: A Case Study of Risk Reduction in Bududa, Eastern Uganda." *PLoS Currents* 10. doi:10.1371/currents.dis.49e8e547de25ca1c1f9edbbfc8b9efa5.

Neumann, Kathleen, and Henk Hilderink. 2015. "Opportunities and Challenges for Investigating the Environment-Migration Nexus." *Human Ecology* 43 (2): 309–322. doi:10.1007/s10745-015-9733-5.

Ntabadde, Catherine. 2011. "Teso Sub Region Flooded Again!" ReliefWeb. https://reliefweb.int/report/uganda/teso-sub-region-flooded-again.

Ntozi, J., A. Nzabona, and F. Tumwine. 2011. "Chapter 10: Evolution of Migration in Uganda Since the 1950s." In *Migration in the Service of African Development*, edited by J. Oucho, 343–360. Ibadan: Safari Books.

Oucho, J. 2015. *Migration in East Africa: Practice and Knowledge Gaps for Policy*. Nairobi, Kenya: African Migration and Development Policy Centre.

Parnell, Susan, and Ruwani Walawege. 2011. "Sub-Saharan African Urbanisation and Global Environmental Change." *Global Environmental Change* 21: S12–S20. doi:10.1016/j.gloenvcha.2011.09.014

Population Secretariat (Government of Uganda). 2012. "State of Uganda's Population: Uganda at 50 Years: Population and Service Delivery; Challenges, Opportunities and Prospects." Kampala, Uganda: Population Secretariat. http://npcsec.go.ug/wp-content/uploads/2013/06/The-State-of-Uganda-Population-Report-2012.pdf.

Population Secretariat (Government of Uganda). 2013. *The State of Uganda's Population 2013. Population and Social Transformation: Addressing the Needs of Special Interest Groups*. Kampala, Uganda: Population Secretariat. http://npcsec.go.ug/wp-content/uploads/2013/06/State-of-Uganda-Population-Report-2013.pdf.

Rahman, Munshi Khaledur, Bimal Kanti Paul, Andrew Curtis, and Thomas W. Schmidlin. 2015. "Linking Coastal Disasters and Migration: A Case Study of Kutubdia Island, Bangladesh." *The Professional Geographer* 67 (2): 218–228. doi:10.1080/00330124.2014.922020

Rukundo, Peter M., Bård A. Andreassen, Joyce Kikafunda, Byaruhanga Rukooko, Arne Oshaug, and Per Ole Iversen. 2016. "Household Food Insecurity and Diet Diversity After the Major 2010 Landslide Disaster in Eastern Uganda: A Cross-Sectional Survey." *British Journal of Nutrition* 115 (4): 718–729. doi:10.1017/S0007114515004961.

Rukundo, Peter M., Per O. Iversen, Baard A. Andreassen, Arne Oshaug, Joyce Kikafunda, and Byaruhanga Rukooko. 2015. "Perceptions on the Right to Adequate Food After a Major Landslide Disaster: A Cross-Sectional Survey of Two Districts in Uganda." *BMC International Health and Human Rights* 15 (1): 9. doi:10.1186/s12914-015-0047-x

Sassen, Marieke, and Douglas Sheil. 2013. "Human Impacts on Forest Structure and Species Richness on the Edges of a Protected Mountain Forest in Uganda." *Forest Ecology and Management* 307: 206–218. doi:10.1016/j.foreco.2013.07.010

Scheffran, Jürgen, Elina Marmer, and Papa Sow. 2012. "Migration as a Contribution to Resilience and Innovation in Climate Adaptation: Social Networks and Co-Development in Northwest Africa." *Applied Geography* 33: 119–127. doi:10.1016/j.apgeog.2011.10.002

Schoonover, Rod, Christine Cavallo, and Isabella Caltabiano. 2021. "The Security Threat That Binds Us: The Unraveling of Ecological and Natural Security and What the United States Can Do About It." In *The Converging Risks Lab, an Institute of The Council on Strategic Risks*, edited by Francesco Femia and Andrea Rezzonico. Washington, DC. https://dev.biodiversitylinks.org/learning-evidence/one-health-evidence/one-health-evidence-inbox/schoonover-2021_the-security-threat-that-binds-us.pdf/view

Singh, Chandni. 2019. "Migration as a Driver of Changing Household Structures: Implications for Local Livelihoods and Adaptation." *Migration and Development* 8 (3): 301–319. doi:10.1080/21632324.2019.1589073

Sseviiri, Hakimu, Mukwaya Paul Isolo, Twinomuhangi Revocatus, Yeeko Kisira, Nuwahereza Viola, Byarugaba Disan, Kayima Patrick, and Nakalanzi Swabra Mandela. 2022. Heat Risk Perception and Communication Strategies for Adaptation within Low-Income Communities in Kampala City, Uganda. American Red Cross and Global Disaster Preparedness Center (GDPC)doi:10.13140/RG.2.2.15419.28961

Stapleton, Sarah Opitz, Rebecca Nadin, Charlene Watson, and Jan Kellett. 2017. *Climate Change, Migration and Displacement: The Need for a Risk-Informed and Coherent Approach*. London, United Kingdom: Overseas Development Institute.

Stites, Elizabeth. 2020. "'The Only Place to Do This Is in Town': Experiences Of Rural–Urban Migration in Northern Karamoja, Uganda." *Normad Peoples, White Horse Press* 24 (1): 32–55. doi:10.3197/np.2020.240103.

Stites, Elizabeth, Darlington Akabwai, Dyan Mazurana, and Priscillar Ateyo. 2007. "Angering Akuj\uu: Survival and Suffering in Karamoja: A Report on Livelihoods and Human Security in the Karamoja Region of Uganda." Research Report. Strengthening the Humanity and Dignity of People in Crisis Through Knowledge and Practice. Boston, USA: Feinstein International Center. https://fic.tufts.edu/assets/Stites-Angering+Akuju-Survival+and+Suffering+in+Karamoja.pdf.

Stites, Elizabeth, and Carrie Stefansky Huisman. 2010. "Adaptation and Resilience: Responses to Changing Dynamics in Northern Karamoja, Uganda." *Briefing Note*, Feinstein International Center. https://fic.tufts.edu/wp-content/uploads/Adapt-Resilience.pdf

Su, Yvonne Yanyun. 2014. "The One Billion 'Climate Refugees' That Never Was: INGOs and the Human Rights Perspective to Climate Change-Induced Displacement." Oxford Monitor of Forced Migration. https://www.academia.edu/7328949.

Suhrke, Astri. 1994. "Environmental Degradation and Population Flows." *Journal of International Affairs*, 473–496. https://www.proquest.com/docview/220711877?parentSessionId=hMTVDIUq90VzkTFqlCbo%2Bym2gifiVbZWNatDjRL2a%2Bk%3D.

Sunam, Ramesh, Keith Barney, and John F. McCarthy. 2021. "Transnational Labour Migration and Livelihoods in Rural Asia: Tracing Patterns of Agrarian and Forest Change." *Geoforum; Journal of Physical, Human, and Regional Geosciences* 118: 1–13. https://www.sciencedirect.com/science/article/abs/pii/S0016718520302724.

Szabo, Sylvia, William Neil Adger, and Zoe Matthews. 2018. "Home Is Where the Money Goes: Migration-Related Urban-Rural Integration in Delta Regions." *Migration and Development* 7 (2): 163–179. doi:10.1080/21632324.2017.1374506

Twinomuhangi, Revocatus, and Hakimu Sseviiri. 2020. *Jinja Pilot Project on Migration Management Strengthening Capacity for Urban Migration Management and Migrants' Livelihood Improvement in Jinja, Uganda: Baseline Study Final Report*. Kampala, Uganda: Makerere University Centre for Climate Change Research and Innovations (MUCCRI), Cities Alliance, Jinja City Council, ACTogether Uganda. doi:10.13140/RG.2.2.19292.51845.

UBOS. 2016. *National Population and Housing Census 2014: Main Report*. Kampala, Uganda: Uganda Bureau of Statistics. https://www.ubos.org/wp-content/uploads/publications/03_20182014_National_Census_Main_Report.pdf.

UBOS. 2017. *Uganda Demographic and Health Survey 2016 Key Indicators Report*. Kampala, Uganda: Uganda Bureau of Statistics.

Uganda Investment Authority. 2016. "Karamoja Investment Profile." Kampala, Uganda: Uganda Investment Authority. https://www.ugandainvest.go.ug/wp-content/uploads/2016/04/uia-Karamoja-profile.pdf.

UNFCCC. 2015. "Human Mobility in the Context of Climate Change UNFCCC- PARIS COP-21. Recommendations from the Advisory Group on Climate Change and Human Mobility." UNHCR. 2015. https://www.unhcr.org/protection/environment/565b21bd9/human-mobility-context-climate-change-unfccc-paris-cop-21-recommendations.html.

UN-HABITAT. 2012. *Kampala, Uganda: Climate Change Assessment*. Climate Change Vulnerability Assessments, 150/10E. Nairobi, Kenya: UN-HABITAT. https://oldweb.unhabitat.org/books/climate-change-assessment-for-kampala-uganda/.

UNHCR, and UNCDF. 2018. "Uganda Country Assessment on Affordable and Accessible Remittances for Forcibly Displaced Persons and Host Communities." United Nations Capital Development Fund (UNCDF), New York, USA. https://reliefweb.int/sites/reliefweb.int/files/resources/77384.pdf.

UNICEF. 2015. "UNICEF Annual Report 2015: Malawi." https://www.unicef.org/about/annualreport/files/Malawi_2015_COAR.pdf.

United Nations. 2018. "Global Compact for Safe, Orderly and Regular Migration." Global Compact for Migration. https://refugeesmigrants.un.org/sites/default/files/180711_final_draft_0.pdf.

Warner, Koko. 2010. "Global Environmental Change and Migration: Governance Challenges." *Global Environmental Change, Governance, Complexity and Resilience* 20 (3): 402–413. doi:10.1016/j.gloenvcha.2009.12.001.

Warner, Koko, and Tamer Afifi. 2014. "Where the Rain Falls: Evidence from 8 Countries on How Vulnerable Households Use Migration to Manage the Risk of Rainfall Variability and Food Insecurity." *Climate and Development* 6 (1): 1–17. doi:10.1080/17565529.2013.835707

World Bank. 2017. "Migration and Remittances Data." 2017. https://www.worldbank.org/en/topic/migrationremittancesdiasporaissues/brief/migration-remittances-data.

The World Bank Group. 2016. "An Assessment of Uganda's Progressive Approach to Refugee Management." Washington D.C, USA: The International Bank for Reconstruction and Development/The World Bank Group, United Nations High Commission for Refugees (UNHCR), Government of Uganda. http://documents.worldbank.org/curated/en/259711469593058429/pdf/107235-WP-PUBLIC.pdf.

World Economic Forum. 2017. *Migration and Its Impact on Cities.* Geneva, Switzerland: World Economic Forum. http://www3.weforum.org/docs/Migration_Impact_Cities_report_2017_low.pdf.