

Assessing The Evidence Migration, Environment & Climate Change Nexus in Uganda

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Assessing The Evidence **Migration, Environment & Climate** **Change Nexus in Uganda**

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Acronyms and Abbreviations

AIDS	Acquired Immunodeficiency Syndrome
AML	Anti-Money Laundering
BMAU	Budget Monitoring and Accountability Unit
BoU	Bank of Uganda
COMESA	Common Market for Eastern and Southern Africa
COVID-19	Coronavirus Disease of 2019
CRED	Centre for Research on the Epidemiology of Disasters
DJF	December, January and February
DRC	Democratic Republic of the Congo
DRR	Disaster Risk Reduction
EAC	East African Community
EARS	East African Rift System
ECD	Early Childhood Development
ERP	Economic Recovery Programme
FAO	Food and Agriculture Organization
FSD/U	Financial Sector Deepening/Uganda
FSPs	Financial Services Providers
FY	Financial Year
GBV	Gender-Based Violence
GCM	Global Compact for Safe, Orderly and Regular Migration
GDP	Gross Domestic Product
GHG	Greenhouse Gases
GKMA	Greater Kampala Metropolitan Area
GoU	Government of Uganda
HIV	Human Immunodeficiency Virus
IDMC	Internal Displacement Monitoring Centre
IDPs	Internally Displaced Persons
IFRC	International Federation of Red Cross and Red Crescent Societies
IGAD	Inter-Governmental Authority on Development
IMF	International Monetary Fund
IOM	International Organization for Migration
IPCC	Inter-governmental Panel on Climate Change
KALIP	Karamoja Livelihoods Improvement Program
KCCA	Kampala Capital City Authority
KNOMAD	Global Knowledge Partnership on Migration and Development
KYC	Know Your Customer
LDC	Least Developed Country
MAAIF	Ministry of Agriculture, Animal Industry and Fisheries
MAM	March, April and May
MDAs	Ministries, Departments and Agencies
MECC	Migration, Environment and Climate Change
MEMD	Ministry of Energy and Mineral Development
MFIs	Micro-Finance Institutions
MFPED	Ministry of Finance, Planning and Economic Development
MGLSD	Ministry of Gender, Labour and Social Development
MGR	Meter Gauge Railway
MIC	Middle-Income Country
MMOs	Mobile Money Operators

MoWT	Ministry of Works and Transport
MSMEs	Micro, Small and Medium Enterprises
MTOs	Money Transfer Operators
MUCCRI	Makerere University Centre for Climate Change Research and Innovations
MW	Megawatt
MWE	Ministry of Water and Environment
NAADS	National Agricultural Advisory Services
NAP Ag.	National Adaptation Plan for the Agricultural Sector
NAPA	National Adaptation Programme of Action
NCCP	National Climate Change Policy
NCM	National Coordination Mechanism on Migration
NDCs	Nationally Determined Contributions
ND-GAIN	Notre Dame Global Adaptation Initiative
NDP	National Development Plan
NEMA	National Environment Management Authority
NFA	National Forestry Authority
NGOs	Non-Governmental Organizations
NP/DPM	National Policy on Disaster Preparedness and Management
NPA	National Planning Authority
NPC	National Population Council
NUSAF	Northern Uganda Social Action Fund
NYTIL	Nyanza Textiles Industries Limited
ODK	Open Data Kit
OPM	Office of the Prime Minister
OVCs	Orphans and Vulnerable Children
OWC	Operation Wealth Creation
PEAP	Poverty Eradication Action Plan
PMA	Plan for Modernization of Agriculture
PME	Participatory Mapping Exercises
PMM	Population Mobility Mapping
PWDs	People with Disabilities
RAPs	Resettlement Action Plans
RBA	Risk-Based Approach
RPF	Resettlement Policy Framework
RSPs	Remittance Service Providers
SAGE	Social Assistance Grant for the Elderly
SCG	Senior Citizens' Grants for Empowerment
SON	September October November
SOV	Space of Vulnerability
STA	Settlement Transformation Agenda
UAE	United Arab Emirates
UAERA	Uganda Association of External Recruitment Agencies
UBOS	Uganda Bureau of Statistics
UGX	Ugandan Shillings
UK	United Kingdom
UNCDF	United Nations Capital Development Fund
UNDP	United Nations Development Programme
UNFPA	United Nations Population Fund
UN-HABITAT	United Nations Human Settlements Programme
UNHCR	United Nations High Commissioner for Refugees
UNICEF	United Nations Children's Fund
UNMA	Uganda National Meteorological Authority

USA	United States of America
USAID	United States Agency for International Development
USD	United States Dollar
UWA	Uganda Wildlife Authority
UWEP	Uganda Women Entrepreneurship Programme
VFG	Vulnerable Family Grant
YLP	Youth Livelihood Programme



Definition of Key Terms and Concepts

Adaptation	In human systems, adaptation is the process of adjustment to actual or expected climate and its effects, in order to moderate harm or exploit beneficial opportunities (IPCC, 2012).
An environmental migrant/s	“a person or groups of persons who, predominantly for reasons of sudden or progressive change in the environment that adversely affects their lives or living conditions, are obliged to leave their habitual homes, or choose to do so, either temporarily or permanently, and who move either within their country or abroad” (IOM, 2011).
Circular migration	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.
Climate change	“[A] change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to other natural climate variability that has been observed over comparable time periods” (UNFCCC, 1992).
Climate information services	The production, packaging, delivery and dissemination of useful climate data, information, and knowledge to specific users (Brasseur & Gallardo, 2016).
Demographic dividend	The United Nations Population Fund (UNFPA) defines demographic dividend as; “the economic growth potential that can result from shifts in a population’s age structure, mainly when the share of the working-age population is larger than the non-working-age share of the population”.
Disaster	“A serious disruption of the functioning of a community or a society involving widespread human, material, economic or environmental losses and impacts, which exceeds the ability of the affected community or society to cope using its own resources” (UNISDR, 2009).
Disaster displacement	Refers to situations, where people are forced or obliged to leave their homes or places of habitual residence, in particular as a result of or in order to avoid the effects of disasters triggered by natural hazards. Such displacement can occur within a country, or across international borders.
Disaster risk reduction	“The concept and practice of reducing disaster risks through systematic efforts to analyze and manage the causal factors of disasters, including through reduced exposure to hazards, lessened vulnerability of people and property, wise management of land and the environment, and improved preparedness for adverse events” (UNISDR, 2009).
Disaster surveillance	Is a tool in disaster management that provides ongoing, systematic collection, analysis and interpretation of injuries, illness and deaths for use in planning, implementation and evaluation of disaster response practices, while providing insights into future disasters (Khan et al., 2014; Stephen & Duncan, 2017; Wurster, 2016).
Displacement	“Forced removal of a person from his or her home or country, often due to armed conflict or natural disasters” (IOM, 2011).
Early warning system	The set of capabilities needed to generate and disseminate timely and meaningful warning information to enable individuals, communities and organizations threatened

	by a hazard to prepare and to act appropriately in order to reduce the possibility of harm or loss” (IOM, 2014).
Environmental change	“Changes in the physical and biogeochemical environment, over a large scale, either caused naturally or influenced by human activities” (Foresight, 2011)
Environmental migrants	Persons or groups of persons who, predominantly for reasons of sudden or progressive changes in the environment that adversely affect their lives or living conditions, are obliged to leave their habitual homes, or choose to do so, either temporarily or permanently, and who move within their country or abroad (IOM, 2011).
Environmentally displaced person	“Persons who are displaced within their country of habitual residence or who have crossed an international border and for whom environmental degradation, deterioration or destruction is a major cause of their displacement, although not necessarily the sole one” (IOM, 2011).
Forced migration	“A migratory movement in which an element of coercion exists, including threats to life and livelihood, whether arising from natural or man-made causes” (IOM, 2011).
Hazard	“A dangerous phenomenon, substance, human activity or condition that may cause loss of life, injury or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage.” (UNISDR, 2009). A natural hazard is a “natural process or phenomenon that may cause loss of life, injury or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage” (UNISDR, 2009).
Mailo land tenure system	A form of land ownership in Uganda where land is fully owned and used in eternity or unendingly, putting other factors aside.
Migration	“The movement of a person or a group of persons, either across an international border, or within a state regardless of length, composition and causes. It includes migration of refugees, displaced persons, economic migrants, and persons moving for other purposes, including family reunification” (IOM, 2011). Migration can be voluntary or involuntary (forced); it can also be temporary or permanent. Examples of temporary migrations include seasonal migration, circular migration, transhumance and some labour migrations.
Nexus	A connection, relationship or linkage between things. A set of critical interlinkages between the different natural resources (Bleischwitz & Miedzinski, 2018).
Participatory Mapping Exercise (PME)	Means through which researchers engage with key informants through group discussions to gather information about resources, special sites and local perceptions within a shared geographical or spatial framework (Newing, 2010).
Planned relocation	Refers solely to the collective movement of a community, the “permanent (or long-term) movement of a community (or a significant part of it) from one location to another, in which important characteristics of the original community, including its social structures, legal and political systems, cultural characteristics and worldviews are retained (Campbell, 2010). The community stays together at the destination in a social form that is similar to the community of origin.
Population Mobility Mapping (PMM)	An analysis of population mobility dynamics, patterns and definition of priority sites or spaces of vulnerability (IOM, 2018b).
Seasonal migration	Refers to moving with each season and/or in response to labour, environmental and/or climate conditions.

Shock	Environmental shocks are unpredictable exogenous changes in the environment (including climate) that threaten livelihoods or welfare of a society or community.
Space of Vulnerability (SoV)	Geographical spaces “at risk” - with increased exposure to hazards and vulnerabilities and/or with limited resilience (IOM, 2017).
Stress	An overwhelming situation arising from unmanageable pressures. Environmental stress is negative, subjective psychological response to an environmental stimulus (Gatersleben & Griffin, 2017a). Stress occurs when the demands of the physical environment outweigh an individual’s ability to deal with such demands.
Surveillance	The monitoring of behavior, activities or information for purposes of information gathering, influencing, managing or directing.
Transhumance	Migration that occurs in a pastoral livestock production system and is characterized by seasonal movement of herds and herders to access water and pasture, between complementary ecological areas within a country or across borders between countries.
Uganda’s cattle corridor	A broad arid and/or semi-arid region stretching from the southwestern to northeastern parts of Uganda. The region covers more than 40% of the country’s land area and is dominated by fragile rangeland ecosystems in which the main economic activities are pastoralism and agro-pastoralism, although crop cultivation is also on the rise. The cattle corridor is characterized by high temperatures, high rainfall variability, late onset of rains, droughts, and food insecurity is high in some parts of this region.

Executive Summary

Uganda is being highly exposed and vulnerable to the impacts of climate variability and climate change, while at the same time facing widespread environmental degradation. Over the past century the mean annual temperature increased by 0.8 to 1.5°C, and is projected to increase between 2 and 5°C by 2100. The major climate hazards and disasters being experienced in the country are drought, floods, landslides, erratic rainfall and/or intense rainfall patterns and the projected climate shows that the frequency and severity of climate hazards and disasters is likely to increase significantly. While most of the climate hazards have occurred over the last three decades, most of these adverse effects have occurred in the 'cattle corridor' (a semi-arid and fragile ecosystem) and the mountainous regions. At the same time, Uganda is facing widespread environmental degradation, most especially desertification, deforestation and forest degradation, encroachment on wetlands and riverbanks, soil erosion and declining soil fertility. This land and ecosystem degradation, compounded by the adverse impacts of climate change, threatens Uganda's natural resource-dependent livelihoods, most especially agriculture as the resilience of communities and ecosystems remains low. The combined effect of climate change and environmental change is creating hardships that manifest as hunger and food insecurity, water shortage, rising poverty and general disintegration of the traditional livelihoods that further contribute to successive famines, disease outbreaks and conflicts that often trigger human mobility and migrations.

As a significant portion of Uganda's population still depends on agrarian and nature-dependent livelihoods, it remains susceptible to climatic and environmental changes. The importance of migration as an adaptation strategy response to climatic shocks and environmental stressors is on the rise and will continue to do so in the foreseeable future. There has been no comprehensive study to assess and document evidence on climate and environmental migration in Uganda.

IOM commissioned a study to provide evidence on the migration, environment and climate change (MECC) nexus in Uganda by collecting the secondary evidence available to date in scientific research and publications of Uganda and other development/international organizations. The study also conducted participatory Population Mobility Mapping (PMM) exercises, surveys and field assessment in the Eastern Uganda districts of Amudat, Bududa and Katakwi where primary evidence on environmental and climate-induced migrations was collected and documented.

This report documents both the slow-onset processes and the sudden-onset climate impacts and highlights how they influence migrations directly and/or indirectly; examines the existing policy and legal frameworks with respect to the migration, environment and climate change nexus and offers guidance on mainstreaming migration in Uganda's environment and climate change and general deployment policy and practice; and, assesses the state of research and identifies the knowledge gaps that should be filled through future research.

The key findings and conclusions of the study include:

- Uganda is highly vulnerable to the adverse effects of climate change, including both the slow-onset processes such as temperature rise, drought, desertification, melting of glaciers, and general land degradation and biodiversity loss; as well as sudden-onset events, such as floods, rainstorms, and landslides that are expected to increase in frequency and severity in the future, affecting people in various ways in all parts of the country.
- Whereas climate and environmental impacts and stresses affect most parts of the country, some areas, particularly the mountainous areas, face severe land degradation, run-off, floods and landslides, and the Cattle Corridor, most especially Karamoja, is faced with drought, desertification and severe water scarcity, while the urban areas are facing ecosystem destruction and flooding.
- The cumulative effects of rising temperatures, desertification, droughts, and erratic rainfall result in water shortage, declining land productivity, crop failure, loss of grazing land, loss of livestock, food insecurity and ultimately loss of livelihoods and rising poverty that drive human mobility.
- Both the slow-onset and sudden-onset climatic and environmental changes have a strong influence on population migration patterns in Uganda, but in different ways. Sudden-onset events (floods and landslides) often cause destruction of livelihoods and displace the affected populations who have to leave their homes at mainly temporarily but in some cases permanently, like the cases of landslides in Mt. Elgon sub-region and flooding in Teso sub-region. Sometimes, the relocation of the displaced persons has been done by government. On the other hand, many people have migrated and/or people are expected to migrate due to gradual land and environmental deterioration that causes livelihood hardships that are perceived as irreversible in some cases.

- Most of the migrations are internal, but cross-border migrations also occur among pastoral communities searching for pastures and water, and most of these are temporary migrations. In particular, rural-urban migration is on the rise especially among the youth.
- It is not easy to single out an individual driver of migration especially for voluntary migrations related to slow-onset processes. This is because of the multi-causal occurrences that even in cases where the climatic or environment shocks (e.g., drought) are the dominant driver of migration, the situation is usually compounded by socio-economic factors like soil infertility, water shortage, food insecurity, unemployment or poverty. The decision to or not to migrate is influenced by many factors like the available resources, social networks and the perceived alternatives to migration, which also depend on the individual or household's ability to cope with and adapt to climate shocks and stresses.
- Land and resource conflicts are evidently on the rise in both migrant destination areas and places of origin, exacerbating poverty. The poor communities, women, children and people with disabilities are the worst hit and affected by these conflicts.
- Uganda lacks a comprehensive migration policy/legislative framework that also recognizes environmental or climate change migration. The current migration policy frameworks are fragmented and do not mainstream climate change. There is a need for Uganda to develop a comprehensive migration policy that covers both internal and international migration, voluntary and forced migration, as well as planned relocation and/or resettlement, and migration as adaptation strategy. The different segments national policies related to migration need to be consolidated to inform actions for migration as an adaptation strategy.
- Currently most Government ministries departments and agencies (MDAs), and in particular the district local government, are not deeply engaged in migration management. The focus has been mainly on refugees and Internally Displaced Persons (IDPs) handled by OPM and UNHCR in a rather top-down approach with highly centralized processes, and yet migration is multi-causal and multi-dimensional. It is thus essential that inter-agency and inter-ministerial coordination and cooperation on migration and climate change or disaster risk reduction (DRR) are developed and supported. To enhance coherent policymaking for migration as an adaptation strategy, and to prevent forced migration in the context of environmental and climate change, a common platform or forum should be formed to enhance coordination of migration in government MDAs with active participation of the development partners, academia and civil society.
- It is crucial that migration is mainstreamed into local development plans and adaptation strategies especially for districts where out-migration and in-migration take place to enable them manage migration. Currently, however, there are no guidelines to enable environmental and climate-smart migration policy development and implementation at national and local levels. Therefore, it will be crucial that guidelines for migration management, including planned relocation, that address the climate and environmental risks and vulnerabilities be developed to guide national and local governments to document and manage migration.
- Currently, technical staff both at national and district levels lack capacity (knowledge and skills) to document and manage internal migrations, including those driven by environment and climatic shocks and stresses. In addition, districts lack institutional structures for managing migration. It is, therefore, essential that technical staff at national and local levels are trained and skilled on how to plan for and manage climate and environmental migrations and relocation. Capacity needs assessment should be conducted and capacity enhancement toolkits and manuals developed and used for training and skilling of technocrats at various governance levels on continuous basis.
- Limited research has been conducted to generate the evidence on climate-induced migrations or the impact of climate change on migration to inform policy. Therefore, further research is required to generate evidence on internal migration and importance of environmental and climate migration in national and local development policy and practice. Such evidence offers opportunities to harnessing migration as an adaptation strategy and as well as, mainstreaming migration into the country's development, climate change and environment policy contexts.
- Migration provides opportunities for livelihood improvement, fostering adaptation and transformational change, and supporting innovative solutions and long-term adaptation measures to deliver transformational benefits in areas of migrants' origin and destination. Implementation of nature-based solutions for environmental sustainability and socio-economic development will be critical to tackling the long-term migration, environmental and socio-economic challenges, and could potentially deliver co-benefits for adaptation, economic growth, and human-welfare. In all these, the Government will have to play a leading role but the support of other key stakeholders such as civil society, academia, researchers, UN agencies and other development partners will have to be harnessed.

Finally, a combined action of research and policymaking will be essential for meaningful and effective management of environmental and climate migration in Uganda. Assessing and documenting evidence on the nature, scale and timing of environmental and climate change-driven migration, displacement and planned relocation should be central to evidence-based policy planning and implementation. National and local governments should be supported to put in

place measures for the protection of vulnerable individuals in affected communities (like reducing human trafficking) and for addressing the needs of seasonal in-migrants and displaced persons through increasing capacity for providing additional shelters and household needs for areas that receive in-migrants. Continued investment into disaster risk reduction (DRR), including strengthening of early warning systems in disaster hotspot regions especially where flood, landslides and drought exposures are high that trigger migration, is essential.



1. Introduction

This report documents the existing evidence on the migration, environment and climate change nexus in Uganda, a landlocked country in East Africa. Migration, environment and climate change (MECC) are increasingly recognized to be interlinked phenomena (IOM, 1992, 2018a). The UN 2018 Global Compact for Safe, Orderly and Regular Migration observes that understanding environmental degradation is crucial for addressing migration (United Nations, 2018) and the Internal Displacement Monitoring Centre (IDMC) estimated that approximately 40.5 million people were internally displaced in 2020. More than 75 percent of such displacements were caused by disasters, of which 98 percent were caused by weather-related events (IDMC, 2021). For Uganda, evidence on the MECC nexus remains rather scanty. The changes in environment reflected through widespread ecosystem degradation, water stress, decreasing land productivity and rising food insecurity, often compounded by climatic hazards and disasters, have for long adversely affected natural resource-based livelihoods in some parts of Uganda. Some changes in the environment and climate often result into displacements and migration, and yet such area has been under-researched (Twinomuhangi, Sseviiri, & Kato, 2021). In many instances, migration has also been taken as an adaptation mechanism to the adverse impacts of climate extremes by providing migrants with alternative livelihoods and safe refuge from inhabitable locations.

Currently, Uganda is facing significant environmental and climate change vulnerabilities. Slow-onset processes like soil erosion and declining fertility, land and ecosystem degradation, rising temperatures, increasing variability in rainfall seasons, and drought are a challenge across the country. In addition, sudden or rapid onset of events such as rainstorms, floods, droughts, and landslides is also increasing in frequency and severity in some parts of the country, most especially in the semi-arid and arid Cattle Corridor region, mountainous regions and northern parts of the country. The combined effects of slow-onset processes and sudden onset events create livelihood hardships especially as hunger and food insecurity, water shortage, high poverty and general disintegration of the traditional livelihoods that further contribute to successive famines, disease outbreaks and conflicts that often trigger human mobility.

The formulation of environmental and climate-friendly migration policy and programmes remains significantly constrained by limited credible and reliable evidence base on the impact of environment and climate change on

migration in Uganda. As USAID (2017) put it, “There is no programmatic experience or evidence” on the scale, routes, and trends of environmental migration and displacement. Whilst the Uganda Bureau of Statistics estimates that 5% of Uganda’s population has migrated (UBOS, 2021), and some of the migrations are climate-induced with migrants being mainly the youth moving to urban areas (UBOS, 2016a), the scale and trends of how environment or climate change induces migration is not deeply understood. Therefore, very little data is available to support the linkage between migration, environment and climate change in Uganda.

It is against this background that this study was conducted to assess the nexus between migration, environment and climate change in Uganda. This report documents the vulnerabilities to environmental and climate hazards and disasters and how they induce migration in Uganda. The report also maps the existing policy and institutional frameworks for managing migration, environmental and climate change, and examines whether these policies speak to each other, and are based on evidence. Finally, the knowledge and policy gaps on the nexus are presented and policy recommendations and priority actions are identified.

1.1 Methodology

The MECC assessment was conducted through a desk review of literature, field assessments and national policy dialogues or stakeholder consultations. The field assessments were conducted in Amudat, Bududa and Katakwi districts in Eastern Uganda and involved participatory mobility mapping exercises conducted in December 2020, as well as a survey conducted in February to May 2021. The districts of Amudat, Bududa and Katakwi were selected by IOM as pilot districts for primary data collection because of their high vulnerability to drought, landslides and flooding respectively.

1.1.1 Literature review

The assessment started with a comprehensive desk review of MECC-related documents and other secondary data sources that included books and journal articles, technical reports and policy papers from government, donor agencies, NGOs and think tanks. The documentary review covered migration across the entire country, aimed at profiling Uganda’s national context and migration profile, as well as taking stock of the information related to the linkage between migration, environment and climate change. In addition, the current migration and disaster risk reduction policy frameworks and response mechanisms were analyzed, and information gaps identified.

1.1.2 Field assessment and consultations

The field assessments involved population mobility mapping exercise in the three pilot study districts (Amudat, Bududa and Katakwi districts) followed by field survey using questionnaires administered to migrant and non-migrant respondents as detailed below. As the field exercises took place during the COVID-19 pandemic in the country, COVID-19 standard operating procedures were followed, including wearing of face masks, social distancing and using hand sanitization during the meetings and interviews.

Population Mobility Mapping (PMM)

Drawing from IOM’s PMM methodology, one Participatory Mapping Exercise (PME) was conducted in each of the three pilot districts i.e., Amudat, Bududa and Katakwi in December 2020 (making a total of three PMEs). The PMEs were conducted through consultative meetings with key people in a workshop-related setting, through which preliminary information on migration, environment and climate change impacts was collected using facilitated vulnerability mapping and group discussions. Through vulnerability mapping exercises, six MECC ‘hotspots’ (two parishes per district) were prioritized as study sites for detailed field assessment and data collection. The site selection was based on district-level facilitated discussions that informed identification, ranking and mapping of areas or spaces of vulnerability (SOVs) to environment and climate change hazards and disasters, where migration has taken place in the last decade. The prioritized SOVs included Achorichor and Lokales parishes in Looro and Karita sub-counties respectively (Amudat district); Nametsi and Bufutsa parishes in Bundesi and Bushika sub-counties respectively (Bududa district); and Akurao and Omasia parishes in Toroma and Magoro sub county respectively (Katakwi district).

Sixty purposively selected persons participated in the three PMEs, and their selection was based on their positions in district local governments, communities and civil society. Participants' selection was based on their expertise, experience and knowledge of migration, environment and climate change hazards and disasters in the districts. For example, some local government technical officers were drawn from departments like agriculture/production, environment and natural resources, disaster risk reduction, community development, population/migration and planning. In addition, political leaders, security officers, staff of non-governmental organizations (NGOs), and elders in the districts also participated in the PMEs. A report entitled "Participatory mapping of population mobility for environment and climate change in Uganda" was produced and published by IOM (see: <https://dtm.iom.int/reports/uganda-participatory-mapping-population-mobility-environment-and-climate-change-august-2021>).

Detailed field surveys and assessment

On-site village surveys and/or assessments were conducted using questionnaires in the sites or spaces of vulnerability identified and prioritized in the PMEs. Data was collected from 536 anonymous and voluntary/consenting respondents, of which 35 per cent (n=187) were migrants and 65 per cent (n=349) were non-migrants, using questionnaires to capture demographic, socio-economic, climatic and environmental hazards and disasters, and migration information. The questionnaires were designed, validated and uploaded on already-programmed tablets, using the Kobo toolbox and/or Open Data Kit (ODK) applications. The questionnaires were administered to the respondents by trained enumerators during face-to-face interviews with migrants and non-migrants. In addition, 27 key informants interviews were conducted with technical staff at national and local levels, opinion leaders and representatives from civil society in the study districts. The data collected through the survey and field assessments was used to produce three dashboards for the districts of Amudat, Bududa and Katakwi and published by IOM.

1.1.3 National policy dialogue

The draft MECC research report was presented at a national policy dialogue that also doubled as a dissemination workshop held on 15th March 2022. The dialogue was attended by 40 participants drawn from government ministries departments and agencies (MDAs), development partners, civil society and academia. The aim of the event was to disseminate and validate the study findings, and to generate a discussion on evidence of the MECC nexus and also coming up with potential avenues for the inclusion of environmental and climate change-induced migration in Uganda's migration policy, as well mainstreaming migration into national and local policies, plans and programmes on development, environment, climate change, and disaster risk management.

1.2 Background and context

1.2.1 Geography and climate

Uganda is a landlocked country located astride the equator in the eastern part of Africa. It lies between longitudes 29° 34' and 35° 0' East, and latitudes 4° 12' North and 1° 29' South and is bordered by Kenya in the east, South Sudan in the north, Democratic Republic of the Congo (DRC) in the west, Rwanda in the south-west and Tanzania in the south (see Figure 1). Uganda covers an area of approx. 241 550.7 km², about 0.8 per cent of the total geographical area of the African continent (Nsubuga et al., 2014), of which 41,027.4 sq.km (or 17 percent) is open water and swamps, and the land area is 200,523.3 sq.km or 83 per cent (UBOS, 2015). The main land uses/landcover are; agriculture (43.6%), grasslands (21.3%), while forest cover is 12.4 per cent (Gabiri et al. 2020; Lunyolo et al. 2021).

Uganda's terrain is mostly plateau ranging between 1,000m and 2,500m above sea level (a.s.l.). The lowest point is 620 meters (in the Albert Nile) and the highest points is at 5,100 meters (the peak of Mt. Rwenzori) (GoU 2014). The main mountain areas are Mt Rwenzori, a permanently snow-capped mountain located in western Uganda marking the border with the Democratic Republic of the Congo (DRC); Mt. Elgon (4,321m a.s.l.), an extinct volcano in the eastern part of the country at the border with Kenya; and Mt. Muhabura (4,127m a.s.l.) in the south-west bordering Rwanda and D.R.C. The central part of the country is largely flat plateau with an elevation of 1,000m to 1300m a.s.l. characterized by flat-topped hills, gentle slopes and broad valleys, most of them with swamps.



Figure 1: Map of Uganda showing water bodies, urban areas and neighboring countries

Uganda is generally fertile, and a well-watered country with many lakes and rivers. The most notable is Africa's largest lake, Victoria, which is also the source of the Nile River, one of the world's longest, occupies the southeastern part of the country, and is shared between Uganda, Kenya and Tanzania. The other significant water bodies include lakes Albert, Kyoga, Edward and George, and the other rivers include Katonga, Kafu and Mpologoma.

Uganda has a tropical climate with moderate temperatures, and rainfall is regular with a bimodal rainfall distribution. A continuum of factors including latitude, orographic aspects and proximity to water bodies explain the country's modified tropical climate (Nsubuga & Rautenbach, 2018). The mean daily temperatures are at 28°C and the long-term mean near-surface temperature is 21°C. The temperatures range from 21 to 25°C with the hottest periods experienced in the months of July to September, and December to February. However, the mountainous and highland areas have much cooler temperatures (NEMA, 2016). As for rainfall, most regions of Uganda, apart from the dry area in the north, have an annual rainfall of between 1,000mm and 2,000mm, with two peaks of MAM (March, April, May) and SON (September, October, November) (NEMA, 2016).

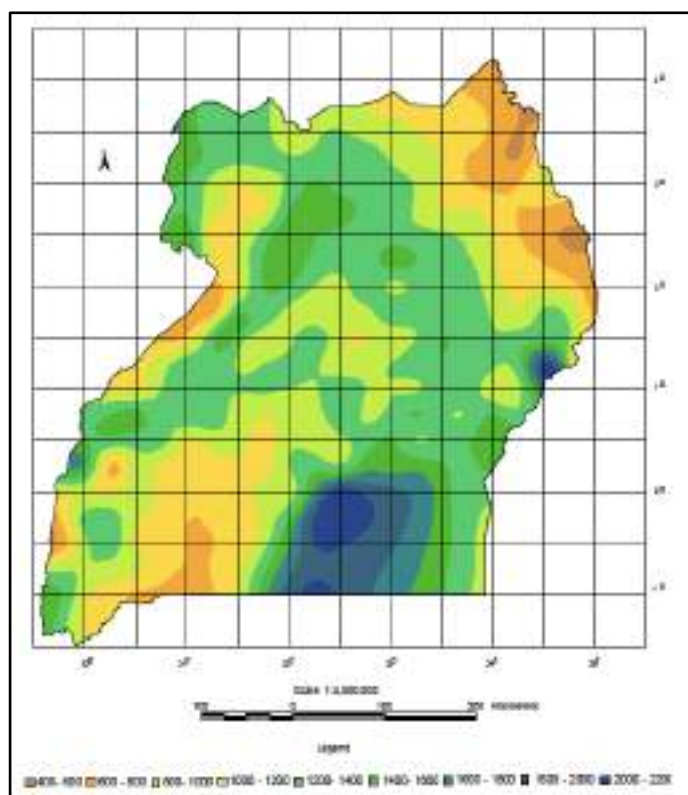


Figure 2: Mean annual rainfall for Uganda Source: MWE, (2015)

However, Uganda's climate is changing and vulnerabilities to the impacts of climate change are very high in almost all sectors of the economy and in many parts of the country (MWE, 2015; Twinomuhangi, Sseviiri, Mulinde, et al., 2021), and are reconfiguring the country's geography. Between 1900 and 2009, temperatures increased by 0.8 to 1.5 °C and annual rainfall reduced at an average rate of 3.5 per cent per decade since 1960 (Mcsweeney et al., 2010; USAID, 2013; World Bank Group, 2015a). Climate change projections indicate that within the next 50 to 80 years, Uganda's temperatures could rise by about 2 °C to 5 °C and rainfall amounts will decrease slightly across the country. Exposures to extreme weather events like rainstorms, drought, flooding and landslides are increasing in frequency and severity and adversely affect livelihoods and ecosystems.

1.2.2 Population and urbanization

Uganda's population is estimated to be 41 million (UBOS, 2021), of which 51 per cent are female and 49 per cent are male, and the life expectancy at birth at 63.1 years, having increased from 50.4 years in 2002 (UBOS, 2020). A significant demographic challenge is that Uganda's population is growing very rapidly at three per cent per annum, making it one of the world's fastest-growing populations (UBOS, 2016b). The population rose from approximately 2.5 million people in 1911 to over 34.5 in 2014. The highest proportion of the country's population (54%) is young, under 18 years, and 73 per cent of population is living in rural areas while 27 per cent is urban (UBOS, 2021). The total number of households increased from 7.3 million in 2014 to 8.3 million in 2017, 75 per cent of which are in rural areas, and 30 per cent are female-headed, while 23 per cent are youth-headed (UBOS, 2016b, 2018, 2020). The population density is 173 persons per square kilometer with an average of 4.7 persons per household (UBOS, 2016b, 2018). However, the distribution of the population widely varies across the country as Kampala records the highest population density (7,928 persons/km²) and Kaabong (at 23 persons/km²) has lowest population density (UBOS, 2016b). Literacy rate, the ability to read and write in any language, of persons aged 10 years and above, is at 74 per cent (UBOS, 2018).

1.2.3 Urbanization

The urban population in Uganda is still relatively small (approximately 27% in 2021), but the country is urbanizing very rapidly (Brown, 2014; Twinomuhangi, 2018). For example, the urban population was at only 1.67 million in 1991 and rose to over 7.43 million in 2014. With an annual urbanization at over five per cent, the urban population could hit 22 million people by 2040 (World Bank, 2020) and account for 60 per cent Uganda's population by 2060 (Farley-Kiwanuka & Yiga, 2020; UNFPA, 2017). The main city is Kampala, which is also the capital city but there are other seven cities which were operationalized in 2020, including: Arua, Fort Portal, Gulu, Jinja, Mbarara, Mbale and Masaka cities, and another 8 cities that include; Hoima, Entebbe, Lira, Kabale, Moroto, Nakasongola, Wakiso and Soroti will be operationalized starting from July 2023. The creation of new cities aims at decongesting Kampala city as a prime center of administrative, socio-economic, and industrial activities that increasingly attract migrants.

Although urbanization in Uganda is a consequence of natural population increases and reclassification of previously rural areas as urban centers, rural-urban migration constitutes a dominant driver to rapid urbanization. The country's open policy to hosting refugees also adds another complex layer or dimension to Uganda's urbanization process as many refugees end up self-settling into cities. Uganda's Vision 2040 and its National Development Plans (NDPs) recognize urban areas as centers of economic growth and development and indeed poverty levels are much lower in urban areas at 9.3 per cent than in rural areas at 22.8 per cent (MFPED & UNDP, 2014). However, the weak capacity to plan, manage and guide urban growth and development (UN-HABITAT, 2012), has led to the emergence of unplanned urban developments that are associated with urban poverty, poor housing (slums), lack of basic infrastructure services and high vulnerability to natural disasters including those related to extreme weather events such as flooding. The urban poor, and most of them urban migrants in slums and informal settlements, are highly vulnerable to the effects of climate change and of late the effects of COVID-19 (Twinomuhangi & Sseviiri, 2020). The emergence of self-settled urban refugees and the urban youth bulge reflect a dynamic configuration for urban migration management and the associated inequalities and social exclusion. Such urban growth is expected to increase the demand for land, housing, health, education, jobs and services, and also adversely affect the environment and ecosystems.

1.2.4 Human development

As economic conditions are important drivers of migration, it is essential to first understand the country's human development context. Uganda's current demographic structure and indicators not only present a challenge to investment in the population and harnessing the demographic dividend, but they are also an indirect driver to migration and human mobility as people migrate for various reasons including the search for better economic opportunities. Uganda has a human development index (HDI) of 0.516, and is ranked 162nd out of 189 countries in the low human development category countries (NPA, 2020). In addition, the country has a Human Capital Index of 38 per cent, implying that with the current state of education and health, a child born in Uganda is expected to achieve only 38 per cent of their productive potential at 18 years of age (NPA, 2020).

Despite the government's poverty reduction programs that span over the past three decades, the degree and levels of inequalities in Uganda are still rising (Lwanga-Ntale, 2014), and are a grave concern (Esaku, 2021). The number of people living in poverty increased from 19.7 per cent in 2012/13 to 20.3 per cent in 2021, with approximately 1.3 million people living in absolute poverty (UBOS, 2021). But still, nearly three quarters of Ugandans would be categorized as poor based on the international poverty threshold of USD 3.20 per day (NPC, 2019) many of whom migrate to other areas seeking for better livelihood opportunities. Evidence indicates that many households presumed to have "prospered" or had their income improve over the past two decades, are still very vulnerable to poverty (Esaku, 2021; Lwanga-Ntale, 2014; Ssewanyana & Kasirye, 2012) and climate and environment risks (UBOS, 2021). Moreover, the rate at which poverty is declining is far slower than during the period between 2005 and 2012 (Mejia-Mantilla et al., 2019). With the COVID-19 pandemic and lockdown restrictions imposed to stop the spread of the disease since early 2020, economic activity has significantly slowed, many people have lost jobs and livelihoods and poverty levels can only increase in the foreseeable future.

While the quality of workforce is critical to enhancing productivity, sustaining economic transformation and averting the intergenerational transfer of poverty, less attention has been paid to building a skilled and healthy workforce in Uganda. This has resulted in investments in social sectors, including health and education remaining low (NPC, 2019). Uganda's national budget allocations have over the years been highly skewed to infrastructure sectors at the expense

of social sector financing. The country's young population (that is 54% below 18 years) means a high dependency ratio; and so, significant resources should be invested in the provision of social services (health and education). On a positive note, an improvement in life expectancy at birth has been realized from 51.5 years in 2009 to 63.3 years (UBOS, 2021). Unemployment and underemployment remains significant challenges mainly amongst the youth and women, especially those with limited skills, but overall employment in the formal sector is very low (UBOS, 2016a). To address the current unemployment crisis and the economic shocks of the COVID-19 pandemic, Uganda needs to create over 600,000 jobs per year, above the current levels of only 75,000 jobs created annually.

1.2.5 Economy

The country's long-term goal, articulated in the Uganda Vision 2040 (adopted by Government of Uganda in 2010), aims at 'transforming Ugandan society from a peasant to a modern and prosperous country within 30 years and attainment of a middle-income country (MIC) status with per capita increasing from USD 506 in 2010 to USD 908 in 2020. The country would have supposedly achieved a lower MIC status, and then targeting to achieve an upper MIC status with a per capita income of USD 9,500 by 2040. However as of 2021, the country had not yet achieved the envisaged MIC status and Uganda is still a Least Developed Country (LDC) with a per capita GDP of USD 794.3 (World Bank, 2019b). Uganda's economy has been growing fast and consistently over the last 30 years. However, annual economic growth was 2.9 per cent in 2020, which is less than half the 6.8 per cent growth recorded in 2019, due to the effects of the COVID-19 pandemic on the economy (World Bank, 2021b). Since March 2020, the economy has experienced a downturn due to the severe impact of COVID-19 pandemic lockdown measures implemented to curb the spread of the COVID-19 (Grant Thornton, 2021). Consequently, Uganda's economy grew by only approximately 3.1 per cent in 2020 although it is expected to rebound to about four per cent (Grant Thornton, 2021).

As at mid-2021, the country's debt-to-GDP had reached a record high of 50.09 per cent. Core inflation is now at 3.7 per cent, below Bank of Uganda (BoU)'s projections of five per cent, thanks to the low food and energy price inflation, the decline in international oil prices and a stronger exchange rate (IMF, 2019). The high incidences of poverty and inequality coupled to structural constraints to investment including compromised access to credit and finance, poor infrastructure and inadequate availability of skilled labour deprive many people from fully contributing to society and economy.

Although the services sector dominates contribution to Uganda's GDP at 51.1 per cent followed by agriculture (21.9%) and industry (18.7%) (UBOS, 2021), agriculture remains Uganda's dominant economic activity. It employs around 64.3 per cent of the country's population (47% employed in subsistence farming), and accounts for 21.9 per cent to the GDP (2018/2019). Tourism is another important economic sector for Uganda, a top foreign exchange earner, contributing to over 7 per cent to GDP and 6.7 per cent to total employment (Grant Thornton, 2021). The country's development agenda focuses on agro-industrialization, and oil and gas development. Heavy infrastructural investment is prioritized in energy (hydro-power), oil and gas, and roads sectors which are defined as the country's investment priorities. Urban areas contribute greatly to the country's GDP (Twinomuhangi, 2018). For example, the Greater Kampala Metropolitan area which has approximately 10 per cent of the country's population accounts for 60 per cent of the country's GDP and about 80 per cent of the country's industrial and commercial activities (KCCA, 2014).

Despite having a high labour force proportion (81.1%), labour underutilization remains a challenge with only 19.5 percent in paid employment because some are either highly skilled and working in low-paying jobs or working part-time (NPA, 2020). Approximately 28 per cent of the children are in child labour (UBOS, 2016a). Education impacts the type of employment, as half of the people with no education could only find seasonal and temporary jobs while around 75 per cent of employed people with higher education have a more stable all-year job (IMF, 2019). The failure of the formal economy to absorb the unemployed population, prevalence of unskilled or semi-skilled labour, heavy taxation regimes and burdensome regulatory frameworks have led to the rise of informality in Uganda. Similar to other developing countries, the informal sector has become central to production of goods and services and creation of the much-needed jobs (Mugoda et al., 2020; Twinomuhangi et al., 2021b). The informal sector continues to dominate the business landscape (78%) and is a source of livelihood to the urban poor and vulnerable individuals within different communities across Uganda, and is characterized with widespread socio-economic risks, income insecurity, poor working space and unsustainable business operations (FSD Africa, 2015; Hillier et al., 2020;). Besides, the sector

remains unregulated and not monitored by existing governance structures to adequately track its contribution to the national economy.

1.3 Migration – Evidences from the past

1.3.1 Migration through history

Migration is an old-age phenomenon comprising voluntary and involuntary movements and involving both internal and international migrations which have been an integral part of Uganda's history (Mukwaya et al., 2012). The peopling of East Africa, in which Uganda lies, is closely linked to the Bantu and Luo migrations that occurred several centuries ago (Vansina, 1995) and migrations continued throughout pre-colonial, colonial and post-independent Uganda. During the precolonial era, migration was predicated in the conflicts among traditional chiefdoms and kingdoms across the current Uganda. During the colonial period, migration was predominantly driven by conflicts and violence and labour migrations occurring most especially from the southwestern (Kigezi sub-region) and northwestern (West Nile) parts of Uganda to the sugarcane plantations and private coffee farms in the central and eastern Uganda (Lyons, 1996; Rutabajuka, 1989).

The 1969 census reveals historical evidence of internal migration in Uganda, and at that time Uganda had only 18 districts. The then West Mengo district, which included Kampala city and the current Greater Kampala Metropolitan Area, attracted the highest proportion of in-migrants relative to the district total (28%), followed by districts of Bunyoro (26%), Mubende (24%), East Mengo (22%), Busoga (13%) and Toro (13%) (Uganda Statistics Division, 1976). The relatively high migrations were mostly induced by migrants seeking wage employment to improve their socio-economic well-being. During the 1950s and 1960s, many migrants were attracted to West Mengo and East Mengo districts for paid employment in coffee farms, tea plantations and the associated processing factories.

Migration in the colonial and post-colonial period was also fueled by resettlement policies. The government promoted rural-rural migration from densely populated areas of the southwestern part (Kigezi) and eastern part (Bugisu) to western and central parts of Uganda that is Ankole, Buganda, Bunyoro and Toro (Mukwaya et al., 2012; Ntozi et al., 2011, 2012). In addition, there was resettlement of European nationals fleeing violence and conflict into different parts of Uganda (Jallow et al., 2004). Also, ethnic cleansing reflected in the expulsion of Ugandan residents of Indian origin in the 1970s occurred (Flahaux & Haas, 2016).

As for international migration, refugees and asylum seekers displaced from neighboring conflict-stricken countries of Africa like Rwanda, Burundi, DRC and South Sudan have migrated and settled in Uganda over the last six decades or so (The World Bank Group, 2016). On the contrary, an increased number of Ugandans have migrated to Europe and USA, regularly and irregularly since 1960s, in search of jobs, better living conditions (IOM, 2015), but also others as refugees fleeing political violence. The generally stable political environment in Uganda since the 1990s has led to the return of Indians/Asians expelled during the economic war of 1972 and also made Uganda to become the home to hundreds of thousands of refugees from neighboring countries (IOM, 2015).

The internal migrations in the 1960s were largely influenced by availability of free and fertile land most especially in Ankole, Toro and Bunyoro and, as already mentioned, the government encouragement of people from high-density districts to migrate to sparsely settled areas (Uganda Statistics Division, 1976). Apart from the availability of virgin land that attracted cultivators, the migrants' attraction to Toro district was in part attributed to availability of employment opportunities in the Kilembe copper mines and tea estates (Masereka & Wadembere, 2019). Busoga district also attracted in-migrants who sought job opportunities in the Kakira sugar estate and factory but also in Jinja which was Uganda's main industrial town (Byerley, 2013). The migrants worked in industries such as Nyanza Textiles Industries Limited (NYTIL), which was the largest of its kind in East Africa in the 1950s and 1960s. As Uganda's industrial town, Jinja became a hub of migrant attraction with labor migrants originating from various corners of the country, and even from as far as Rwanda and Kenya (Uganda Statistics Division, 1976).

The volatile socio-economic and political situation (instabilities) in Uganda caused significant and temporary reverse migration from major towns to rural areas in the late 1970s and early 1980s (Mukwaya et al., 2012; Potts, 1997). The

civil war of 1981 to 1986 displaced many people from what was popularly known as the “Luwero Triangle” in Central Uganda (Ntozi et al., 2011). In the 1990s and 2000s, northern Uganda was hit by political instability that forced people to migrate from rural areas to towns. The civil war in northern Uganda was caused by the Lord’s Resistance Army (LRA) insurgency and cattle rustling in the Karamoja sub-region in north-eastern Uganda (IOM, 2015). In all, between 300,000 and 600,000 migrants are said to have moved to urban areas due to the war in Northern Uganda, and about 2,000 persons from Karamoja, mostly women and children, moved to Kampala city streets in 2006 (Brown, 2014).

Of late, environmental migration has been on the rise in Uganda, in which environmental shocks, including those related to climate change and resource degradation are driving displacement and human mobility in Uganda (Maastricht Graduate School of Governance, 2017). The recurrent droughts, floods and conflicts between pastoralists and herders in Karamoja compel some people to move to urban areas (Brown, 2014). The IOM (2015) also reports that environmental risks and natural disasters are becoming major drivers of displacement and internal migration.

1.3.2 Internal displacement

Uganda has also experienced involuntary movements generated by both man-made and natural disasters. World-wide, the number of internally displaced persons (IDPs) is estimated to be about 55 million (IDMC, 2021), and Uganda has been among the top-most countries with huge number of IDPs (i.e. IDPs rose to about 1.6 million in 2006 (UNHCR, 2007)). The prevalence of such numbers of IDPs has been a serious population issue in the last two decades.

Heavy rainfall and flooding have in the last three decades increased internal displacement of people in Uganda. In 2007, Uganda was devastated by the El Niño climatic phenomenon that was characterized by intense and prolonged rains that caused extensive flooding in the eastern part of the country and 48,000 people were temporarily displaced by the flooding (M. A. Abebe, 2014; UNICEF, 2011). The most severely affected areas are the Teso and Mt. Elgon sub-regions including the districts of Soroti, Amuria, Katakwi, Bukedea, Kumi and Sironko in the Eastern region of Uganda. On the prevalence circular migration among the resettled population, the Bududa district environment officer remarked:

“The people displaced by landslides in Nametsi and Bufutsa, Bududa district were resettled in Kiryandongo and Bulambuli districts respectively. However, the environmental and socio-economic conditions in the resettlement area are not very conducive for them (e.g., dry conditions, poor soils, low crop productivity, food insecurity and land shortage), and the resettled peoples usually return to their areas of origin during the wet seasons to plant crops (March to May) and during the harvesting period (mainly August)”. (Says Musa Natsambwa, the Environment Officer of Bududa district- 4th April 2021)

Man-made catastrophes have also forcibly displaced persons in Uganda. The civil conflict in the country forcibly displaced thousands in 1995 and 1996 when the government forced civilians in northern Uganda into protected villages, to control the high rate of abductions and killings by the Lord’s Resistance Army at the height of the insurgency. These protected villages later became IDP camps. By the end of September 2000, it was estimated that there were nearly 640,000 people living as IDPs in Uganda. These included 2,000 in Adjumani, 114,000 in Bundibugyo, 370,000 in Gulu, more than 11,000 in Kabarole, 20,000 in Kasese, 82,600 in Kitgum, 5,000 in Masindi and 35,000 in Teso sub-region (Lomo et al., 2001). Around 2006, insurgency reduced, and about two-thirds of the 1.8 million IDPs re-migrated towards their areas of origin. But at the same time, another insurgency caused by Allied Democratic Forces (ADF), was in western Uganda (in the districts of Kasese, Bundibugyo and Kabarole) that also led to IDPs (Scorgie, 2011). By 1998, many people in this region had been killed and up to 200,000 people were herded into 84 IDP camps. By 2006, the number of IDPs in Uganda had risen close to two million (UNHCR, 2007).

1.3.3 Transhumance mobility

Transhumance mobility is an integral part of pastoralist livelihoods and a key element for its sustainability (Manzano et al., 2020). It involves the relatively more regular movement of herds between well-defined wet and dry season pastures in order to exploit the seasonal availability of pastures. In Uganda, transhumance mobility is widely common within the typically semi-arid cattle corridor where people’s livelihoods totally or partially depend on livestock and

have some sort of attachment to cattle (Kinyera & Doevenspeck, 2019). Uganda's cattle corridor covers approximately 42 per cent of the country's land area stretching from the north-east in Karamoja sub-region (Kotido, Moroto, Nakapiripirit districts), through parts of Teso (Katakwi, Amuria and Soroti districts), Lango (Apac and Lira districts), and parts of Buganda (Luweero, Nakasongola, Mubende, Masaka and Lwengo, and parts of Ankole (Kiruhura and Mbarara) up to the south-western Uganda district of Isingiro (Barasa, 2020). The cattle corridor supports a considerable number of the livestock population (mainly cattle, goats and sheep) kept by pastoral and agro-pastoral communities.



Figure 3: Uganda's cattle corridor and transhumance communities. (Source: Barasa, 2020)

The land tenure in most part of the cattle corridor is communal. Nature-dependent grazing (based on natural pasture) dominates, although major socio-economic dynamics are taking place in some parts, especially, where communities are transforming traditional grazing lands into cultivation (Nimusiima et al., 2013). The cattle corridor, and most especially the agro-pastoralist Karamoja sub-region in the north-eastern Uganda, is faced with a harsh climatic condition characterized by prolonged dry seasons and recurrent droughts that cause water, pasture and food shortages which often prompt seasonal and permanent migration to other areas for better grazing lands and for survival (Egeru et al., 2014).

Transhumance mobility is often characterized by well-organized seasonal mobility in search for better grazing and watering areas. The most notable communities engaged in transhumance within Uganda are the “Balaalo” or Bahima cattle keepers of Ankole sub-region and Karimojong pastoralists in north-eastern Uganda and the migration is either short term or long-term. On the other hand, cross-border migrations by the Pokot from the Turkana region of Kenya cross over to Uganda when severe drought occurs in the north-western part of Kenya. Short-term migration is usually triggered by regular seasonal changes, whereby herders temporarily migrate to a new location to access pasture, water, or salty grass (Epule et al., 2018). Once the rains reappear, they return to their place of residence. Long-term migration, on the other hand, is triggered by climate extremes such as extended dry spells and droughts. In this case, migrating groups move far away from their places of residence in search of pasture and water. They stay for extended periods of time. Sometimes they return to their places of departure in small numbers when the climatic extreme subsides, or they may never return.

The migratory routes and patterns in Karamoja sub-region have changed considerably over time. The survey conducted in Amudat district revealed that most migrations are now short-term and often limited by administrative borders, as opposed to the past when long-term and long-distance migrations were more common. The migratory patterns in Karamoja have been affected by new settlements, competing land uses with cultivators along traditional grazing routes, water availability, as well as border disputes as the coordinator for Food for the Hungry, an NGO in Amudat district had this to say:

“In Karamoja, migrations are not as longer-term as they used to be in the past. Many people have moved away from transhumance to other livelihood activities especially cropping and trade that are not compatible with pastoral lifestyles. In addition, some agricultural projects have been implemented in the region that foster a shift from transhumance to permanent settlements. In Kalita Town Council and Lokales village, communities have set up permanent settlements with people engaged in farming, and trade and commerce” says Moses Mwalye on 19th March 2021.

The key informants interviewed in the wetter parts of Amudat and Katakwi district revealed that unlike in the past, the “Balaalo”, Pokot, Bagisu and Karimojong mobility searching for grazing grounds and water is an increasingly concern among agrarian communities in Uganda, and land conflicts are on the rise. The recent migration of Bahima and Karimojong pastoralists into Teso sub-region are associated with resources conflicts (land, pasture and water), cattle rustling and the deterioration of in-situ agro-pastoral activities. While government efforts to disarm the Karimojong have reduced armed confrontations, resource conflicts and cattle rustling continue to exist in the sub-region as indicated during the PMM and interviews with key informants. During the PMM exercises in Amudat district it was revealed that:

“Pastoral mobility often results into to resource conflicts between the pastoralists and host communities in Karamoja and Teso sub-regions. The worsened drought conditions have also led to cross-border pastoral community migrations from north-western Kenya (the Turkana) to Karamoja (Uganda). Cattle rustling is also common amongst the pastoral communities”. PMM discussions at Amudat district local government on 7th December 2020.

1.3.4 Internal migration

Internal migration is defined as change of usual residence within the administrative boundaries of countries (Rees, 2020). Such movement can be short-term or long-term, and different directional flows between rural and urban areas can be distinguished (rural-rural, rural-urban, urban-rural and urban-urban) (Nyaoro et al., 2013). As already indicated in section 1.3.1, internal migration in Uganda has been largely driven by internal conflicts or civil unrest and insurgencies. For example, in the early 1980s the Central region (Luweero triangle) was characterized by civil war and insurgency against (1981–1986). On the other hand, the Eastern Region (Teso sub-region) experienced wars against the current Museveni government in late 1980s), and in the northern region (mainly Acholi) experienced the Joseph Kony-led insurgency in the late 1980s and the whole of the 1990s. These civil unrests resulted in IDPs, government resettlements, changes in ownership of natural resources, and rural-urban migration (Adopeju, 2008; IOM, 2015).

Economic considerations also cause internal migration in Uganda. Labour migration, especially from West Nile area, contributed to the outflow to plantations and industries in Jinja industrial zone for employment opportunities. The 2019/2020 Uganda National Household Survey (UNHS) estimates that 5% of the country’s population (slightly over two million people) are internal migrants (UBOS, 2021). While rural-to-rural migration represents about 42% of the migration as rural-urban and urban-urban migration accounts for 40% (Boutin, 2018; UBOS, 2021). Contemporary migration streams do not move so much to rural destinations (only 18%) and are comparatively more to centers of agglomerations (Ntozi et al., 2011). Young people appear to take up the largest proportion of the population on the move. However, the prevailing COVID-19 pandemic crisis and associated containment measures including lockdowns and closure of many informal sector livelihood activities like public transport and markets ignited cyclic urban-rural and rural-urban mobilities across major urban centers in Uganda. This is because majority of the urban poor sought refuge in their rural families and social networks for survival.

Further, the opening up of new areas through the eradication of disease vectors such as the tsetse fly prompted the re-direction of population from these densely populated areas towards the planned tsetse fly-free zones in Ankole, Toro and Buganda districts (Ayorekire, 1999). These events led to migration from war-affected districts, mainly to neighboring districts and urban areas – followed by return migration when relative peace prevailed. Moreover, internal migration in Uganda manifests as a complex issue because people move to both urban and rural areas, and even the households may have linkages to the two different localities (Mekonnen et al., 2020). Despite the likelihood of individual migrants to move to rural areas as compared to urban areas (Mensah & O’Sullivan, 2017), most of the internal migrants (65.9%) in Uganda are in urban areas, and females constitute the largest proportion of urban and rural internal migrants (IOM, 2015).

Internal migration in Uganda has for long been defined as mobility from rural districts to the more urbanized Kampala city. The biggest migration streams have for long been predominantly from Masaka to Kampala and Mpigi to Kampala. Other big streams include Kampala to Wakiso, Bushenyi to Mbarara, Masaka to Wakiso, Mukono to Kampala, Mpigi to Wakiso and Luweero to Kampala all comprising of all dynamics including rural-rural, rural-urban, urban-rural and urban-urban migration patterns (Ntozi et al., 2011). Overall, Kampala district was and continues to be an in-migration hub; attracting the biggest number of large streams. This underlines the supremacy of the capital city as a focal point of in-migration. Its attractiveness stems from the real and perceived opportunities which migrants hope to take advantage of in a bid to improve their livelihoods. Currently, a significant proportion of Kampala residents especially those in affluent settlements are increasingly abandoning the city to settle in the city region peri-urban areas (like Mukono, Wakiso, Mpigi, Entebbe and Luweero). This mobility trend is being driven by increasing demand for land and urban space by commercial and business investment potentials at the expense of well-planned residential settlements. Moreover, the volume of internal migration streams can depend on the distance people have to travel to the target destination. Upcountry districts like in eastern, western and northern regions of Uganda reflect long-distance mobility patterns that portray both rural-rural and rural-urban migration tendencies in Uganda (UBOS, 2002).

According to IOM (2015), environmental change and climate-related disasters are becoming the major drivers of internal migration in Uganda. As already mentioned in section 1.3.2 (internal displacement), droughts, floods and resource conflicts between pastoral and agro-pastoral areas in Karamoja cause both temporary and permanent migrations within Karamoja and adjacent regions and urban centers (Brown, 2014). Droughts cause poor harvests, livestock loss and food insecurity which are causes of out-migration to neighboring communities/regions. Men tend to seasonally migrate with their livestock to areas with water and pastures, leaving their families behind. Karimojong migrations to neighboring sub-regions of Teso and Acholi cause tensions and conflicts over water and pasture (UNPF, 2006). The PMM exercise in Amudat revealed that an increasing number of migrants from Karamoja sub-region are women and children, but also young men is a major concern across the Karamoja sub-region. The failed livelihoods are exposing children to human trafficking into urban areas of Uganda (Abebe et al., 2016). A significant portion (more than 40%) of the street children in Kampala city are from Karamoja, having been trafficked into the city, and most of these children (more than 75%) are girls (ANPPCAN, 2015; Luwangula, 2017).

1.3.5 Cross-border migration

Globally, the Eastern and the Horn of Africa (also known as the Great Lakes region) is home to the highest number of IDPs and refugees, with about 12.4 million IDPs and 5.21 refugees and asylum seekers (Mohmand, 2019). The region is synonymous with forced migration and protracted displacement caused by recurrent conflicts, ensuing violence and continuous waves of displacement with no immediate solution in sight. With Uganda pursuing an “open door policy” to refugees, the refugee influx is a significant challenge for the country (Ahimbisibwe, 2019), and mostly reflects Uganda’s cross-border migration regimes and patterns. Currently, most of the refugees in Uganda originate from neighboring countries of Burundi, DRC, Eritrea, Somalia, Ethiopia, Rwanda, and South Sudan (Ahimbisibwe, 2019; UNHCR, 2016, 2020).

Uganda’s experience with cross-border migrations through hosting refugees started during World War II when Europeans displaced by war were settled on its territory (Gingyera-Pinyawa, 1998). The refugees included over 7,000 prisoners of war from Poland, Germany, Romania, Austria, Bulgaria, Yugoslavia, Hungary, France and Malta (Ahimbisibwe, 2019; Jallow et al., 2004). During the colonial period, the British government invited Zionist leaders in

Europe to settle Jewish people fleeing from persecution in the north-eastern Uganda (World Bank Group, 2016). Furthermore, the collapse of the Anglo-Egyptian condominium of Sudan led to the Anyanya rebellion and consequent influx of 80,000 refugees into Uganda with some largely and spontaneously settled in northern Uganda, while others headed to urban centers like Kampala and Jinja where significant communities of Sudanese Nubians resided (World Bank Group, 2016). The influx was soon followed by numerous refugees generated by unrest in the aftermath of the various independence struggles in neighboring countries; for example, Kenya's independence struggles in the 1950s, DRC between the 1950s and 1960s (during the aftermath of independence and Patrice Lumumba's assassination), and the political turmoil in Rwanda in the 1950s and 1960s that forced over 80,000 Rwandan Tutsi to flee the country (Gingyera-Pinycwa, 1998; The World Bank Group, 2016).

Contemporary Uganda has also received a number of refugees from Burundi, Somalia, Ethiopia, Eritrea, Kenya and more recently (since 2013) a new influx of South Sudan refugees (Ahimbisibwe, 2019). As at 2021, Uganda hosts 1,470,858 refugees and asylum seekers, which is the largest in the region and most of the refugees are from South Sudan (903,198), followed by DRC (428,892), Burundi (50,276), and Somalia (46,373).

Uganda adopted a settlement approach in responding to the refugee crisis (Clements et al., 2016; Ruaudel & Morrison-Métois, 2017) and gazetted refugee settlements in different parts of the country (World Bank Group, 2016). Currently, there are 26 gazetted refugees settlements mainly situated in the Northern and Western regions (UNHCR, 2020). Refugees in settlements are provided with humanitarian assistance, land and basic services including health, education, water and transport infrastructure whereas the self-reliant ones are allowed to settle in urban areas (UNHCR, 2016). The refugee influx has, however, created many challenges including pressure on existing social service infrastructure, caused environmental and ecosystems degradation and resource conflicts between refugees and host communities (Ahimbisibwe, 2019). With land increasingly becoming scarce, compounded by environmental degradation in and around refugee settlements, declining land productivity and rising food insecurity, the sustainability of Uganda's progressive refugee approach is at risk (Herbert & Idris, 2018).

Finally, cross-border migration is also reflected in the presence of non-Ugandan nationals that increasingly enter Uganda on diplomatic missions, business investments, academic and tourism missions either on short-term or long-term basis. The prevailing political stability in the country has attracted several foreign investors and business enterprises from all over the world especially from China, India and some European countries. The existing foreign investments, multi-national enterprises, foreign agencies and partnerships have for long triggered cross-border migration through the influx of foreign expatriates that come to offer advisory and technical knowledge in relation to contemporary development priorities. In addition, there are many scholars, students and tourists that frequent the country on temporary basis and some have decisively resolved to acquire Ugandan citizenship. On the other hand, cross-border migration manifests at different border points of Uganda and its neighboring countries through movement of border communities across different international boundaries for trade, commerce and socio-political interactions and exchange. Similarly, many Ugandans have crossed its borders and travelled to neighboring countries, within Africa, Europe, the Americas, Asia and Arab world for socio-economic and political reasons.

1.3.6 Internal and international remittances

Remittances are defined as the non-reciprocal money or goods that migrants transfer to families and friends in origin communities. Despite mostly being categorized financially, remittances also comprise social facets like ideas, behavior, identities, social capital and knowledge that migrants acquire and transfer to their communities of origin. There exist both formal and informal remittance transfers, with the later not adequately documented and estimated.

The global growth of financial transfers made in form of remittances by migrants has rapidly accelerated, and is almost four times larger than official development assistance. The remittances, which are estimated to touch the lives of over one billion people (KNOMAD, 2017; Martin & Bergmann, 2017) surpassed the sum of Foreign Direct Investments (approximately USD 259 billion) and overseas development assistance (approximately USD 179 billion) in 2016. It is argued that migration is more effective at reducing poverty than other development programs in certain settings (Gibson & McKenzie, 2014). However, with the COVID-19 pandemic-related effect on wages and employment for

migrant workers, remittances flows fell by only 1.6 per cent (to USD 540 billion) – smaller than the recorded 4.8% falls during the 2009 global financial crisis (Ratha et al., 2020).

Over the past 20 years, remittance inflows into Uganda have been increasing steadily while outflows have remained relatively stable (see Figure 4). By 2016, Uganda was the sixth-highest recipient of remittances in Africa with over USD 1 billion (World Bank, 2017). Current inflows indicate an added equivalent of over four per cent to the Ugandan GDP (at USD 1.425 billion), making remittances a vital source of capital for economic growth and development (World Bank, 2021a). Kenya is the most popular destination country for Ugandan migrants, followed by South Sudan, Rwanda, the United Kingdom (UK) and the United States of America (USA). Overall, Uganda receives 49 per cent of the value of remittances from developed countries and 51 per cent from developing countries, especially neighbors (World Bank, 2017). In 2016, the highest amount of remittances received in Uganda were from United Kingdom (UK) (around USD 275 million), followed by South Sudan and Rwanda (Cooper et al., 2018) (see Figure 5). Further, the diaspora in the UK sends almost USD 4,000 per person per year back home and by comparison, the diaspora in Kenya sends USD 170 per year (Cooper et al., 2018).

Although the World Bank does not show any data on the Middle East being a destination for Ugandan migrants or a source of remittances, it is estimated that at least 165,000 Ugandans are employed either as semi-skilled or manual laborers in the Middle East countries (mainly in Oman, Qatar, Saudi Arabia, United Arab Emirates (UAE), Kuwait, and Bahrain). Uganda's economy benefits from remittances sent by migrants in the Middle East; for example, the remittances from the region grew from USD 51.4 million in 2010 to USD 309.2 million in 2018, accounting for approximately 23 per cent of the overall remittances (USD 1.3 billion) (Nattabi et al., 2020). Both formal and informal remittances are also flowing across borders to support the high number of refugees in Uganda, implying that remittance services need to cater for refugee camp residents which have limited access to formal identification and financial institutions (Cooper et al., 2018).

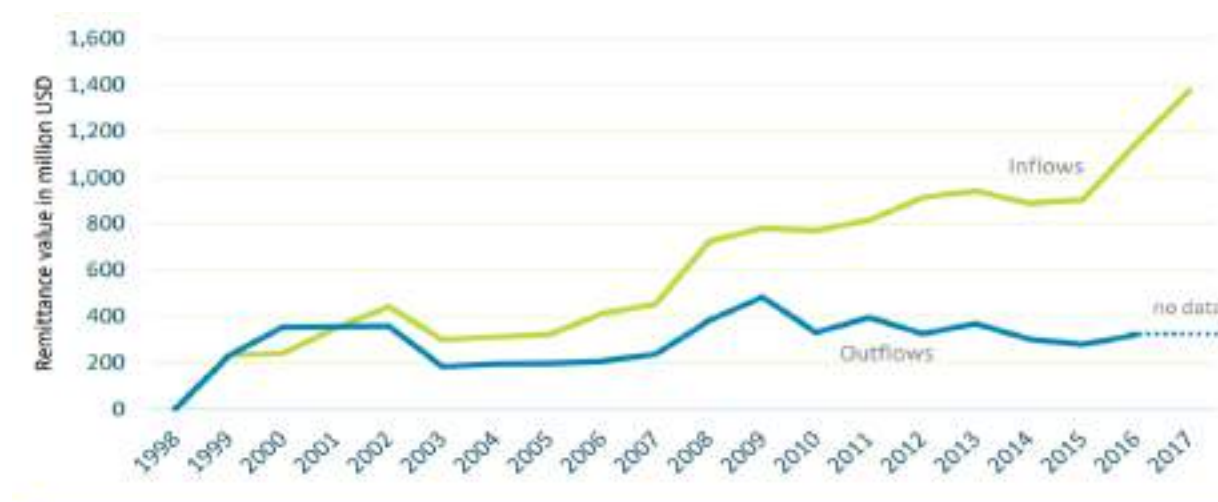


Figure 4: Uganda remittances inflows and outflows over time. Source: (World Bank, 2017)

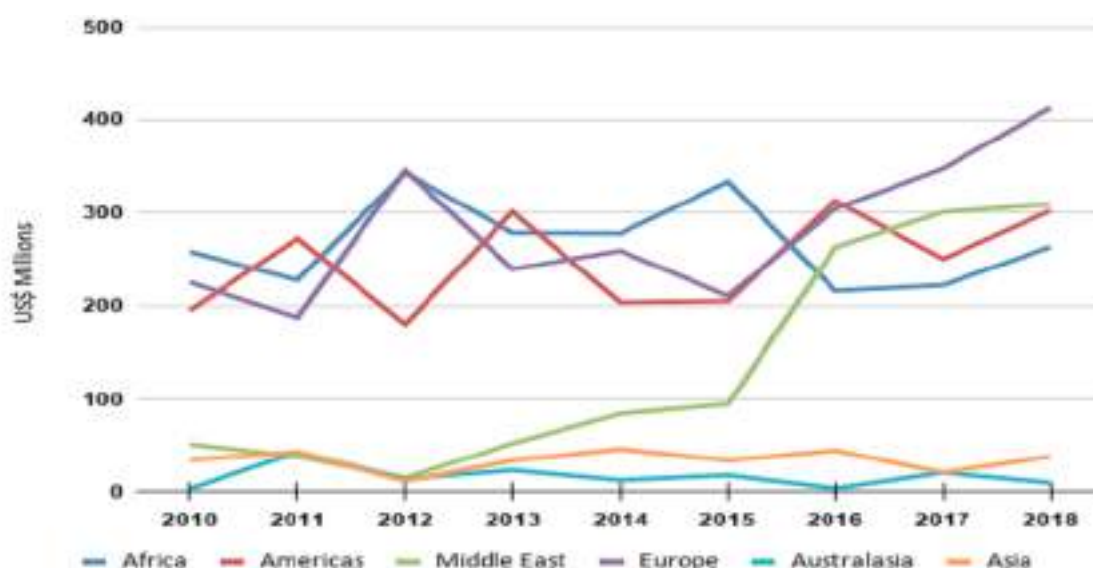


Figure 5: Personal transfers to Uganda by source region. (Source: Nattabi et al., 2020)

Remittances into Uganda flow both formally and informally. The informal means include sending or receiving money via buses or taxis and/or through trusted individuals. In addition, there are informal dealers that offset trade payments without money crossing the border. These happen at the back of illicit financial flows that are complemented by complex forex and accounting services (Cooper et al., 2018). Formal remittances, on the other hand, flow via banks partnering with licensed financial institutions such as money transfer operators (MTOs), the post office, microfinance institutions (MFIs) or mobile money operators (MMOs). Mobile money is particularly highly embraced and its increased entrenchment in Uganda has spurred growth in remittance volumes and values. The Bank of Uganda (BoU) estimates that 75 per cent of cross-border remittances were received through formal channels. International MTOs accounted for 50 per cent, followed by bank accounts (31%), mobile money (11%), local MTOs (8%) and the post office (0.2%) (BoU, 2017).

For domestic remittances, it is estimated that around 10 million adults in Uganda send or receive money within Uganda and 82 per cent of them do so via mobile money (FSDU, 2018). Informal remittance channels in Uganda are reportedly cheaper compared to formal channels as recipients only pay a small commission fee to informal agents, which is lower than commission payable to formal agents (UNHCR & UNCDF, 2018). The newly introduced mobile money tax has increased the cost of money transfers, further widening the gap between informal and formal mechanism costs (Cooper et al., 2018).

The recipients of remittances in Uganda variedly utilize them. For example, the bulk of personal transfer receipts during 2016 were used for home consumption (69.5%), with household expenses and education being the most common expenditure categories (BoU, 2017). About half of the cash received was reported to have been spent on education and household necessities with 38.4 per cent for general household expenses, while 22 per cent were used for education (BoU, 2017). Non-consumption expenditures accounted for 24.5 per cent, most of which was on business-related activities. Amidst widespread poverty in rural communities, remittances partially remove credit and insurance constraints. Remittances have also promoted farming, especially application and use of inorganic fertilizers among Ugandan farmers, and commercial livestock rearing and mainly because with remittances, improved agricultural inputs become affordable (Veljanoska, 2021). Besides, the country also receives remittances in kind such as clothing, footwear, vehicles and electronics. The composition of items in kind shows inclination towards consumption. Not only do remittances serve as safety nets for those who have lost incomes, livelihoods and housing as a result of climate and environmental shocks, they also facilitate swift mobility from one place to another following exposure to climate hazards and environmental shocks. Generally, remitters greatly support Uganda's economic activity through both consumption and non-consumption items that directly and indirectly contribute to the economy and livelihood improvement.



2. Key challenges: The migration, environment and climate change nexus

2.1 Environmental Challenges in Uganda

2.1.1 Environmental Degradation

In least developed countries, including Uganda, livelihoods and socio-economic development are largely dependent on the environment and natural resources (Freduah et al., 2017; Ofosu et al., 2020). Land and natural resources remain Uganda's prime capital assets available to the population and for development, accounting for 54 per cent of the country's total assets (Twinomuhangi et al., 2015), which are mainly used for crop production, pasture lands, protected areas, forests and wetlands. This high nature-dependence makes environmental and natural resource degradation a major concern (Asongu et al., 2019). In Uganda, deforestation and forest degradation have been observed. For example, forest cover has reduced from 24 per cent of the country's surface area in the 1990s to a mere 12.4 per cent, which is equivalent to approximately two per cent annual loss of forest cover, which is among the world's highest forest cover loss (MWE, 2019). At this rate, unless significant forest conservation and restoration takes place, Uganda could lose all forest cover by 2041 (NFA, 2015). Wetland cover has also reduced significantly, from 17 per cent of Uganda's land area in 1964 to 15.6 per cent in 1994, and is currently approx. 8.9 per cent (MWE, 2019; NEMA, 2019).

Land and ecosystem degradation, and biodiversity loss are majorly driven by the increasing population and the need for land for settlement and agriculture expansion, among others. For example, between 1990 and 2015, 80 per cent of the land lost from forestry and wetlands was converted into agricultural land (NEMA, 2019). Environmental degradation reduces ecosystems' resilience to climate variability and climate change, which amplifies the negative impacts of climate change in the country. Besides, biodiversity loss decreases the structural diversity of vegetation, affects soil nutrients and structure, and can lead to soil erosion, which in turn increases vulnerabilities to climate shocks and extreme weather events (World Bank, 2015).

Soil erosion and soil nutrient depletion constitute the two most important forms of land degradation and major threats to sustainable agriculture in Uganda. Between 60 and 90 per cent of land in some parts of Uganda is affected by soil

erosion, some above the tolerable levels especially the densely populated mountain slopes and highlands of eastern, western and south-western Uganda. Severe soil erosion also occurs in the rangelands of the cattle corridor, most especially in Karamoja, Kiruhura, Luweero and Nakasongola where overstocking and overgrazing have obliterated the fragile vegetation cover. The rate of soil fertility loss in Uganda is among the highest in sub-Saharan Africa (SSA) (Stoorvogel & Smaling, 1990; Wortmann & Kaizzi, 1998), mainly attributed to the limited and declining use of fallow, low use of inorganic or organic sources of soil nutrients, and other poor fertility management practices. The economic cost of environmental degradation is very high. For example, the economic loss attributed to land degradation in the 1990s ranged from four per cent to 12 per cent of Uganda's GDP (Twinomuhangi et al., 2015), 85 per cent of which was attributed to soil erosion and nutrient loss. In all, it is estimated that biodiversity loss, degradation of soil resources, and wetland encroachment costs the Ugandan economy approximately US\$197.8 million, US\$87.9 million, and US\$ 782,000 every year respectively (Moyini et al., 2002).

Environmental degradation is being exacerbated by the impacts of climate change, more especially through droughts' cascading effects. The rising temperatures, droughts, intense rainfall, flooding, compounded by degradation of wetlands and catchments are linked to deteriorating water quality and quantity. Severe water shortages are a rising concern in the cattle corridor, especially in Karamoja sub-region and they will worsen in a changing climate. Water contamination is also emanating from pollution and poor waste management practices. Disasters can cause environmental degradation in form of soil erosion, soil and water salinization as well as loss of biodiversity (FAO, 2015).

The increasing influx of refugees in Uganda is another driver of environmental degradation. Refugee-hosting areas have experience widespread land, forest and wetland degradation (UNHCR & UNCDF, 2018) as the refugees and host communities invade ecosystems to get wood for shelter building and domestic cooking energy, and encroach on forests and wetlands for farm land. Wood is also an income generating resource for refugees and host communities. In some cases, refugees and host communities have entered protected areas to extract forest resources for their livelihoods. For example, the Ocea Central Forest Reserve in northern Uganda was originally well protected but is now rapidly being degraded by refugees for supply of wood-fuel and construction materials. This situation trend is common in other refugee settlements across Uganda.

2.1.2 Environment and resource conflicts

The way natural resources are used and managed in the developing world is a major driver of rising resource disputes and conflicts (Raleigh, 2011; Warner, 2000). Land and water conflicts have been reported, coupled with conflicts over forests, grazing land (Abrahams, 2020; Cousins, 1996), protected areas and human-wildlife conflicts. The rising resource conflicts in Uganda emanate from the high dependence on nature and from the numerous functions of natural resources and the overriding and competing needs of users, poor management of scarce resources, disputes over resource boundaries, as well as conflicting property rights which allow pluralism in resource ownership (Edossa et al., 2005; Haro et al., 2005). Over the years, these conflicts have been exacerbated by the increasing population and urbanization, and the growing insufficiency of resources to sustain livelihoods, both of which lead to increased pressure on the resources (Castro & Nielsen, 2003; Nathaniel, 2021). The migration of people to both resource-rich and stricken areas is increasingly leading to conflicts over access, utilization and appropriation of resources. The field assessment revealed that the weaker communities often migrate to safer areas which further exacerbates the challenge to such destination areas.

Before 1990, only about 10 per cent of land in Uganda was affected by land conflicts, but this rose to 23 per cent in 2004-2005 (UBOS, 2007). The complex land tenure systems are also another driver of land/resources conflicts (Haitez et al., 2021). For example, under the mailo land tenure system in Central Uganda (mainly Buganda and Bunyoro), conflicting interests and overlaps in rights exist on the same piece of land between the tenant and the mailo landowners. Under this insecurity of tenure, some land users do not care about sustainable land utilization or resource conservation. Under the communal land ownership of the customary land tenure, especially in some parts of northern and eastern, land/resources conflicts between cultivators and pastoralists are high, and overstocking and overgrazing are the main drivers of land degradation.

Conflicts have also been fueled by the weak customary institutions due to diverse socio-cultural characteristics, especially in situations where migration and other demographic shifts have changed the ethnic composition of a community. As a result, communities affected by the conflicts (like eviction from natural areas such as forests, and wetlands, among others) tend to run to their political leaders to compromise these processes (Cousins, 1996). The situation becomes worse in the period towards general elections when politicians at all levels promise the electorate that they would fight for their rights over natural resources if elected into power (Grimmer & Stewart, 2013; NFA, 2015). However, in some instances, communities with severe natural resource degradation are forced to migrate due to poor land productivity hence this reduces the propensity of conflicts over natural resources (Nkonya & Markelova, 2015).

Refugee and host community conflicts are on the increase in Uganda (Lwasa et al., 2021). The major conflicts in refugee-hosting areas include land disputes, livestock thefts and killings, conflicts over access to water and theft of crops, among others. The conflicting relationship between host communities and refugees, and in some cases internally displaced persons, calls for identifying main sources of conflict and co-existence in the relationship for achieving peaceful relationships and coexistence (Lwasa et al., 2021).

2.2 Climate change in Uganda

The global climate is changing and predictions show that the climate system will experience more changes. Uganda's climate is also changing and vulnerability to the impacts of climate variability and change are high (Government of Uganda 2014; Okaka, 2020). The country is ranked by the 2020 ND-GAIN index as the 12th most vulnerable country in the world and the 36th least ready country to adapt. Climate extremes and hazards including extreme temperatures, prolonged droughts, severe windstorms and rainstorms, floods, high temperatures, and increase in pests and diseases, among others, affect Uganda and are increasing in frequency and severity (Government of Uganda, 2007; Oriangi et al., 2020). The impacts are unevenly distributed throughout the country (World Bank Group, 2015a). For example, frequent droughts have been mainly documented in northeastern and the cattle corridor regions (Egeru et al., 2014; Makuma-Massa et al., 2012) while recurrent floods have mainly been occurring in eastern, central and western regions of Uganda (Sliuzas et al., 2013a).

Uganda's vulnerability to the different climate-related hazards is largely influenced by the high dependence on natural resources and climate-sensitive sectors (most especially on rainfed agriculture), weak institutional capacity, high poverty levels, and limited access to climate information services, among others (Berrang-Ford et al., 2012; Nkuba et al., 2020). The impacts of climate change affect almost all sectors, but most especially agriculture, livestock production, energy, water, tourism, transport, human settlements (urban and rural), and health, among others. An economics of climate change study conducted by the Ministry of Water and Environment (MWE) reveals that the cost of inaction (not adapting to climate change) is very high, estimated to reach between USD 3.1 and USD 5.9 billion per year by 2025, which is more than twenty times higher than the cost of adaptation (MWE, 2015).

For example, in the agricultural sector, around 800,000 hectares of crop cover are destroyed annually (Kitutu et al., 2009). Most of the affected crop cover is under rain-fed agricultural system, which is practiced by more than 80% of the rural smallholder farmers (Ojara et al., 2020). Other impacts include water shortages and shortage of fodder. These impacts lead to aggravation of poverty, famine, migration, conflict over diminishing natural resources and poor health, among others (Government of Uganda, 2007; NFA, 2015).

However, Uganda has made significant steps to adapt to climate variability and climate. At the national level, institutional arrangement has been put in place including establishment a department responsible for the same in the Ministry of Water and Environment. Its major role is to coordinate and consolidate cross-sectoral capacities to shape the country's climate change adaptation and mitigation efforts. Different sectors have also embarked on several strategies to mainstream and institutionalize climate change response efforts (Gumisiriza et al., 2017; Walekhwa et al., 2009). The efforts and actions include increased adoption of agricultural technologies that reduce the impact of climate-induced stressors such as irrigation technologies and use of resistant crop varieties (Government of Uganda, 2007; Mubangizi et al., 2019), increased involvement in climate-neutral businesses and diversification of livelihoods (Government of Uganda, 2007; Kitutu et al., 2009). Others include integrating climate and climate change advisory

services and application of evidence-based practices and technologies (Hisali et al., 2011), such as development of climate change monitoring and early warning systems in order to reduce vulnerability to climate change (Zake & Hauser, 2014). The Ministry of Works and Transport has developed a climate change risk management strategy for the transport sector to set guidelines for developing climate change-proof infrastructure, especially in the road and bridge design, construction and operation. The ministry has also established procedures for early warning and preventive maintenance interventions (World Bank, 2015).

2.2.1 Historical and predicted climate change

Over the past century, significant changes in temperature and rainfall patterns have been observed in Uganda. The mean annual temperature increased by 0.8 to 1.5°C between 1900 and 2010 (DEWPoint, 2012). The period 1960 to 2008 was progressively warmer, with the last decade of the 20th century warming significantly, about 0.6°C higher on average, than the previous three decades (World Bank, 2015) and the warming is projected to continue with some spatial variations over the different regions of Uganda. The number of rain and cool days has reduced, while rainfall intensity and heat waves have increased. Rainfall has been observed to be highly variable between years but without extremes. For example, for the period 1900 to 2009, the rainfall received in 2000 to 2009 in Uganda was on average about eight per cent lower than rainfall received between 1920 and 1969. The June to September rainfall appears to have been declining for a longer period, but the March to May decline has only occurred recently. Three long epochs of below-normal rainfall occurred between 1940 and 1960, in the 1970s, and between the 1980s and 1990s. Above-normal rainfall periods occurred during the early 1960s, late 1970s, and late 1990s.

Climate models predict that mean annual temperature is likely to continue increasing until 2100, with temperatures predicted to increase by between two and 5°C by 2100 (Nsubuga & Rautenbach, 2018). The projected annual rainfall totals will differ little from what is presently experienced, with projected changes within a range of less than plus or minus 10 per cent from present rainfall (MWE, 2015). However, less rainfall is expected to occur over most of Uganda, with slightly wetter conditions over the west and north-west. Rainfall totals are likely to drop significantly over Lake Victoria (-20 per cent from the present). What is significant is the projected increase in seasonal rainfall for the December-January-February (DJF) season (up to 100 per cent from the present), which is indicative of a longer wet season that extends from September, October, November (SON) towards December, January, February (DJF). The predicted change in climate is likely to be associated with increase in extreme weather events, especially extreme heat, droughts, intense rainfall events and floods.

2.2.2 Weather extremes in Uganda: the normal, abnormal and global warming

Rainfall patterns in East Africa are largely characterized by large-scale inter-seasonal and inter-annual variability, which results into frequent extreme weather events such as rainstorms, droughts and floods. These extreme weather events have become more frequent over the years (Haile, 2005). Emerging evidence further shows that climate change will increase rainfall variability and the frequency of extreme weather events (IPCC, 2007). Uganda has suffered from both natural and human-induced disasters but more severely in the period 1996 to 2010 (FAO, 2010). Over 70% of the disasters experienced in Uganda are climate-related and have led to loss and damage. For example, climate related disasters accounted for a 3.5% reduction in GDP between 2010 and 2014. In 2010/2011, drought affected 35 districts and caused loss equivalent to 7.5% of GDP. In 2016/17, prolonged drought reduced the country's GDP by about 2.3% and poverty levels rose from 19.7 to 21.4%. Droughts cause decline in agricultural production which increases food insecurity and malnutrition, illness, poverty, asset loss and migration. In eastern Uganda, the heavy and erratic rainfall in the Mt. Elgon sub-region causes landslide disasters that cause displacement of people. In the low-lying areas, floods destroy crops, homesteads and infrastructure (Kansiime, 2012; Mulinde et al., 2016).

2.2.3 Sudden-onset events

Floods

Floods are a common disaster occurrence in Uganda because some regions experience higher rainfall and intense rainfall events, but even in drier regions, there is likelihood of a higher frequency of more intense rainfall which causes flooding (Conway, 2009), and the projected climate is likely to have more extreme rainfall events that could cause

more frequent and severe flooding. Floods also occur when rivers overflow (burst banks), when landslides occur and due to dam breakages (OPM, 2011). Flood hazards are particularly concentrated in five areas of Uganda i.e. (i) the Central region, in the Lake Victoria basin; (ii) eastern region, mainly east of Lake Kyoga (the Teso sub-region); (iii) north-western part along the White Nile; and, (iv) around the southern lakes (Rakai, Isingiro and Kiruhura districts); and (v) south along the border with DRC, especially along Semliki river (World Bank, 2019a). The DesInventar database reports that since 2011, more than 1,000 flood events have occurred in Uganda that have caused approx. 500 deaths, damaged 50,000ha of crops, and affected more than four million people directly and indirectly.

Apart from causing death, floods cause outbreak of infectious diseases (mainly malaria, cholera and typhoid); damage infrastructure (transport, energy, buildings) and destroy crop gardens and livestock, and create increased demands for social security. The El Nino floods of 1997/98 that occurred in many parts of the country are estimated to have killed over 1,000 people, displaced 150, 000 people and led to infrastructure damage worth \$400 million (Orindi & Eriksen, 2005). In 2007, the El Niño rainfall resulted into extensive flooding in the eastern region, and most especially in the Teso sub-region causing a lot of loss and damages and displacing up to 50,000 people (GoU, 2009). On this issue, the Katakwi district environment officer remarked:

“Flooding is the main climate hazard in the Teso sub-region. The rivers flowing from the Mt. Elgon region discharge a lot of water in the low-lying areas of Katakwi district during heavy rains which adversely affects farming and displaces people. the most affected areas by flooding are Omasia and Ngariam that are repeatedly affected by flooding and water logging”. Says Simon Okello on 28th March 2021

In 2008, Uganda experienced about 200 flood incidents, and in the following years more than 50 flooding incidents were reported every year (NEMA, 2019). In 2018, the country experienced about 113 flood incidents (NEMA, 2019). Most of the flooding incidents were seasonal, and were mostly experienced in the April/May and October/November rainfall seasons (NEMA, 2019; Ogato et al., 2020). The Ugandan Agricultural Census reported that about 7% of agricultural households are prone to flooding, especially in the eastern region of the country (UBOS, 2012). Since 2013, Kasese district in western Uganda has been hit by heavy rainfall that resulted in severe flooding that caused loss and damage and displacement of people. The July 2020 floods in Nakasongola district left over 700 people displaced and in Bundibugyo district, the flash floods that occurred in 2020 left over 200 houses damaged, and thousands of people affected. The recent rising water levels in several lakes such as Victoria, Albert and Kyoga have displaced over 8,000 people in various parts of Uganda. In all, it is striking that over 80 per cent of the most severe floods since 1900 have occurred within the last 20 years (CRED, 2014). This supports claims that extreme weather events have been increasing in Uganda over the recent years.

The effects of rainstorms and floods are devastating in Uganda, especially for the agricultural livelihoods and food security of local populations, as it takes up to two to six years to recover from each flood episode (Mulinde et al., 2016). The 2007 floods in Teso destroyed crops causing hunger and starvation (GoU, 2009). The floods that occurred in 1961/62, 1997/98 and in 2007 saw widespread infrastructure damage, displacement and destruction of livelihood assets (Hepworth & Goulden, 2008). Floods are also associated with increases in water quantity, pollution of water and increased water table and more destructive than before. For example, in 2018, over 500 people were displaced by floods in Kampala (NEMA, 2019). The 2007 floods led to cholera outbreak in Mbale, Pallisa, Tororo, Butaleja, and Manafwa districts, causing 35 deaths out of 1,662 cases in 2007 and 54 deaths out of 26304 cases in 2008. In Rakai district, violent hailstorms of 2005 resulted in three deaths and displacement of about 2,800 people. Flooding of 1997/98 resulted into direct killing of about 1,000 people, 1,682 deaths (out of 41,857 estimated cases) from cholera due to poor sanitation triggered by the floods in 39 districts. It also led to the displacement of about 150,000 people from their homes most especially in eastern and central regions (Government of Uganda 2007; NEMA 2019; Ogato et al. 2020). Deforestation, wetland degradation, poor waste management, prolonged rains and climate change effects are the major factors that trigger frequent re-occurrences of floods in Uganda (NEMA 2019). With the predicted change in climate, there is a high likelihood for an increase in the frequency of extreme events especially heavy rainstorms and flooding, among others (MWE, 2015; USAID, 2013).

Landslides

Landslides are a result of an interaction of different attributes including the geological, morphometric, climatic and anthropogenic that directly or indirectly cause slope instability (Singh, 2010). Although Uganda's highlands are heterogeneous, they are highly vulnerable to slope instability. Increase in annual rainfall, steep nature of slopes, high weathering rates and slope material with a low shear resistance or a high clay content are some of the common factors that trigger mass movements in Ugandan highlands, turning them into an inherently susceptible area to natural disasters (Glade & Crozier, 2005). Other factors that precondition landslide occurrence are inherently dependent on the high population growth within these highland areas, that increase deforestation and excavation activities along steep slopes (Kajura, 2001; Nyssen et al., 2002).

Uganda has continued to experience an increased occurrence and intensity of landslides especially in Elgon mountainous sub-region in eastern Uganda (Sironko, Bududa, Mbale and Kapchorwa districts), the Rwenzori mountains in western Uganda (Kasese, Bundibugyo and Ntoroko districts) and southwestern highland region (Kabale, Rubanda, Kisoro and Kanungu districts) (Kitutu et al., 2009; Mugagga et al., 2012). The mass movements associated with intense rainstorms are reported to have occurred sporadically in the highlands of Uganda since the 20th century but the increase in fatalities and losses due to landslides has drawn attention nowadays (Muwanga et al., 2001). Between 2012 and 2017, occurrence of landslide disasters decreased, but again shot up in 2018 with 30 landslide events recorded countrywide (NEMA, 2019). In 2010, about 132 landslide events were recorded and 58 events were recorded in 2011.

Bududa district in the Mt. Elgon sub-region has experienced the most disastrous landslides and over the past three decades that have caused severe losses and damage, and displacement. Landslide events most frequently take place in years with exceptionally high rainfall, for example during the El Niño periods over the region, including 1998; and especially at the end of the rainy season when the soil saturation is maximized (Knapen et al., 2006). With the projected increase in rainfall in the near-term, mid and end of the century, landslide events are expected to leave a great population of Ugandans in these high communities helpless at the fate of this disaster (Kansiime et al., 2013). The PPM exercises, field assessments and key interviews conducted in Bududa revealed that 80% of the slopes are perceived to be unstable and highly susceptible to landslides and mudslides.

Earthquakes and volcanic eruptions

Earthquake occurrence in Uganda is associated with the East African Rift System (EARS). Uganda lies between the two arms of the EARS. Its west border with the DRC lies almost entirely in the western arm of the EARS, and the eastern border is a few hundreds of kilometers from the Eastern arm of the EARS. There is more seismic activity in the western than in the Eastern arm of the rift valley (Maasha, 1975b, 1975a). Other tectonic features that have a great influence on earthquake occurrences in Uganda include the Rwenzori Mountains; the Katonga Fault; and Aswar Shear Zone. The tectonic setting mentioned above makes Uganda earthquake-prone, and tectonic movements of geological structures have been responsible for the occurrence of major earthquakes in Uganda. The severity of earthquakes and volcanic eruptions in the East African region and Uganda is generally low (Hollnack, 2001). However, the frequency of occurrence of earthquakes has increased over time compared to the past and the country has continued to experience associated impacts whenever they occur.

Most earthquake epicenters in Uganda are hosted in the western arm of the East African rift valley (Kato, 2018), putting the western region at a higher risk of earthquakes (NEMA 2019). In 1966, a major earthquake, that is the Toro earthquake with a magnitude 6.8, occurred in the Rwenzori Mountain sub-region in western Uganda at the border with DRC, causing about 157 deaths (104 deaths in Uganda) and left more than 5,800 buildings/houses damaged in the current Kabarole, Bundibugyo and Kasese districts. Between 1994 and 2017, a total of 95 earthquakes of magnitude 3.7 and above, were recorded. In 1994, another earthquake of record magnitude 6.2 was recorded near Fort Portal in Kabarole district (in the Rwenzori Mountain sub-region) and caused eight deaths, and an estimated loss of USD 70 million in damages to buildings. About 15 earthquakes of magnitude 3.7 and above were recorded only in 2002. In 2013, about 10 earthquakes of magnitude 3.7 and above were recorded while only four earthquakes of magnitude 3.7 and above were recorded in 2017, including one with magnitude 5.3 that caused collapse of buildings in Rakai district (NEMA, 2019). By 2018, the most prone districts in Uganda were Arua, Buhweju, Bundibugyo,

Bunyangabu, Bushenyi, Ibanda, Kabarole, Kagadi, Kamwenge, Koboko, Kyenjojo, Maracha, Moyo, Nebbi, Ntoroko, Pakwach, Rubirizi, Yumbe and Zombo (NEMA 2019). Earthquakes are also potential triggers of landslides especially in the East African Rift valley zone, and are potential drivers of migration and displacement in different parts of the country.

Volcanic fields exist in southwestern Uganda and the western branch of the EARS of Uganda, but most of these are extinct volcanoes. However, several active volcanoes exist in the Virunga mountains along Uganda's south-western border with Rwanda and Democratic Republic of the Congo (DRC) that are potential hazards to Uganda in case of eruptions. For example, Mt. Nyiragongo erupted in January 1977, January 2002 and recently in May 2021, and in many cases, the eruptions have caused death and displacement. Although these eruptions and displacement were not in Uganda, future eruptions could affect, and or have cascading effects to Uganda. But still, the volcanic deposits in the Bunyaruguru volcanic field in western Uganda indicate potential for explosive volcanic eruptions, and oral local histories suggest some recent volcanic activity in this area (World Bank, 2019a).

2.2.4 Slow-onset events

Rising temperatures

Uganda has one of the world's fastest-changing climates with temperatures predicted to rise by between 1.5°C and 5°C by 2100 (GoU 2007; NEMA 2019). The rising temperatures will heat up Uganda, causing higher evaporation and water stress. Currently, the country's mean temperatures have risen by approximately 1°C above the 1900 level, and by 0.6°C in the last three decades (World Bank, 2015). Rising temperatures directly and indirectly impact economic and social sectors: energy generation, transport, agriculture, health, education and tourism, and hence they affect economic growth and the livelihood systems. For example, temperature rise reduces availability of water for crops and livestock, which affects agricultural production, food security, incomes and people's livelihoods. In Karamoja and Teso sub-regions in northern and eastern Uganda, around 475,000 people were food-insecure between January and March 2019 (NEMA 2019), due to water stress (caused by extreme temperatures and drought). Caravani (2019) observes that the past two generations have witnessed persistent water shortage, hunger and loss of livestock in Karamoja sub-region that forced several agro-pastoralists in the region to migrate and resettle in areas more suitable for agriculture. The sub-county chiefs of Loro and Karita sub-counties in Amudat district (Karamoja) revealed that:

"Hot temperatures and erratic rainfall are the most common and severe climatic effects to our communities. When extreme heat and drought conditions hit, livestock keepers migrate searching for pasture and water resources and in the process livestock disease outbreaks occur e.g. foot and mouth disease, anthrax and nagana." (James Omonyo from Loro subcounty on 20th March 2021 and; Muse Tome Museli from Karita sub-county on 16th March 2021)

An elder or cultural leader from Achorichor, Amudat district remarked:

"Rising temperature and water scarcity are causing severe crop failure that cause hunger and malnutrition. Snake bites are also on the rise that have claimed lives as people search for water around the spatially scattered water points." (Longai Andrew from Achorichori village on 21st March 2021)

The rising temperature affects crop cultivation, especially crops that are highly sensitive to temperature like coffee. It is estimated that by 2050, the land area suitable for coffee growing (especially Arabica coffee) could reduce by 50% – a result of warmer temperatures (MWE, 2015). The rising temperatures could also take a heavy toll on livestock and fisheries, as water availability and quality pastures reduce, and pests and disease outbreaks increase. The rising temperature is also likely to reduce Uganda's biomass stock and cause wood fuel scarcity, leading to biodiversity loss due to loss of habitats which will also affect eco-tourism.

Drought

A drought occurs when there is a sustained period of below-normal water availability. Most of the droughts and dry spells in Uganda are seasonal (lasting for about 3-4 months) and meteorological in nature (NEMA 2019). They are majorly characterized by low humidity, high temperatures, strong dry winds, and reduced water levels (GoU 2007; NEMA 2019). Droughts are a recurrent hazard in Uganda, but there is a marked increase in frequency and severity.

Notable drought events occurred in 1967, 1979, 1987, 1988, 1993, 1998, 1999, 2002, 2005, 2008, 2010, 2017 (Government of Uganda, 2007; World Bank, 2019a), with the 2017 drought making more than one million people to be in need of food aid.

Droughts have been associated with water scarcity. About 4.5 million people are affected by water scarcity each year mainly in the south-eastern and north-eastern parts of Uganda. Agricultural drought risk, the potential lack of rainfall and its impact on rainfed agriculture, is highest in central Uganda, most especially in Mubende and Wakiso districts, but it also hits hardest in Otuke district in northern Uganda. It is estimated that agricultural drought causes a loss of approximately USD 80 million once in every ten years (World Bank, 2019a). On the other hand, hydrological drought, which is the potential reduction in water in rivers, lakes and other reservoirs is highest in the arid and semi-arid regions of north-eastern Uganda (mainly Karamoja sub-region) that is dominated by agro-pastoralism, as well as in central Uganda (in the Lake Victoria basin) that have high concentration of population and urban centers (including Kampala city) that are all susceptible to water scarcity (World Bank, 2019a).

While Uganda's entire cattle corridor is more prone to drought, Karamoja sub-region is the most hit; but in addition, the West Nile sub-region in the northwestern part of the country has been affected by many and severe drought incidents (Branch 2018; NEMA 2019). A respondent from Amudat district revealed that:

“Drought and water shortage are a big challenge in Karamoja. The dry seasons are also associated with strong winds and dust reducing visibility.” (Deborah Ariong, the Environment Officer of Amudat district)

Apart from causing significant water shortage, droughts cause cracking of soils and wilting of plants, leading to severe shortage of pastures and forage and crop failure which in turn cause famine, hunger, malnutrition, poor health, reduced incomes and rising poverty (Government of Uganda, 2007; Kaggwa et al., 2009). All these socio-economic hardships cause displacement and migration of people seeking for better livelihood options elsewhere.

Desertification

Desertification is defined as land degradation in arid, semi-arid, and dry sub-humid areas resulting from various factors, including climatic variations and human activities (Reicher & Stott, 2020). Uganda is among the countries facing the desertification threat, with the main drivers being drought, land degradation, deforestation, bush burning and poor farming methods (MAAIF, 1999; Nalukwago, 2020). Uganda's dependence on rain-fed agriculture puts it at higher risk of desertification (Kabaseke, 2020). Desertification is already pronounced in the cattle corridor of Uganda and especially in Karamoja sub-region and in Nakasongola and Rakai districts (Nalukwago, 2020). In the Karamoja sub-region, and other areas of the cattle corridor, overgrazing, charcoal production, rangeland and wetland degradation, compounded by drought, are escalating the rate of desertification. Group discussions and key interviews conducted in Amudat district in Karamoja and Katakwi district in Teso revealed that these districts are drying very fast, characterized by water scarcity, disappearance of vegetation (bare soil) and increase in invasive species. Most river beds had also dried up.

Desertification escalates the gradual soil productivity loss in many districts of Uganda and is likely to impede the country's agricultural development efforts by reducing crop yields and heightening poverty levels. As such, the affected communities resort to negative coping strategies like selling off livelihood assets (like land and livestock), marrying off young girls for financial and material gains, and children are kept out of school. Desertification and resource degradation have created harsh conditions that are triggering rural-urban migration across the country as migrants (especially the youth) seek for alternative livelihoods and employment in urban centers.

Land and forest degradation

Land degradation refers to the loss of productive and ecosystem services provided by land resources. In section 2.2.1, we already mentioned land degradation as one form of environmental degradation in Uganda. It is a widespread challenge in the country that involves gradual but substantial disturbances of land through activities that change the

land use/land cover and alter soil biochemical properties, which also leads to long-term and irreversible loss of ecosystem functioning and productivity (Bai et al., 2008). Land degradation reduces the stock and quality of natural resources, and as mentioned earlier in section 2.2.1, most of the degradation has been due to the high population growth, reduced fallow, land fragmentation, agricultural expansion into forests, wetlands and rangelands, overgrazing, charcoal production, poor agricultural practices like bush burning and production of perennial crops that deplete nutrients more than the annual crops (Nkonya et al., 2008). Degradation is further fueled by use of inorganic fertilizers, and soil chemicals to improve crop production. The chemical fertilizers are detrimental to the soil's organic composition, including microbial organisms that shape the structure of soil (Kay, 2018).

In Uganda, about 20 per cent of the country was mapped as land degradation hotspots. The areas that show early signs of declining land productivity are in the Karamoja sub-region (Nakapiripirit, Moroto, Napak and Kaabong districts) and West Nile. Stable but stressed (areas with low degradation) areas are located around Masindi Hoima, Mukono, Kaliro, Paliisa, Kibuku, Namutumba, Wakiso, Iganga, Jinja, Mubende, Kibale, Kyenjojo, Nwoya, Kiryandongo, Koboko, Dokolo, Alebtong and Yumbe district (Nkonya et al., 2008). The widespread soil degradation reduces agricultural livelihoods triggering rural-rural migrations and rural-urban migration in the sub-Karamoja region (Gray 2011).

Uganda's protected areas are under increasing threats from deforestation and degradation, owing to increasing human population and activities (Gizachew et al., 2018; Jagger & Kittner, 2017). Deforestation and forest degradation are the major causes of forest cover loss (Haro et al., 2005; Nkonya et al., 2008). The private forests are the most converted forests, as owners seek to harvest more benefits from converting these areas to farmlands than retaining them as forests. For example, many forests in the central region, and Masindi and Hoima districts have been converted into farmlands because they are thought to have fertile soils for agriculture. In Masindi and Hoima, forests have been turned into sugarcane plantations. Clearance of forests in these regions has been highly perpetrated by migrants and refugees from West Nile and the DRC who come to border districts and end up settling near forests, which they eventually clear for farming (Haro et al., 2005; NFA, 2015; Nkonya et al., 2008). The distribution of farming incentives among this population such as tractors and seeds from sugar factories further exacerbates forest conversion and intensifies agriculture (NFA, 2015).

Deforestation and forest degradation are also rampant in the savanna woodlands both in and outside of community forest resources. The drivers are mainly illegal charcoal burning and firewood cutting, coupled with opening up land for agriculture, ranching and settlements. The cattle corridor and the savanna woodlands of the northern region have been most affected (NFA, 2015; Nkonya & Markelova, 2015).

“Also, the invasion of locusts, deforestation, riverbank destruction and land degradation are the most serious environmental challenges that communities face across Amudat district” (James Omony from of Loro Subcounty on 20th March 2021 and; Muse Tome Museli from Karita sub-county on 16th March 2021).

Soil erosion and declining soil fertility

In Uganda, soil erosion is widespread but extreme in highland areas, the cattle corridor, and the northeastern regions (NEMA 2019). The highland areas are generally susceptible to erosion due to their steep topography, abundant tropical rainfall and the high rates of de-vegetation to support agricultural activities (Bagoora, 1988; Karamage et al., 2017). Soil erosion has generally been fueled by lack of adoption of recommended soil, land and water conservation practices by most farmers, poor land husbandry practices such as overgrazing in the cattle corridor that leaves the soil bare, exposed to erosion (Kagoya et al., 2018; Karamage et al., 2017).

Changing water levels in lakes

The longterm climate change effect on Uganda's water bodies is likely to be a decrease in water levels (Government of Uganda, 2007). Water level decreases have been revealed in most lakes while some fish ponds, streams and valley dams are drying up, and some wetlands are also disappearing. Uganda's wetlands and floodplains have been intensively developed, particularly for agriculture but also for settlements, industry and road infrastructure establishment. The rising levels of encroachment combined with the impacts of climate variability affect water levels

in lakes and rivers, a change that could be avoided with application of ecosystem-based approaches and/or nature-based solutions.

Water levels in Uganda's main lake, Victoria, are very sensitive to climatic factors. Indeed, the falling water levels in the lake in the past have been driven by climatic forces, especially decrease in rainfall in the lake basin, but it is also influenced by water extractions, catchment land use and land cover changes. Lake levels have fallen in the past as observed at Entebbe and the Jinja hydro power station between 1965 and 2005 (Awange et al., 2008). However, between August 2019 and May 2020, the heavy rainfall in the Lake Victoria sub-region unprecedentedly increased water levels to 13.42 meters (Nile Basin Initiative, 2020). Water vulnerabilities are worsened by dependence on Lake Victoria and River Nile for both water supply and hydro-electricity generation. This rise in the water levels has adversely affected settlements and business communities (especially fishing, navigation, markets and farming) along the lake shores, and the urban poor communities are most affected, with some facing forced displacement. Community resilience to water level rise effects and associated economic shocks has been compromised by the multiplier effect of the COVID-19 pandemic lockdown in the country as water levels rose when there were lockdown restrictions that hindered victims from moving to safer places.

Lake Wamala, another fresh water lake in central Uganda, is shrinking and at the verge of extinction due to encroachment and the effects of climate change. Uganda's National Wetlands Atlas shows that the lake used to occupy 164 sq.km. In 1990, it reduced to less than 80 sq.km., and its depth has reduced due to silting. The dynamism in lake water levels is projected to intensify with the projected future climate and significantly affect water quality and supply, energy security, health and micro-economic systems (Parry et al., 2009; Taylor et al., 2015). Such effects shall disproportionately affect the urban informal sector given its high exposure and sensitivity accompanied with least capacity to cope and respond to climate change-related shocks and stresses.

Glacial retreat and related impacts

The rise in air temperature is causing retreat of glaciers, particularly in the tropics (Kaser, 1999). In Uganda, the ice caps on Rwenzori Mountains are retreating (Mölg et al., 2003; Taylor et al., 2006). Between 1955 and 1990, glaciers on Rwenzori Mountains had receded by about 40 per cent and the remaining glaciers are projected to disappear by 2030 (Government of Uganda, 2007). The recession in ice caps varies from one peak to another. For example, the ice cap on Mount Baker, has receded at a rate of 96 per cent, followed by Mount Speke at 91 per cent and Mount Stanley at 68 per cent (Kaggwa et al., 2009). The melting of ice on Mountain Rwenzori has also been associated with the increased erosive capacity of River Semliki, whose siltation downstream leads to blockage of its original course (Government of Uganda, 2007). Recently, glacial retreat is one of the drivers of frequent flooding along River Nyamwamba catchment that causes infrastructural and crop damages, and displacement of people in Kasese district.

The gradual loss of ice caps on Mt. Rwenzori has led to a continuous reduction of water supplies to over one million people in Uganda and DRC, flora and fauna species extinction and will remove one of Uganda's major tourist attraction and negatively affect tourism and the economy. Initially, the melting ice increased the water volume of River Semliki and siltation downstream, which led to erosion of the riverbanks, blockage of the original course of the river that lies along the borderline between Uganda and DRC. As a result, a new river course was created, which is about one kilometer inside Uganda from the borderline which created political tensions between Uganda and DRC (since the river originally passed on the borderline serving both countries' population) (Government of Uganda, 2007). The melting of Mountain Rwenzori glaciers has also led to loss of cultural values such as its beautiful ice-sheets which have been a source of cultural attachment, and local perceptions of the indigenous people in this region (Fankhauser & Dietz, 2014; Government of Uganda, 2007).

Loss of biodiversity

Uganda has a rich biodiversity found in various ecosystems and habitats (the forests, rangelands, wetlands and water bodies, among others) that is essential to economic growth, long-term stability and human well-being. It is home to more than half of Africa's birds, 40 per cent its mammals, about 20 per cent of the continent's plants and amphibians and hosts more than 50 per cent of the world's remaining population of mountain gorillas. Most of this biodiversity is in the Albertine Rift running along Uganda's western border with the Democratic Republic of the Congo (DRC). The

animal biodiversity associated with Uganda and the many ecosystems - the land and waterscapes – underpin the eco-tourism industry, which is Uganda’s leading foreign exchange earner and growing source of employment (NEMA, 2016). Plant biodiversity is important to the health sector and there is wide application of over 300 species of wild trees, shrubs, flowers, and weeds in traditional healing systems, upon which approximately 80 per cent of Ugandans depend (NEMA, 2016). The government officially gazetted protected areas and forests reserves, that are under the management of Uganda Wildlife Authority (UWA) and National Forestry Authority (NFA) respectively. The gazetted protected areas (PAs) include 10 national parks, 12 wildlife reserves and 10 wildlife sanctuaries, five community wildlife areas, 506 central forest reserves and 191 local forest reserves.

However, the widespread ecosystem degradation and the increased occurrence of extreme weather events are causing alteration and loss of biodiversity (Government of Uganda, 2007). Over 50 per cent of Uganda’s biodiversity are outside designated protected areas, mostly on privately owned land where there are little or no efforts to protect them (NEMA, 2016). There has been enormous decimation of wildlife populations. For example, Ugandan rhinoceros and oryx populations are now close to extinct. While the elephant population had reached its lowest point in the mid-1990s, and has been recovering, still its recovery has slowed. Elephants, leopards, lions, cheetah, painted dogs and 10 other mammals, are considered critically endangered, and the mountain gorillas, endemic to the Albertine Rift are as well categorized as vulnerable to extinction. Altogether, Uganda has 247 species vulnerable to extinction, 170 endangered, and 109 critically endangered (Prinsloo et al., 2016). There has been a rapid loss of wildlife habitats and of some plants including medicinal species, and plants used as sources of income and food (Nanyunja, 2002). According to Pomeroy et al. (2017), the rate of forest biodiversity loss in Uganda is estimated at over one per cent per year.

The drivers of ecosystem degradation and biodiversity loss are agricultural expansion, forest fires, poaching and other illegal activities (for example, illegal logging and trade in wildlife and their products, among others), pest and disease outbreaks, charcoal production, oil and gas exploration and development and hydro-electricity developments, among others. Another driver of biodiversity loss is climate change events such as increasing in temperatures and droughts that weaken hydrological cycles and render natural ecosystems vulnerable to several disasters including forest fires, pests and disease outbreaks, and create conditions that favor colonization by invasive species. Colonizers such as the *Lantana camara*, has gradually replaced about 50 per cent of forage in Uganda (Shackleton et al., 2017). The loss of biodiversity leads to loss of genetic materials which underpins many ecosystem services and socio-economic development in Uganda (Pomeroy et al., 2017).

2.2.5 Vulnerability mapping

The IPCC Fifth Assessment Report defines vulnerability as “the propensity or predisposition to be adversely affected” (IPCC, 2014a). However, vulnerability has been contextually defined as the contracted capacity of an individual, group or community to forestall, cope with, resist and/or recover from the effects of a natural or man-made hazard. Generally, the concept of vulnerability embeds terminologies like exposure, sensitivity and adaptive capacity as fundamental in building longer-term resilience to environmental or climate risks and disasters (IPCC, 2014b; Twinomuhangi, Sseviiri, Mulinde, et al., 2021). Vulnerability is context-specific to localities, communities or even households and varies across socio-economic groups and sectors. The vulnerability of individuals or communities is dependent on factors that include, among others, access to resources, social or income status, and access to infrastructure and services, and options to diversify livelihood sources (Berman et al., 2015). Due to their constrained adaptive capacity, communities and individuals that are socio-economically, politically and culturally marginalized are most vulnerable to hazards and disasters, most of which in the Uganda context are environment and climate-related (Mfitumukiza et al., 2020; Twinomuhangi, Sseviiri, Mulinde, et al., 2021).

Within the household and community vulnerability basket, four indicators dominate including: access to daily necessities, health, healthcare and education (Ide et al., 2014). Education has for a long time been recognized as a key factor for reduced sensitivity to and enhancing adaptive capacity to environmental changes due to the ability and preparedness of well-educated people to find employment outside the agricultural sector or to introduce innovations (UN ISDR, 2002). While access to daily necessities enables populations with sufficient caloric intake, food security and access to clean water to be less vulnerable to climate change, healthy populations are less susceptible to climate

stress; for example, to heat waves or drought related malnutrition (Ide et al., 2014). Correspondingly, the vulnerability of rural poor communities in Uganda is worsened by over-reliance on nature-based subsistence agriculture (rainfed farming) that is highly sensitive to changes in climate variability. Farmers with more land, education, access to government extension, a non-farm livelihood have more capacity to buffer shocks through increased assets and entitlements than poorer farmers who are more likely to engage in opportunistic behavioral activities like casual laboring (Cooper & Wheeler, 2017). Indeed, the population mobility mapping exercises and field assessments conducted in Katakwi, Bududa and Amudat districts revealed that communities sell off livestock and agro-produce (92%) to sustain livelihoods amid exposure to climate extremes and environmental shocks. Widespread poverty (73%), water and land resources degradation (69%) and diminishing access to property rights and resources (68%) complement the existing climatic and environmental change stressors to exacerbate the vulnerability of rural communities.

In the urban space, urban poor communities' adaptive capacity is constrained by dependence on informal economies that are associated with irregular incomes and widespread income security risks (Twinomuhangi & Sseviiri, 2020). Majority of urban poor communities do not engage in decent employment, with the biggest proportion being women and youths lacking adequate skills and education to garner appropriate jobs (Twinomuhangi et al. 2021b). Therefore, vulnerability in Uganda is a product of socio-economic and income inequalities that are compounded by the effects of environmental and climate change (Nyaoro et al., 2013).

The World Bank Group (2015b) observes that Uganda is vulnerable to current and future climate risks due to a unique set of exposures, sensitivities and adaptive capacities. As it is widely becoming recognized that climate change will intensify the vulnerability of human-environment systems, socio-economic and ecological vulnerability assessments are fundamental for informing adaptation to climate change policy (Elum, Modise, and Marr 2017; Twinomuhangi et al. 2021b). Since inequality in livelihoods drives household ability to cope and adapt to climate risk, adaptive capacity varies with external attributes of sensitivity.

"We now face flooding and landslides both of which lead to loss of lives..... In 2019 and 2018, we lost 20 and 40 people in Nametsi and Bukalasi respectively. There is a lot of fear in communities that landslides could reoccur when the rainy seasons begin. With our people living in poverty, they are not able to prepare for or respond to the socio-economic threats caused by flooding and landslides. For some people, the only option is seeking refuge to neighbors, relatives and nearby schools." (Discussions in the Bududa district PMM exercise on 12th December 2020).

The high poverty levels, high population growth and widespread environmental degradation reportedly limit opportunities for building climate change resilience (Government of Uganda, 2014; Irish Aid, 2017). The high rates of deforestation, land degradation, encroachment on wetlands, flood plains, and protected areas undermines the delivery of ecosystems services, including protection against natural disasters such as floods, landslides and drought. Building community resilience to climate change effects and existing societal challenges requires access to adequate social protection for large parts of the society as a way of reducing poverty and vulnerability to the increasingly frequent and severe environmental and societal stressors.

Social protection programs are rather limited in Uganda and migration comes up rather strongly as an adaptation strategy in communities that are highly vulnerable. For example, the Karimojong have adopted migration as a coping mechanism or an adaptation strategy to drought and water shortage. Indeed, seasonal agro-pastoral patterns and mobility of people and animals are central to the success of livelihood systems and ecological management in Karamoja sub-region (Ellis & Swift, 1988; Stites et al., 2007). Labour migration is also increasingly becoming a livelihood coping strategy. Again in Karamoja, both men and women are increasingly moving to Kampala and other major urban centers to find employment, with men accounting for 65% of the migrants (Adger et al., 2009). Labour migration enables the migrants to contribute to the survival of households through remittances, which are either monetary, food and/or clothing. Further, the rise in lake levels reportedly led to the temporary migration of fishing communities to nearby informal settlements within Jinja city (Twinomuhangi & Sseviiri, 2020). The ability to cope (resilience) is dependent on the household's initial assets and networks. However, the discussions in PMEs further revealed that when environmental hazards and climate change become

so severe, they undermine abilities of households and communities to cope, hence distress migration and/or livelihood changes are more likely to occur. Multiple factors influence resilience that is unrelated to environment like availability of markets, access to infrastructure, and the delivery of aid influences the ability to prepare for and withstand environmental changes. These are external to the community, but have an important influence on resilience.

Vulnerability of different economic sectors

Agriculture

As mentioned in chapter 1 (section 1.2.5 – economy), agriculture is the cornerstone of Uganda’s economy, and is largely rainfed which makes it highly climate-sensitive (Ojara et al., 2020). Farming is dominated by smallholder subsistence farmers depending on nature, family labour and using traditional tools. The main adverse impacts on agricultural production are the rising temperatures, droughts, flooding, changing rainfall seasons, water scarcity and land degradation that are reportedly causing a collapse of Uganda’s agricultural and food systems (Irish Aid, 2018).

However, droughts and floods appear to affect crop yields to a greater extent than does slow-onset climate change and over 800,000 hectares of crops are destroyed annually by climate related hazards (Kaggwa et al., 2009). Droughts cause moisture deficits ranging from 128 m³ to 242m³ and 128m³ to 251m³ for non-perennial crops and perennial crops respectively, and during drought periods crop productivity reduces sharply (DWRM, 2011). The production of maize and beans, which are the most widely grown food crops, is likely to be affected by changes in the inter-annual rainfall variability. However, some crops such as cassava, sweet potato and sorghum are less sensitive to climate change (Caffrey et al., 2013).

Uganda’s leading export crops, especially coffee and tea, are equally affected by climate change. Particularly for coffee, area suitability for coffee growing and export value could fall by half or more by 2050 due to the rising temperatures. Indeed, Uganda’s agricultural export value could be strongly affected by climate with total costs (loss) estimates ranging between USD 134m to USD 196m by 2025, and USD 641m to USD 938m by 2050 (MWE, 2015). Potential climate-related losses from cotton production are expected to range from 60 to 77 per cent by 2050.

The loss and damages to agriculture affect the most vulnerable populations (the rural and urban poor, the women and children) who are at risk of hunger and food insecurity. For example, the Karamoja sub-region a semi-arid and most poverty-stricken part of Uganda, is facing hunger and food insecurity mainly driven by drought, water scarcity and sporadic flooding. The findings of a survey conducted in Amudat district confirmed that drought adversely affects food security by causing crop failure (87%), reduced livestock productivity (81%), rise in food prices (79%), reduced availability of food in markets (69%), income losses (58%) and inability to have a balanced diet (49%).

In another sub-region in the northern cattle corridor, Teso, the survey conducted revealed that flooding and drought have been in the recent past major drivers to crop failure (90%) and severe food shortage (78%). Due to declining crop productivity in the northern region and in Karamoja sub-region, food needs have often been covered by aid (USAID, 2011). Not only is food security a big challenge for Uganda, but malnutrition levels could reach at 20 per cent by 2050 (Irish Aid, 2018). Uganda is not yet self-sufficient in food production with a Global Hunger Index of 27.6 and a projected number of food-insecure people at 60 per cent (about 30 million) in 2025.

Water

Water resources and water availability are already affected by climate variability and will likely to be more strained in Uganda’s future changing climate. While it is projected that precipitation will increase in some parts of Uganda, warmer temperatures will accelerate evapotranspiration, reducing the benefits of increased rainfall. With more frequent and severe droughts, Uganda will likely experience negative impacts on water supply, biodiversity, and hydropower generation. A shift in rainfall patterns may decrease the recharge of rainwater into the soil, which will have a negative impact on groundwater resources and water tables in wells. Limited surface water infrastructure inhibits flood and drought response options, while uncontrolled and inadequate land use and wetland degradation will continue to increase future damage from flooding and extreme weather events.

Uganda's growing population and its rising need for food, water and energy are increasing water demand, a demand that will increase almost ten-fold by 2050, from 408 million cubic metres per year to 3,963 million cubic metres per year (MWE, 2015). At the same time, however, with the changing climate, an increase in occurrence of extreme weather events, especially an increasing incidence of drought, will reduce water availability. As a result, Uganda is likely to face more severe water shortages during most months of the year.

Apart from population growth, other non-climate stressors on water availability include urbanization, increased agricultural irrigation extraction, poor land use methods, increased pollution and wetland intrusion. Extreme increases in water extraction rates for large-scale surface water irrigation, industrialization and domestic consumption are having widespread water scarcity impacts in many parts of the country that will be exacerbated by the predicted future impacts of climate change.

Energy

Vulnerabilities are also high for the energy sector. As of 2019, the country's energy mix was dominated by biomass energy (88%) consumed mainly through firewood and charcoal, electricity (2%) and oil or fossil fuels at 10 per cent (MEMD, 2020). Generally, the country's population heavily relies on traditional biomass energy (firewood and charcoal) for cooking and on hydro-electricity as the dominant modern energy source, which are all climate-sensitive. The dependence on biomass energy is a major socio-economic and environment challenge; it is a driver to deforestation and forest degradation, a source of greenhouse gases (GHG) emissions that cause climate change, source of indoor air pollution with the associated health challenges, and a major hindrance to socio-economic transformation.

The current balance between supply and demand for biomass is very fragile and the shortage of biomass is already being experienced with prices of charcoal rising sharply, and large deficits in biomass supply are expected in the 2020s and beyond. Not only will demand for biomass increase, but climate change will almost certainly reduce the availability of biomass (even though it is hard to quantify by how much) and so Uganda will need to seek alternative energy sources. The unmet biomass demand, even without climate change, is estimated at 1,710 million tonnes over the period 2010 to 2050, and with climate change, could add a loss of five to 10 per cent of domestic wood between 2020 and 2050. Drought and rising temperatures affect biomass availability, causing gradual drying up of biomass which will increase hardship for most Ugandans who are dependent on wood fuel for their domestic energy needs. The projected change in climate means that more droughts will occur which will increase scarcity of biomass. During extreme wet seasons, access to firewood is limited because of the reduction in the amount of available dry firewood, and the dangers associated with fetching firewood in such conditions. Nonetheless, the limited availability of alternative affordable clean energy sources for cooking means that biomass will remain Uganda's most important source of cooking energy in the foreseeable future.

Uganda depends on hydropower for its electricity, and it is accounting for more than 80 per cent of the country's electricity supply, with the other sources being thermal (8%), cogeneration (8%) and solar (4%). Grid-installed electricity generation capacity has been increasing over the years from 183 megawatts (MW) in 1997 to 1,246MW in 2019, while the energy losses in the distribution segment have reduced from 34 per cent in 2008 to 16.4 per cent in 2019 (MEMD, 2020). However, hydro-power generation is dependence on water availability which itself is dependent on climate. Droughts and higher temperatures often reduce water in lakes and rivers, causing a reduction in electricity generation. For example, persistent droughts have in the past reduced water levels in Lake Victoria, affecting hydropower generation at the Nalubaale electric power generation dam in Jinja (Lubovich, 2009; Swenson & Wahr, 2009). Electricity generation at the hydro-power plant on Mpanga river in western Uganda significantly declines during prolonged dry seasons or droughts. It is predicted that a reduction in rainfall caused by climate change could reduce Uganda hydropower potential by about 26 per cent by 2050 (MWE, 2015).

Health

Environmental and climate change have both direct and indirect health effects for Uganda (MWE, 2015; Irish Aid, 2018). Indeed, environmental threats to human health are not only a challenge for Uganda but are also becoming major challenge for international cooperation and global solidarity. A rise in frequency of zoonosis and related diseases

appears to be associated with the degradation of ecosystems and biodiversity, and climate change through human action. Before the current Covid-19 pandemic that has unsettled the world, and severely affected Uganda, Uganda has had outbreaks of Ebola, Marburg and Zika viral diseases, amongst other pathogens and diseases that are known to transgress between animals and humans. Climate change is an important driver of newly emerging infectious diseases more generally that are coinciding with widespread environmental destruction arising from human activity (such as deforestation, wetland degradation, intensive agricultural activity) and threats such as rising temperatures, flooding and water scarcity.

Several diseases that are currently endemic in Uganda will likely increase in prevalence and distribution due to environmental degradation and climate change. The rising temperature and extreme weather events, most especially drought, heavier rains, flooding and landslides do exacerbate disease outbreaks, most especially malaria, cholera and malnutrition that heighten health related risks.

Cholera is an endemic disease in Uganda, with a yearly incidence of 250 to 5,000 cases, but it is more prevalent in Kampala city's slums and along the south-western border with the DRC. (Irish Aid, 2018). Cholera outbreaks are becoming increasingly prevalent as abnormal rainfall patterns lead to drought and then intense rainfall and flooding which displace populations and overwhelm environmental sanitation capabilities. The burden of typhoid in Uganda also rising due to contaminated water sources mainly associated with flooding occurrences (Kabwama et al., 2017). With only 33 per cent of the population having improved sanitation, and 25 per cent not accessing clean and safe water, the effect of waterborne diseases is significant (UNICEF & WHO, 2021).

Besides, the impacts of climate change also threatens human health through their effects on agricultural production, growing food insecurity, hunger and malnutrition (USAID, 2017). Already one in three children suffer from malnutrition, 14 percent of the children are underweight, and 32 per cent of women of reproductive age are anemic. Malnutrition is very visible in food insecurity-hit communities in northern and north-eastern Uganda which affects nutrition and health. In addition, about 7.4 percent of Uganda's population has HIV/AIDS, which is also the leading cause of death, followed by malaria (12%), and lower respiratory infections (7%). Importantly, HIV/AIDS has been associated with worsening nutritional status, particularly among the poor, women, children and refugees that are compounded by climate change, and all these risks could increase in the future with the predicted change in the country's climate.

Communities whose populations are already exposed to climate related shocks and stresses like vector- or water-borne, food shortages, increase in the frequency of floods and droughts experience effects especially on the health status of people living with HIV/AIDS, which accordingly strains their incomes and lessens their adaptive capacities, making them vulnerable to AIDS.

Malaria is endemic in 95 per cent of Uganda and poses significant health challenges and economic and social costs. The rising temperatures create favorable environments for the breeding and survival of mosquitos that spread malaria even in high-altitude areas of Uganda (Mubiru & Magunda, 2010). Malaria is now prevalent and has reached endemic proportions in the Kigezi highlands of south-western Uganda, which were previously malaria-free due to their cold temperatures (Kark, 2013; Lindblade et al., 1999). The cost of managing malaria in south-western Uganda, where the disease is more epidemic (sporadic) in nature, is expected to increase from between USD 0.7m - 15.8million in 2010 to between USD 1.55m and 41.7million in 2050 (MWE, 2015).

Besides, droughts, floods, and landslides destroy livelihoods and infrastructures (including health facilities) and force people to relocate. Displaced populations are often poorly equipped to feed themselves, find shelter, or benefit from medical services leading to a vicious cycle of further deteriorating health conditions. Population displacement adds pressures on already scarce resources, potentially leading to conflict, which itself has been linked to a higher prevalence of disease.

Infrastructure

In the presence of climate change, infrastructure is affected in two ways: one through effects on the normal use of buildings, roads and railways, among others; and the other, through damage done by extreme events, particularly heavy rains and flooding (MWE, 215). Extreme flood events cause infrastructural damages and lead to delays in the movement of people and goods which in turn derails the productivity of businesses across the country. The floods have led to breakdown of transport infrastructure including roads, bridges and buildings, destruction of crops, homes and other property. In addition, the country also suffers from inadequate road infrastructure, with a high portion of the road network unpaved, unmaintained or poorly constructed, which increases its susceptibility to rainstorms and flooding. Most of the road infrastructure is constructed without considering the current and predicted climate conditions.

Vulnerability of livelihoods

The vulnerability of livelihoods to the direct and indirect impacts of climate change is increasingly shaped by existing burdens of ill-health, climate-sensitive infrastructures, reliance on rainfed agriculture, climate-sensitive livelihoods, limited adaptive capacity, poor service infrastructure, weak institutions and socio-economic and political inequalities. The poor, most disadvantaged communities and marginalized populations, who are most reliant on natural resources for their livelihoods and yet with limited capacity to respond to natural hazards, are the most vulnerable to climate change and environmental stressors.

Rainfed crop and livestock production is an important livelihood activity of rural households for achieving food and income security (Wichern et al., 2019), but rainfall patterns and temperatures are affecting these production systems and causing livelihood hardships. The field assessments conducted in the Karamoja sub-region (Amudat district) confirmed high livelihood vulnerabilities. In this semi-arid and fragile environment, livelihood hardships are compounded by the prevailing high poverty levels, drought occurrences, severe water shortage, resource conflicts as well as hunger and food insecurity. The field assessment conducted in the Elgon mountainous sub-region in Eastern Uganda (Bududa district) reveals that the population pressure and severe land degradation in the sub-region expose communities to run-off, landslides and flooding. Communities and individual households face declining crop production, crop destruction, declining water quality and income losses. Landslides often destroy housing and other livelihood assets and cause displacement.

The high dependence on traditional biomass energy (charcoal and firewood) is another vulnerability. The rising shortage of biomass energy and price of charcoal are increasing energy poverty amidst widespread deforestation and lack of affordable alternatives. Indigenous communities such as the Batwa, Benet and Karimojong are at high risk of food and nutritional insecurity due to factors like discrimination, social exclusion, land dispossession and yet malnutrition amongst such populations is very high. Besides, high rural poverty undermines resilience abilities.

In urban areas, the livelihood of urban poor communities who live in flood-prone slums and informal settlements are highly vulnerable to climate change. In Kampala city, floods usually destroy informal business backyard gardens, make roads impassable, accelerate contamination of air and water sources, and contribute to the intensive spread of water-borne diseases like cholera and malaria (Lwasa et al., 2018). These vulnerabilities and effects are a replica across the urban areas of Uganda, including the newly created cities like Jinja, Mbale, Fort Portal, Arua, Gulu, Mbarara and Masaka. The weak urban infrastructures and physical planning regimes undermine human health and security characterized by inadequate sanitation, access to clean water and modern energy services, and compounded by environmental and ecosystem destruction that undermine resilience building (Richmond et al., 2018). Urban and industrial development trajectories have drastically degraded wetlands and water catchment systems across Uganda, which has compromised resilience to natural hazards such as flooding, drought and landslides.

Effects of livelihood vulnerability on migration

As already mentioned, Uganda is facing an increasing population and the pressure it exerts on land, has resulted in declining soil fertility, land use/land cover changes and land degradation (forest, soils, wetland and water resources) through increasing deterioration and scarcity. In all, the natural resources ability to deliver ecosystem goods and services is dwindling and livelihood impoverishment is on the rise (Ejigu, 2009). Existing poverty, resource scarcity,

hunger and food insecurity are compounded by environmental and climate vulnerabilities and people can no longer gain secure livelihoods in their homelands; they feel that they have no alternative, but to only seek sanctuary elsewhere (Barihaihi, 2010; Myers, 2005).

As mentioned in sections 1.3, 2.1 and section 2.2.5, socio-economic vulnerabilities driven by environmental and climatic conditions are linked with migration in Uganda. The land degradation in Kigezi sub-region is linked to migration of people in search for fertile land for cultivation during the mid-20th century. Overpopulation and droughts in the 1940s and 1950s compelled the British colonial government to initiate the resettlement of people from southern part of Kigezi (current Kabale, Kisoro and Rubanda districts to present-day Kanungu district, who later gradually and voluntarily migrated to Ankole, Tooro and Bunyoro sub-regions between 1955 and 2000 (Hartter et al., 2015; Mugisha, 2002). In the cattle corridor, droughts drive increased vulnerability among agro-pastoralists who migrate searching for areas with better pastures and water security (Akwango et al., 2016). The recent flooding in eastern and western Uganda caused displacement (Floodlist, 2020). Droughts and floods disrupt agricultural production, threatening food security, and provoking involuntary migration. Soil degradation has compromised agricultural livelihoods and has been reported to increase rural-urban migration in north-eastern Uganda (Gray, 2011).

Climate change is likely to lead to an increased frequency of extreme events that exacerbate the degradation of biodiversity, especially those in fragile ecosystems like forests, wetlands and mountains. This is because climate change impacts like droughts and longer dry spells make other areas unproductive and spur migration and increased encroachment on fragile ecosystems for settlement and agriculture. Some movements have already been attributed to climate change, especially in Uganda's arid and semi-arid lands which experience drought due to either extremely low or lack of rainfall (Oucho, 2015). For example, in Amudat district, seasonal migrations are mainly driven by water scarcity or water stress (82%) and poor quality of pastures (81%) that are linked to drought. The impacts of climate change have increased internal displacement in the eastern and northern parts of Uganda, with 48,000 people temporarily displaced and over 2,000,000 million persons affected (Abebe, 2014; UNICEF, 2011). The 2006 and 2015 El nino rains, for example, extensively destroyed infrastructure, submerged 80 per cent of the farmlands and subjected populations in Teso, Lango and Acholi sub-regions to displacement with over 2000 people in need of relocation (IMF, 2010; Inter-Agency Regional Analysts Network, 2015).

Effects of migration on vulnerability

Migration can also increase environmental and socio-economic vulnerabilities in Uganda. Refugee-hosting areas, including refugee settlements and host communities, are highly vulnerable to environmental and climate shocks and stresses as compared to non-refugee-impacted areas. This is mainly because refugees are poorer as compared to nationals, which reduces their resilience to socio-economic, environmental and climatic risks. Besides, the influx of refugees in Uganda has increased demands of refugees on already-stressed resources; that is, rising need for biomass energy, construction materials and more land for food growing, which leads to encroachment on forests and wetlands. Water shortage is also high in refugee camps. For example, around Kyaka II (western Uganda) and Rhino camp (West Nile) refugee settlements, forest cover and the natural vegetation are almost depleted. Energy insecurity is a high vulnerability in refugee settlements due to dependence or reliance on wood fuel for cooking and heating, which is a major cause of forest degradation, and also indoor air pollution which adversely affects health.

But still, growing population pressure, shrinking agricultural land and urban development, compounded by environmental degradation and climatic stresses (for example; drought, reduced soil fertility, crop failure and famine), induce population movement that is catalytic to encroachment on forests, wetlands, protected areas, rangelands and river banks in search of land for settlement, cultivation and grazing. In the Mt. Elgon and Kigezi sub-regions the rising population pressure has expanded settlements and farming upslope into fragile eco-systems, forest land and protected areas (like, Mt. Elgon national park is severely encroached on). In the Lake Mburo national park in western Uganda, livestock grazing is encroaching on the conservation, and human-wildlife conflicts are on the rise in this area. Encroachment on wetlands is widespread across the country; in urban areas, especially the Greater Kampala Metropolitan Area, for industrialization, road infrastructural development and settlement, in western Uganda for dairy farming and in eastern Uganda for rice growing. Apart from perpetuating environmental degradation and

reduced resilience to natural disasters, encroachment on forests, wetlands and protected areas makes people vulnerable to forced evictions and leaves them without adequate social and physical infrastructure.

Drought and desertification-induced migrations are fueling resource conflicts and violence that increase vulnerabilities. When droughts occur, Karimojong men are compelled to migrate with their livestock to areas with water and pastures within Karamoja but also to neighboring sub-regions of Teso and Acholi, which raises tensions and conflicts over water and pasture resources with the host communities (UNFPA, 2006). Besides, cross-border migration also occurs and it fuels resource conflicts amongst agro-pastoral groups in Karamoja and Teso, and immigrant pastoral groups from the Turkana region of north-western Kenya (Stites et al., 2007) and from South Sudan cross into Uganda searching for pastures and water. Some Karimojong migrate to urban centers, and major towns in search of an alternative source of livelihood. A major concern is that a significant proportion of the urban migrants from the region are women and children. Human trafficking has been reported in this migration where women and youths, including children desperate to escape the socio-economic burdens, are exposed to human trafficking into urban areas of Uganda, especially Soroti, Mbale, Jinja and Kampala, and most of the children end on streets as beggars. The lack of gainful employment in Karamoja drives young men and boys to migrate to gold mines within the region itself, Kenya and South Sudan, and this has been on the rise in the recent years (Ayoo et al., 2013). Such labor migration enables the migrants to contribute to the survival of households through remittances, which are either in form of monetary means, food and/or clothing. However, some of artisanal mining activities also drive deforestation and land degradation and are potential drivers of land conflicts.

Social capital networks are critical for labour migration and survival of communities during periods of environmental shocks and scarcity. Social networks are forged through the connections between people of the same origin and destination, which may then lower the cost of movement through information access regarding destination labour market and the migration process itself. Karimojong migrants, especially women and children, rely heavily on established networks in urban areas and nearby districts, in Teso sub-region. While the old engage in petty income-generating activities (trading, hawking, street vending, household workers and casual labour) for livelihood sustenance in urban centers, children are involved in undesirable actions like begging, scrounging or theft. Despite the distance, migrants maintain contact with family through regular mobile telecommunications with family members or relatives (IOM, 2015). Such established social networks form migrant corridors that strongly facilitate and influence internal and even transnational migration.

In the presence of such established social networks, even small climatic triggers may lead to massive livelihood-based migration responses referred to as “amplification mechanism” (Nawrotzki et al., 2015). Such responses facilitate adaptation to climate change through rural households receiving remittances and knowledge that can be used to adapt to climate change in their local communities (UN-HABITAT, 2012) and thus, preventing climate migrations. For example, households could learn from their relatives and friends who migrated to the other areas on irrigation techniques and receive the necessary funds to implement the technology on their own fields (Denton et al., 2014). Stites et al. (2020) give an example of migrants that had retained links with their communities acquiring key productive assets such as land, social networks and community members cohesion through remittances and other forms of support.

2.3 Case studies on migration, environment and climate change

2.3.1 Flood and drought-induced migrations in Katakwi district - Teso sub-region

Katakwi district is located in the Teso sub-region in eastern Uganda. It is part of Uganda’s cattle corridor - a semi-arid and fragile ecosystem. The main economic activities in the district are crop cultivation (known for ox-traction) and livestock rearing, in which a subsistence economy dominates. The PPM exercise and survey conducted in the district revealed that the main climatic and environmental hazards and shocks affecting the district are flooding, drought, locust invasion, deforestation, wetland degradation and river bank destruction (see Figure 6). Declining soil fertility, water shortage and overgrazing were also mentioned as significant challenges in the district.

Environmental and climatic shocks and stresses affected both the migrants and non-migrant populations in the district. Among non-migrants they caused death of livestock (90%), water contamination (86%), displacement of people (79%), destruction of shelters (75%), soil infertility (74%), pests and disease outbreaks (66%) and shortage of pastures (56%) (See Table 1). Among the migrants, the shocks and stresses were responsible for loss income (37%), crop failure (33%), displacement of people (30%), pests and diseases outbreak (28%), infrastructural damage and destruction of property (23%) and constrained access to gardens or grazing fields (26%) were reported. Women are more affected by climate and environmental shocks (70%) as compared to men (30%).

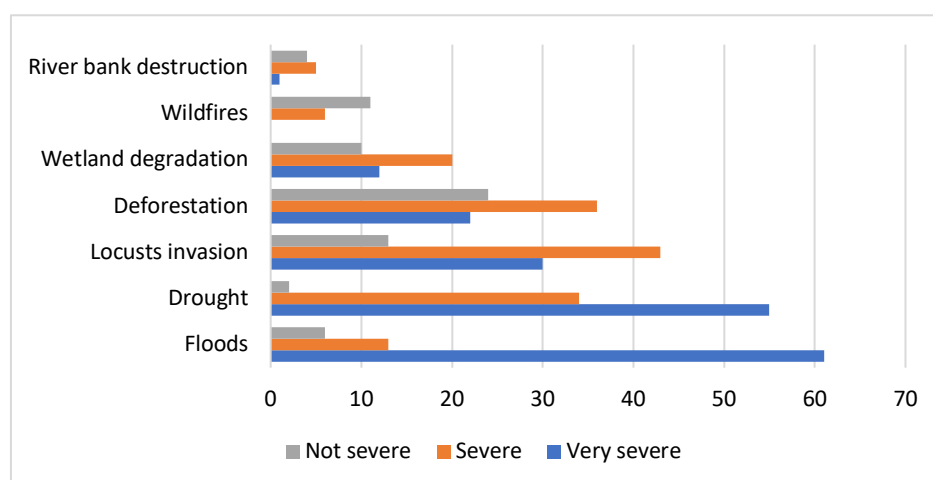


Figure 6: Perceived severity of climatic and environmental shocks and stresses in Katakwi district (Source: Field Survey, 2021)

Table 1: Effects of harsh environmental and climatic conditions on livelihoods

Effects on livelihoods	Migrants (%)	Non-migrants (%)
Displacement of people	30	82
Death of people	7	13
Injury of people	9	31
Livestock deaths	19	90
Crop failure/reduced crop yields	33	33
Water stress/water scarcity	12	47
Reduction in water quality/Water contamination	16	86
Increase in pests and disease outbreaks	28	66
Infrastructural damage	23	79
Destruction of shelter/housing	23	75
Constrained access to gardens and/ grazing fields	26	36
Soil erosion	7	24
Loss of soil fertility	5	74
Shortage of pastures	19	56
Poor animal quality	12	86
Loss of income	37	1
Loss of jobs	2	4

During the group discussions, it was revealed that children and pregnant women were significantly affected by water shortage and water contamination caused by drought and flooding. School-going children could not access schools during flooding in the different parts of the district due to blockage of roads and school infrastructure.

“We last experienced a flood event in November 2020, and it damaged our gardens and housing units. About 55 houses were destroyed and roads were submerged. We were forced to use boats as means of transport following the routes of submerged roads.” Says Lawrence Akodi from Akurao, Katakwi district on 26th March 2021.

While Katakwi district does not receive high rainfall that would cause severe flooding, it is a lowland area where water from surrounding uplands and highlands in Karamoja and Sebei (Mt. Elgon) is discharged. Such water is responsible for the frequent flooding and displacement of people. Discussions during the PME revealed that severe flooding occurred in 2007, 2010, 2011, 2013, 2015 and 2018. Flooding has been associated with many challenges including destruction of infrastructure, crops, loss of livestock and livelihoods and spread of diseases.

“When floods occur, they are followed by disease outbreaks, most especially malaria, typhoid and cholera especially amongst the children and the elderly. As most of the young people do not have shoes foot rot is another challenge.” (Remarked Patrick Osia from Omasia sub-county, Katakwi district on 23rd March 2021)

About 24% of the population in Katakwi district is said to have migrated in the past. The areas most affected by migration were in Kapujan, Magoro, Palam and Toroma sub-counties which are also regarded as highly exposed to climate hazards and disasters (especially floods and drought). The main drivers of migration and displacement in the district were perceived as resource conflicts, harsh climatic conditions, deteriorating environmental conditions e.g. soil infertility, pastures and water shortages, but unemployment was also another major driver of migration (see Figure 8).

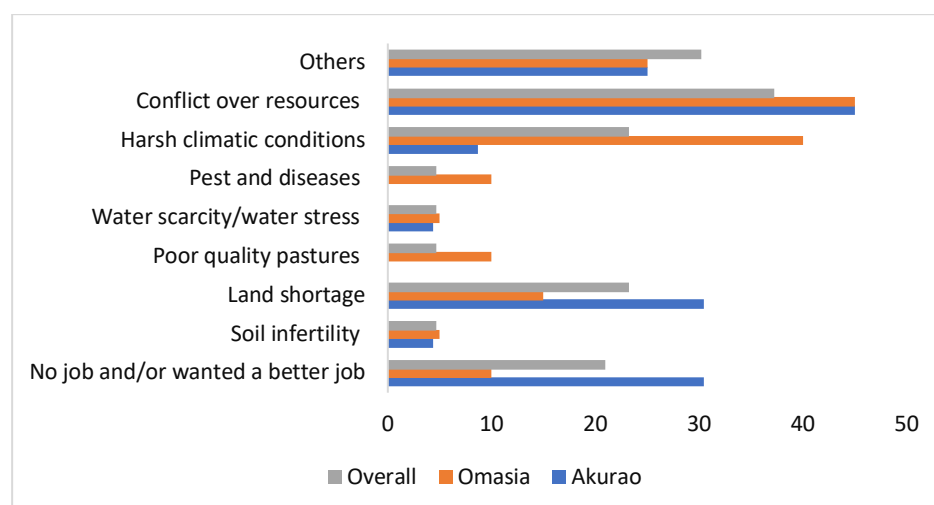


Figure 7: Major drivers of migration in Katakwi district (Source: Field Assessments)

The main climatic factors driving migration were flooding (44%) and drought (30%). In all, most of the drivers of migration (including resource conflicts, food and water shortage, land shortage, unemployment, soil infertility and pests and diseases can also be regarded as slow on set of environmental processes that drive migration.

“Droughts force people to move livestock to neighboring parishes that have water and pastures especially Toroma, Omasia, Kapujan ... Harsh climatic conditions also force people to migrate looking for better conditions in areas of Kapelebyong, Nakapiripirit, Amuria and Abim districts..... About 20 households left my village in the past year.... Some people migrate temporarily whereas others migrate permanently.” (Remarked Francis Okolot in Omasia sub-county on 28th March 2021).

Most of the migrations taking place in the district (>70%) were forced migrations or displacement mainly caused by flooding. Approx. 65% of the migrations were permanent while 26% were considered more of temporary or seasonal

migrations. Approx. 43% of the non-migrant respondents revealed having considered migrating in the past as a result of flooding (27%), drought (23%), pasture shortages (12%), pests and disease outbreaks (7%), reduced land productivity (6%) and other drivers including water scarcity, resource conflicts, seeking for jobs and better business opportunities, and cattle rustling. In addition, approx. 43% of non-migrant respondents revealed having had a household member or relative who migrated. While most of migrations were internal, occurring within the district and Teso sub-region, an increasing number of people are migrating outwards to urban areas as far as Kampala city, Lira, Soroti, Mbale, Iganga and Jinja (See Table 2).

To the contrary, the Teso sub-region has been receiving rising in-migrations from the neighboring Karamoja as the region's pastoralists migrate to escape severe drought conditions in Karamoja searching for water and pastures for their livestock in Teso. Another emerging migration concern is the rising numbers of Bahima/Balaalo pastoralists originating from western Uganda migrating into Teso with large herds of cattle searching for grazing land. The influx of pastoral communities is increasing pressure on natural resources (especially water and pastures) and causing land degradation and resource conflicts that sometimes result into violence. The region is also experiencing an increase in land and resource conflicts because when some of the people displaced during floods and drought return, they find their land being occupied by other people, most especially the Bahima/Balaalo cattle keepers, as another interviewee from Omasia sub-county revealed:

“The people displaced by flooding are provided with temporary shelters until water clears and they go back to their homes. Some of those who have stayed longer from their homes return and find that their land has been occupied by other people, especially the Balaalo pastoralists.”
Says Agnes Ahanyu from Omasia Sub-county on 15th March 2021.

Table 2: Known destination areas for environmental/climate migrants

Destination of household and community migrants	Migrants
Within the same community/sub-county	48
Within a district	39
Outside the district, in Uganda	61
Outside Uganda	0
Others	4

2.3.2 Landslides induced-migration in Bududa district - Mt. Elgon region

Bududa district is located in the Mt. Elgon sub-region, located in Eastern Uganda, a densely populated region dominated by crop cultivation in what is famously known as the ‘*coffee-banana farming system*’. The mountainous region receives high rainfall and is an important water tower that nourishes a vast array of rivers including the Nile and varied biodiversity hotspot but is facing land shortage caused by high population densities reaching up to 952 persons/km². As a result, the mountain slopes have been severely degraded - deforestation and encroachment on protected areas and river banks are so high that they have accelerated land degradation on the steep slopes. Environmental degradation in this mountainous sub-region is compounded by high rainfall which results into severe and more frequent run-off, flooding and landslides that cause displacement of people. Indeed, Mt. Elgon sub-region is considered one of the most vulnerable to climate change in Uganda. The PME and survey conducted in Bududa district revealed that landslides are the main climatic and/or environmental-related challenges faced. The other challenges are deforestation, river bank destruction and floods, although locust invasion was also mentioned (see Figure 8).

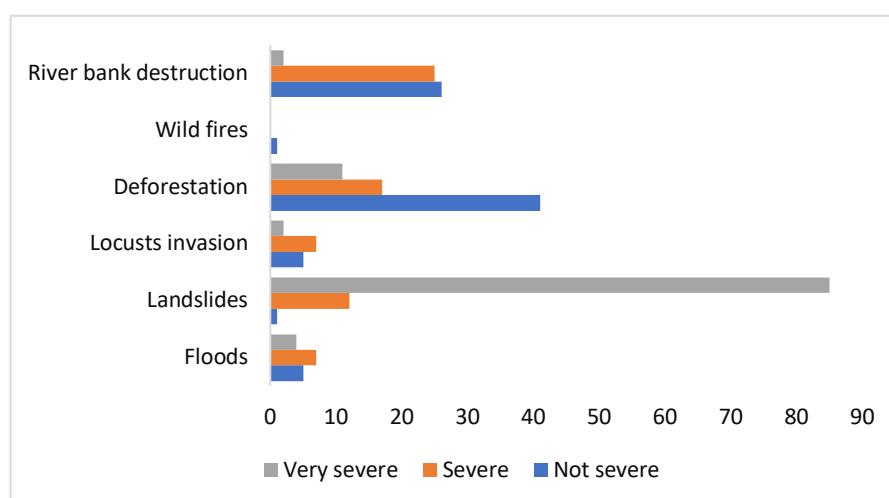


Figure 8: Perceived severity of environmental and climatic conditions in Bududa district.
(Source: Field Assessments)

The harsh climatic and environmental conditions affect livelihoods in the sub-region including causing destruction of infrastructure, shelter or housing, displacement of people, soil degradation, crop failure, death of people and animals, loss income and reduced water quality.

Bududa district has experienced the most disastrous landslides compared to any other district in the Mt. Elgon region or Uganda. What is more worrying is that the landslides are becoming more frequent and severe causing significant damage to infrastructure, deaths and displacement of people. In 1964, about 18 people were killed by landslides in Bududa. In 1970, about 60 people were killed by a landslide in one event when celebrating a circumcision ritual. Between 1990 and 1993, about 516 people were reportedly killed by landslides in Bududa. Another 48 people were killed and 10,000 displaced by landslides in 1997 (Kitutu et al., 2009). In 2010, a massive landslide killed over 400 people and around 5,000 were displaced (NEMA, 2016b). The PME conducted in the district revealed that Bufutsa in Bushika and Nametsi in Bundesi sub-counties respectively are the most affected in the district.

“Landslides and mudslides are the main and most common hazards in the district. The worst landslide event happened in 2010 that killed many people and livestock; it destroyed a health center, school, gardens, and damaged housing in Nametsi. In 2019, a mudslide at Bufutsa claimed about 25 lives and destroyed many crop fields.” (remarked by Musa Natsambwa, the Bududa Environment Officer said on 5th April 2021).

The effects of climate hazards and environment shocks on non-migrants were destruction of shelter (88%), displacement of people (86%), death of people (83%), loss of income and soil erosion (77%), crop failure (76%), infrastructural damage (68%), death of animals (65%), reduced water quality/contamination (64%), injury of people (51%) and constrained access to gardens (50%) (See Table 3). Migrants, on the other hand, reported to have experienced displacement and crop failure (30%), soil erosion (28%), destruction of shelter/housing (25%), constrained access to gardens/farms and infrastructural damage (23%), death of people and animals (20%), loss of income (18%), and reduced water quality (15%) as livelihood effects of hazards and shocks (See Table 3).

Table 3: Effects of climate and environmental hazards and shocks

Livelihood effects	Migrants (%)	Non-migrants (%)
Displacement	30	86
Death of people	20	83
Injury of people	8	51
Death of animals	20	65
Crop failure/destruction	30	76
Water stress/scarcity	0	1
Reduced water quality/contamination	15	64
Pests and diseases outbreak	10	74
Infrastructural damage	23	68
Destruction of shelter/housing	25	88
Constrained access to gardens/farms	23	50
Soil erosion	28	77
Loss of soil fertility	10	39
Shortage of pastures	0	14
Poor animal quality	3	8
Loss of income	18	77
Loss of job	3	13
Others	8	15

About 24% of the population in Bufutsa and Nametsi had migrated, with approx. 60% of the migrations being involuntary (displacements) and 40% were voluntary. More females (77%) than males (23%) were reported to have been displaced by landslides. The majority of the migrations (73%) were regarded as permanent while only 27% were temporary. Approx. 59% of the non-migrant respondents interviewed revealed having considered migrating in the recent past because of landslide occurrences (>55%), but also due to other factors like land shortage and land conflicts, seeking for jobs, and the declining land productivity. More than 70% the non-migrant respondents revealed that a household member had migrated.

The main drivers of migration in the area were harsh climatic conditions, followed by unemployment, land shortage land conflicts but also food shortage was reported. The migrants' choice of destination areas was mainly influenced by the availability of fertile land for cultivation (56%), safety from climate hazards (20%), absence of land/resource conflicts (15%) and other factors that included proximity to relatives, and job/ business opportunities (See Table 4).

"Climatic conditions used to be conducive in the past, but of recent it has started raining heavily and destroyed our crops. The heavy rains cause landslides, and our community lives in fear, distress and panic. We are hoping that the government will relocate us and save us from this fear." (observed by Ronald Wanambwa Nambale, the Bushika parish chief on 3rd April 2021)

Table 4: Factors for migrants' choice of destination areas

Factors for choice of destination area	Bufutsa (%)	Nametsi (%)	Overall (%)
Safe from climate hazards	17	18	17
Pasture availability	4	0	2
Adequate land for farming activities	30	18	24
Soil fertility/land productivity	9	12	10
No resource conflicts	9	24	15
Others	30	47	32

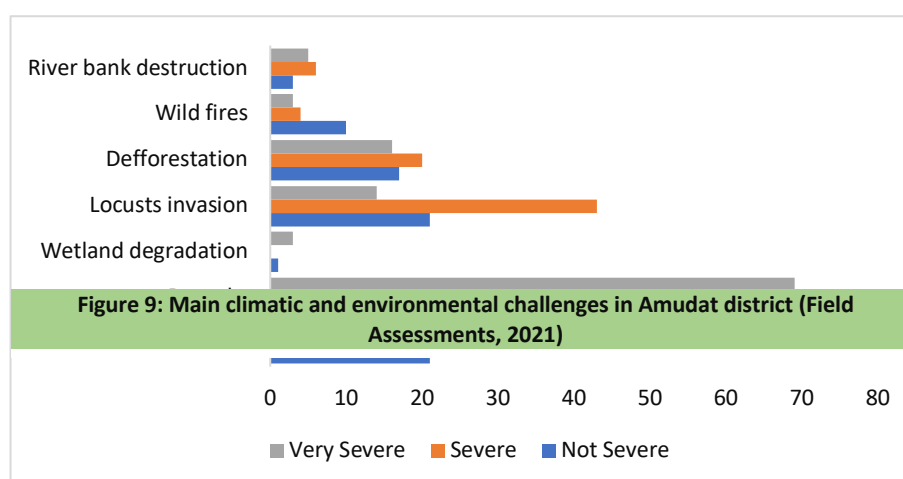
The GoU is engaged in the relocation of landslide-displaced persons. Some of the displaced persons had been resettled in Kiryandongo district in western Uganda, and in Bulambuli district which is within the Mt. Elgon sub-region. However, some of the resettled persons were reported to be returning to Bududa for farming activities (during planting and harvesting seasons) and then going back to areas where they had been resettled.

2.3.3 Drought-induced migrations in Amudat district – Karamoja sub-region

Amudat district is located in the Karamoja sub-region, an arid region in the north-eastern Uganda that is also part of the country's cattle corridor. The dominant economic activities are pastoralism and agro-pastoralism, although crop cultivation is on the rise. The areas within Karamoja sub-region can be regarded as the best example of environmental and climate-induced migrations in Uganda. Karamoja sub-region is often referred to as one of the world's poorest, and government statistics estimate that 65.7 % of the people in Karamoja are poor. Historically, the people of Karamoja rely on food relief because they have faced and continue to face chronic food insecurity (Gayfer et al., 2012).

Temperatures in Karamoja are very high, sometimes reaching 40°C. Annual average rainfall is very low ranging from 300mm to about 1,200mm. The districts are experiencing severe environmental degradation, desertification, and climate variability and change undermine the already limited resources and development through recurring droughts, flash floods, prolonged dry spells and generally unpredictable rainfall patterns, already exist. Droughts are becoming more frequent and severe and they reduce water and pasture availability, adversely affecting livestock rearing, causing crop failure, severe hunger and food insecurity as well as high poverty. Although the population in Karamoja have for long adapted to droughts, the growing food insecurity, water shortage and poverty, combined with population growth and natural resource scarcity, are leading to increases in the number of internally displaced persons and in migration more generally.

The PME and survey conducted in Amudat district revealed that the main climatic and environmental challenges are drought, flash floods, locust invasion and deforestation, with others being river bank destruction, wildfires and wetland degradation (see Figure 9).



All the respondents (100%) had been affected by drought, while approx. 50% had been affected by flash floods. About 66% of the male respondents had migrated due to drought as compared to 34% female ones.

“Locust invasions destroy crops, resulting into food insecurity. Droughts and extreme heat reduce pasture and water availability, and cause livestock deaths and reduction in the quality of milk and meat products. Pests and disease outbreaks e.g., of anthrax and ticks are common in drought periods due to migrations and mixing of the cattle.” Says Dominic Achesa, Kalita sub-county chairperson, on 20th March 2021.

Migration incidences are high in Amudat district. For example, approx. 58% of the population migrated in the past 20 years, with the most affected areas being in Loro sub- county and Karita sub- county. Approx. 53% of the migrations were involuntary, while 47% were voluntary migrations. Approx. 70% of the migrations were permanent, 17% temporary (seasonal), while 13% of the migrants were not sure of the permanence or temporary nature of their migrations. Both in-migrations and out-migrations were prevalent in the district, with in-migrants originating from within Amudat district itself (37%), neighboring districts (43%), and cross-border migrants from Kenya (20%). Apart

from relocations within Amudat district itself, most out-migrants destination areas were also in neighboring districts, but others migrated to Kampala city, and others are cross-border migrations into Kenya.

The main causes of migration and displacement were drought-related hardships i.e., water scarcity (82%), poor pastures (81%), food insecurity (68%), and flooding (60%) (See Figure 10). The other drivers of migration were land shortage, pests and diseases, resource conflicts, and declining soil fertility, which are also linked to environmental and climatic shocks and stresses (See Figure 10). The factors influencing migrants' choice of a destination area included pasture availability (57%), water availability (50%), availability of land (fertile) for cultivation, (35%), absence of resource conflict (20%) and safety from climate hazards (18%), especially severe drought and flooding.

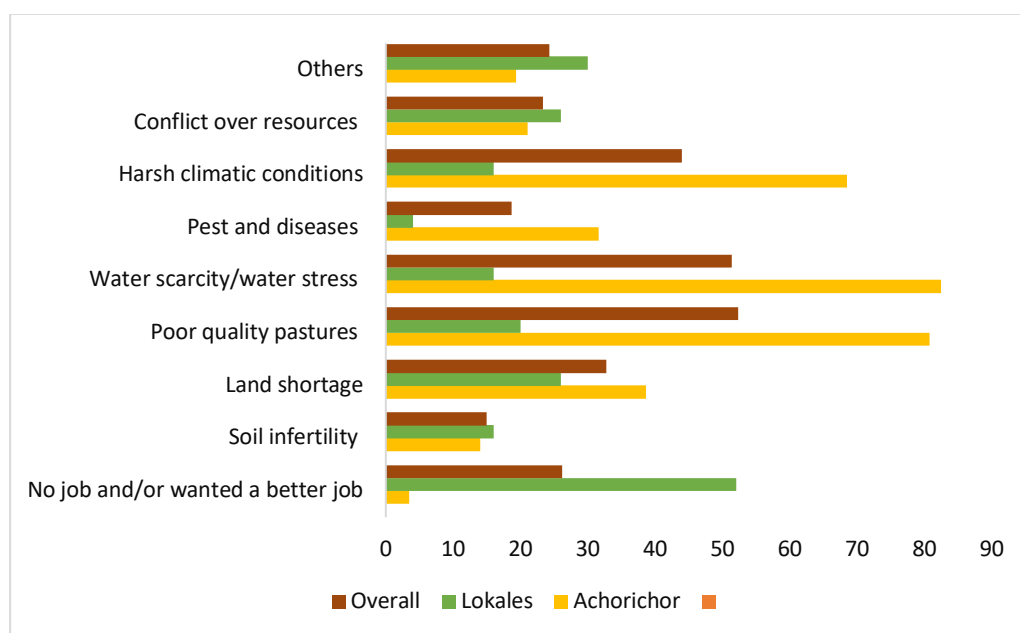


Figure 10: Main causes of migration and displacement in Amudat

Less than 10% of the non-migrant population had considered migrating in the past due environmental and climatic-related hardships that include drought (22%), water scarcity (15%), shortage of pastures (15%), pests and diseases outbreaks (15%), flooding (11%) as well as resource conflicts, declining land productivity and searching for jobs. In addition, 54% of the migrants and 47% of non-migrant respondents had a household member(s) who had migrated driven by water scarcity, shortage of pastures and drought.

Among non-migrants, environmental and climate shocks caused livestock death (87%), shortage of pastures (87%), water stress/scarcity (81%), displacement of people (75%), poor animal quality (72%), crop failure or reduced crop yields (71%), increased pests and diseases (61%), reduction in water quality or contamination of water (56%) and loss of income (52%) are the most pressing livelihood impacts of climate and environmental hazards (See Table 5). Among the migrants, the effects were shortage of pastures (64%), livestock deaths and water shortage (62%), displacement of people (60%), crop failure (52%) and loss of income (52%) as the main livelihood effects of climate hazards and environmental shocks in their areas of origin (See Table 5).

Table 5: Effects of harsh environmental and climatic conditions on livelihoods

Effects on livelihoods	Migrants	Non-migrants
Displacement of people	60	75
Death of people	19	39
Injury of people	5	8
Livestock deaths	62	87
Crop failure/reduced crop yields	55	71
Water stress/water scarcity	62	81
Reduction in water quality/water contamination	41	56
Increase in pests and diseases outbreak	35	61
Infrastructural damage	11	28
Destruction of shelter/housing	9	39
Constrained access to gardens and/ grazing fields	26	33
Soil erosion	7	20
Loss of soil fertility	15	25
Shortage of pastures	64	87
Poor animal quality	49	72
Loss of income	52	52

In Amudat district, migration is considered as an adaptation strategy. During severe drought and prolonged dry periods, water sources and pastures dry up and pastoralists migrate with their livestock to places that still have water and pastures. Water and pasture-driven migrations are largely mainly seasonal or temporary (up to six months), dominated by the men and boys (sons) while the women and girls are left behind, which also causes family separations. Other drought-coping strategies are selling off livestock to buy food, some dig oases at the base of seasonal or dried-up river beds to get water. Stocking/storage of cereals and cultivation along river banks is another adaptation strategy. In 2020, the Karamoja sub-region faced a locust invasion that was addressed by the government-led initiative of spraying. When flooding occurs, the responses are relocation from flood-prone areas to safer areas, carrying out farming on raised lands, channeling water into trenches and valleys, and planting trees along river banks.

“Migration is a coping mechanism to environmental and climate stresses in the Karamoja sub-region. Seasonal migrations take place among pastoralists during droughts and prolonged dry periods. Drought deprives pastoralists of green pastures and water for their herds of cattle, compelling them to move towards Nakapiripirit, Napak and Katakwi districts in search for water and pasture.” (Discussion during PME in Amudat district on 7th December 2020)



3. Prospects for evidence-based policymaking

This chapter presents an overview of legal policy and institutional frameworks relating to migration, environment and climate change (MECC), and recommendations for effective evidence-based policy development towards addressing the MECC nexus challenges, benefits and opportunities.

3.1 Existing and pending policy frameworks

3.1.1 International and regional policy frameworks

3.1.1.1 *International frameworks*

Uganda is signatory to several international conventions and agreements on migration, environment and climate change including the United Nations Framework Convention on Climate Change (UNFCCC), Kyoto Protocol, the Paris Agreement on Climate Change and the Sustainable Development Goals (SDGs). Through these policy frameworks, Uganda commits to the adoption and implementation of policies and measures designed to address environmental and climate change-related migrations. The UN Global Compact on migration fosters safe, orderly and regular migration that addresses climate change as a push factor for migration. The Paris Agreement requires countries to observe the rights of migrants when addressing climate change. And in particular, the UNFCCC Cancun Agreement calls on countries to put in place measures to enhance understanding, coordination and cooperation with regard to climate change-induced displacement, migration and planned relocation. In reference to the sustainable development goals (SDGs), SDG 13 mandates countries to take urgent action to combat climate change and its impacts, and this study contributes to achievement of targets in this SDG and also having direct and indirect impact towards attainment of other sustainable development goals.

3.1.1.2 *Regional policy frameworks*

Africa is among the first continents to have developed a legal regime on migration, following the need to address challenges faced by large numbers of African refugees fleeing anti-colonial struggles. Initial efforts at addressing

migration were through the promulgation of the regional convention on refugees in 1969 by the then Organization of African Union (OAU), now the African Union (AU) (T. T. Abebe, 2017). The Abuja treaty signed in 1991 advocates for free movement of persons and capital to enhance regional integration and development in Africa. The increasing migration within and from Africa due to globalization and deteriorating political, socio-economic and environmental conditions led to adoption of the Migration Policy Framework and the African Common Position on Migration and Development in 2006; the former is under revision following decade of operationalization. The Migration Policy Framework recognizes migration as a sensitive issue in the 21st century and calls for its management to realize the potential benefits to origin and destination areas.

Regarding internal displacement, the AU in 2009 adopted the Kampala convention with an aim to offer protection and assistance to internally displaced persons (IDPs) (Stavropoulou, 2010) as the region searched for solutions to challenges of forced migration, environmental degradation, conflicts and human rights violations. The Inter-Governmental Authority on Development (IGAD) has set up measures to address MECC-related challenges amongst the communities highly vulnerable to changes in the environment and climate change. IGAD established the Centre for Pastoral Areas and Livestock Development (ICPALD) in 2012 whose mandate is to promote, facilitate and advocate for a people-centered gender-responsive sustainable development in arid and semi-arid areas (ICPALD, 2020). In 2018, the IGAD concluded a protocol on transhumance, aimed at enhancing free movement of pastoralists living in the border areas of the IGAD member countries searching for pastures for their livestock especially during periods of drought (Musau, 2021). The protocol is expected to prevent loss of livestock due to perennial droughts experienced in the IGAD while enhancing security of pastoralists and their host communities. So far, the initiatives for setting up of transhumance corridors through cross-border stock routes mapping, animal health management and integrated climate change early warning systems are increasingly being realized following signing of memorandums of understanding (MoUs).

3.1.2 Domestic/National policy frameworks

3.1.2.1 *Relevant provisions of the Constitution of Uganda*

The 1995 Constitution of Uganda commits to building a better future for Ugandans by establishing a socio-economic and political order based on the principles of unity, peace, equality, democracy, freedom, social justice and progress. Chapters 4 and 15 of the Constitution requires the state to fulfill the fundamental rights of all Ugandans to social justice and economic development by ensuring: social and cultural well-being of people, and equal access to education, health services, clean and safe water, work, decent shelter, adequate clothing, food security, property rights and, importantly ensuring a clean and safe environment.

The Constitution further obliges the state to put in place effective mechanisms for addressing and/or responding to natural or man-made hazards and disasters that result in displacement of people or disruption of normal life (Paragraph XXIII of the National Objectives and Directive Principles of State Policy). Paragraph XXVII of the Constitution requires the state to promote sustainable development and increase public awareness on the need to manage land, air and water resources in a balanced and sustainable manner for the present and future generations and to take all possible measures to prevent or minimize damage and destruction to land, air and water resources, including promoting the rational use of natural resources to safeguard and protect the country's biodiversity. In effect, these constitutional provisions require the state to ensure safeguarding against environmental and ecosystem degradation, while at the same time promoting restoration and rehabilitation of degraded ecosystems and landscapes, which are essential in regulating climate and increasing protection of communities and ecosystems from the destructive effects of natural disasters such like drought, flooding, landslides and wildfires, among others.

Article 110 of the Constitution particularly addresses disaster response, which includes displacement of people. The Article empowers the President to declare a state of emergency in any part of the country facing a disaster and for the Minister in charge of disaster preparedness and management to provide to the president all the relevant details on the cause and effects of the hazard and/or disaster, and the disaster mitigation and relief measures that should be undertaken to mitigate loss and damage. The main gap, however, is that the Constitution focuses largely on sudden-onset events or disasters that could cause displacement as the only issues that need intervention from the state, but does not equally prioritize slow-onset processes related to climate variability and environmental degradation that

cause hardships and conflicts that trigger internal migration and its cascading effects on the environment and livelihoods.

Nonetheless, the existing constitutional safeguards to human rights and environmental protection have laid foundation to the development of various policies, laws and governance structures necessary for fostering a sustainable development and climate-resilient path in the country. Further, a conducive environment for fostering disaster risk reduction (DRR), and settlement policies and practices are also becoming mainstreamed. But still, some constitutional challenges exist that could trigger migrations and displacements compounded by the impacts of climate change. For example, constraints to equitable access to land for all Ugandans, the rising land/resource conflicts and weak environmental governance and stewardship are areas that still need strong constitutional provisions. Specifically, the current land tenure regimes are very complex and the most contentious issue across the country.

Although the Constitution vests land in the citizens and recognizes four historic forms of land such as customary, leasehold, freehold and mailo tenure arrangements, only a small proportion of land between 15 and 20 per cent is formally registered. The access and control of productive land is inequitably distributed across regions, income groups and gender, and remain indirect or direct drivers of land/resource conflicts and environment degradation that are catalytic to human mobility and migration. Many individuals, groups and even communities lack land tenure security and often face evictions and displacement. For some groups that are facing hardships, displacement and evictions, encroachment on wetlands, forests and protected areas remain the only option for survival. But still, rich and politically powerful individuals and groups as well as the various government infrastructure projects also cause evictions and displacements of the poor and vulnerable without adequate compensations. For example, many people in the oil-rich Albertine basin are victims of displacement and evictions due to the oil and gas developments in the basin (Aboda, 2019; Mugagga et al., 2021). Similarly, the road and rail transport network infrastructural development in Greater Kampala Metropolitan Area (GKMA) are increasingly causing displacement and eviction of people.

Despite the strong constitutional safeguards for environmental protection and sustainable development, some government policies and practices have over the years done the opposite. For instance, the allocation of urban forests and wetlands for urban and industrial expansion, degazetting of protected areas for settlement and agriculture, and oil and gas development and infrastructure projects in ecologically sensitive areas have escalated ecosystem and natural resource degradation in both urban and rural areas of Uganda (GoU, 2016; Nkonya & Markelova, 2015) that in turn inevitably reduces the resilience to natural and climatic hazards and disasters that cause displacements. The combined pressures for forest conservation and agricultural cultivation have pushed indigenous groups like the Batwa and Benet communities in south-western and Mt. Elgon forest regions respectively off their land, and yet the adjudication and compensation claims are not feasible for them. In northern Uganda, the formerly displaced populations were unable to return to their homes and land (after the security situation improved) because their traditional/customary lands have been in many cases occupied by others who claim ownership over such land. There is therefore need for support to strengthen key government agencies that deal with land/property rights and environmental protection responsibilities to address these increasing resource/land conflicts and stop the destruction of ecosystems and natural resources.

3.1.2.2 Migration policy

Uganda's principal migration law is the Citizenship and Immigration Control Act of 2002, which regulates the entry and residence of migrants in Uganda as well as the issuance of citizenship, but it does not cater for emigration or return migration. In addition, the Act has not yet been revised following Uganda's ratification of International Convention on the Protection and Rights of All Migrant Workers and Members of Their Families. Uganda has domesticated and expanded the definition of trafficking in persons in the Prevention of Trafficking in Persons Act of 2009. Uganda is yet to ratify the United Nations Protocol to Prevent, Suppress and Punish Trafficking in Persons, Especially Women and Children. The GoU has adopted a comprehensive refugee response approach in which refugees are included in the NDPs through the Settlement Transformation Agenda (STA) that outlines government priorities (GoU et al., 2017). The STA was formally introduced in 2015 in NDPII (GoU, 2015), implying that refugee issues are incorporated in national development planning, and it operationalizes the national legal framework and aims to achieve self-reliance for refugees and bring social development to Ugandan nationals in refugee-hosting areas through

six thematic areas: (i) land management; (ii) sustainable livelihoods, (iii) governance and rule of law; (iv) peaceful co-existence; (v) environmental protection; and, (vi) community infrastructure.

The refugee legal framework is embodied in the Refugee Act of 2006 and the Refugee Regulations of 2010. The refugee framework opens Uganda to all asylum seekers, granting refugees with relative freedom of movement, the right to seek employment and opportunities, and to acquire land (IOM, 2015). Refugee response in the country is led by the Office of the Prime Minister (OPM) - Department of Refugees and the UNHCR which jointly oversee inter-agency coordination. At the district level, the OPM's refugee desk officers oversee refugees in refugee-hosting districts and work with the District Local Government to coordinate response. At the field level, each refugee settlement is managed by OPM through a Camp Commandant and other OPM leadership, while OPM and UNHCR jointly coordinate humanitarian actors working in each refugee hosting-location.

Due to the protracted nature of refugees and displacement in Uganda, the government outlined a policy of self-reliance for refugees in 1998 and accordingly, development programs and initiatives are designed with self-reliance aspect in mind. In addition to the refugee rights, the government also decided to grant every refugee household a plot of land for agricultural purposes in order to increase "food self-sufficiency" among refugee communities and to integrate refugees into the host communities (World Bank Group, 2016). This livelihood-based settlement policy has provided refugee settlements opportunities to produce their own food and generate incomes (Zewdu, 2018).

Despite all these policy achievements, Uganda still lacks a specific (stand-alone) policy on migration; rather, migration policy issues are scattered in various national policy documents. Indeed, Uganda's land policy highlights the need for a resettlement policy to guide voluntary migration and resettlements, but this is not yet in place. Nonetheless, Uganda has established an institutional framework and operational capacity to implement migration policies across scales. The National Citizenship and Migration Board and Directorate of Citizenship and Immigration Control within the Ministry of Internal Affairs are responsible for border management, the issuance of visas, processing citizenship applications and deportations. The Diaspora Services department in the Ministry of Internal Affairs is the dedicated government agency responsible for engaging with the Ugandan diaspora. A formal inter-ministerial coordination mechanism, the National Coordination Mechanism on Migration (NCM), was established in 2015 and is led by the Office of the Prime Minister (OPM). The NCM is comprised of key government agencies, international organizations, migration-related civil society organizations, and members of the academia. Regular migration and border policy issues are codified in Uganda's Citizenship and Immigration Control Act. Separate laws and policies such as the National Policy for Internally Displaced Persons, the Refugees Act, the Refugees Regulations, the Prevention of Trafficking in Persons Act and the Employment Act promote equal opportunities for migrant workers (IOM, 2015; Santner, 2013).

The National Population Policy for Uganda observes that migration and increasing wave of refugees is one of the key areas that require policy intervention. In particular, rural-urban migration and its associated implications on the growth of slums, increase in number of urban poor, unemployment, and the pressures it puts on urban socio-ecological resources and services is highlighted (MFPED, 2008). The policy foresees the need for analyzing and documenting trends in migration and implications. Other pieces of migration policy content are also covered in Uganda's development framework - the Uganda Vision 2040, the National Development Plans (NDPs), and the National Population Policy, among others. The Vision 2040 recognizes the need for policies and systems for managing emigration and controlling immigration. The vision points to the need to have regularly updated data on population and establishment of a national identification system to track demographic changes. It also highlights the importance of strengthening measures to ensure rights and protection of refugees and internally displaced persons (IDPs), as well as strengthening disaster mitigation and management (NPA, 2013).

Uganda's NDP III recognizes the lack of a comprehensive national migration policy as a challenge to migration management and human development in Uganda. As a result, one of the objectives of Uganda NDP III is to enhance refugee protection and migration management, and proposes three interventions to achieve this objective. (i) coordinating the responses that address refugee protection and assistance; (ii) developing and operationalizing the

national refugee policy, and (iii) developing a migration policy. The NDP recognizes that some migration and conflicts are consequences of climate change.

Uganda is also party to international conventions and frameworks guarding the rights of migrants including: the Convention on the Rights of the Child, Convention Relating to the Status of Refugees, International Convention on the Protection of the Rights of All Migrant Workers. The country Uganda is a member of multilateral and regional partnerships including the East African Community (EAC), the Common Market for Eastern and Southern Africa (COMESA) and the Intergovernmental Authority on Development (IGAD) which adopted a regional migration policy framework in 2012. Uganda hosted the third Pan-African Forum on Migration in 2017 with the aim of compiling Africa's inputs for a global compact on migration (IOM, 2015).

The lack of a comprehensive national policy on migration, poor coordination of migration issues with migration data scattered between different institutions, lack of a systematic way of capturing data on irregular migration, human smuggling and trafficking, limited use of migration data for planning and limited integration of migration into development plans, hinder effecting migration documentation, integration and management. Data is lacking on how migrants (immigrants and emigrants) contribute to Uganda's economy, and data on internal migration and how it affects development remains scanty (Mushomi, 2019).

Considering the above, GoU has already embarked on the domestication of global migration policy and development of a national policy on migration to provide direction on migration management in the country. Currently the policy process is revolving around domestication of the Global Compact on Migration (GCM) through the National Coordination Mechanism on Migration. The national migration policies that are being formulated include the National Migration Policy, the National Diaspora Policy, and National Policy on Refugees. While the latter two policies are still in early stages of development, the National Migration Policy is in advanced stages; a draft policy is already in place. The National Migration Policy is being developed to be a comprehensive policy to guide the management of internal, intra-regional and international migration flows. The overall goal of the National Migration Policy (in draft) is to "effectively manage migration for socio-economic and political development of Uganda".

Uganda's national policy of disaster preparedness and management has specific provisions addressing displacement impacts following disasters. Importantly, this policy covers internal armed conflicts and displacement of persons and prescribes policy for facilitating mobilization of large-scale disaster relief in the event of armed conflict. However, the country's national disaster preparedness and management system does not have top-down and bottom-up emergency community systems to timely and effectively address the specific vulnerabilities of migrants. The national disaster coordination center is still in the process of building capacity around early warning systems and is yet to mainstream migrants as a specific vulnerable group.

Following an analysis of Uganda's legal and policy frameworks for receipt of international disaster assistance, it was recommended that a comprehensive law on disaster risk management and health emergencies be enacted to strengthen Uganda's institutional framework for disaster management that reflects international disaster response litigation. The Uganda Red Cross Society (URCS) has since 2011 engaged the Office of the Prime Minister to discuss the development of the Disaster Risk Management Bill (DRM Bill). As of 2019, stakeholder consultations with parliamentarians and district local governments had been conducted to gather contributions to the content of the DRM Bill. Currently, efforts toward drafting the DRM Bill in 2021 are still ongoing with support from URCS and it is hoped that the process shall engage with all relevant stakeholders to capture views that shall compose an inclusive, just and transformative DRM Bill.

In all, there is hardly any evidence to suggest that the current and proposed migration-related policy framework specifically incorporates environment and climate change aspects as migration drivers or as factors that increase the vulnerability of migrants. Neither do the policies look at migrations as adaptation strategy to environmental and climate change-related shocks and stresses, or adaptation and resilience as avenues for controlling migration.

3.1.2.3 Migration in climate change policies

Uganda Vision 2040 states that the country aspires to achieve a green economy, clean environment and resilience to climate change while at the same time achieving sustainable development and poverty eradication. Uganda's primary climate change policy is the National Climate Change Policy, but in the last two decades, Uganda has developed other policy documents to guide climate change adaptation and increasing resilience, including, among others, the National Adaptation Programme of Action (NAPA), and the Nationally Determined Contribution (NDC). However, migration as adaptation to environmental and climate change is neither comprehensively considered within the country's existing climate change policy frameworks nor completely ignored.

In 2007, the GoU adopted the NAPA to address the impacts of climate change. While the NAPA proposed sustainable land management strategies to reduce the impact of climate change on rural livelihoods as a way of easing migration to urban centers, no plan or strategy was proposed to manage migration to urban areas (Farley-Kiwanuka & Yiga, 2020). Besides, the NAPA did not specifically refer to the nexuses between climate change impacts and migration, nor migration as an adaptation strategy. On the other hand, the National Climate Change Policy (NCCP) observes that declining rural livelihoods (especially agriculture, forestry and fisheries) cause rural-urban migration and lead to the formation of slums. The policy also recognizes existence of environmental refugees highlighting that disaster risk management is key to addressing socio-environmental conflicts and human security concerns, both locally and regionally, that cause and or affect environmental refugees. However, the policy does not specifically refer to the rural-rural migrations and displacements that are driven by both slow-onset processes and sudden-onset events like rising temperatures, drought, floods, landslides. Uganda's first NDC and the National Climate Change Bill (passed by Parliament in April 2021 and waiting presidential assent before it becomes law) are all silent on migration, not mentioning it at all.

The country's National Adaptation Plan for the Agricultural Sector (NAP Ag.) explores the linkage between climate change and food availability that in turn influence rural-urban migration. Such trajectory affects agricultural production and yet stable agricultural systems foster cohesive rural societies and contribute to balanced urban-rural dynamics thus stemming migration and ensuring political and national stability (MAAIF, 2018). The NAP Ag. also proposes strategies to increase food production through reducing dependence on rainfed agriculture like irrigation farming and modern inputs to boost the adaptive capacity of the agricultural sector but does not explicitly focus on containing migration (and its cascading effects) because of environment and climate stressors.

3.1.2.4 Migration in disaster risk response policies

Disaster risk reduction, prevention, preparedness and management are core to addressing challenges relating to displacement caused by environmental and climatic changes (Nyaoro et al., 2013). In 2010, Uganda put in place the National Policy for Disaster Preparedness and Management (DPM) aimed to "establish institutions and mechanisms that will reduce the vulnerability of people, livestock, plants and wildlife to disasters", including those caused by climate hazards such as droughts, floods and landslides.

The policy recognizes that environmental and climatic-induced internal displacement of people and migrations occurs in Uganda caused by droughts, famine, environmental degradation, floods, landslides, conflicts and disease outbreaks, among others. The policy proposes a response framework to support affected communities in times of disasters, coupled with administrative, legislative and technical measures. The DPM regulates disaster management in Uganda through prevention, preparedness, response and recovery with an overall goal of promoting national vulnerability assessment, risk mitigation, disaster prevention, preparedness, effective response and recovery in a manner that integrates risk management with development planning and programming (Balikuddembe & Ardan, 2014). The disaster policy in Uganda highlights preventive actions in response to disasters such as early warnings, physical planning, legal framework, public awareness, sensitization and advocacy campaigns, routine surveillance, education and training. Other measures include research and documentation, coordination, monitoring and evaluation, resource mobilization, capacity building and partnerships, and a holistic disaster management approach among different stakeholders in managing disasters within and outside Uganda (NPDPM, 2010).

Currently the Office of the Prime Minister (OPM) Department of Relief, Disaster Preparedness and Management is the coordinating institution on all disaster-related matters in Uganda. However, the responsibilities for disaster response are spread along different national level ministries, departments and agencies (MDAs), international and national non-government organizations and research institutions, and additionally shared across national, regional and local level governance structures.

Additionally, the disaster management policy does not put in place strategies to address climate change and migrations or displacements (Farley-Kiwanuka & Yiga, 2020). It puts a lot of emphasis on disaster displacement management and massive mobilization of relief support to displaced communities. Such assistance includes provision of foodstuffs, household items (clothing, blankets, and cooking utensils) and planned relocation to safer areas (OPM, 2011). Moreover, the lack of a disaster risk reduction and/or management law (but a Bill is in the making), constrains programming and implementation of meaningful targeted responses to climate risks or hazards and environmental shocks. While the field assessments and surveys conducted revealed that climate and environmental stressors (drought, floods, landslides, soil infertility, land degradation and food insecurity) were culminating into displacements and human mobility in Eastern Uganda, response strategies only targeted addressing short-term disaster displacement challenges. In the communities where migrants originate, perceptions are that hardly any strong medium to longer-term mechanisms exist to build resilience to mitigate future displacements. And while the national risk and vulnerability atlas maps out areas that are prone to climate and environmental change shocks, it does not map out hazard-prone hotspots as migration corridors that require adequate contingency planning and response.

3.1.2.5 Disaster-related displacement and planned relocation

Internal displacement of people has been a common occurrence across Uganda and, therefore, the relocation and/or resettlement of internally displaced persons (IDPs) is an important component of disaster risk management, that is also highlighted in the country's national disaster preparedness and management policy. Internal displacement of people in Uganda has been largely driven by socio-political conflicts, natural disasters and of recent the quest for land for infrastructural development programs (Kamara et al., 2017) with the main natural disasters that caused IDPs being floods, landslides and drought.

The Uganda National Land Policy 2013 recognizes that vulnerable people, including IDPs are prone to loss of land rights and commits the government to protect the land rights, through resettlement or ensuring adequate compensation. The policy also emphasizes the need for a resettlement policy to guide government-led resettlements. In addition, Uganda is one of the few countries with a national IDP policy that was adopted in 2004 which aims at, among others, minimizing internal displacement and its effects, and assisting the safe and voluntary return of IDPs. Importantly, the IDP policy recognizes that an increasing number of displacements are caused by natural disasters like floods and landslides, which will be compounded by climate change. The policy puts in place a multisectoral institutional structure to manage internal displacements coordinated by the OPM. Through this policy, the government commits to uphold the rights of IDPs to return voluntarily, safely and in a dignified way to their homes, places of habitual residence or to resettle voluntarily in other parts of the country where their life, health, safety and liberty would not be at risk. In addition, the GoU (with support from the World Bank), developed a Resettlement Policy Framework (RPF) that establishes resettlement and compensation principles, implementation arrangements, and the legal and institutional framework for resettlement, among others. The framework provides for the preparation of Resettlement Action Plans (RAPs) before implementing major projects (such as infrastructure) to minimize displacement of people and interference with their livelihoods as much as possible. However, this resettlement framework is very project-specific and may not be very applicable for disaster-related displacements where relocation should be done immediately.

Besides, the weak implementation of both the IDP policy and the resettlement framework has meant that many IDPs still face many challenges including security threats, human trafficking, limited access to humanitarian assistance, and indeed difficulties in resettlement or even returning home. For example, some of the people displaced by landslides in Bududa (Mt. Elgon sub-region) are still settled in areas that are not gazetted for settlement because they are also high-risk areas (Neema et al., 2018), and their relocations do not have RAPs. Many of such relocations are not participatory and the affected peoples' views and considerations are not taken seriously (Delima et al., 2021). Besides,

the fact that some of the landslide victims resettled in Bulabuli and Kiryandongo districts have often returned to landslide-prone areas in the Mt. Elgon sub-region, point to lack of adequate participatory planning in the resettlements. In all, there is a gap or disconnect between government plans and disaster responses and affected communities' needs with incidents where some displaced people end up in more disaster-prone areas (Vlaeminck et al., 2016). The internally displaced people of Kween district (Mt. Elgon) have ended up encroaching on river banks (along fragile slopes) for cultivation which makes them more vulnerable to other disasters (Norwegian Refugee Council, 2014). The result is more people getting exposed to repeated hazards resulting into repeated displacement and migration (Vlaeminck et al., 2016).

3.1.2.6 Development and conservation-based displacement and planned relocation

Development and environmental conservation-related displacement are on the increase in Uganda (Adeola, 2017; Anyuru et al., 2016). Some of the projects causing displacements are run by the government, but others by Ugandan and foreign investors (Adeola, 2017). To spur economic growth and attract direct foreign investment, the government allows both domestic and international investors to purchase or lease land for development projects. Unfortunately, these development projects cause displacement of people and bar local communities from accessing water sources, farmlands, and forest products (like wood fuel). In many cases, land has been transferred to the investors without consulting and/or compensating the occupants and local communities (Adeola, 2017; Neema et al., 2018; Mugagga et al., 2021a), and in some cases people are just evicted. This often results into resentment of the development projects by the local community, which causes delays in implementation (Anyuru et al., 2016; Norwegian Refugee Council, 2014).

Conservation projects also result in displacements and eviction of people from gazetted protected areas. For example, an effort to create land for the proposed Apaa game reserve in northern Uganda caused displacement of people, in which the ensuing land disputes resulted in destruction of property, and 2,240 homes were burnt down. In an effort to get rid of forest encroachers in Mpokya forest reserve (western Uganda), the government in 1992 evicted 3,500 families (Anyuru et al., 2016). Unfortunately, the evictees did not receive the promised compensation (Mugagga et al., 2021a). Complaints were raised and the government promised each family UGX 12 million but the funds ended up in the hands of group leaders through which it was channeled and the targeted people/families never received the money. Annoyingly, these group leaders have never faced disciplinary action and the evictees are still waiting for their benefits/compensation from government (Adeola, 2017).

The Madhvani sugarcane project in Amuria district (northern Uganda) has faced resentment due to inadequate consultation of the local community. Hydro power development projects such as the Bujagali hydro power development project in Buikwe district left many people displaced (up to 953) in the name of development (Adeola, 2017; Kimbowa & Mourad, 2019) but also was associated with destruction of natural resources and social disintegration. Besides, people received insufficient and delayed compensation, while others were resettled in poorly constructed houses. In all, livelihood restoration activities are largely insufficient and the lives of many become worse afterwards (Anyuru et al., 2016; Kimbowa & Mourad, 2019). Another case in point is oil and gas development in the Albertine graben that has caused large-scale displacement and eviction (Aboda, 2019). Fifty families were evicted in Bugambe sub-county in Hoima district (Mugagga et al., 2021a; Ogwang et al., 2018). Oil and gas development has also been accompanied by land grabbing and land market speculation cases, influx of foreigners into the area causing competition for resources and social services, rising cost of living, sky-rocketing land values and conflicts between the local community and the in-migrants (Ogwang et al., 2018).

The Uganda Constitution and the National Land Policy 2013 provides a framework for compulsory land acquisition by government and/or for infrastructure development, and mechanisms for the compensation and settlement of the displaced persons. And, whereas Uganda's Resettlement Policy Framework (RPF) provides for the preparation of Resettlement Action Plans (RAPs) before implementing major infrastructure projects to minimize displacement of people and leaving people's livelihoods worse off, most relocations lack RAPs, and/or if they exist, they are not formulated in an inclusive manner. For example, the relocation process of people displaced by oil and gas development in the Albertine Graben included cash compensation, resettlement and land-for-land packages (Aboda, 2019; Mugagga et al., 2021a). However, the majority of the affected people opted for the cash packages (Ogwang et

al., 2018), and many of these people's livelihood end up being worse off as the compensation funds are not well used. It is, therefore, important to strike a balance between development and protection of those displaced or evicted (Adeola, 2017).

3.1.2.7 Urbanization, housing and settlement planning

The urbanization process is closely associated with migration and/or displacement (Brøgger & Agergaard, 2019). With the increasing climate and environmental stressors across different parts of Uganda, the expansion of existing urban centers coupled with the emergence of new urban centers is expected to happen due to rural-urban migration and displacement. The perceptions that urban centers often provide better access to income through non-farm employment and services like health, housing and education compared to migrants' home, builds expectations that cities are safe-haven to the already constrained opportunities and resources amongst deprived populations (Geyer, 2015; McGranahan & Satterthwaite, 2014). Further, the desire and aspirations for modern lifestyles coupled with the urge for less-dependent livelihoods and family re-unification explain attraction to cities (Mukhopadhyay et al., 2017). However, migration-induced urbanization in Uganda is increasingly exacerbating all forms of urban inequalities especially for housing and settlement planning, consequently turning cities into potential loci of different levels of vulnerabilities, poverty and conflict. As the influx of populations into cities becomes unavoidable, planning for sustainable and habitable cities dependent on recognized standards that include provision of infrastructure, services and suitable livelihood options need to be prioritized.

Generally, Uganda lacks a human settlement policy that coherently aligns and integrates other disparate policies for a more sustainable urban and rural settlement development approach (Twinomuhangi et al., 2015). The policy and legal framework for the housing and urban development is inadequate and scattered under different instruments, which makes it hard for the sector to effectively implement them (MoLHUD, 2016). While Uganda's rapid urbanization process is largely a result of rural-urban migration, and some of the urban migrations are driven by internal displacement, Uganda's National Urban Policy 2017 does not have any policy intervention or action on migration management, nor does it recognize urban migration as a challenge. And without specifically tackling urban migration, the policy may not effectively guide efforts to stop the proliferation of slums and the environmental and socio-economic barriers they create to the achievement of sustainable and resilient cities. Equally, a migration policy gap exists in Uganda's National Housing Policy 2016. While the policy pints out a rising deficit in urban housing provision, it does not recognize that the housing shortage is largely driven by an influx of in-migrants into urban centers. However, the policy aspires to provide adequate housing for all, including social housing for the vulnerable including for the IDPs, the poorest of the poor, but does not specifically target housing provisioning for urban migrants, and yet these are highly vulnerable to disaster risks including those induced by environmental and climate change.

Amidst these policy gaps, including the contradicting policies and legislations that directly or indirectly guide the urban housing, self-built housing, often unplanned and constructed incrementally, is very typical and dominates the housing market and urban space. In addition, there exist non-traditional microfinance arrangements that offer competitive products for lower-income households to incrementally meet their housing needs. For example, housing upgrading schemes for slum settlements have led to the implementation of Namuwongo Upgrading and Low-Cost Housing Pilot Project (1987) and Masese Self-Help Women's Project (1989), and reconstruction and redevelopment of the war-ravaged areas of Mbarara, Masaka and Arua (MoLHUD, 2016). The National Urban Policy (2017) and National Housing Policy (2016) are at initial stages of augmenting the formation of housing cooperatives across both rural and urban areas. Such cooperatives are being piloted by a multiplicity of actors in the academia, civil society, private and public sectors, and are initiating pro-poor mechanisms of resource mobilization towards establishing decent housing, securing land tenure rights while at the same time revolutionizing inclusive local-level settlement planning in terms of basic infrastructure demands within informal settlements and rural areas. The creation of appropriate spaces and infrastructure for economic activity, migration management, livelihood enhancement and urban economy integration are the key aspects prioritized by housing upgrading cooperatives being initiated across the country.

However, urban authorities and decision-makers in Uganda have not appreciated proper planning for urban migrants within cities hence the rise of new and expansion of existing informal/slum settlements in Ugandan cities. Whereas temporary relocation of people has a way of becoming permanent, early and safe return arrangements of affected

populations to pre-disaster sites is not addressed within the existing policy and legislative frameworks yet it needs to be promoted as a way of offsetting cities or urban centers from the burdens of housing infrastructural inadequacies.

3.1.2.8 Population policy and planning

In the early 1990s, Uganda Government realized the importance and significance of mainstreaming population dynamics (fertility, mortality and migration) in its development policies and programmes, and formulated the first-ever National Population Policy in 1995. The population policy was geared at addressing the prevailing unfavorable population characteristics most especially high fertility, high mortality and high population growth. In addition, the high HIV/AIDS prevalence, low literacy levels, and low life expectancy of only 43 years were addressed by the policy. In 2008, Government developed a revised national population policy that also incorporated population factors in development planning at national and local governments. The policy recognized the rural-urban migration and internal displacement that created pressure on urban areas and urban infrastructure. While the policy further recognized that rural-urban migration was causing the proliferation of slums, and increasing urban poverty and unemployment, and put further service demand pressures, it ran short of putting in place policy directions and strategies for tackling not only urban migration but also the associated challenges.

A new national population policy was approved by cabinet in 2020 and is expected to steer the country towards harnessing the demographic dividend given the changing population structure, comprising of a much younger population. The overall goal of this policy is to attain a quality, cohesive, productive and innovative population for social transformation and sustainable development. One of the policy's objectives is to leverage internal and international migration to achieve the greatest development benefits with the strategic actions for the policy objective being institutionalizing diaspora remittance channels, promoting better management of internal migration for better resource management, environmental protection, promoting organized urbanization, improving management of labour externalization and labour migrants, and supporting a development approach that empowers IDPs, refugees and hosting communities.

3.1.2.9 Protection of vulnerable groups and stabilization of livelihoods

Environmental and climate change risk and the associated displacement and migrations disproportionately affect the livelihoods of vulnerable communities and individuals in both rural and urban areas of Uganda. The vulnerable groups most affected include the poorest of the poor women, children, orphans, the elderly, youths, and PWDs. Particularly vulnerable are the IDPs and refugees, and pastoral communities in arid and semi-arid areas whose resilience is lower compared to other groups. Although the poor and vulnerable populations in Uganda have historically been cared for through family and community systems, such traditional systems cannot be relied upon under contemporary monetized and urbanization trends (Getu & Devereux, 2013) that undermine traditional social safety nets and social capital.

Uganda has put in place a number of policies for the protection of vulnerable communities, groups and individuals that include, among others, the National Youth Policy (2016), The National Gender Based Violence (GBV) Policy (2016), National Early Childhood Development (IECD) (2016), The Uganda Gender Policy (2007), The National Employment Policy (2010), The National Policy for Older Persons (2009), The National Policy on Disability (2006), The National Child Labour Policy (2006), The National Orphans and Other Vulnerable Children Policy (2004), and National Social Protection Policy (2015). These policies are geared at promoting inclusivity and equality in policy, planning and practices. Indeed, the GoU, with donor support, is championing inclusive and longer-term resilience building interventions such as support to orphans and vulnerable children (OVCs), Community Based Rehabilitation Programmes for Persons with Disabilities (PWDs), School feeding Programmes and Social Assistance Grant for Empowerment (SAGE) that target to socio-economically protect vulnerable groups and increase their resilience. The Uganda Vision 2040 underscores the importance of social protection to address risks and vulnerabilities (NPA, 2013) that includes a universal pension for older persons, public works schemes for vulnerable unemployed persons and social assistance to vulnerable children, persons with disabilities and the destitute. The Vision 2040 also fosters universal health insurance as one of the key strategies for alleviating the high cost of health care by households and

enhancing access to affordable health services for all, that are operationalized in the NDP and National Social Protection Policy.

However, the implementation of social protection systems has been limited in scope and coverage, and often excluding some of the most vulnerable populations. For example, the existing social protection strategy is fragmented, excluding almost 85 per cent of the workers in paid employment (Getu & Devereux, 2013; NPC, 2019) and close to 90 per cent of the population employed in the informal sector (smallholder farmers and informal traders, casual laborers and MSMEs, among others). Similarly, the OVC support only reaches to 1.7 million OVCs, which is just 23 per cent of the total estimated OVCs in the country. Equally, the vulnerable populations in IDPs camps, and in pastoral and fishing communities, ethnic minorities, and the urban poor do not have social protection. Although the 2019 National Social Security Amendment Bill seeks to extend mandatory coverage of the scheme to all workers in the formal sector while encouraging voluntary membership in the informal sector as a way of increasing coverage gap and adequacy of benefits, it does not directly target the vulnerable groups.

In its effort to stabilize people's livelihoods, and to reduce poverty and vulnerabilities, government has initiated programmes over the years. The Economic Recovery Programme (ERP), Poverty Eradication Action Plan (PEAP), Plan for Modernization of Agriculture (PMA), National Agricultural Advisory Services (NAADS) and Operation Wealth Creation (OWC) were geared at modernizing and commercializing agriculture, and fostering agri-business, agro-industrialization, and rural development to increase household incomes, create jobs and eradicate rural poverty. However, most of these programs have been implemented on a "temporal basis" and did not become entrenched vehicles for livelihood improvement. Currently, the outcome target is to raise household incomes to a minimum of UGX 20 million (approximately USD 5,700) per household per year (Budget Monitoring and Accountability Unit (BMAU), 2017).

Some of the schemes to stabilize livelihoods in Uganda including direct income support comprised unconditional non-contributory cash transfers to reduce chronic poverty and inequality and embed social assistance for the poorest and most vulnerable (NPC, 2019). Examples include the Senior Citizens Grant (SCG) and the Vulnerable Family Grant (VFG), both of which provide bi-monthly cash transfers of 50,000 Ugandan Shillings (Dietrich et al., 2020); the cash for work public and works programs embedded in the Northern Uganda Social Action Fund (NUSAF) and Karamoja Livelihoods Improvement Program (KALIP) that have benefitted over half a million people of whom more than 50 per cent are female. The field assessment conducted in Bududa district revealed that NUSAF mobilizes communities to participate in public road and water infrastructural works and in turn remunerates them for the services offered. Direct income support has recently been expanded to include certain livelihoods programs like the Youth Livelihood Programme (YLP) and the Uganda Women Entrepreneurship Programme (UWEP) as livelihoods enhancement initiatives. Whereas the YLP targets youth aged 18-30 years and is aimed at addressing the unemployment challenge through promotion of self-employment, the UWEP addresses the historical marginalization of women, gender inequity and the need for their empowerment (NPC, 2019). Nonetheless, the genuine political commitment and the capacity of government to deliver cash transfers effectively remains low (Pruce et al., 2016). In addition, coupled with the small size of current cash transfers and exclusionary tendencies regarding target populations, cash transfers continue to undermine the poverty reduction agenda and livelihood stabilization prospects across recipients and communities.

Some international actors are collaborating with local governments, civil society organizations, the private sector and the academia to foster social protection in rural and urban communities. For example, Cities Alliance is partnering with Makerere University, ACTogether, National Slum Dwellers Federation of Uganda (NSDFU), Centenary Bank, Uganda Microfinance Support Centre and Jinja City Council to foster urban migration management and integration of urban migrants into the urban economy. Community development and housing upgrading funds have been set up that target stabilization of the urban migrants' livelihoods through enterprise development and management, and slum housing improvement. In addition, the capacity of Jinja City Council, to manage urban migration is being strengthened (Twinomuhangi & Sseviiri, 2020). The community and housing funds set up with funding support from Cities Alliance are owned by urban migrant communities and enhanced by savings from the community groups being engaged. Such funds and savings aim at creating a pool of resources that can sustainably augment business enterprise development, service and infrastructure provision and livelihood enhancement within the urban poor in Jinja city.

3.1.2.10 Labour migration, remittances and development

In Section 1.3.6, internal and international remittances from labour migrants were discussed. With many youths joining productive age and joining the labour market annually against a labour market that is incapable of absorbing them, labour externalization is currently the most feasible alternative way out of this unemployment quagmire. Indeed, the Uganda government accepts and recognizes the importance of labour externalization in contributing to the welfare of participating migrants, their families and overall national development. To this end, the Ministry of Gender, Labour and Social Development (MGLSD) has licensed more than 100 private labour recruitment agencies and also facilitated recruitment of over 70,000 Ugandan migrant workers to largely casual jobs in United Arab Emirates (UAE), Saudi Arabia, Jordan, Bahrain, Oman, Qatar, Iraq, Somalia, Afghanistan and Mali, among others (Nattabi et al., 2020). The ministry has also negotiated and signed bilateral labour agreements with the Kingdom of Saudi Arabia and Government of Jordan. The Uganda Association of External Recruitment Agencies (UAERA) estimates that at least 165,000 Ugandans work in various sectors in the Middle East (Nattabi et al., 2020) and numbers continue to rise. The jobs have been instrumental in enabling the migrant workers to acquire new skills and trainings and contribute to the country's foreign exchange earnings.

The migrant workers' remittances form a strong source of financial support to many urban and rural households through increasing their purchasing power and stabilizing livelihoods especially for those highly affected by hazards and environmental shocks. While Uganda government has taken steps to seek legal protection of migrant workers, human trafficking and violation of migrant workers' rights continue to taint labour externalization efforts and needs to be effectively addressed. Further, efforts to enhance financial inclusion and expansion through amendment of the Financial Institution Act to allow agency banking has reportedly increased the consumer value of and demand for digital banking services amongst not only migrant workers abroad but also locally within the Ugandan population. The expansion of digital banking services has enhanced rural households' access to remittances that are in turn used to build household or community resilience amidst the prevailing climatic conditions and environmental change.

3.2 Policy gaps and options

Uganda does not have stand-alone migration policy, and migration policy issues are scattered in various national policy documents which makes migration policy implementation and coordination difficult. This MECC assessment finds that there is a need for a specific migration policy that both covers internal and international migration, voluntary and forced migration, planned relocation or resettlement and migration as adaptation strategy. Considering climate change and its effect on migration, consolidation of national policies related to migration, environment and climate change (MECC) is essential and such policies should consider migration as an adaptation strategy to build resilience to the adverse impacts of climate change and land degradation. Promoting resilient socio-economic development and improved community livelihoods will empower vulnerable communities and individuals to withstand and build resilience against natural hazards which minimize environmental and climate change-induced migrations.

Uganda's land policy highlights the need for a resettlement policy to guide voluntary migration and resettlements, but this policy gap has not been addressed yet and needs attention from government. Another migration policy gap is in the urban policy framework. The displacement of people due to natural hazards gives impetus to internal migration, especially rural-urban migration and urbanization. However, the current urban development policy framework does not highlight the potential threats posed by rural urban migration to sustainable development and there are no appropriate policy tools and, or response mechanisms to address such challenges. It is essential, therefore, that the country's urban (settlement) planning and development policy framework is reviewed and consolidated to address challenges of migration and urbanization with emphasis on inclusive and sustainable urban development planning. Special attention should be given to addressing urban migrants' environmental, climate change and socio-economic vulnerabilities more especially for the urban poor and slum dwellers. Supporting planned relocation and resettlement as adaptation policy tools should be explored and incorporated in physical planning and local development planning policy and practices.

Currently, many government ministries and agencies, and local governments are not deeply engaged in addressing migration challenges, with focus mainly on refugees and IDPs handled by OPM and UNHCR rather in top-bottom approach. Therefore, inter-agency and inter-ministerial coordination and cooperation, with involvement of affected local governments and communities should be strengthened to enhance institutional capacity and streamline existing and future knowledge on migration as adaptation (including relocation) into the planning of migration and adaptation to environmental and climatic change.

3.2.1 Minimizing forced migration: improving resilience of communities of origin

The study finds that forced migrations and displacements exist in Uganda, and many of them are driven by environmental and climate changes. And, while some environmentally induced migrations may be adaptive, other forms of forced migration and displacement indicate the inability of the socio-ecological system to adapt. Currently, more attention is focused on evacuations or planned relocations that compel the people flee their home areas or communities but this tends to increase humanitarian needs and exposure to other significant risks that cause further displacements. Further, when displacements occur, the necessary assistance and protection are not timely and is largely inadequate. For those migrants that prefer seeking refuge in urban centers, the inability of urban authorities to adequately plan for urban migrations forces migrants in overcrowded and vulnerable slum settlements that are also prone to climate disasters like flooding that further exacerbates vulnerability. The policy measures suggested below are essential if forced migration is to be minimized in Uganda.

For those areas highly vulnerable to climate and environmental hazards and disasters that force people to migrate, increased investments in nature-based solutions for vulnerability reduction (ecosystem and landscape restoration and rehabilitation, land productivity improvement and livelihood diversification) are essential for building healthy ecosystems and longer-term resilience of communities and livelihoods to mitigate environmental and climate-induced migrations and displacements. Improved land productivity will increase food security, reduce livelihood hardships and strengthen social safety nets that can mitigate some forced migrations. The existing government and civil society efforts to diversify livelihoods in Amudat, Katakwi and Bududa districts through disaster risk financing programs like NUSAF and KALIP, and village credit facilities and agro-enterprise development need to be scaled up for wider uptake and impacts at local level. Such investments provide communities with alternative livelihood sources and livelihood restoration when natural disasters hit. The trapped population that are unable to move due to constrained networks and resources to facilitate mobility are highly vulnerable and need livelihood support opportunities to facilitate recovery from losses and damages caused by a disaster.

Policies and actions towards inclusive and equitable access to natural resources and land tenure security are critical to strengthening community-level resilience that mitigates forced migrations and displacements. For smallholder farmers who are squatters, and pastoralists on customary or communal grazing land and the urban poor in informal/slum settlements, land ownership and tenure security are great incentives for them to permanently stay in home areas and to engage into longer term adaptation interventions that mitigate voluntary and forced migrations. Therefore, deliberate efforts and policy measures to increase tenure security and addressing unjust customary and historical land injustices that often lead to resource-based tensions and violent conflicts must be implemented. Such efforts shall protect the poor and marginalized communities by reducing the drivers of forced migration, that are exacerbated by the impacts of climate change.

Many vulnerable communities may not be aware that their activities adversely affect the environment (such as; overgrazing, bush burning, charcoal production, and encroachment on ecosystems). Even where they know the impacts, these communities lack viable alternative and resilient livelihood sources (including water security, affordable and clean modern cooking energy services, inputs to improve land productivity, off-farm employment and income-generating activities). Therefore, public awareness on sustainable environment management and climate change are necessary for inclusive and participatory environment and natural resources management as pathways to building resilient ecosystems and communities, and productive landscapes. Training and demonstration projects that mobilize communities to apply nature-based solutions, climate-smart agriculture, water harvesting and storage, and livelihood diversification should be part of the awareness-building package. These have potential of reducing the adverse effects of impacts of climate change (like; floods, drought, and landslides) thereby mitigating forced migration.

In addition, local community development, production and environmental management technical staff (most especially extension staff) should be equipped with requisite knowledge, skills, and adequately facilitated to enable/advise communities to engage in environmentally and climate-friendly production and livelihood systems that mitigate disasters and force migration.

The complex and dynamic nature of climate change and extreme weather events requires a robust climate information service and early warning system. However, most of the communities at risk do not have access to timely, accurate and reliable climate information and early warning to enable them to prepare for and respond to disaster risk. This points to the need for increased investment in strengthening climate information services and early warning systems at district and community level. The three districts (Bududa, Katakwi and Amudat) where field assessments were conducted did not have weather stations and weather forecasts provided by Uganda National Meteorological Authority (UNMA) do not suit the daily/seasonal needs of communities (farming and pastoralism) and the information is produced in a technical language too difficult for communities to easily understand (are rarely translated into local languages). Therefore, investment in co-production of climate information services and early warnings is the way to go – involving the climate scientists, users of information, local technical staff and civil society. By doing so, climate information will be co-owned, more acceptable and suit the users' needs.

Introducing and strengthening weather index insurance and social protection systems in vulnerable communities will help communities to reduce residual risk, recover from disaster losses and promote long-term adaptation that minimizes the impacts of disasters and forced migration. Fostering strong synergies between the humanitarian system (emergency response and disaster risk reduction) and the development system, and mainstreaming climate-smart considerations in agricultural production, livestock rearing, water resource management would increase food and water security, increase incomes and reduce livelihood hardships that cause forced migrations. Besides, supporting voluntary migration and other measures that increase resilience to the impacts of climate variability and change are key to mitigating forced migration and its socio-economic and environmental consequences.

3.2.2 Protecting the rights of displaced persons

Existing systems and structures for the protection of displaced persons are weak. It is thus essential that where displacements occur, the necessary humanitarian assistance and protection needs be provided by those affected in an effective and timely manner. A collaborative arrangement between the central and local governments and other stakeholders such as civil society, development partners and the communities are essential not only for providing humanitarian assistance and protection of those affected, but also in the planning and implementation of developmental programs that ensure longer-term sustainability and resilience. The active participation of affected communities is particularly important if development programs are to generate the much-needed buy-in to become locally owned and led, and incorporate indigenous knowledge on disaster risk management.

Mainstreaming of migration into local development plans and adaptation strategies is necessary for districts that receive in-migrants. This should accompany measures for the protection for vulnerable individuals in affected communities (like reducing human trafficking) and for addressing the needs of seasonal in-migrants and displaced persons through increasing capacity for providing additional shelters and household needs for areas that receive in-migrants.

Continued investment into disaster risk reduction (DRR) in disaster hotspot regions, including areas where flood, landslides and drought exposures are high, is essential. This is particularly relevant for areas that are experiencing severe environmental degradation and recurring and extreme climate events and disasters such as the Karamoja sub-region (droughts and flash floods), Teso sub-region (drought and flooding), and the Elgon and Rwenzori mountainous sub-region (landslides and flooding) that generate sudden but also gradual and cumulative vulnerabilities. Realizing this requires the passing of the DRR/M Bill in making so as to lay foundation for the institutional and financial mobilization frameworks that support programming, implementation and financing for disaster risk reduction programs that enhance community response to hazards and environmental shocks.

3.2.3 Improving the resilience of migrants' destinations

While migration would be an appropriate strategy to adapt to the adverse effects of environmental and climate changes, its ability to build resilience depends on the process through which it happens and how it is managed (Masaba et al., 2017a). Importantly, migration management should ensure that migrants are able to co-exist with host communities while at the same time ensuring protection against environmental degradation.

As most of seasonal migrants in drought-hit areas are agro-pastoralists searching for water and pastures, facilitating livestock mobility through the provision of water ponds along established migratory routes would be helpful. Further, creating and allowing opportunities for secure cross-border mobility arrangements could increase the migrants' and host communities' resilience, most especially in Teso and Karamoja, but also other parts of the cattle corridor where livestock migration takes place. Besides, strengthening traditional systems of governance and conflict resolution could also be a key to mitigating resource conflicts, violence and even cattle raids. Moreover, promoting secure land tenure and ownership in livestock-rearing regions (where customary land tenure dominates and encourages communal grazing) could be a potential incentive for people to stay and engage into autonomous in situ adaptation, such as drought-resistant crops and livestock which can mitigate migrations. Such measures that increase tenure security and access to improved livelihoods are crucial in securing natural resources which accordingly builds longer term resilience to drought and flooding. Ensuring tenure security and land ownership could also be useful for urban migrants in informal urban settlements who may engage in measures to prevent flooding and run-off in slum settlements. Effectively implementing constitutional provisions, land policies and fighting corruption will be essential in enhancing tenure security for migrants and the entire vulnerable population in Uganda.

On several occasions, conflicts have risen over resource use between the migrants and host communities. Therefore, before any planned relocation of migrants takes place, the government should improve physical and social infrastructure in the host communities as this reduces social vulnerabilities (Rukundo et al., 2019; Aboda, 2019). Some of the infrastructure in question are schools, health centers, roads, and water and sanitation facilities. Awareness creation among the host communities is key before and after relocation (Masaba et al., 2017b; Mayrhofer & Mersmann, 2016) so that cooperation can be fostered between the migrants/resettled people and host communities (Kimbowa & Mourad, 2019). With continuous awareness, the host communities can accept and live in harmony with resettled people and vice versa hence realizing social integration (Delima et al., 2021; Masaba et al., 2017b).

Initial stages of resettlement by migrants require continued support with food supplies and essentials. As people relocate, their gardens are left at their origin. Since the resettled communities are new in the area, they don't have food and this may result into food theft from host communities. This can create conflicts between the hosts and the immigrants. If food is not provided, malnutrition may occur, or in some cases trigger the resettled people to go back where they came from or to places where they can expect other forms of help (Rukundo et al., 2019).

3.2.4 Planned relocation as a form of state-sponsored adaptation

Planned relocation is a necessary intervention for people who are displaced by disasters and those inhabiting in high disaster risk areas to address their high potential for environmental/climate migration and trapping those vulnerable populations who are unable to move. Besides, planned relocation could also be essential for the destination areas if migrants end up settling in high disaster risk area. Resettlement of displaced people has been applied in Uganda as a long-term disaster response strategy, especially for conflict-stricken northern Uganda and of late landslides-displaced persons in Mt. Elgon sub-region. For example, the people affected by landslides in Bududa district were relocated to Kiryandongo and Bulambuli districts in Western and Eastern Uganda respectively.

Planned relocation is often controversial in Uganda, often leaving the resettled people worse off, and indeed impairing their livelihoods and, should thus be adopted as a last resort. For example, the relocation of the Bududa landslide-displaced victims was not adequately inclusive and taking into account the socio-cultural, economic and ecological differences between the affected areas and people and those in the destination area (Delima et al., 2021). As a result, most of the resettled people have returned to the high landslide risk areas (Neema et al., 2018). Insufficient compensation and lack of continuous follow-up on the resettlement process have also been observed to fail resettlement programs in Uganda, a case observed with the government's oil and gas development, and hydro-power and transport infrastructure projects.

Therefore, all key stakeholders in the resettlement process need to effectively be involved in the entire decision-making process pertaining to the resettlement. On several occasions, government has allocated insufficient funds to manage the relocation process (Graham, 2020; Kimbowa & Mourad, 2019) thereby limiting inclusiveness, and this should be addressed, going forward.

In addition, resettlements should be informed by sound socio-economic and environment risk assessments to establish whether relocations cannot be avoided by implementing in-situ adaptation measures locally to the environmental and climatic risks. Relocations should also be consented to by affected populations and host communities, which has not been the case in most instances, and as already mentioned, the necessary infrastructure and services need to be put in place to guarantee improvement of livelihoods of the relocated persons and host communities. Implementers of resettlement ought to continue evaluating and monitoring the resettled people and ensure that their livelihoods are fully restored (Anyuru et al., 2016). However, currently, the policy and institutional framework for resettlement seems weak and fragmented, and needs to be strengthened.

3.2.5 Harnessing migration as an adaptation strategy

Migration offers an adaptation option for people as it allows them to minimize harm for themselves and/or improve their overall lives. For government and development practitioners, harnessing migration as an adaptation strategy requires planning that takes into consideration socio-ecological requirements for resettlement, including assessing the costs and benefits to choose appropriately between the options available. And, if well planned, migration can be an effective way to build resilience of people facing environmental change and limitations (Afriyie et al., 2018). Comprehensive planning should avoid duplication of activities and their associated costs in ways that minimize the negative effects while maximizing the socio-ecological outcomes of migration. Harnessing the benefits of migration in building resilience may be a stand-alone process or it can be integrated or mainstreamed within sectoral policies and development programs and/or adaptation plans, involving learning lessons.

As there are many Ugandan labour migrants in the diaspora whose remittances benefit the families and communities of origin and Uganda in general, Uganda should adopt and further strengthen the policy and legal framework to support its citizens to search for labour abroad. Whereas it not feasible to encourage people to leave the country, the socio-economic opportunities offered by migration, especially for the unemployed youth, are increasingly making it hard to discourage or restrict such kind of migration in Uganda. Thus, efforts should be focused on prevention of human and/or child trafficking, and investment in local economy so as to create enough economic opportunities for the population. Nevertheless, Uganda should also build upon the recent initiatives and lessons learnt to foster labour externalization and protect its citizens seeking labour abroad from human trafficking and being cheated by external labour recruiting agencies. Besides, Uganda government needs to put in place incentives and robust interventions for mobilizing Ugandans in the diaspora to channel international remittances towards local investments that allow for adaptation to local environmental changes and immediate response after disasters with an aim to enhance long-term resilience solutions. For example, a policy shift could be initiated to subsidize international remittances towards encouraging investments in education, off-farm job creation ventures and other investments that are sensitive to environmental and climate change impacts.

3.3 Research priorities and the need for further evidence

Whereas various forms of migration continue to take place in Uganda, limited understanding of the migration (drivers, processes and effects) constrains the harnessing of the opportunities of migration to socio-economic development processes and addressing the challenges that are associated with it. And, although this study establishes a strong linkage between migration, environmental degradation and climate change in Uganda, except for a few case studies, it is not known as to how many people could be categorized as environmental migrants and/or climate migrants, where they originate, where they have moved to and whether their relocation can be categorized as either voluntary or involuntary, and whether their stay is temporary or permanent. Furthermore, the effect of these migrations on the vulnerability of the areas and communities receiving the migrants, and the migrants themselves are neither well documented nor understood. Migration patterns surrounding sudden and slow-onset processes also need to be

explored to boost targeted responses across scales and actors. Therefore, studies need to generate evidence, knowledge products and systems for migration profiling, documentation and integration of internal migrants.

Perhaps, the most poorly documented are internal migrations driven by slow-onset processes like rising temperatures, land degradation, reduced soil fertility, droughts, famine and food shortages and disease outbreaks, which creates an attribution challenge (see section 2.3 and the PMM report and district dash boards). Although migration is recognized as a form of migration, the spatial and temporal issues of where and when adaptation has been an adaptation strategy are not well documented, and evidence is lacking to inform effective migration policy and management. Therefore, either exclusive migration surveys should be conducted in Uganda and/or national household surveys and national population and housing censuses should include a deeper survey of internal migration aspects (migrants' origin and destinations, drivers, processes, effects and coping, among others) and most especially those aspects relating to the MECC nexus. It would be essential that an investigation is conducted to inform the design and effective operationalization of an integrated migration information management system (Kimbowa & Mourad, 2019).

Coming up with a comprehensive migration policy requires studies to generate empirical evidence on internal migrations, with a specific focus on environmental and climate migrations. A study to map ecological zones or disaster hotspots of migrants/ origin and the potential destination areas, and the current and potential ecological/environmental and socio-economic vulnerabilities of the inhabiting populations is necessary. As mentioned, migration issues (causes, effects and coping) need to be incorporated in national household surveys conducted by Uganda Bureau of Statistics (UBOS) to provide vital migration information on a continuous basis. Another study to deepen understanding of remittances (in coping and adaptation) is essential to inform evidence-based policymaking, and could be best conducted through household panel surveys covering migrant and non-migrant households in areas of migrants' origin and destination.

Research is necessary to generate evidence on urban migration and the associated vulnerabilities to inform the integration of migrants (including those related to environment and climate change) in urban development policies and making them inclusive. Such studies should explore innovative ways of harnessing the opportunities of migration as an urban adaptation tool as this is essential for reducing the urban vulnerabilities of migrants, especially those displaced or forced to migrate by environmental and climate shocks. The environmental, physical planning and local economic development migrations and displacement aspects should be particularly investigated and an evidence-base generated to inform inclusive urban development policy and practice.

Whereas Uganda is embracing planned relocation and resettlement as adaptation strategy, the implementation of relocations for persons displaced by landslides in Bududa has been hugely challenging; it has not been participatory enough and in most cases the displaced persons have been returning to their areas of origin. Therefore, Uganda needs to be supported to develop guidelines for planned relocation which could be a potential 'follow-on' project for IOM Uganda.

3.2 Conclusions and Recommendations

This study set out to assess the nexus between migration, environment and climate change in Uganda in order to generate evidence-base to inform not only migration and adaptation policy in Uganda, but also the mainstreaming of environment and climate change migration in national development policy and practice.

The study findings reveal that Uganda is highly exposed and vulnerable to the impacts of climate variability and climate change and at the same time facing widespread environmental degradation which compound the current and future climate and socio-economic vulnerabilities. Over the past century, the mean annual temperature increased by 0.8 to 1.5°C and is projected to increase between 2 and 5°C by 2100. Over the last three decades, rainfall patterns have become more variable, with many parts of the country receiving less than normal rainfall, and extreme weather events (especially extreme heat, droughts, intense rainfall events and floods) have increased in frequency and severity. The predicted change in climate for the country is likely to be associated with increase in extreme weather events.

The environmental and climate change impacts affecting Uganda include both the slow-onset processes (temperature rise, drought, desertification, melting of glaciers, general land degradation and biodiversity loss), as well as the

sudden-onset events such as floods, rainstorms and landslides that are expected to increase in frequency and severity in the future, affecting people in various ways in all parts of the country. Furthermore, Uganda is facing severe environmental and ecosystem degradation driven mainly by human activity that undermines resilience to natural hazards and disasters and delivery of ecosystem services. The widespread deforestation, encroachment on wetlands, protected areas and river banks, biodiversity loss, reducing water quality and supply, declining soil fertility and soil erosion are some of environmental threats that reduce the productivity of landscapes, cause livelihood hardships and drive migration. Whereas these threats affect most parts of the country, some areas are particularly at risk, especially: the mountainous areas that are facing severe land degradation, run-off, floods and landslides; the cattle corridor and most especially Karamoja faced with drought, desertification and severe water scarcity; and the urban areas facing urban ecosystem destruction and flooding.

Both the slow-onset and sudden-onset climatic and environmental changes have a strong influence on population migration patterns in Uganda, but in different ways. Sudden-onset events (especially floods and landslides) often cause destruction of livelihoods and displace the affected populations who have to leave their homes temporarily but, in some cases, also permanently e.g. landslides in Mt. Elgon sub-region and flooding in Teso sub-region and in some cases, relocation of the displaced persons has been done by government. On the other hand, many people have migrated and/or are expected to migrate due to a gradual or slow-onset processes that cause land and environmental deterioration resulting in livelihood hardships (declining soil fertility, crop failure, food and water shortage, unemployment, etc) with some of them perceived as irreversible, necessitating migration. While most of the migrations are internal, cross-border migrations (to and from Kenya and South Sudan) also occur among pastoral communities searching for pastures and water, but most of these are temporary. Associated with migrations is the rising land and resource conflicts in both the migrant destination areas and places of origin, and the rural-urban migrations that exacerbate poverty. The poor communities, women, children and people with disabilities are the worst hit and affected by these conflicts.

Uganda lacks a comprehensive migration legislative and/or policy framework that also integrates environment and climate change. Migration policy issues are scattered in various national policy documents making the coordination and management of migrations difficult. Besides, existing migration policies do not incorporate climate-smart and environmentally friendly aspects. Moreover, environmental and climate change policies do not incorporate migration. Uganda should consolidate the existing policies to develop a comprehensive migration policy that covers both internal and international migration, voluntary and forced migration, planned relocation or resettlement, and migration as adaptation strategy as a way of building resilience to the adverse impacts of climate change.

The migration, environment and climate change nexus is still not well understood in Uganda and, as this study has identified, further research is needed in many areas to improve the documentation of internal migrants, and to demonstrate the importance of environmental and climate migration in national and local development policy and practice. In all, a combined action of research and policymaking will be essential for meaningful and effective management of environmental and climate migration in Uganda. Assessing and documenting evidence on the nature, scale and timing of environmental and climate change-driven migration, displacement and planned relocation will be central to evidence-based policy planning and implementation.

3.3 Recommendations

3.3.1 Recommendations for policy and planning

As the MECC is not still well understood and appreciated at national and locals level in Uganda, it is necessary to raise policy and public awareness on the complex nexus between migration, the environment and climate change.

Additionally, as Uganda does not have a stand-alone or comprehensive migration policy, development of a comprehensive migration policy that covers all aspects of migration (internal and international migration, voluntary and forced migration) and planned relocation or resettlement of migrants is necessary. Importantly, the policy developed should cover migration as adaptation strategy, while at the same time incorporating environmental and climate change aspects.

Whereas planned relocation is a necessary intervention for people who are displaced by disasters and those inhabiting in high disaster risk areas, the implementation of relocations for displaced persons is still a challenge in Uganda, with some displaced persons returning to their areas of origin. What compounds the problem is the lack of guidelines to provide direction for mainstreaming migration in development policy and practice in an environmental and climate-

smart manner. It is thus recommended that guidelines for migration management including planned relocation, that are climate change and environmentally responsive, are developed to guide national and local governments to document and manage migration.

Furthermore, it is crucial that migration is mainstreamed into local development plans and adaptation strategies, most especially for districts where out-migration and in-migration take place to enable them better manage migration and integrate migrants.

3.3.2 Recommendation for institutional strengthening

It is essential to foster inter-agency and inter-ministerial coordination and cooperation on migration across MDAs in Uganda. In order to enhance coherent policymaking for migration as adaptation, and to prevent forced migration in the context of environmental and climate change, a common platform or forum should be formed and operationalized to enhance coordination of migration in government MDAs, with the active involvement of development partners, academia and the civil society.

3.3.3 Recommendations for further research and action

The study findings reveal that limited research has been conducted to generate the much-needed evidence on the linkages between environment, climate change and migration to inform policy and decision-making. Thus, it is essential to initiate the capturing of MECC data in all national statistics, with an entry point being incorporating environmental and climate migration in national censuses and national household surveys that are conducted by UBOS. This will facilitate generating evidence on migration that can be attributed to environment and climate change on continuous and sustainable basis. Furthermore, data collection for international migration (cross-border) can be improved to capture additional information at immigration points such as the reason for migration, with emphasis on environmental migration aspects, as necessary.

Deeper research to generate evidence across the country and produce knowledge products on environmental and climate-induced migration is necessary on a continuous basis to inform climate smart and environmentally friendly policy and practice at national, local and community levels. The migration research should prioritize covering the full cycle of the events before, during and post-displacement, in order to present the full picture of what happened before, during and after the event. Such evidence offers great opportunities to harnessing migration as an adaptation strategy, preventing forced migrations and for mainstreaming migration into the country's development, climate change and environment policy contexts.

It is also essential to undertake in-depth analysis of current policy and programmatic responses to environment, migration and development and undertake research in identified priority areas.

National and local governments should be supported to put in place measures for the protection for vulnerable individuals in affected communities (like reducing human trafficking) and for addressing the needs of seasonal in-migrants and displaced persons through increasing capacity for providing additional shelters and household needs for areas that receive in-migrants. Continued investment into disaster risk reduction (DRR) in disaster hotspot regions, including areas where flood, landslides and drought exposures are high that trigger migration, is essential.

It is essential that government technical staff at national and local levels are trained and skilled in migration planning and management, and in particular climate and environmental migrations and planned relocations. Capacity enhancement tools and manuals should be developed and used for trainings on a continuous basis.

In Uganda, migration is sometimes perceived or construed as a negative phenomenon much as it is also considered as an adaptation strategy to mitigate the adverse impacts of flood, drought, landslides, etc.) As migration provides some opportunities for livelihood improvement, fostering adaptation and transformational change and supporting innovative solutions and long-term adaptation measures could deliver transformational benefits in areas of migrants'

origin and destination. Migration can be planned and through strengthened early warning system (e.g. drought, flood or landslide), the susceptible community can be enabled to migrate to safer areas, before the disaster occurs.

Implementation of nature-based solutions for environmental sustainability and socio-economic development will be critical to tackling the long-term migration, environmental and socio-economic challenges, and could potentially deliver co-benefits for adaptation, economic growth, and human-welfare. In all these, the government will have to play a leading role but the support of other key stakeholders such as civil society, academia, researchers, UN agencies and other development partners will have to be harnessed.



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