Toward Gender-responsive and Technology-oriented Disaster Management in Eastern Africa

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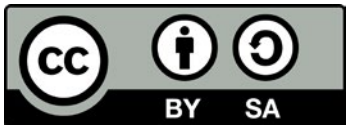

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SHORT SUMMARY

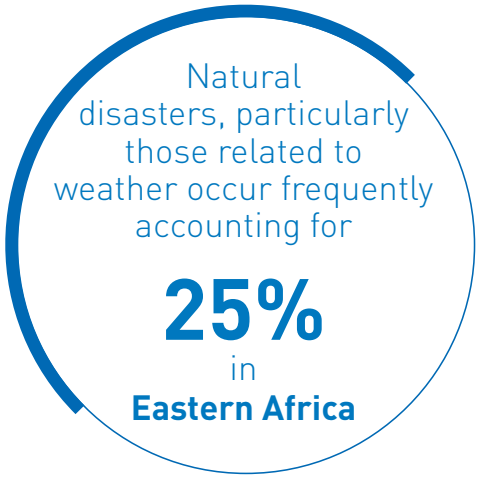
Why Gender and Technology in Disaster Risk Reduction Matters in Eastern Africa?

Extreme climate events and disasters exacerbate the multiple stressors of the economies of East African countries. The Intergovernmental Panel on Climate Change (IPCC) predicts impacts may exceed current coping strategies, impeding sustainable development and in some extreme cases making some countries uninhabitable. There is hence a critical need for accelerated action to prevent risks, and reinforce current disaster response efforts.

One way of preventing risk, enhancing the overall awareness and responsiveness to disasters and climate change is to improve education, develop and leverage advances in modern technologies such as artificial intelligence; application of best practices in citizen science and gender-responsive approaches, which would help bridge the distance, in time and space, between citizens and authorities in those crucial first few moments following the disasters.

This publication

- Highlights Disaster Risk Reduction (DRR) best practices and climate actions to extreme climate-related events;
- Assesses the extent to which regional and national DRR strategies and programs incorporate AI and gender perspectives in their DRR measures;
- Assesses the institutional landscape, the roles and responsibilities of DRR stakeholders; and
- Elucidates the status of DRR initiatives with a gender and social inclusion lens.



We are hopeful that the findings of the publication will influence policy decisions that drive investments for effective use of innovations in AI, citizen science and gender-responsive actions that can enable disaster resiliency in Member States.

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"Since wars begin in the minds of men and women, it is in the minds of men and women that the defences of peace must be constructed"

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EXECUTIVE SUMMARY

Extreme climate events and disasters exacerbate the multiple stressors of the economies of Eastern African countries. The Intergovernmental Panel on Climate Change predicts impacts may exceed current coping strategies, impeding sustainable development and in some extreme cases making some countries especially the small island developing states (SIDS) uninhabitable. In addition, slow-onset hazards such as sea-level rise are likely to compound existing hazards, such as erosion, coastal flooding and salinity intrusion, further exacerbating climate and disaster risk in SIDS. There is hence a critical need for accelerated action to prevent risks, and reinforce current disaster response efforts. These needs have also been clearly expressed in the African Union Agenda 2063, Agenda 2030 Sustainable Development Goals, the Paris Agreement, the Sendai Framework on Disaster Risk Reduction (SFDRR) and the Small Islands Developing States Accelerated Modalities of Action (SAMOA) Pathway.

One way of preventing risks, enhancing the overall awareness and responsiveness to disasters and climate change is to improve education, develop and leverage on advances in modern technologies such as artificial intelligence (AI); application of best practices in citizen science and gender-responsive approaches. The application of AI could help bridge the distance, in time and space, between citizens and authorities in those crucial first few moments following the disasters. The use of such innovative approaches also requires creating enabling policy environments and building the capacities of relevant institutions through direct, sustained engagement using scientifically proven evidences.

This publication documents the findings of studies that analyzed the current institutional, political and decision-support frameworks associated with disaster risk reduction (DRR) in Eastern Africa to support the development and integration of modern technologies such as AI innovations, citizen science and gender-responsive actions into strategies and action plans for DRR in schools, higher education, communities and public sector institutions. The findings are presented in two parts: Part I - Review of Disaster Risk Reduction and Management Initiatives in Eastern Africa with a Gender-responsive and Social Inclusion Lens; and Part II - Analysis of the Enabling Policies and Institutions for Artificial Intelligence and Citizen Science Applications in Disaster Risk Reduction in Eastern Africa.

The study covered ten countries (Comoros, Djibouti, Eritrea, Ethiopia, Kenya, Madagascar, Rwanda, South Sudan, Tanzania, and Uganda) and was conducted as part of the implementation of a Japanese funded project - Strengthening Disaster Prevention Approaches in Eastern Africa (STEDPEA).

A number of recommendations are presented based on the findings:

i. There is urgent need to support the countries in Eastern Africa to update their DRR and management (DRR/M) policies and strategies in a comprehensive and holistic manner in line with the Sendai Framework Target E;
ii. The DRR/M policies and strategies should have coherence with the Climate Change Adaptation (CCA) frameworks to address the emerging risks emanating from climate change to support societal resilience in a holistic manner;

iii. Strengthening capacities and raising public awareness and understanding on the use and application of AI in disaster management including response should be prioritized with active engagement of the media, private sector and research organizations;
iv. Countries must harmonize modern technologies with citizen science to offer new opportunities in strengthening existing DRR approaches and accelerating progress towards disaster resiliency;
v. National governments and other actors must carry out a gendered analysis and profiling of risk and vulnerability to highlight the differential vulnerabilities of women and men, and girls and boys, based on their differential levels of exposure, sensitivity, and ability to cope, adapt, and respond to impacts. The equal and active participation of women and men in DRR will make it possible to achieve the overarching goals of gender equality;
vi. National governments should design and implement DRR legislations and frameworks with a gender and social inclusion lens and/or engender existing ones so that the legislations are responsive to the needs, perspectives, and roles of women and girls in building more inclusive and equitable resilience;
vii. National governments and other actors must integrate Gender and social inclusion into DRR & management strategies, budgeting, monitoring and evaluation, and digital database systems (with sex and gender disaggregated data);
viii. All DRR initiatives should contain elements of community driven early warning strategies and livelihood enhancement to help the most vulnerable (women, children, people with disability, migrants, the elderly, youth, girls and refugees) prepare and respond to disasters as well as broaden their livelihood base.

Finally, this publication proposes a roadmap for mainstreaming gender responsiveness and social inclusion into DRR policies, initiatives and legal instruments.

FOREWORD

On Tuesday, 2nd March 2020, UNESCO and the Government of Japan officially signed the agreement for the commencement of the project that seeks to support the development and integration of science-evidenced artificial intelligence (AI) innovations, citizen science and gender-responsive actions into strategies and action plans for disaster risk reduction in schools, higher education, communities, and public sector institutions in Eastern Africa. By providing substantial funding support to this project, the Government of Japan has again demonstrated their commitment to UNESCO and the humanitarian and development needs of Africa. We take this opportunity to thank the Government of Japan once again for the funding support.

Eastern Africa is one of the most disaster-prone regions in the world. With high sensitivity and limited adaptive capacity, weather-related, conflicts and geological hazards have caused massive havoc in the region. For instance, in May 2020, local media reported floods in more than three quarters of Kenya's counties (36 out of 47), with landslides reported in the Rift Valley, central and the coastal regions causing deaths and displacement of more than 400,000 people. In Rwanda, local media confirmed at least 24 people were killed because of floods and landslides triggered by the heavy rains in 2018. Again, conflict and the severe droughts of 2018 created a disastrous situation in South Sudan. Based on drought reoccurrences in 2018, some 6.9 million people – close to 60 percent of the population – are currently facing severe food insecurity with an estimated 50,000 in "famine-like" conditions. In many areas, malnutrition levels remain critical, with some 860,000 children under the age of five estimated to be severely malnourished.

The high frequency of calamitous events and the often poor and slow response seems to have created a deficit of trust between citizens and national authorities. For quicker and enhanced integration and analysis of data, artificial intelligence (AI) tools are increasingly used which, in addition to immediate rapid reactions, can help to make better and smarter decisions in the future. Developments in AI, Big Data – and innovations in areas such as robotics and drone technology are transforming many fields, including disaster risk reduction and management. This notwithstanding, such technological innovations are limitedly used in Eastern Africa hampering efforts for the development and implementation of sustainable disaster risk reduction (DRR) and preventive solutions.

At UNESCO, we are engaged in the conceptual shift of thinking away from post-disaster reaction and towards pre-disaster action. Working alone or in collaboration with other UN Agencies and/or other scientific entities, UNESCO has been a catalyst for international and inter-disciplinary cooperation in many aspects of DRR and mitigation. With the 'S' in UNESCO standing for 'Science', UNESCO is a leader in incorporating science, technology, and innovation (STI) into DRR policies and strategies. To strengthen scientific capacities, UNESCO facilitates and implements technical trainings, workshops, and research activities in DRR. These activities result in creating networks of technical experts as well as in enhancing knowledge and producing materials and technologies to help decision-makers and stakeholders build or strengthen their capacities in disaster risk management.

Gender Equality continues to be one of two global priorities of UNESCO. UNESCO believes that all forms of discrimination based on gender are violations of human rights, as well as a significant barrier to the achievement of the 2030 Agenda for Sustainable Development and its 17 Sustainable Development Goals. Mainstreaming gender-responsive actions in DRR will ensure that the different concerns and priorities of women fundamentally shape the whole cycle of disaster risk assessments, objective setting, planning, budgeting, identification of relevant stakeholders, implementation, and monitoring and evaluation.

This publication is strategic as it presents important gaps in the application of STI in DRR and elucidates the status of DRR initiatives (policy, strategy, project, and program) with a gender and social inclusion lens. We are hopeful that the findings of the publication will influence policy decisions that drive investments for effective use of innovations in AI, citizen science and gender-responsive actions that can enable disaster resiliency in Member States.

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ACRONYMS

AfDB	African Development Bank
AI	Artificial Intelligence
ARC	African Risk Capacity
ASALs	Arid and Semi-Arid Lands
CADRI	Capacity for Disaster Risk Initiative
CBOs	Community-Based Organizations
CC	Climate Change
CCA	Climate Change Adaptation
COMESA	Common Market for Eastern and Southern Africa
COVID 19	Corona Virus Disease 2019
CSO	Civil Society Organization
DRM	Disaster Risk Management
DRR	Disaster Risk Reduction
DRR/M	Disaster Risk Reduction/Management
EAC	East African Community
EFCCC	Environment, Forest and Climate Change
EWS	Early Warning Systems
FAO	Food and Agriculture Organization of the United Nations
GAR 19	Global Assessment Report on Disaster Risk Reduction 2019
GDP	Gross Domestic Product
GII	Gender Inequality Index
GIS	Geographical Information System
GSI	Gender and Social Inclusion
HDI	Human Development Index
ICT	Information Communication Technology
IDDRSI	IGAD Drought Disaster Resilience and Sustainability Initiative
IDMC	Internal Displacement Monitoring Centre
IDP	internally Displaced Persons/Populations
IFRC	International Federation of Red Cross/Crescent
IGAD	Intergovernmental Authority on Development
MIDIMAR	Ministry of Disaster Management and Refugee Affairs
MTP	Medium Term Plan
NAP	National Adaptation Plan
NAPA	National Adaptation Programme of Action
NDC	Nationally Determined Contribution

NDOC	National Disaster Operation Centre
NDRMC	National Disaster Risk Management Council
NGO	Non-Governmental Organization
PWD	People/Persons with Disability
REMA	Rwanda Environment Management Agency
SDG	Sustainable Development Goals
SFDRR	Sendai Framework for Disaster Risk Reduction
SIDs	Small Island Developing States
SSA	Sub Saharan Africa
UNDAF	United Nations Development Assistance Framework
UNDP	United Nations Development Programme
UNDRR	United Nations Office for Disaster Risk Reduction
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
UNHCR	United Nations High Commission for Refugees
UNISDR	United Nations International Strategy for Disaster reduction
UNOCHA	United Nations Organization for Coordination of Humanitarian Affairs
USD	United States Dollar

GLOSSARY OF DISASTER RISK REDUCTION AND MANAGEMENT

Terms[1]	Definition
Adaptation	The adjustment in natural or human activities in response to actual or expected disaster or their effects, which moderate, harm or exploit beneficial opportunities.
Affirmative Action	A policy, program or measure that seeks to redress past discrimination through active measures to ensure equal opportunity and positive outcomes in all spheres of life
Climate Change	A change in the state of the climate that can be identified (e.g. by using statistical tests) by changes in the mean and/or the variabilities of its properties and that persist for an extended period, typically decades or longer. Climate Change may be due to natural internal processes or external forces or to persistent anthropogenic changes in the composition of the atmosphere or land use
Disaster	A disaster is a serious disruption of the functioning of a community or society causing widespread human, material, economic or environmental loses which exceed the ability of the affected community/society to cope using its own resources
Disaster Risk	The potential disaster losses, in lives, health status, livelihoods, assets and services, which could occur to a particular community or a society over some specified future time period
Disaster Risk Management	The systematic process of using administrative directives, organisations, and operational skills and capacities to implement strategies, policies and improved coping capacities in order to lessen the adverse impacts of hazards and the possibility of disaster.
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.
Empowerment	The process of gaining access to resources and enhancing one's capacities with a view to participating actively in shaping one's own life and that of one's community in economic, social and political spaces

1 Definitions added from the AU Strategy for Gender Equality & Women's Empowerment

Exposure	The situation of people, infrastructure, housing, production capacities and other tangible human assets located in disasters-prone areas
Gender	This refers to the roles and responsibilities of men and women that are created in our families, our societies and our cultures and the expectations held about the characteristics, aptitudes and likely behaviours of both women and men (femininity and masculinity).
Gender Analysis	This refers to the identification of different needs of men and women through collection and analysis of sex-disaggregated information to inform the design and implementation of policy and project
Gender Equality	This refers to women and men having equal conditions for realizing their full human rights and for contributing to, and benefiting from, economic, social, cultural and political development.
Gender Equity	This refers to fairness of treatment for women and men, boys and girls according to their respective needs and in terms of rights, benefits, obligations, and opportunities.
Gender mainstreaming	This is a process to integrate gender into existing policies, program, project and institutions to achieve gender equality
Gender norms	Gender norms refer to social and cultural attitudes and expectations about which behaviors, preferences, products, professions or knowledge are appropriate for women, men and gender-diverse individuals, and may influence the development of science and technology.
Gender-responsive budgeting	The process of planning, approving, executing, monitoring, analysing and auditing budgets in a gender-sensitive way. Involves analysis of actual expenditure and revenue (usually of governments) on women and girls as compared to expenditures on men and boys.
Gender-responsive planning	This refers to assessing the implications for women and men, boys and girls of any planned DRR action, including legislation and policies.
Gender responsiveness	This refers to the identification and acknowledgement of the existing differences and inequalities between women and men and articulation of DRR policies and initiatives, which address the different needs, aspirations, capacities and contributions of women and men.
Gender roles	The responsibilities that are assigned to women, men, girls, boys by society
Gender sensitive	Acknowledging and taking into account the specific gender needs of both men and women at all levels of DRR planning, implementation, monitoring and evaluation

Gender sensitive indicators	This refers to a set of indicators (checklist) that demonstrates whether policies, projects and programs are working towards achieving gender equality
Gender transformative	These interventions create opportunities for women, men, boys and girls and aim to challenge gender norms, promote positions of social and political influence for women and girls in communities, and address power inequities between persons of different genders.
Geological Hazard	Geological 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.
Hazard	A hazard is a dangerous phenomenon, substance, human activity or condition that may cause the loss of life, injury or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage.
Human-induced hazards	These are hazards that are induced entirely or predominantly by human activities and choices
Natural Hazard	Natural processes 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.
Participatory	This refers to enabling and/or allowing women, men, boys and girls and other vulnerable groups to actively take part in or become involved in DRR activities
Resilience	The ability of a system, community or society exposed to hazards to resist, absorb, accommodate to and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions.
Risk Assessment	A methodology to determine the nature and extent of risk by analyzing potential hazards and evaluating existing conditions of vulnerability that together could potentially harm exposed people, property, services, livelihoods and the environment on which they depend.
Sex-disaggregated data	This includes data that are collected and analysed separately on males and females.
Social inclusion	This is the process of conducting gender analysis to identify, address and respond to the diversity of needs of everyone through increasing participation in DRR and management while reducing exclusion

Technological Hazard	A hazard originating from technological or industrial conditions, including accidents, dangerous procedures, infrastructure failures or specific human activities, that may cause loss of life, injury, illness or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage.
Vulnerability	The characteristics and circumstances of a community, system or asset that makes it susceptible to the damaging effects of a hazard.

Review of Disaster Risk Reduction and Management Initiatives in Eastern Africa with a Gender-responsive and Social Inclusion Lens

ABSTRACT

Most of Eastern Africa countries have developed country-based disaster risk reduction (DRR) policies, frameworks and strategies aimed at minimizing the impacts of disasters in line with the Sendai Framework for Disaster Risk Reduction 2015 – 2030. The policies and strategies focus on addressing both natural and human induced disasters. Additionally, national governments, Non-Governmental Organizations (NGOs), Community-Based Organizations (CBOs) and other stakeholders are implementing projects and programs aimed at addressing disasters at various levels; community, sub-national, national and sub-regional level. It is however unclear to what extent these DRR initiatives consider gender and social inclusion. This study aimed to elucidate the status of DRR initiatives (policy, strategy, project and program) with a gender and social inclusion lens. The study covered ten countries - Comoros, Djibouti, Eritrea, Ethiopia, Kenya, Madagascar, Rwanda, South Sudan, Tanzania, and Uganda.

A rapid scoping review of literature was conducted with the aim of collating all documents that relate to DRR policies, strategies/plans, program and projects across the ten countries. This involved using various databases including Google Scholar, Open Access Journals, websites of national governments, NGOs, CBOs and UN bodies (UN High Commission for Refugees, Office of the United Nations High Commissioner for Human Rights, United Nations Educational, Scientific and Cultural Organization etc.). Search of websites for available grey literature and information was done for NGOs and CBOs dealing with issues related to DRR. Data generated was used to provide a description of the DRR policy landscape, strategies, projects and programs aimed at developing and building adaptive capacity and enhancing resilience of women, children, People with Disability (PWD) , the elderly and Indigenous people.

Findings from the DRR initiatives mapping shows that countries in Eastern Africa are implementing various DRR initiatives as part of their disaster risk reduction and management. A total of 155 DRR initiatives were identified with projects comprising the largest number (37.4%). The others were Acts (10.3%), Bills (10.3%), Policy (9%), Program (5.8) and strategy/plans (23.9%). Out of the 155 DRR Initiatives, Kenya had the highest number of DRR initiatives (53 in total) being implemented while, Eritrea had the lowest (3). The high number of DRR initiatives in Kenya is due to the devolved system of government whereby each County government develops its own DRR Act, strategy or policy. Analysis of the 155 DRR initiatives show that 41.9% of the initiatives mention and/or target women, children, youth, PWD, elderly, migrants, Internally displaced persons, refugees, boys, girls, men, poor people and poor households. About 58% do not mention any vulnerable persons. Women are mentioned or targeted in all the DRR initiatives that identify vulnerable people. Children, youth, PWD and the elderly are also frequently mentioned in the 41.9% of the DRR initiatives. The least mentioned category of people are street people, beggars and commercial sex workers. This clearly indicates that national governments and other stakeholders recognize the importance of identifying and targeting different categories of people within a country or community. Review of the DRR initiatives in Eastern Africa showed that 33.5% of them were informed by a gender and social inclusion situational assessment. Out of the 155 DRR initiatives identified, 25.6% of them conducted a Gender and Social Inclusion (GSI) risk analysis and vulnerability profile. 8.4% of the DRR initiatives had a gender specialist in the

organizational staff team. The gender specialist carried out gender and risk analysis and acted as liaison with community members especially women and PWD and helped develop the GSI DRR plans and activities. 15.8% of the DRR initiatives developed a GSI communication method to reach men, women, children, PWD, the elderly and indigenous people. In addition, 22.9% of DRR initiatives identified used gender-sensitive indicators in their M&E frameworks to aid in tracking how different DRR measures or interventions impact the lives of men, women, children, PWD, the elderly and indigenous people. The gender-sensitive indicators are also used to assess whether progress is made towards gender equality and if corrective measures are needed. 18% of the identified DRR legislations mentioned training of staff on skills and knowledge in the various aspects of gender mainstreaming into DRR operations.

From the results obtained, there are clear indications that a number of countries have made significant progress in mainstreaming gender considerations and social inclusion in DRR initiatives. Meanwhile, DRR initiatives, especially the policies and legislation framework should re-orient local and sub-national efforts to address disaster in a more gender responsive and socially inclusive approach. Based on the results, a roadmap for mainstreaming gender responsiveness and social inclusion into DRR initiatives is proposed. The roadmap is largely informed by the overarching Sendai Framework, SDGs and national DRR policies and strategies aimed at mainstreaming GSI into DRR policy development processes while at the same time strengthening the role of the national governments and other actors in addressing GSI perspectives in risks and hazard preparedness. The roadmap is expected to: a) enhance resilience to natural and human induced risks and shocks on the social, environmental, political and economic aspects of the economy, b) contribute to the strengthening of governance and institutional coordination for effective GSI implementation of the DRR interventions at sub-national, national and regional levels and c) identify and incorporate 'best practices' on DRR strategies that can reduce vulnerability, increase adaptive capacity, address specific risks related to each hazard and explore GSI specific opportunities in the context of each hazard.

Key policy points proposed include:

In Eastern Africa, the risks and impacts associated with disasters are not equally distributed amongst women, men, children, people with disability, migrants, the elderly, youth, girls, IDPs, and refugees, since those with the least capacity to cope and adapt are often the most vulnerable

National governments and other actors must carry out a gendered analysis and profiling of risk and vulnerability to highlight the differential vulnerabilities of women and men, girls and boys, based on their differential levels of exposure, sensitivity, and ability to cope, adapt, and respond to impacts. The equal and active participation of women and men in DRR will make it possible to achieve the overarching goals of gender equality

The inability for women, PWD and girls to participate in DRR decision-making processes (preparedness, response and recovery) at community and national levels can lead to a lack of specific protections for women and girls in DRM. Therefore, identification of the DRR needs of women and girls and other vulnerable people is necessary to develop gender transforming and socially inclusive strategies

National governments should design and implement DRR legislations and frameworks with a gender and social inclusion lens and/or engender existing ones so that the legislations are responsive to the needs, perspectives, and roles of women and girls in building more inclusive and equitable resilience

National governments and other actors must integrate Gender and social inclusion into DRR & management strategies, budgeting, monitoring and evaluation, and digital database systems (with sex and gender disaggregated data)

All DRR initiatives should contain elements of community driven early warning strategies and livelihood enhancement to help the most vulnerable (women, children, people with disability, migrants, the elderly, youth, girls and refugees) prepare and respond to disasters as well as broaden their livelihood base

INTRODUCTION

1.1 General information on Eastern Africa

1.1.1 Geography

This report focuses on ten countries located in Eastern Africa: Comoros, Djibouti, Eritrea, Ethiopia, Kenya, Madagascar, Rwanda, South Sudan, Tanzania and Uganda (Figure 1.1). The Eastern Africa sub-region mainly consists of large plateaus and has most of the highest altitudes on the continent (Mts. Kilimanjaro, Kenya and the Ruwenzoris). The sub-region is covered by the Eastern great Rift Valley that runs from the junction of the red sea with the gulf of Barber southward through Ethiopia and Kenya's plateaus and moves across to Tanzania. Western Rift Valley covers the borders of Uganda and Tanzania from the west. Between the eastern and the western rift valleys lies a plateau that runs across most of Uganda and western Tanzania, taking part of Lake Victoria, the second largest freshwater lake in the world.

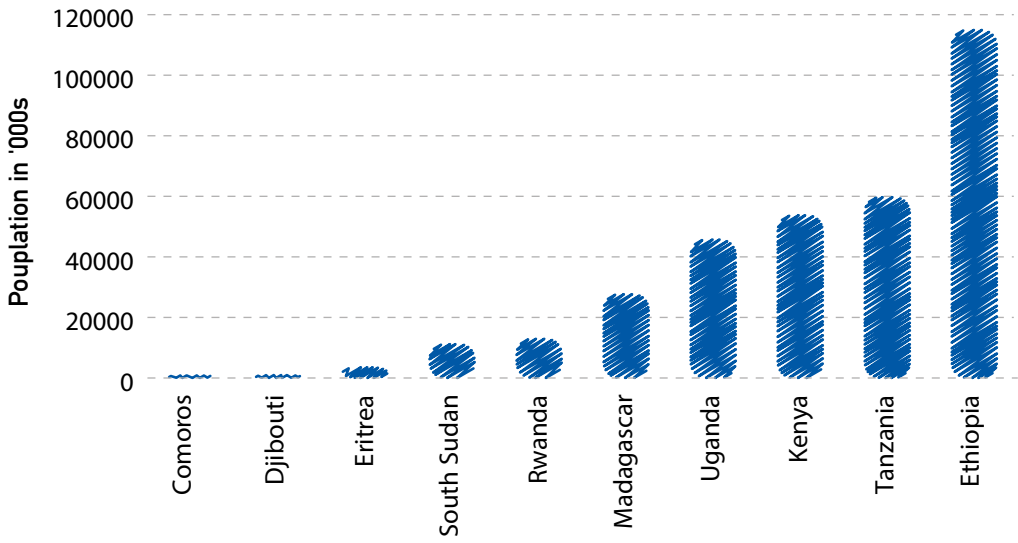
Figure 1.1: Geographical location of the ten countries used in the study

The sub-region is an active volcanic areas and tremors are often felt in isolated places that lead to massive landslides, destruction of infrastructure, e.g., roads and buildings and loss of lives. The flat lying areas including the coastal regions experience frequent flooding events that affects millions of people. Eastern Africa is generally made up of tropical climate with average temperatures that decline with the altitude and high rainfall amounts. This varied climate creates a variety of vegetation in the region from the woodlands and grasslands in wet areas, scrubs, and thorn bushes in semiarid and arid lands (ASALs). The northern part of Kenya, Uganda and Ethiopia into Djibouti and Eritrea and most of South Sudan are ASALs areas that experience frequent rainfall shortage, drought and high temperatures that lead to hunger and death of both humans and livestock. The Small Island States (SIDs) of Comoros and Madagascar form part of this Eastern Africa sub-region and are influenced by large ocean-atmosphere interactions such as trade winds, El Niño, monsoons and tropical cyclones (UN-OHRLLS, 2015).

1.1.2 Demography

According to the United Nations Population Division, Eastern Africa's population ranks number 1 in Africa among sub-regions and is equivalent to 5.71% of the total world population. The population density is 67 people per Km^2. In 2019, 132,520,364 people (29.8% of the population) were living in urban centers. The median age is 18.7 years, thus categorizing Eastern Africa as a young population. The current population is estimated at 453,373,196 people, which has been steadily growing since 1950 (UNFPA, 2019). Populations range from less than 1 million in Comoros and Djibouti to more than 100 million in Ethiopia (Figure 1.2). The populations of Comoros and Madagascar are concentrated in the coastal zone and projected rise in sea- level will have significant and profound effects on settlements, living conditions and island economies (UNFCCC, 2007).

Figure 1.2: Total population in each of the 10 countries in Eastern Africa in 2020 (UN, 2020)



Eastern Africa has three distinct languages classified as Cushites, Nilo-Saharan language and the Bantus. The ethnic group with the largest population is the Oromo, speaking Cushite and who occupy much of southern and southeastern Ethiopia, distributed across Somalia and much of Djibouti. The second largest are the Afar group found in Eritrea and Djibouti. All the ethnic groups have cultural and social norms that govern the roles and responsibilities of women, men, youth, girls and the elderly as well as their access to resources. These cultural and social norms also dictate an individual's adaptive capacity to and response to disasters (see sub-section 3.3 for more details).

1.1.3 Economy

Economic growth across the sub-region is driven by services, industrial, and agricultural sectors. In 2019, real GDP in the sub-region grew by an estimated 6.1 % making it the highest among African sub-regions (AfDB, 2021). However due to the current COVID-19 pandemic, the escalating ethnic conflicts in Ethiopia (the largest economy), the GDP is expected to significantly drop in the subsequent years. Another critical risk factor confronting Eastern Africa is persistent current account deficits and corresponding increases in external indebtedness. Additionally, large fluctuations in agricultural production and a high reliance on the agricultural sector, inadequate market competition and poor infrastructure, most of the economies of the Eastern African countries are extremely vulnerable to natural disasters such as drought, conflicts, ethnic violence and floods (UNECA 2019). It is important to point out that the presence and active involvement of the private sector has helped increase the growth of Eastern African countries' economies by increasing access to reliable power, creating jobs, increasing the standard of living, and managing the innovation tools to improve the region's trademark (UNCTAD, 2018).

1.1.4 Politics

Despite all the countries professing multi-party democracies, East Africa is one of the most conflicted and poorly governed countries (CSIS, 2016). Issues of constitutionalism, corruption, unequal political developments and democracy, and ethnic and armed conflict seem to dominate the political landscape (CSIS, 2016). The region is a troubled political trajectory with poor and despotic leadership, corruption, terrorism, and electoral malpractice, among other political problems, as the common maladies causing insecurity (Bekoe, 2006; Thomson, 2016). For example, South Sudan, Ethiopia, Kenya, Rwanda and Eritrea has experienced disasters of different magnitudes driven by political violence and ethnic cleansing (UN DESA, 2019). This political violence had led to deaths and displacement of millions of people. For example, political violence in Uganda, Eritrea and Kenya led to the displacement of 2.4 million, 132,000, 34,000 people, respectively (UN DESA, 2019). The highest number of people displaced due to political violence is in South Sudan where 1 in 3 people have been displaced (UN DESA, 2019).

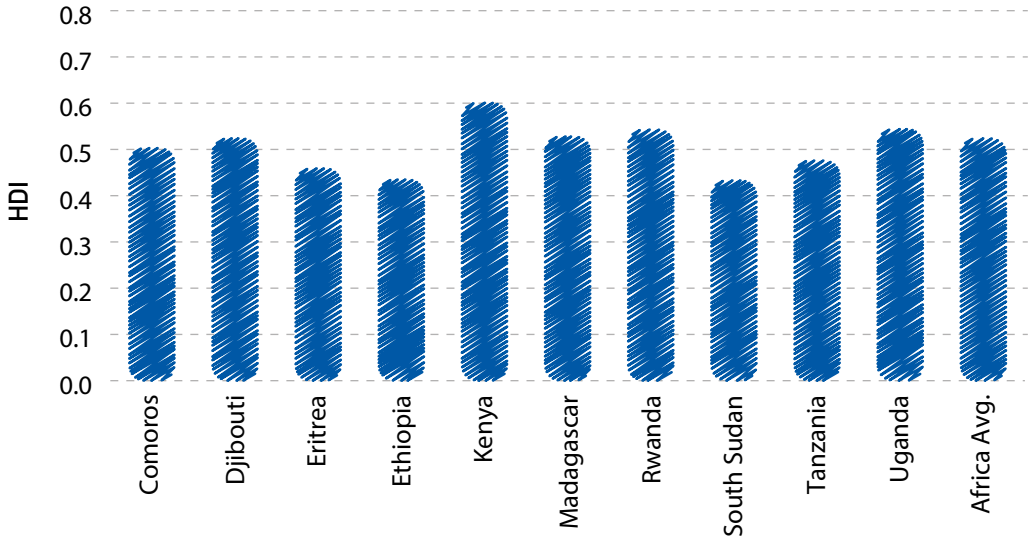
1.1.5 Human development

About 50% of the Eastern Africa's population remains poor based on the dimensions of human development Index (HDI)[2], that is standard of living, education and health, and their relationship with public social spending to achieve the 2030 SDG Agenda. The HDI for the 10 countries is very low and only Kenya is listed as a middle-income country while the rest are listed as low income (Figure 1.3). Uganda, Kenya, Rwanda, Madagascar and Djibouti have HDI that is above the average in Africa.

Eastern Africa countries experience systemic, persistent, and recurring challenges that leads to low human development in the sub-region. Systemic and persistent challenges

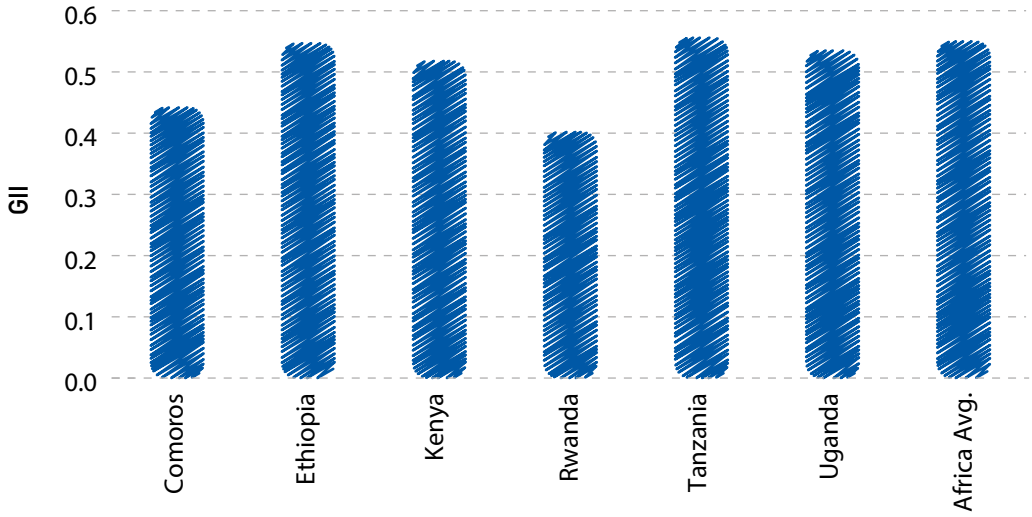
2 UNDP defines human development as 'the process of enlarging people's choices, allowing people to lead a long and healthy life, to be educated, to enjoy a decent standard of living, as well as political freedom, other guaranteed human rights and various ingredients of self-respect' (UNDP, 1997)

Figure 1.3: Human development index 2020 (UNDP, 2020)



include poverty, low income, HIV/AIDS and Malaria pandemic, political instabilities, restrictive cultural and social practices, while recurring challenges are drought, floods, preventable disease epidemics, and economic recessions. These affect the region's ability to prepare and respond to disasters (Fosu and Mwabu, 2010). Gender inequality is also prevalent and the Gender Inequality Index (GII)[3] for these countries is very high (Figure 1.4). These implies that gender is a critical factor in DRR. GII is not available for Djibouti, Eritrea, Madagascar and South Sudan.

Figure 1.4: Gender Inequality Index for some Eastern Africa countries (UNDP, 2020)

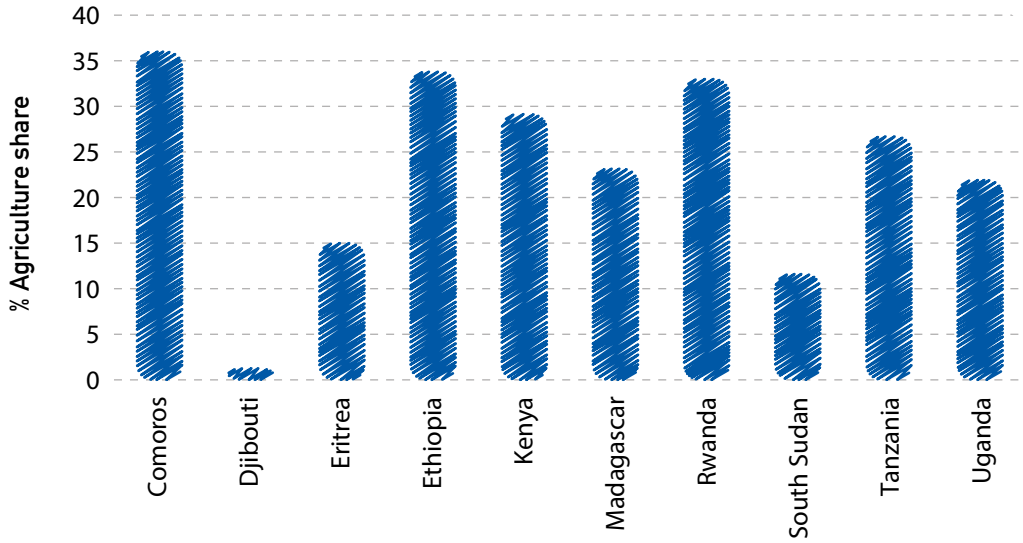


3 Definition: A composite measure reflecting inequality in achievement between women and men in three dimensions: reproductive health, empowerment and the labour market (UNDP, 2020)

1.1.6 Agriculture, food security and nutrition

The economies of Eastern African countries are mainly agrarian though the service industry is the largest contributor to the GDP. The average contribution of agriculture to the GDP is about 23% (Figure 1.5). The agricultural sector is experiencing low productivity due to increased land population pressures, low investment in agricultural research and development and agricultural extension, markets distortions, declining soil fertility and land degradation (Bjornlund et al. 2020). Additionally, cumulative impacts of climate change are adversely affecting the agricultural production and leading to food and nutrition insecurities (Vervoort et al., 2013).

Figure 1.5: Share of agricultural sector to the national GDP (World Bank Data, 2019)



In Comoros and Madagascar, the impacts of climate change is fundamentally altering the fishing industry including loss of traditional fisheries, decrease in profits and jobs, conflicts over new fisheries that emerge because of distribution shifts, food security concerns and a large decrease in fish catch (Cheung et al., 2013). In recent years, the agriculture sector has been affected greatly by locust invasion, which has negatively impacted the food security of Ethiopia, Kenya, Eritrea and Uganda (TNE, 2020).

1.1.7 Education and literacy levels

School enrollments have increased rapidly in Eastern Africa especially in Tanzania, Uganda and Kenya due to free primary education. However, some children do not attend school due to a number of factors including lack of clothing and books, local attitudes and/or traditional practices, health and nutrition, crisis and instability, distance to school, poor quality environment, political violence, poor legal enforcement of education

policies and disease pandemics such as COVID-19 (UNESCO, 2016). The literacy rate for the Eastern Africa countries is shown in Table 1.1. Amongst the Eastern Africa countries, Kenya has the highest literacy rate at 81.5% while South Sudan has the least at 34.52% (UNESCO, 2018). The global average is 84 percent (UNESCO, 2018). There is no data available for Djibouti.

Table 1.1: Literacy rate for Eastern Africa countries (UNESCO, 2019)

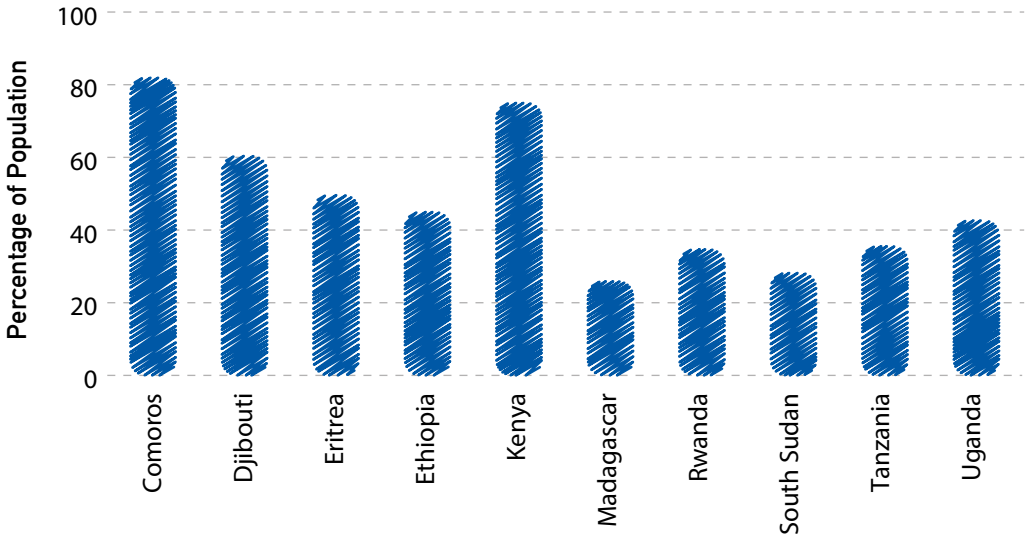
Country	Overall literacy rate (%)	Literacy rate by sex for people aged 15 years and older (%)	
		Male	Female
Comoros	58.82	64.64	52.96
Eritrea	76.57	84.37	68.95
Ethiopia	51.77	59.2	44.42
Kenya	81.50	85.00	78.20
Madagascar	74.80	77.28	72.38
Rwanda	73.22	77.56	69.39
South Sudan	34.52	40.26	28.86
Tanzania	77.89	83.2	73.09
Uganda	76.53	82.66	70.84

1.1.8 Access to electricity

Electricity is becoming the backbone of Eastern Africa's economy. All the economic sectors depend on the reliable delivery of electricity. More than 75% of the population in sub-Saharan Africa lack access to electricity (IEA, 2019). Factors limiting electricity access include larger capital investment required to develop energy generation, transmission, and distribution services to non-urban consumers, sparsely distributed rural homes, which make extending the grid more expensive, poor conditions of transboundary and interconnections of electricity in the region, poor energy infrastructure, and a small number of consumers who can pay for electricity service connection (Vervoort et al., 2013). However, a number of countries especially Comoros and Kenya have made great strides in both grid connections and deployment of off-grid system (Figure 1.6).

Natural hazards such as cyclones, floods and earthquakes can affect the electricity supply and result in power outages, which can trigger accidents, bring economic activities to a halt and hinder emergency response until electricity supply is restored to critical services. Emergency recovery for electricity can take from a few hours to months in the sub-region and urban centers have better recovery than rural areas.

Figure 1.6: Percentage of people having access to electricity (World Bank data, 2018)



1.1.9 Trade

Trade in the sub-region has been boosted by the Common Market for Eastern and Southern Africa (COMESA) intra-regional trade bloc. This has enhanced economic development due to unrestricted goods and services within some of the Eastern and Southern African borders. In Eastern Africa, the structure of trade[4] and growth patterns are characterized by a lack of resource mobilization, lack of economic diversification; weak regional integration; low industrialization and high unemployment rates (AfDB, 2019). Almost all the ten countries depend on unprocessed commodities for exports. Falling global commodity prices negatively affect their trade terms, resulting in persistent current account deficits (UNECA 2019). In recent years, the focus on agriculture as a driver of economic growth has diminished due to their low-value chain with little value addition (Vervoort et al., 2013). Therefore, the countries are becoming net importers of food despite having a vast potential for agricultural resources (Epeju, 2019). However, there is a thriving private sector, driven by domestic and foreign direct investment, particularly in mining, forestry, construction, manufacturing, and tourism (Vervoort et al., 2013).

1.1.10 Transport and infrastructure

Transport and infrastructure play a major role in development and supports economic growth and wealth development. Modes of transport such as roads and railway interconnect the countries of Eastern Africa, thus enabling easier movement of goods between the countries. Lack of infrastructure, particularly in rural areas, is stalling economic growth and widening the poverty gap in the sub-region. In rural areas,

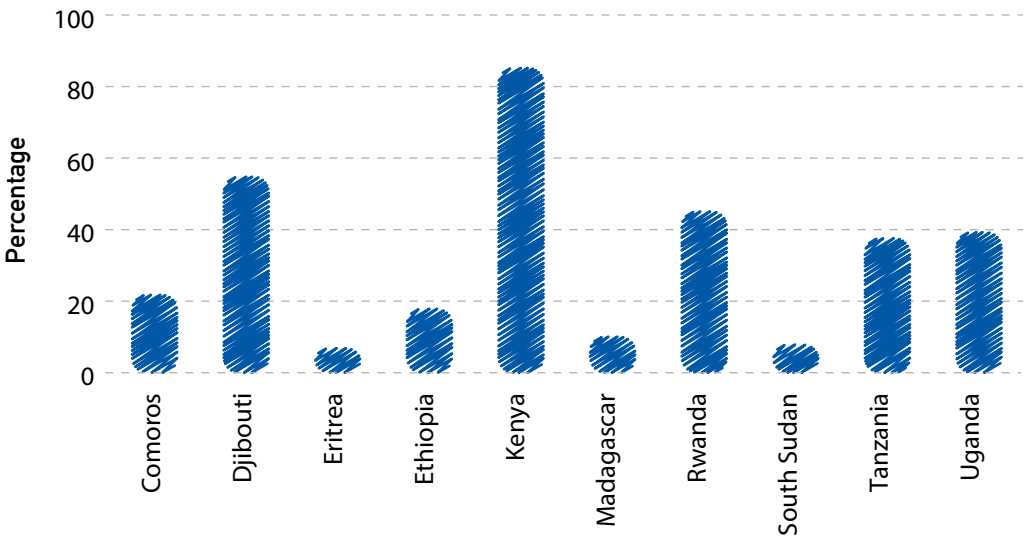
4 Trade refers to a system that allows the transfer of goods or services from an individual to another with an often exchange for the monetary term

farmers and other entrepreneurs cannot compete due to lack of access to markets and electricity and high input and production costs (Vervoort et al., 2013). In recent decades, regional road and rail networks and other infrastructural improvements have attracted investment from foreign private sector companies, creating employment and opening up most of the rural areas.

1.1.11 Information and communication technology

Information and Communication Technologies (ICTs) infrastructure has improved significantly through public-private partnerships, leading to rapid industrialization in urban and industrial areas (Vervoort et al., 2013). For instance, more efficient information systems and e-commerce (including fiber optic cables' installation) has reduced communication and internet costs and advanced agricultural technologies (Baumüller, 2016). For example, access to market intelligence via mobile phones has enabled farmers to get better prices for their produce (Magesa et al. 2020). Kenya has the highest percentage of its citizens using internet at 85.2% while Eritrea has the lowest percentage at 6.9% (Figure 1.7). However, increased usage of internet and overall ICT transformation has not been even within a country. Educated urban dwellers have capitalized on the improved ICT to create innovate employment opportunities, e.g., establishing e-commerce to facilitate effective service delivery, while rural people do not have the technical skills nor knowledge to use ICT and are being left behind. This has created a digital divide (Vervoort et al., 2013).

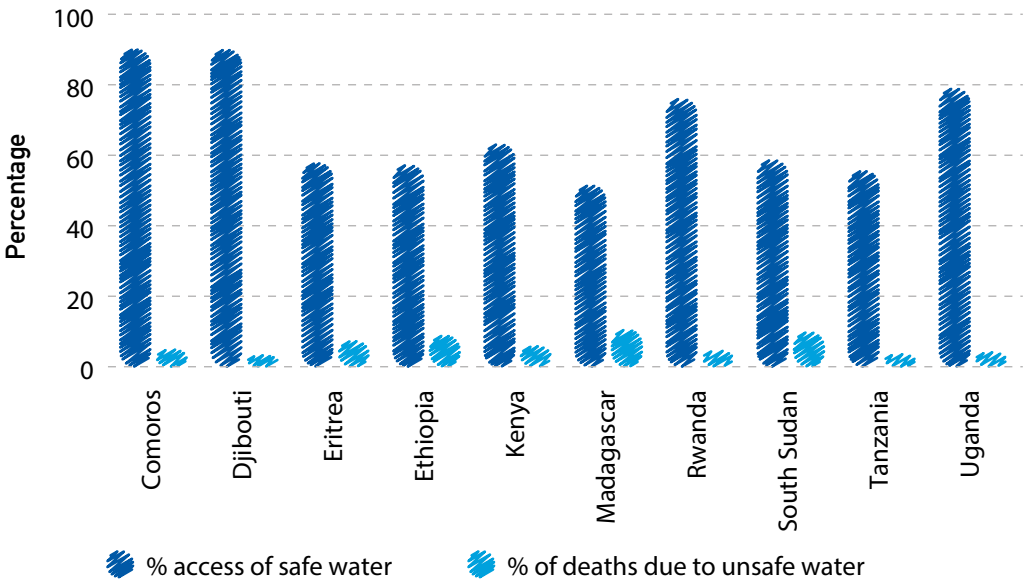
Figure 1.7: Percentage of people using internet across Eastern Africa (Statista, 2020)



1.1.12 Water resources

Most notable water bodies and systems that are of outmost importance to the Eastern Africa region include Lake Victoria, Lake Tanganyika and the Nile River Basin. However, water's spatial distribution varies significantly, with Eastern Africa's western component considered to have more water bodies. Access to water is critical, and water quality is declining significantly, mainly due to human activities in both the catchments and river basins (Opere et al., 2019). The water resources in the region face challenges like an increase in the rate of evaporation and inadequate supervision of groundwater aquifers. 29% of the world does not have access to safe drinking water and this number is higher in Eastern Africa (Ritchie and Roser, 2019). Comoros and Djibouti have the highest number of people having access to improved water sources. An improved drinking water source includes piped water on premises, public taps or standpipes, tube wells or boreholes, protected dug wells, protected springs, and rainwater collection (Ritchie and Roser, 2019). The least are Madagascar and Tanzania. Human deaths[5] from unsafe water sources show that Madagascar, South Sudan and Ethiopia have a high percentage of deaths (Figure 1.8). The unsafe water is due to contamination after cyclones in Madagascar while in South Sudan and Ethiopia, it is due to lack of use of appropriate water sources and thus forcing people to drink dirty water, putting them at risk of waterborne diseases such as cholera and diarrhoea (UNICEF, 2018). The most affected are children under the age of five years (UNICEF, 2018).

Figure 1.8 Percentage of people having access to improved water sources and death due to unsafe water (Ritchie and Roser, 2019)



In Arid and Semi-Arid lands of Eastern Africa, water shortages are frequent, and a large population of women and children spend up to one-third of their day fetching water from a fresh water source (Graham et al. 2016; Koolwal and van de Walle, 2013; Davis et al.

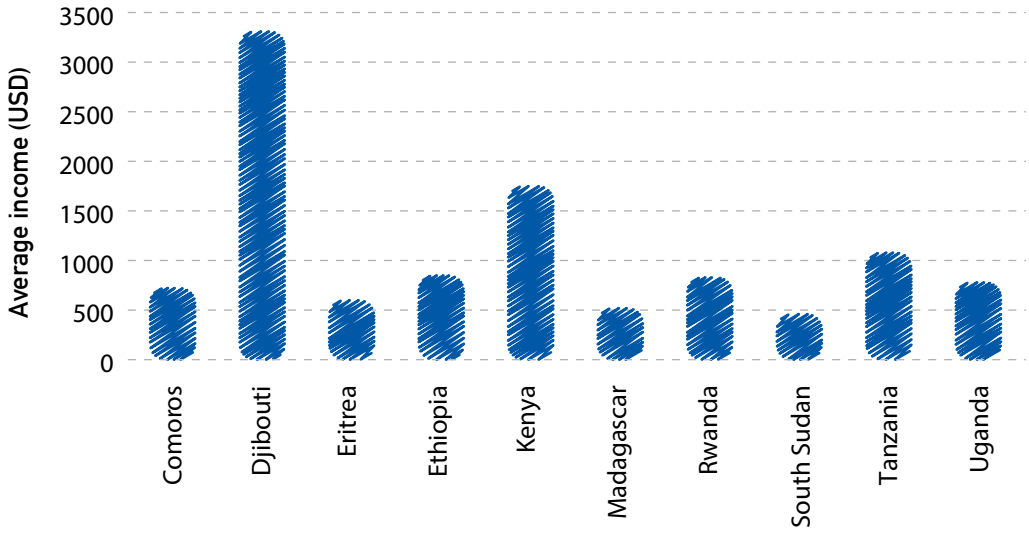
5 Death rates measure the number of deaths per 100,000 people in a given country or region.

2012). Trekking long distance in search of water exposes the women and girls to serious dangers including sexual violence and also makes them susceptible to water-borne diseases.

1.1.13 Livelihoods

Majority of people in Eastern Africa are involved in a plethora of livelihood activities that ranges from farming, hunting and gathering, livestock keeping to fishing. Both mixed crop-livestock systems and cash crop farming are contributing to the food security in the sub-region (Weinreb et al 2020). Off-farm activities include formal employment in government, private sector, NGO and CBOs and informal medium and small enterprises. Average income per capita is highest in Djibouti and lowest in South Sudan (Figure 1.9).

Figure 1.9: Average income per capita in USD (World Data, 2020)



Poor agricultural productivity, limited access to inputs such as fertilizers and improved seed, drought, floods, land and ethnic conflicts and the rise of largescale commercial agriculture are driving people out of rural areas into urban centers, seeking employment in the manufacturing and service industry (Weinreb et al 2020; Duda et al., 2018; Pickbourn 2018).

1.1.14 Development challenges in Eastern Africa

The Eastern Africa sub-region faces numerous constraints that prevent countries from alleviating poverty, meet food security and nutritional needs; stimulate overall economic growth, and conserve natural resources. These constraints include natural factors (such as degradation of natural resources, climatic and weather unpredictability); poor and/or inadequate policy and regulatory frameworks, political insecurity and terrorism, inadequate access to productive resources especially for women and PWD,

inadequate participation of local communities in decision making, poor physical infrastructure and utilities, weak institutional framework, and low public expenditure; rapid population growth rate; rapid urbanization; high incidence of poverty, inadequate social infrastructure, and gender inequality (Makame, 2012). All these factors make the economies and people vulnerable to internal and external shocks.

Eastern Africa countries depend on export revenues and industries and these are adversely affected by a significant deceleration in major export markets. This was observed during the flare-up of trade tensions between the United States and China, two major countries that absorb most of the expert from Eastern Africa (World Bank, 2020b). The emergence of COVID-19 in 2020 and the tensions between the United States of America and China accelerated the downward pressure on both the demand and price of key export goods and that resulted in a dip in export sales (World Bank, 2020b). Weakening export revenues, including from cash crops and tourism, sustained imports were reflected in a deteriorating government current account balance (World Bank, 2020b).

1.2 Profiling natural and human induced disasters in Eastern Africa and their causes

Globally there has been an increase in the number of natural and human induced disasters that have negatively affected the economies and livelihoods of people around the world. In the past decade, a number of severe weather and extreme climate-related events and internal conflicts have led to disasters of devastating consequences to many societies, thus arousing even keener interest by the general public and policy makers. More recently, the COVID-19 pandemic is causing devasting economic losses and disrupting social lives with tens of millions of people being at risk of falling into extreme poverty. It is estimated that countries in Africa could lose up to 20 to 30% of its fiscal revenue, about 20 million jobs will be lost both in the formal and informal sectors and remittance flows are expected to fall by 23.1% (Deloitte, 2020; Gondwe, 2020; OECD, 2020).

In Eastern Africa, disasters occur ranging from highly localized to regional phenomena. UNISDR (2009) defines a disaster as '*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'.* Disasters are categorized based on their origin that is either natural or human induced. Natural disasters, particularly those related to weather occur frequently accounting for 25% in Eastern Africa and more than 70% globally (Vinod, 2017; IPCC, 2012; Shiferaw et al. 2014). Natural disaster includes floods, cyclones, earthquakes, volcanic eruptions, tsunamis, landslides, droughts, tidal waves and high temperatures. Increased human activities have played an important role in influencing the frequency and severity of natural disasters (IPCC, 2007). Human induced disasters occur as a result of human activities and are divided into technological, chemical spillovers and leaks, man-made fires, politically and ethnic instigated violence (ILO, 2000).

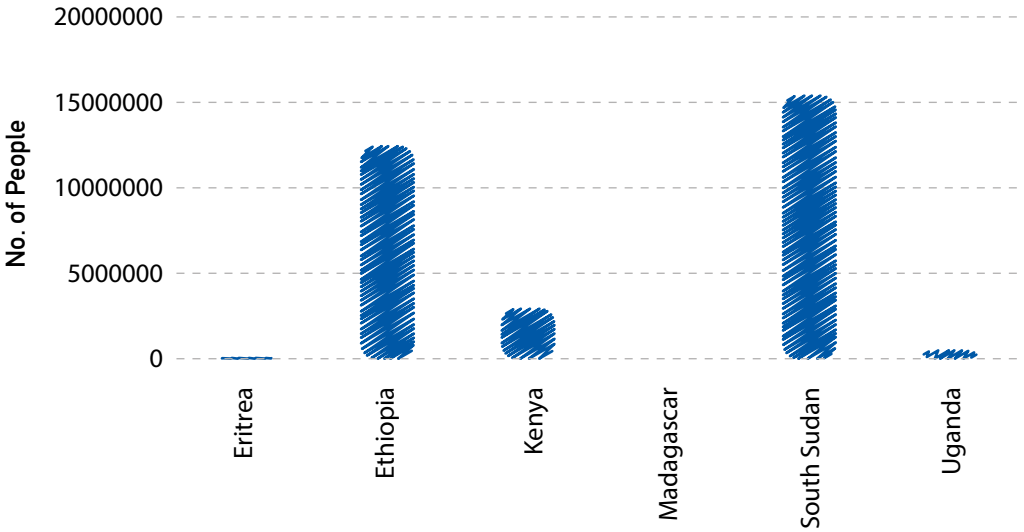
The Eastern African sub-region is prone to natural hazards such as floods, droughts, earthquakes, landslides, lightning and their secondary impacts of diseases and epidemics such as cholera. Drought, floods and landslides are the most frequent disasters in the sub-region that are heavily influenced by rainfall distribution and the physiography of the region (ICPAC, 2020). For example, the Lake Victoria Region surrounded by Uganda, Tanzania and Kenya is known for its very active and convectional weather resulting in heavy thunderstorms, flooding, lightning and landslides in the low-lying areas. The island of Madagascar experiences an average of 1.5 cyclones annually and each year an average of 700,000 people are impacted, damaging infrastructure, including homes, schools and roads (OCHA, 2020) (Appendix I). This leads to disease outbreaks, such as the bubonic and pneumonic plague (OCHA, 2020). In particular, the 2018 cyclone Ava in Madagascar caused about USD$ 130 million in damages and USD$ 156 million in losses (Randrianalijaona, 2018; World Bank, 2019). This loss accounted for 2.9% of the country's 2017 Gross Domestic Product (OCHA, 2020; ARC, 2020; World Bank 2019).

Associated with the short-term losses, are longer-term losses and recovery from these losses is extremely challenging and devastating for most of the citizens of Eastern Africa who live on less than one US dollar a day. Majority of the citizens and the economy relies on agriculture which, most of the time, gets destroyed during floods, drought, landslides and cyclones. More than 65% of the population live in rural areas, which become inaccessible when the storms and floods hit and destroy the weak infrastructure (World Bank, 2018). Furthermore, citizens do not have insurance to claim on damage that is done to human life, crops, livestock and /or homes (Lassa et al. 2019; Raheem et al. 2013). Additionally, for the people working in the informal sector, there is no government social protection or support to fall on when they lose their jobs and livelihoods due to disasters (van Niekerk et al. 2020; Olokesusi and Aiyegbajeje, 2019: Hinchberger, 2017).

1.2.1 Human induced disasters

Human induced disasters have led to conflicts in Eastern Africa. The conflicts include national violence and riots, ethnic conflicts and massacres. Between the years of 2010 and 2019, the total number of internally displaced people due to conflicts in Eastern Africa was about 31,316,100. The highest number of internally displaced due to conflicts is 15,396,000 and 12,440,000 people in South Sudan and Ethiopia respectively (Figure 1.10) (IDMC, 2019). Since 2011, South Sudan has experienced ethnic violence, the Sudanese conflict in South Kordofan and Blue Nile, Sudan–South Sudan Border War commonly known as the Heglig Crisis and the South Sudanese Civil War. On the other hand, Ethiopia has had two major conflicts that is the 2010 Eritrean-Ethiopian border skirmish and the ongoing Tigray Conflict. About 3,480,100 people were displaced in Eritrea, Kenya, Madagascar and Uganda (IDMC, 2019). According to IDMC (2019), there were no internally displaced people due to conflicts in Comoros, Djibouti, Rwanda and Tanzania.

Figure 1.10: Number of people internally displaced by conflicts: 2010-2019 (IDMC, 2019)



Causes or triggers of conflicts in Eastern Africa are due to structural, political, economic, social and cultural factors that lead to sporadic and endemic violence (Boone, 2017; Bellal, 2017). Conflicts also arise due to lack of power and basic resources (such as food and water) as well as denial of human basic needs such as identity, security, respect and recognition (Boone, 2017; Bellal, 2017). Though considered a natural disaster, the changing climate is considered a "risk multiplier" that can exacerbate conflicts in already fragile countries where poverty, ethnic violence, social insecurity and social tensions are prevalent (Abrahams, 2020; UNEP, 2018; UN 2016; Huntjens and Nachbar, 2015).

1.2.2 Natural induced disasters

Climate and weather-related hazards account for more than 87 percent of all disaster displacement globally while geological disasters account for 12.73% (Figure 1.11) (IDMC, 2019). This is due to the increasing incidences of extreme climate events and associated impacts and the increasing concentration of populations in areas exposed to floods, storms and droughts (IDMC, 2019). Disasters increase people's vulnerability through loss of homes, assets and income, reduced access to basic needs and services such as water, food, healthcare and education and disrupted social and cultural networks (IDMC, 2019). Additionally, there is increased social and economic insecurities associated

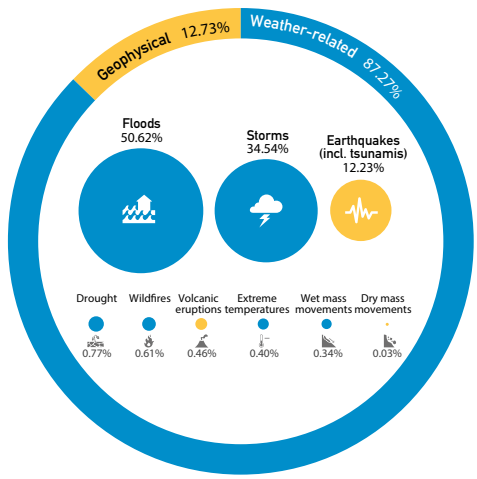
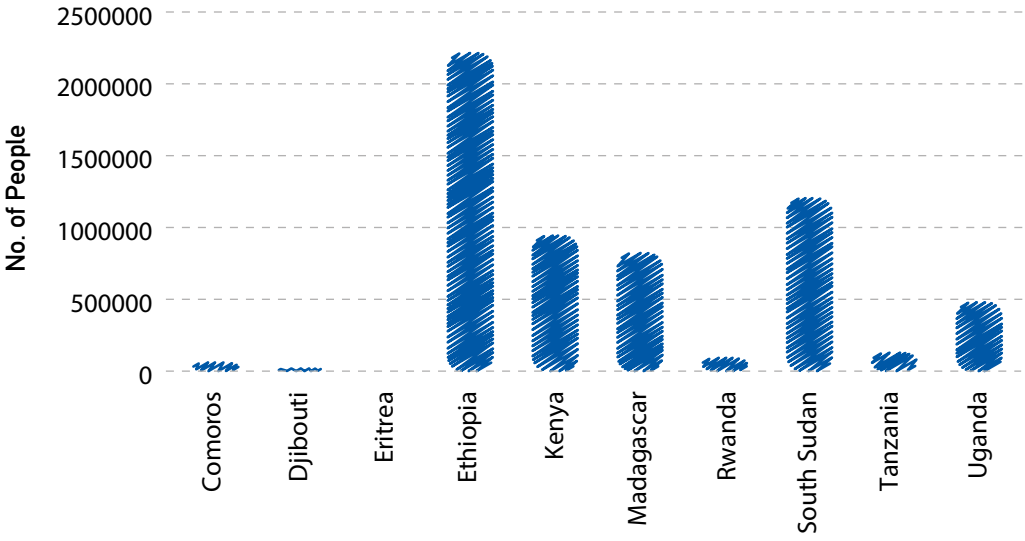


Figure 1.11: Global displacement by natural hazard category (IDMC, 2020)

with natural disasters, particularly amongst children (especially the girl child), women, PWD and the elderly people (Seddighi et al. 2021; Koren et al. 2020; Stark and Landis, 2016).

Between 2010-2019, the number of people internally displaced by disasters was highest in Ethiopia at 2,215,000, followed by South Sudan (1,204,600), Kenya (943,800) and Madagascar (822,900) (IDMC, 2019). The least was observed in Eritrea with 100 people displaced (Figure 1.12).

Figure 1.12: Number of people internally displaced by disasters: 2010-2019 (IDMC, 2019)



1.2.3 Common disasters across Eastern Africa

a) Droughts

Drought is one of the most common and significant disaster in Eastern Africa, more so in Kenya and Uganda. Drought affects many key sectors, such as manufacturing, education, national security, tourism, health and nutrition, water and sanitation, agriculture and livestock and the environment. In 2011, a severe drought affected most of the countries in Eastern Africa and led to severe food crisis across Somalia, Djibouti, Ethiopia and Kenya (Haile et al. 2019; Winkler et al. 2017). The food crisis threatened the livelihood of 9.5 million people. With most of Kenya being arid and semi-arid land, droughts have affected over 3.7 million people and significantly led to reduction in economic growth of the country, with damages and losses that are estimated to be 12.1 billion USD, and the cost of recovery and reconstruction estimated to be 1.77 billion USD (GoK, 2010). Severe droughts have occurred in the Karamoja region, North Eastern Uganda, due to a combination of dry spells and high temperatures experienced in the months of June-July (Nakalembe, 2018). This leads to serious crop failures every five years (Akwango et al. 2017). In Tanzania, drought occurs roughly every four years, and affects more than

3.6 million people (Nicholson, et al. 2018: Winkler et al. 2017. In Rwanda, recurrent drought incidences have caused a serious deterioration in food security (Aremu et al. 2021; Rwanyiziri et al. 2019; Mukamuhirwa, 2016).

Climate change is a risk multiplier, and it is part of a complex matrix of peoples' lives in conflict and post- conflict contexts and is inherently gendered (Yoshida, 2020)

b) Floods

Flood is another common and significant disaster in Eastern Africa brought by natural factors like hurricanes, flash floods, river floods, and coastal floods. Madagascar, Uganda, Rwanda, Tanzania, Ethiopia and Kenya are prone to floods due to heavy rainfall caused by a tropical disturbance (Finney et al. 2019; Rapolaki et al. 2018) Floods lead to death of human and animals, damage to crops and roads leaving villages isolated, destroys infrastructure such as telecommunication lines and power lines, destruction of homes, schools and hospitals, erosion of productive layers of the soil, mental and physical mental and physical stress, increased diseases epidemics especially water related ones and increased conflicts over water resources (Okaka and Odhiambo, 2018; Wossen et al. 2018).

c) Landslides and mudslides

Landslides and mudslides usually follow heavy rainfall and high ground water flowing through cracked bedrocks (Fenta et al. 2020). In Uganda, Tanzania and Ethiopia, landslides are one of the most significant hazards especially on hilly slopes that are under cultivation (Broeckx, et al. 2018; Nakileza and Nedala, 2020).

d) Disease epidemics

Human and livestock diseases and pests are causing havoc in Eastern Africa. The social and economic consequences of the human epidemic (malaria, HIV/AIDS, Cholera and the current COVID-19) are widely felt across the region, not only in the health sector but also in education, industry, agriculture, transport, human resources and the economy in general (Deloitte, 2020; OECD, 2020). The epidemics continue to devastate communities, rolling back decades of development progress. Livestock diseases have a large economic impact on livestock and livestock producers in Eastern Africa. Twelve of the major animal diseases (such as Rift Valley Fever, East Coast Fever, Rinder pest Contagious Bovine Pleuropneumonia, Rabies, Anthrax, Blackleg, and Trypanosomiasis) are present in Eastern Africa that leads to 20% loss in production (Casey-Bryars et al. 2018; Muhanguzi et al. 2017), This has negatively impacted human health in terms of malnutrition and deficiency of protein and micro-nutrients derived from milk, eggs and meat (Oyas et al. 2018). Crops are also not spared from unwanted and destructive insects and animals that attack food both during the growing and post-harvest seasons, consequently leading to food shortages, famine and economic stress (Abera et al. 2018).

e) Earthquakes

Eastern Africa region is home to the Great East African Rift System that produces earthquakes in the Rift valley and the adjacent highlands (Alaneme and Okotete, 2018). Uganda is the most affected country by earthquakes in the region (UNDRR, 2014). Rwanda, Ethiopia, Tanzania and Kenya experiences tremors that lead to loss of lives, destruction of infrastructure (UNDRR, 2014).

f) Cyclones

Madagascar is the country that is hardest hit by cyclones. More recently in 2021, Tropical Cyclone Eloise, with wind speed of up to 95 kmh affected people, homes, schools and hospitals (OCHA, 2021) Accompanying the cyclones are heavy rains of between 200mm and 300mm that leads to flooding (OCHA, 2021). Economic losses from these cyclones are huge (Table 1.2). Though not hit directly by the cyclone, Kenya, Ethiopia, Uganda, Somalia and South Sudan are heavily impacted by the presence of cyclones in the Indian Ocean (ECHO, 2021).

Table 1.2: Cost of disasters in Comoros and Madagascar (UNDRR, 2016)

Hazard	Average annual loss (USD)		100-year return period loss	
	Total direct losses	Emergency costs	Total direct losses	Emergency costs
Comoros				
Tropical cyclone	3.6 million	830,000	43 million	9.9 million
Flood	2.0 million	460,000	10 million	2.3 million
Earthquake	99,000	16,000	1.8 million	280,000
Madagascar				
Tropical cyclone	87 million	20 million	810 million	190 million
Flood	23 million	3.1 million	120 million	27 million
Earthquake	1.3 million	200,000	15 million	2.3 million

g) Violence and unrest

The causes of ethnic conflicts, civil unrest, and generalized insecurity may lie in social, religious, cultural, gender, ethnic tensions arising from failures of governance and competition for scarce resources (Reuss and Titeca, 2017; Christopher, 2013). In some parts of Eastern Africa, areas of conflict often correspond with areas of environmental degradation, chronic food insecurity and overpopulation such as South Sudan, Eritrea, Ethiopia, Kenya, Uganda and Rwanda (van Baalen and Mobjörk, 2018).

1.3 Impact of disasters on women, children, elderly, indigenous people and people with disability in Eastern Africa

The occurrence of natural and human induced disasters in Eastern Africa are showing a positive trend as annual incidents of disaster events have increased in the sub-region. At the global levels, the impact of disasters is equivalent to a global $520 billion loss in annual consumption and drives an estimated 26 million people into poverty each year (Hallegatte, 2017). In Eastern Africa, the number of poor people who live on less than $5.50 per day is about 85%, most of who are women, the elderly, Indigenous people, PWD and children who are disproportionally affected by natural and human induced hazards and

disasters (Auguilar et al. 2019). This is because these categories of people are highly vulnerable to disasters and have lower ability to cope with and recover from the impacts of the disaster (Hallegatte et al. 2017a). Climatic shocks, conflict and economic instability continue to drive food insecurity in the Eastern Africa sub-region with millions of women, children and the elderly experiencing acute levels of food insecurity and malnutrition. In 2018 in Ethiopia, Eritrea, Kenya, Rwanda, Tanzania and South Sudan, more than one in five people were acutely food insecure (World Vision, 2019). During conflicts, women, children and the elderly are constantly on the move as ethnic and political instability arises. At the moment, the Eastern Africa sub-region hosts the largest number of forcibly displaced persons on the African continent (IDMC, 2019). In disaster situations, water and sanitation sources are at a minimum, affecting the needs of women and girls (Heller, 2019). Women and girls also face physical and sexual violence during disasters (Heller, 2019).

In South Sudan, mothers fear malaria and water-borne diseases after floods (World Vision 2019)

Gender inequality and social exclusion in the face of disasters has been widely reported (Karim and Noy, 2014; Harris et al. 2013) especially on women and children (Heller, 2019; Kousky, 2016). The destruction and loss caused by disasters affect multiple aspects of women and children's well-being, both physically, economically, socially and culturally. Available literature on disasters and on gender and resilience, demonstrates that disasters negatively affect women and the shocks and stresses that disasters bring lead to changes that are detrimental to the well-being of women (Otzelberger, 2014; Enarson, 2000). Disasters especially disease epidemics and flooding that can cause widespread cholera leads to increased labor for women as they take care of the sick (Hallegatte et al. 2017b).

Case Study 1: Recovery support and increased disaster and climate resilience in Comoros

The Union of Comoros is generally threatened by tsunamis, cyclones, floods, droughts, seismic and volcanic activity. In spite of this, the Government of Comoros has demonstrated commitment in strengthening the country's resilience to natural and climate related disasters. This is in light of her experiences resulting from the category 3 Kenneth cyclone that hit the country on 24th April 2019. This cyclone was characterized by strong winds, high waves and torrential rains leading to the destruction of houses, crops, businesses and core infrastructure. Being one of the most devastating tropical cyclones in the country's history, it prompted for improvement of emergency response measures and procedures, which were integrated into the 2030 Emergency Plan. This disaster caused damages and losses amounting to USD 185 million coupled with destruction of important public services. The post Kenneth impact evaluation was supported by UNDP as the lead agency, the World Bank and International Federation of the Red Cross (IFRC) coupled with coordinated efforts by the Centre for Relief and Civil Protection (COSEP). The impact evaluation highlighted that recovery and

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reconstruction needs amounted to USD 34.1 million. The recovery and reconstruction needs focused on nine priority sectors including: urban, transport, housing, social protection, health, agriculture, fishery and energy and finance competitiveness and innovation. The housing sector had the highest needs totaling to USD 87.6 million.

In her commitment towards strengthening resilience to natural and climate related disasters, the Government of Comoros (GoC) contributed to humanitarian emergency through her national budget coupled with donor support. In addition to the available national budget, GoC raised USD 650,000 for emergency funding by holding on to a portion of her civil servants' monthly salary. This was specifically used to finance first aid for cyclone victims. This was further complimented with support from the UN Central Emergency Response Fund (CERF), UNICEF, WFP and International Federation of the Red Cross (IFRC) offering meals, shelter, clean water and sanitation to affected people in Grande Comoroe Island, Southern Island of Mohéli and South eastern island of Arjouan.

The Comoros Post-Kenneth Recovery and Resilience Project which was generally supported by the World Bank coupled with resources from the International Development Association (IDA) sought to tackle the effects of the Kenneth cyclone by allocating USD 45 million under the crisis response window (CRW) component. This project supplements ongoing government processes and programs especially where there is limited or no donor support. In particular the project focused on activities connected to the results from the impact evaluation, coordination with development partners and analysis on agriculture and transport connections. Through the project, awareness was raised and a climate resilient approach was introduced towards increasing reconstruction needs. Rehabilitation works of the primary road network was done towards facilitating the flow of agricultural products. This is because agriculture provides employment for 38% of the total population which represents 36% of GDP. The intentions behind the project towards addressing the effects of Kenneth cyclone were further complemented by community associations which played a critical role in provision of community areas which acted as temporary shelters and schools. Women groups also came together to organize cleaning campaigns coupled with hygiene and sanitation kits that were distributed rapidly by the government. (Source: The World Bank, 2019).

In 2019, over 16 million children faced food insecurities in Eastern Africa as a result of floods, landslides, drought and cyclones (UNICEF, 2019). During disasters, schools and universities are hampered in their operations. In most instances, many schools are unable to open due to flooding. Parents with sufficient income can transfer their children to other schools while children from low-income households' drop out of the education system. In some areas of Eastern Africa, such as western Uganda and Kenya, going to school is a nightmare for students who have to either wade through flooded lands or board canoes that are dangerously rowed through the raging river (Erima, 2017).

Compounding this is the hunger that the students have to endure the whole day. Students in such circumstances do not pay attention in class and can suffer from mental illness (Chuang et al. 2018; Conteh, 2015; Akello, 2014). The girl child faces additional burden than the boys during disasters. Increased girl child marriages and sexual violence have been reported during disasters (Spencer 2015). Child headed households are on the rise with children losing their parents or adults due to disasters (Sealza, 2019). As a result, children who should be in school are forced to drop out to take care of their younger siblings (World Vision, 2018).

Children suffer from irreversible impacts of disasters on health and education in the long run. Such events lead to missed days at school and dropping out (Kousky 2016).

The elderly people are especially vulnerable to natural and human induced disasters (IASC, 2008). The elderly people have difficulty in adapting to challenges and coping with disasters (Jia et al. 2008). Age-related decline in mobility, vision and hearing can increase elderly people's vulnerability to disasters by making it harder for them to prepare for a potential disaster (such as cyclones) and by making it harder to evacuate and protect themselves (Jia et al. 2008). Most of the elderly people in Eastern Africa do not have pension that can cushion them when disaster strikes (Guven, 2019).

Most disaster relief packages such as most shelters do not adequately address the needs and conditions of older people, for example, lacking privacy, appropriate bedding (in terms of height and size of cots), and access for the disabled, and often having high noise levels and poor security (PAHO, 2016).

PWD often lack adequate support, information and protection during disasters (Gutnik and Roth, 2017; WCRWC, 2008). Like the elderly people, PWD face mobility and other challenges that hinders them from preparing for disasters (Gutnik and Roth, 2017; WCRWC, 2008).

1.4 Why gender responsive and socially inclusive DRR measures matters

In Eastern Africa, the way disaster affects a community, and the response measures are always specific to the particular environmental and socio-cultural context in which that community lives. For example, the poorer the community, the more extreme the impact is likely to be. Furthermore, within a poor community, or any community, the impacts will be different for children, men, youth, elderly, women and PWD. This is due to persisting gender inequalities and social exclusion that makes certain categories of people more vulnerable to impacts of disasters. In Eastern Africa, women and PWD are more likely to become direct victims of weather-related disasters. Studies have shown that during cyclones and heavy rainstorms that leads to flooding, women and girls are more likely to die because they do not how to swim nor can they migrate (Mukuna, 2015; Wahlström, 2012; Campbell and Yates, 2010). During droughts and floods, women have to work harder to secure food, water, and fuel, and thus have less time for participation in DRM decision-making processes (Akwango et al. 2017; Ngcamu and Chari, 2016). In certain religious communities, women and girls' mobility is sometimes strictly controlled

and thus female-headed households and widows can be isolated during a disaster event. Additionally, women, youth and PWD tend to have fewer assets (land, finance, information and skills) to rely on than men thus making them extremely vulnerable to disasters. Due to isolation and high rates of illiteracy, women, the elderly and PWD are less informed about disasters and do not attend trainings on disasters management. This calls for gender responsive and socially inclusive DRR.

Gender responsive and socially inclusive (GSI) DRR is not just about responding to women's issues. It addresses the concerns of children, youth, women, men, the elderly, PWD and the migrants. GSI involves supporting empowerment of different categories of people and actively engaging with them to understand their roles and responsibilities in DRR. GSI entails working with children, youth, women, men, the elderly, PWD and the migrants to ensure that DRR initiatives upholds and strengthens gender equality and equity.

GSI in DRR is a process of ensuring that all activities, and the way the activities are planned, implemented and budgeted for contributes to gender equality by transforming the lives and livelihoods of children, youth, women, men, the elderly, PWD and the migrants. Therefore, this means support children, youth, women, the elderly, PWD and the migrants with greater access to and control over resources and, stronger participation and leadership in decision-making processes. It also means ensuring that the different concerns and priorities of children, youth, women, the elderly, PWD and the migrants fundamentally shape the whole cycle of disaster risk assessments, objective setting, planning, budgeting, identification of relevant stakeholders, implementation, and monitoring and evaluation. Finally, it also means, national governments, UN Bodies, NGOs and CBOs and other organizations involved in DRR initiatives ensure that their own internal systems and structures reflect an awareness of gender equality, and social inclusion and aim to strengthen it. This includes technical issues, such as policies, planning, budgets, monitoring and evaluation systems, recruitment, capacity building, gender balance of staff and performance management.

1.5 Rationale and objectives of the study

To address and effectively minimize impacts of disasters in the Eastern Africa sub-region, countries have developed national and ratified regional and international frameworks and commitments. Most of the Eastern Africa sub-region countries have realized the need to have both reactive (response actions) disaster risk management and proactive (Prevention actions) with a view to adapt to and mitigate the impacts of disasters. At the global level, the Sendai Framework for Disaster Risk Reduction (SFDRR) 2015 - 2030 aims to prevent new risk, reducing existing risk and strengthening resilience across countries (UNISDR, 2015). The SFDRR expects all countries to 'prevent and reduce disaster risk, all-of-society and all-of-State institutions engagement'. One of its guiding principles incorporate elements of inclusive and empowerment and 'paying special attention to people disproportionately affected by disasters, especially the poorest. Gender, age, disability and cultural perspective should be integrated in all policies and practices, and women and youth leadership should be promoted". The SFDDR recognizes that different categories of people are affected by disasters in different ways with 'women, children and people in vulnerable situations disproportionately affected'. The SFDDR is a gender and

socially inclusive framework in that it aims to engage and empower women, children and youth, persons with disabilities, poor people, migrants, indigenous peoples, volunteers, the community of practitioners and older persons in the design and implementation of country based DRR response, recovery, rehabilitation and reconstruction approaches.

Most of Eastern Africa countries have developed country-based DRR policies, frameworks and strategies aimed at minimizing the impacts of disasters in line with the Sendai Framework for Disaster Risk Reduction 2015 – 2030. The policies and strategies focus on addressing both natural and human induced disasters. Additionally, national governments, non-government organizations, Community based organizations and other stakeholders are implementing projects and programs aimed at addressing disasters at various levels; community, sub-national, national and sub-regional level. It is however unclear to what extent these DRR initiatives consider gender and social inclusion. This study therefore aimed to analyze DRR policy initiatives in DRR with a gender and social inclusion lens to enable the mainstreaming of gender-responsive actions into strategies and action plans for disaster risk reduction in schools, communities and public sector institutions in ten beneficiary countries - Comoros, Djibouti, Eritrea, Ethiopia, Kenya, Madagascar, Rwanda, South Sudan, Tanzania, and Uganda.

The specific objectives of the study were to:

a) Review the disaster profiles of the targeted countries taking into account major disasters (climate-related threats, natural disasters and geological hazards) occurring in the past ten years and their future projections,
b) Review perceptions to disasters risks from a gender perspective,
c) Review the impacts of natural disasters and hazards on livelihoods (from a gender perspective)
d) Review past (5-10 years), on-going and future gender-responsive actions, initiatives, projects and programmes in the beneficiary countries,
e) Conduct a gender analysis of current institutional, political and decision-support frameworks associated with DRR to allow the enactment or strengthening of gender-responsive regulatory frameworks, policies and institutions for DRR,
f) Provide case studies of impactful gender responsive DRR actions, policies, leg framework to inform the promotion of north/south-south cooperation on disaster management.

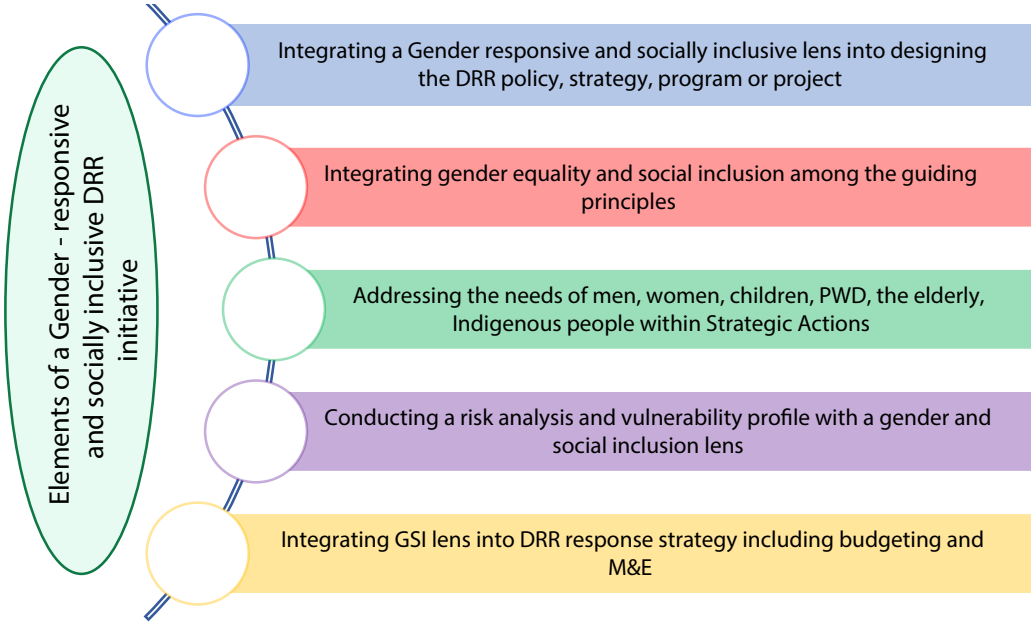
METHODOLOGY

2.1 Analytical framework

Studies have shown that men, women, children, Persons With Disabilities (PWD), the elderly, and Indigenous people are impacted by disasters in different ways and often have distinct coping strategies. A gender-responsive and socially inclusive (GSI) approach to DRR planning therefore means that gender-based differences and social inclusion issues are considered in the design and implementation of the policy, strategy/plan, programme and project. This implies that the design and implementation of the policy, strategy/plan, programme and project should be informed by the gender and sex-disaggregated analysis of how gender norms, roles and inequalities shape vulnerability and resilience of men, women, children, PWD, the elderly, and Indigenous people. Such a detailed and comprehensive analysis will lead to a better understanding of what each category of person does within the community, what assets they own or have access to, what their needs and priorities are, and the existing power differences. The findings from such an analysis will inform the design, implementation and monitoring of DRR actions so that the gender and social inclusion issues relevant to disasters are adequately addressed in the related plans, policy documents and programmes.

A GSI policy, strategy/plan, programme and project should aim at increasing the resilience of and reduces the workload of women and girls, PWD and the elderly. Finally, the GSI should include women, PWD, the indigenous and the elderly people in decision-making positions in disaster risk management authorities/institutions. Adopting a framework developed by FAO (2016) and UNISDR, UNDP, and IUCN (2009), and guidelines from the globally agreed Sendai framework for DRM and the African Union's Gender Strategy, this

Figure 1.13: A GSI framework for analyzing DRR initiatives



study used five-point criteria to assess the gender-responsive and social inclusiveness of disaster risk reduction policies, strategies, programs and projects in Eastern Africa (Figure 1.13). The framework allows for qualitative assessment of DRR initiatives to explore whether existing initiatives are gender responsive and socially inclusive: that they applied a gender lens to all activities for prevention, preparedness, response and rebuilding before and after a disaster strikes (See Appendix II for more details).

2.2 Key disaster and gender terms identified

UNISDR (2017) defines disaster as *'A serious disruption of the functioning of a community or a society at any scale due to hazardous events interacting with conditions of exposure, vulnerability and capacity, leading to one or more of the following: human, material, economic and environmental losses and impacts'*. This study identified key disaster terms as defined by the UNDRR terminology (UNISDR, 2017) and disaster, risk, hazard, disaster risk reduction, disaster risk management, preparedness, mitigation, recovery, resilience, warning, safety, response and prevention. Additionally, the gender and gender related terms such as gender responsive, social inclusion, women, children, youth, PWD, elderly/older persons, gender sensitive were also identified. UNESCO (2003) defines gender as the roles and responsibilities of men and women that are created in our families, our societies and our cultures and the expectations held about the characteristics, aptitudes and likely behaviours of both women and men (femininity and masculinity). In the context of disasters, gender responsiveness is defined as the identification and acknowledgement of the existing differences and inequalities between women and men and articulation of policies and initiatives which address the different needs, aspirations, capacities and contributions of women and men. UNESCO (2005) defines social inclusion as a process of addressing and responding to the diversity of needs of all learners through increasing participation in all learning, cultures and communities, and reducing exclusion within and from education. Therefore, in the context of disasters, social inclusion is the process of conducting gender analysis to identify, address and respond to the diversity of needs of everyone through increasing participation in DRR and management while reducing exclusion.

2.3 Document search and review

A rapid scoping review of literature was conducted with the aim of collating all documents that relate to DRR policies, strategies/plans, program and projects across the ten countries in Eastern Africa. This involved using various databases including Google Scholar, Open Access Journals, websites of national governments, Non-Governmental Organizations (NGOs), Community Based Organizations (CBOs) and UN bodies (UN High Commission for Refugees, Office of the United Nations High Commissioner for Human Rights, United Nations Educational, Scientific and Cultural Organization etc.). Search of websites for available grey literature and information was done for Non-government organisations and Community Based Organizations dealing with issues related to DRR. Some of the organizations that were searched included HelpAge International, European Community Humanitarian Office, CARE International, World Vision, Oxfam, Merlin, WaterAid among

others. Data generated was used to provide a description of the DRR policy landscape, strategies, projects and programs aimed at developing and building adaptive capacity and enhancing resilience of women, children, PWD, the elderly, Indigenous people.

2.4 Data analysis

All the data collected was entered into a database. Data analysis involved a systematic keyword search and a content analysis of DRR initiatives across scales, including national, sub-regional and global levels. For the sub-regional and global levels, DRR initiatives that are implemented across more than one country in Eastern Africa were considered. For example, the East African Community (EAC) disaster risk reduction and management strategy that is implemented across Tanzania, Rwanda, Uganda, Burundi and Kenya, and the Sendai framework at the global level. Content analysis (using the framework on Appendix II) of the documents provided an assessment of the extent to which gender responsive and social inclusion key terms are considered in DRR initiatives, and how and in what ways women, children, the elderly, PWD and Indigenous people are included qualitatively. The findings were subsequently summarised using descriptive statistics (frequencies and percentages) for each country.

RESULTS AND DISCUSSION

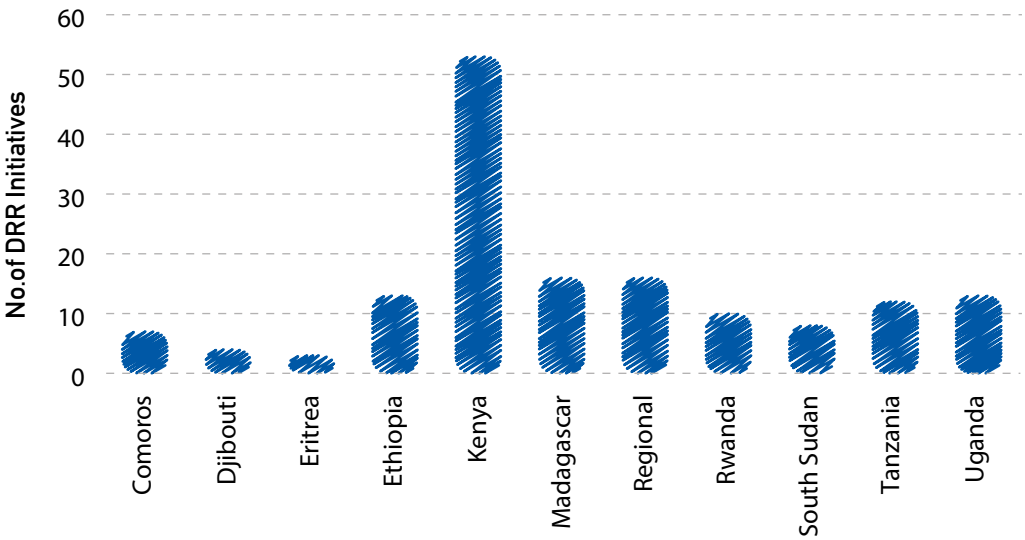
3.1 Gender outlook of DRR initiatives being implemented in Eastern Africa 2010-2019

Conflicts, droughts and floods are some of the major factors that trigger disasters in Eastern Africa. Additionally, the sub-region is equally predisposed to manmade disasters such as urban fires, water pollution, HIV and AIDS and outbreaks of disease epidemics (Appendix III). Findings from the DRR initiatives mapping shows that countries in Eastern Africa are implementing various DRR initiatives as part of their disaster risk reduction and management. These initiatives are implemented by different stakeholders including but not limited to: National and sub-National Governments, NGOs, CBOs and UN Agencies. This provides diverse contexts and ways in which each stakeholder is navigating and addressing disasters across the region to achieve resilience.

A total of 155 DRR initiatives including policies, strategies/plans, projects, programs surveillance tools and Networks/Partnership/Alliance, were identified (Appendix IV). Out of the 155 DRR Initiatives, Kenya has the highest number of DRR initiatives at 53 being implemented while, Eritrea has the lowest (3) (Figure 1.14). The high number of DRR initiatives in Kenya is due to the devolved system of government. There are 47 sub-national County governments, and each County government has developed its own DRR Act, strategy or policy.

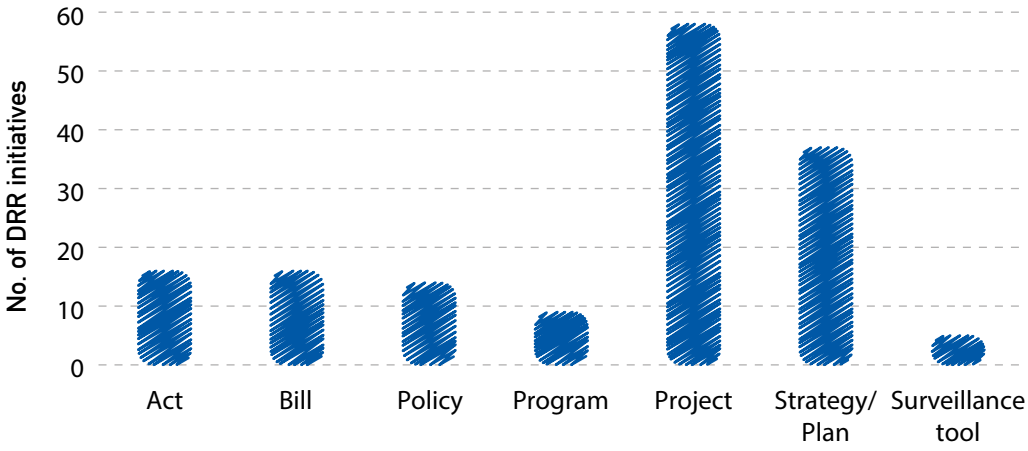
For the period between 2010-2020, a total of 155 DRR initiatives were identified that are on-going or completed. Out of 155 DRR initiatives, the highest number comprise of projects (37.4%) while disaster surveillance tools were the least (3.2%) (Figure 1.15). The

Figure 1.14 Number of DRR initiatives implemented in Eastern Africa 2010-2020 (n=155)



other DRR initiatives included Acts (10.3%), Bills awaiting ascendency to law (10.3%), Policy (9%), Program (5.8) and Strategy/plans (23.9%). The high number of DRR projects can be attributed to the various stakeholders that are implementing DRR activities amongst communities in Eastern Africa. Additionally, 2-3 projects can emerge from one strategy/plan or policy. For example, Comoros' Disaster Risk Management strategy has 3 priority actions that were implemented as stand-alone projects.

Figure 1.15: Types of DRR initiatives implemented in Eastern Africa 2010-2020 (n=155)



3.2 Targeting vulnerable people

As discussed earlier, when disasters occur, certain segments of the population are hit the hardest and recovery for such people can take years. Women, youth, elderly, PWD, migrants and indigenous people are not only more vulnerable to disasters shocks, but they also have fewer resources to prevent, cope with, and adapt to (Hallegatte et al. 2016; Neumayer and Plümper, 2007). These category of people have less access to social safety nets, do not participate in decision making and in some instances, are totally invisible (Diehl and Dzubinski, 2016; Nordling, 2017). For example, Parsitau (2021) reported that as countries are fighting the COVID-19 pandemic, women and girls are largely invisible in or are missing from decision-making, policy, and governance circles. And yet, 'women and girls have largely borne the brunt of the pandemic, as the virus has exacerbated already-existing gender inequalities, laying bare serious fault lines in safety, physical and mental health, education, domestic responsibilities, and employment opportunities' (Parsitau, 2021).

The Sendai framework only identifies women, children and youth, PWD, older people, indigenous people and migrants as the most vulnerable people. This clearly indicates that national governments and other stakeholders recognize the importance of identifying and targeting different categories of people within a country or community. These stakeholders recognize that they should not be limited to the list of vulnerable people mentioned in the Sendai framework, but identify more vulnerable people depending on the location they are implementing DRR initiatives. Analysis of the 155 DRR initiatives

show that 41.9% of the initiatives mention and/or target women, children, youth, PWD, elderly, migrants, Internally displaced persons, refugees, boys, girls, men, poor people and poor households. The rest of the DRR initiatives, that is 58.1% do not mention any vulnerable persons. Women are mentioned or targeted in all the DRR initiatives that identify vulnerable people. Children, youth, PWD and the elderly are also frequently mentioned in the 41.9% of the DRR initiatives (Table 1.3). The least mentioned category of people are street people, beggars and commercial sex workers.

Table 1.3: The category of vulnerable people targeted in DRR initiatives in Eastern Africa (n=65)

Categories of vulnerable people	No. of DRR initiatives that mention specific vulnerable people	Categories of vulnerable people	No. of DRR initiatives that mention specific vulnerable people
Women	65	Illiterate	22
Children	55	IDPs	27
Students	12	Refugees	14
Indigenous people	29	Commercial sex workers	9
Poor people	18	Men	11
Migrants	13	The sick	24
Youth (female & male)	49	Mentally challenged persons	11
Elderly	33	Street people	4
Business women	8	Beggars	4
Farmers and livestock keepers	16	Pregnant/ breastfeeding mothers	15
Homeless	13	Girls	21
People with Disability (PWD)	43		

A GSI situational analysis, which is a preliminary assessment of a particular situation where the project/program is to be implemented in a particular geographic area, is a scoping and analyzing process, which helps project team to develop a common understanding of their project's context. Such an analysis can also help project team to identify the different categories of people, their needs and problems and are able to define what kind of interventions can respond to the identified problems and needs. Analysis of use or mention of gender and social inclusion terminologies within the 155

DRR initiatives shows that the word Gender equality is the commonly used word, and it is mentioned in 88 of the DRR initiatives (Table 1.4). The least mentioned term is gender transformative.

Table 1.4: Mention of gender and social inclusion terminologies in DRR initiatives in Eastern Africa (n=155)

GSI terminologies	No. of DRR that mention GSI terminologies	GSI terminologies	No. of DRR that mention GSI terminologies
Gender equality	88	Sex-disaggregated data	33
Gender equity	65	Participatory	62
Inclusive	34	Gender norms	19
Gender analysis	23	Gender roles	32
Gender mainstreaming	19	Gender transformative	7
Gender sensitivity	23	Gender- responsive budgeting (GRB)	18
Gender sensitive indicators	49	Gender- responsive planning	13
Gender alone	91		

The frequent mention of gender, gender equality, gender equity and gender analysis and targeting of women within the DRR initiatives is due to increased acknowledgment that disasters hit women the hardest because of their exposure to disaster risks. Additionally, national governments and development organizations including the United Nations are accepting that women can bring unique experiences and skills to disaster risk reduction and management and therefore their skills and knowledge needs to be tapped.

Gender analysis, gender mainstreaming, gender responsive planning and budgeting for DRR are not highly considered (Table 1.4). This implies that over 80% of the DRR implemented in Eastern Africa do not recognise the difference between the situations, needs and opportunities of women, men, youth, PWD, migrants and the indigenous people and as such possibilities of not planning and budgeting for the gender differentiated DRR activities can skew resources in favor of men. Mainstreaming a GSI perspective into DRR initiatives especially during planning and budgeting will ensure that the needs of women, men, youth, PWD, migrants and the indigenous people are taken into consideration at all stages of the DRR cycle. A GSI planning, investments and budgeting process can facilitate National and sub-National governments in allocating resources efficiently and equitably.

Case Study 2: Supporting the return of IDPs and expellees to communities of origin or new resettlement in Eritrea

The Eritro-Ethiopia war has destroyed agricultural assets, which were critical for the livelihood of the IDPs. The war caused severe damages to shelter, water systems, education and health systems. In addition, most areas were made unsafe due to landmines. It is in this regard that a joint programme between UNDP, UNICEF, WFP and the Government of Eritrea was initiated with a budget of USD 60, 975,000 towards returning and resettling 30,000 IDPs either to their communities of origin or government designated areas. This initiative commits to support vulnerable families, women and children especially in regard to access of adequate social services such as water, education food/nutrition, health and shelter. This coupled with long-term sustainable livelihood opportunities. Given that agriculture is the main source of livelihood especially for returnees, the programme seeks to rehabilitate rain-fed cropping, irrigated cropping for households and restocking of small ruminants for vulnerable households. This is coupled with the provision of water wells equipped with solar pumps and permanent water reservoirs and delivery system. Further, shelter is provided with extra support being given for households headed by women towards covering labour costs coupled with training and supervision of construction models. Education and awareness was also carried out towards empowering people on the dangers of land mines towards reducing their related accidents. Through this programme, about 19,000 IDPs were resettled successfully in their village of origin (Gash Barka region, Western Eritrea) from Adi Keshi camp in 2005. Further, a reviewed and extended joint programme on IDPs between UNDP, UNICEF, UNHCR, UNFPA and the Government of Eritrea saw 45,345 people resettled over a three-year period from 2006. As a result, there are no IDP camps in the country (UNDP et al., 2006).

3.3 Perceptions of disaster risks from a gender and social inclusion lens in Eastern Africa

This section focuses on how disasters are perceived from a gender and social inclusion perspective and will explore concepts such as sexual and domestic violence, death especially amongst women and children, early marriages, nutrition, poverty, sanitation, gender roles, and cultural norms. The section provides existing data in terms of number of people affected and some of the existing policies that aim to protect individuals and mitigate the risks before, during, and after disaster situations and mediate the risks. Despite the increased call and recognition of gender issues in development, limited policies and strategies exist that significantly and increasingly address gender and social inclusion in disaster risk, reduction, and response. Limited policies and strategies were identified in this study that have a GSI lens and yet national development agendas for

the countries in Eastern Africa push for disasters, especially climate related disasters to be understood in terms of the strengths and weaknesses within a society that will determine how a society and its people will respond to any risk.

Eastern Africa countries have GSI neutral framework of disasters and the consequences of these are often observed after disasters occur, such as increased mortality rates in pregnancy, breastfeeding mothers, children, elderly and PWD (Wagner et al. 2019; UNICEF, 2019; FAO et al, 2019; WHO, 2019c, UNISDR, 2014) and increased sex and domestic abuse (Spencer, 2015; La Mattina, 2012). In recent years, there has been calls for both disaggregating people exposed to disasters in terms of sex, gender, age, disability, poverty, location, religion, and other social, cultural and economic determinants as well as designing and implementing disasters legislations and frameworks with a GSI lens. Through this process, national governments will be able to hear the voices of the unheard and invisible people before, during and after a disaster, document them, identify, and implement lasting gender responsive and socially inclusive DRR and management policy and technical interventions.

The increased occurrences and intensity of natural and human-induced disasters underscore the need for an increased understanding of the perceptions of disaster risks from a gender and social inclusion perspective. In more recent years and with future predictions, climate change will contribute to the greatest disasters through increasing the frequency and severity of floods and droughts and by increasing people's vulnerability to these hazards (Boko et al 2007). For instance, heavy rainfalls/cyclones in Eastern Africa often cause flooding that creates a conducive environment for the outbreaks of water-borne and infectious diseases that affect expectant and breastfeeding mothers, toddlers, and young children (FAO, 2010). Women, girls, children, People Living with Disability (PWD), and the elderly are more likely to be negatively impacted by disasters than men due to the intertwining of several factors including gender inequalities, social exclusion, decreased food security and nutrition, dependence on natural resources, low literacy levels and a lack of access to formal employment, entrepreneurial opportunities, and credit facilities. The impacts include:

- Women, girls, and boys (aged below 13 years) are 14 times more likely than men to die during a disaster (Peterson, 2007)
- High dropout rates for girls during disasters to provide care for the sick and elderly and other domestic chores
- Cyclones affect more women than men, raising maternal mortality rates due to their inability to migrate
- Children under the age of 5 become malnourished due to lack of nutritious foods and poor water and sanitation facilities (OCHA, 2020).
- More men and young adult boys are more likely to die than women and girls during war and/or ethnic cleansing (Wagner et al 2019).
- Increased post conflicts trauma for women and girls (Harroff, L. 2019)
- Women and girls are traditionally overwhelmingly tasked with caring for the affected, chronically sick, children, the elderly, and people with disabilities (Ritchie, 2015).
- During drought period, women and girls walk long distances to collect water for domestic use, spending about 8 hours/day and end up expending more than 85% of a woman's daily energy intake (UNESCO, 2020).

- Girls and women experience sexual and domestic abuse before, during, and after disasters.
- Girl child marriages is increasing due to the changing climate
- Women and teen mothers fall ill very fast during and after disasters because they have specific nutritional needs when they are pregnant or breastfeeding.
- Decreased amounts of food consumed by women and girls due to children, men and boys being given priority during mealtimes (food-eating hierarchies/food - eating structure) within the household.

Disasters exacerbate existing vulnerabilities of women, girls, children, PWD, and the elderly and tend to play along social and generational lines. Peterson (2007) estimates that women, girls, and boys (aged below 13 years) are 14 times more likely than men to die during a disaster. In times of war, more men and young adult boys are more likely to die than women and girls (Wagner et al 2019). For example, in Eritrea, Burundi, and South Sudan, more men and young boys have died from war than women and girls (Blanc, 2017; Bundervoet et al. 2009). On the other hand, during the war and ethnic cleansing, women, PWD, the elderly, children, and girls lose their livelihoods and adaptive capacity, experience increased physical violence and psychological trauma (Cottyn, 2018; Corbin and Hall, 2018). For example, the ethnic cleansing of 1994 in Rwanda, the political cleaning of 2007 in Kenya, and the ongoing Tigray armed conflict in Ethiopia has killed more men than women, while more women and girls faced increased post conflicts trauma (Harroff, L. 2019; La Mattina, 2012; UN News, 2021).

Case Study 3: Promoting sustainable disaster risk management in a cost effective manner in Tanzania.

Dar-es-Salaam is prone to floods with the most vulnerable being those residing in informal settlements dominated by low income especially in Tanadale and Buguruni kwa Makanda settlements. These areas are unplanned, under resourced and unmapped spanning about 80% of the city. The Ramani Huria is an initiative that has allowed community members from informal settlements, volunteers and university students to be trained on the use of platforms that create open source maps of the most flood prone areas of their city. The use of novel technologies including unmanned aerial vehicles (UAV) commonly known as drones have been employed to gather vital information in an accurate and timely manner and sharing it with Ward Executive Officers and other decision makers towards reducing community vulnerabilities, enhancing community preparedness, response capabilities and recovery mechanisms. Raw data gathered is fed into publicly accessible tools such as OpenStreetMap and InaSAFE where relevant authorities can identify areas most at risk of flooding and further simulate disaster scenarios.

In addition, residents are also able to know well in advance which structures in their neighbourhood will be affected the most in the event of a disaster allowing them to take appropriate actions and also make a credible case for resource

contd.

allocation for future disasters. The project has not only harnessed the power of community but has realized an effective and more pragmatic way to manage disasters in their neighborhoods. This also goes a long way in opening up opportunities for future disaster risk managers, computer scientists and cartographers. Before this initiative was introduced, it was very costly and laborious to acquire the much needed datasets as tens of thousands of dollars were required to hire chartered flights. Currently, communities in 21 wards of Dar-es-Salaam have cooperated in the delivery of the same information at a fraction of the cost accounting for 1.3 million of the city's 5.5 million residents. The model of this initiative has been replicated by similar projects in other parts of the country with the Tanzania Commission for Science and Technology (COSTECH) applying the same technology towards assisting the Ministry of Lands, Housing and Human Development set a course for conferring around 300,000 land titles on rural farmers. In turn it has allowed farmers to access loans towards investing on their farms and livelihoods. (Source: GFDRR: https://www.gfdrr.org/en/feature-story/taking-disaster-risk-management-new-heights).

Across Eastern Africa, women and girls are traditionally tasked to care for the old and the sick (Schatz et al. 2015; WHO, 2012). During disasters, women and girls are overwhelmingly tasked, with caring for the affected, chronically sick, children, the elderly, and people with disabilities (Ritchie, 2015). Therefore, decisions to evaluate before, during, or after a disaster is a difficult choice for most women and girls. The health implications for staying to provide care are numerous and severe and include sexual and domestic abuse and mental and physical health issues that affect them for years to come. For example, Le Masson et al. (2016) and Davis et al. (2005) reported that more women and girls become victims of domestic and sexual violence at home while those that seek refuge in temporary shelters and refugee camps are frequently sexually assaulted and are exposed to higher risks compared to male refugees. Social strains in these temporal shelters and refugee camps aggravate stress levels in the family, which in most cases result in incidences of domestic violence (Krause, 2020); Listo, 2018). Another example is that during droughts women and girls walk long distances to collect water for domestic use, spending about 8 hours/day and end up expending more than 85% of a woman's daily energy intake (UNESCO, 2020). The strain of walking eight hours carrying water usually on their head or back, leads to physical health problems (Geere et al., 2018; Geere et al., 2010).

On the extreme side, girls are increasingly becoming vulnerable during and after disasters. As earlier stated, girls also experience sexual and domestic abuse before, during, and after disasters. Girl child marriages have slowly been on the rise (Spencer, 2015; and North, 2010). In Madagascar, Kenya, Uganda, and South Sudan, climate change is driving early girl-child marriages. In these countries, families, especially those living in rural and marginalized places face financial difficulties from disasters like floods, droughts, and storms and decide to marry off their daughters, as young as 13 years (UNICEF, 2019; Lilian et al. 2015). More recently, the COVID-19 pandemic will force more than 13 million girls into early marriages (NYT, 2020).

In Eastern Africa, disasters affect people (both men and women, youth, PWD, and the elderly) of low socioeconomic status in both rural and urban settings. People living in unstructured housings usually in urban settings and peri-urban environments are more prone to flooding, sewage spillage, and pollution due to poor infrastructure development, and inadequate sanitation facilities. The most affected are cities such as Nairobi, Kampala, Dar es Salaam, Addis Ababa, Djibouti, Moroni, and Antananarivo that are rapidly expanding with poor or lack of access to sanitation and use of unsafe drinking water, which leads to about 88% of outbreaks from diarrheal diseases especially in the slum areas (Ssemugabo et al. 2021; Njuguna, 2019; Oyekale et al. 2018; Bastaraud et al. 2018; Beyene et al. 2015; Thomas et al. 2013; Prüss-Üstün et al. 2008).

There is differential impact of cyclones on women and men, poor and rich, young and old in Madagascar. This country experiences an average of 1.5 cyclones annually, the highest number in Africa, and each strong cyclone on average affects 700,000 people. Cyclone Ava in 2017 affected more women (25,950) than men (17,300). Cyclone Eloise devastated the livelihoods, homes, and lives of a million people in 2021, displacing over 8,000 women, children and elderly and forced them to live in temporary shelters. During this period, maternal mortality rates are high and more than 50% of children under the age of 5 become malnourished (OCHA, 2020).

Every two seconds an underage girl (12-15 years old) is forced into marriage across the globe. COVID 19 will add an extra 13 million child marriages (NYT, 2020).

Case study 4: Bee keeping for woman and youth to curb early girl child marriages and build resilience in Uganda

Alternating drought and heavy rains are wreaking havoc on families in drier areas of Uganda. Conflicts over scarce resources is straining relations amongst ethnic groups. In such situations, families experience food shortages and starvation and diseases outbreaks. Desperate families turn to early marriages for their daughters, usually to much older men. Church World Service (CWS) in collaboration with communities initiated bee keeping income generating activities and established village savings and loans groups (VSLGs). Bee keeping is an agricultural activity that can be carried out in arid and semi-arid areas, has limited environmental footprint, and families earn significant income by harvesting, processing and selling honey. Part of the income is saved in the VSLGs which builds financial stability and families can access it during droughts or floods and use to purchase food and drugs and thus accelerate their recovery after the disaster. This has stopped the families from marrying their girls at an early age and the girls are continuing with their schooling. Through this initiative, more community members have started bee keeping and established 14 savings groups, whose members are mostly women from female and widow-headed households.

Poverty, nutritional status, gender roles, and cultural norms shape survival capabilities during disasters in Eastern Africa. For example, in most of the communities in Eastern Africa, women and girls are expected to stay at home while older and young men venture out in search of alternative livelihoods (more often in urban centers). This makes women and girls poorer and vulnerable, and studies have shown that poverty is a determinant of nutrition and ill health. Poor people, especially women, children, girls, PWD, internally displaced persons, child-headed households, the landless, and the elderly do get predisposed to infectious diseases as they tend to work in harsh and polluted environments (especially after flooding) as well as tend to the sick (Waller et al. 2019; Suri et al. 2018).

Globally poor sanitation costs the economy an estimated US$ 223 billion. In Madagascar, Tanzania, Uganda and Kenya, the estimated costs are about US$ 103 million, US$206 million, US$177 million and US$324 million annually (Lixil et al. 2016).

Due to poverty levels, the nutritional status of the above-mentioned people/groups is very poor, and it affects their capacity to deal with disasters. Women and teen mothers fall ill very fast during and after disasters because they have specific nutritional needs when they are pregnant or breastfeeding. Additionally, in some cultures, women and girls are prohibited from eating certain nutritious foods and adhere to food-eating hierarchies (Kariuki et al. 2017; Golden et al. 2019; Chakona and Shackleton, 2019; FAO et al. 2018). For example, in Eastern Africa, women of reproductive age experience anemia and are below their normal weight (Teshale et al 2020; Kibret et al. 2019; WHO, 2019c). Therefore, poverty and nutritional status makes women, girls, and children at greater risk to their survival and recovery in the aftermath of disasters.

Globally, persons living with a disability represent 15% of the world's population (with 80% found in developing countries) and are usually among the first victims of natural disasters (iDAD, 2014). A study by UNIDSR (2014) identified five major disaster risks faced by PWD and in order of greatest impact, as floods, extreme weather, drought, earthquakes and cyclones. In Eastern Africa, there is limited information on disasters and PWD. Generally, this is due to lack of sex-disaggregated data more so on PWD as well as how to define people with disability (Lunga et al. 2019). Furthermore, PWD are often considered under medical model of disability, hence conceptualising disability as an individual health issue (Lunga et al. 2019) and solutions are geared towards cure rather than building resilience before, during and after a disaster. This study did not identify a policy legislations or framework for PWD in all the ten countries. Some of the policies that mention PWD as a target group include the East Africa Disaster Risk Reduction and Management Strategy for Burundi, Rwanda, Uganda, Tanzania and Kenya; under education sector, Kenya addresses disasters management for PWD under the Sector Policy for Learners and Trainees with Disabilities and the national Policy for Disaster Management.

Case study 5: Pastoral people with disability are shifting from relief to resilience in Ethiopia

Intermon Oxfam is collaborating with PWD amongst pastoral communities in Borana district, Ethiopia to shift from emergency relief to resilience. The aim is to ensure inclusive food security and early recovery during and after drought events. Working with village leaders and local government authorities, Intermon Oxfam conducted a baseline survey and identified PWD in each household. Through the program, PWD are receiving improved drought tolerant cattle, drought resistant crop seeds and re-stocking their goatherd. For the PWD who are able to undertake manual labor, they are employed as laborers in digging ponds and rehabilitating roads for cash.

3.4 Critical stakeholders in disaster risk reduction initiatives

Children and youth are agents of change and should be given the space and modalities to contribute to disaster risk reduction, in accordance with legislation, national practice and educational curricula (Sendai Framework 2015-2030).

The Sendai framework calls for a people-centred preventive approach to disaster risk and urges national governments to engage a wide range of stakeholders including women, children and youth, persons with disabilities, poor people, migrants, indigenous peoples, volunteers, the community of practitioners and older persons. The framework also calls for a multi-hazard and multisectoral, inclusive approach that targets private sectors, civil society organizations, academia and scientific and research institutions as well. In the next sub-sections, this study analyses how the DRR initiatives in the 10 countries in Eastern Africa are targeting the above-mentioned categories of people.

3.4.1 Women

Disasters have different effects for men and women. Their response to disasters is equally different. This reflects gender inequalities and social exclusion issues caused by socioeconomic conditions, cultural beliefs, and traditional practices that have repeatedly put women at a disadvantage. The situation is exacerbated by the multiple roles that women play within the society that also intensifies pre-existing response and recovery inequalities. These are especially true in Eastern Africa, where women typically depend on subsistence agriculture- a sector highly dependent on weather conditions; while formal remunerated jobs are often the exclusive domain of men. The systematic social and economic marginalization of women is also mirrored in the leadership sphere, where they are often excluded from decision-making processes and fora at multiple levels. The

Women have critical contributions to make towards disaster risk management.

problem is that DRM efforts tend to be gender blind, set at a male default, which often leaves women and in most cases girls suffering greater consequences. This exclusion reinforces inequalities, as women's voices and perspectives are not represented in decisions made on disaster risk reduction and preparedness.

Case Study 6: Gender mainstreaming and social inclusion perspectives are part of Kenya's national policy for disaster management

Kenya is highly prone to both natural (floods and droughts) and human induced (accidents, fires, civil unrest and conflicts, terrorism and industrial accidents) disasters. Therefore, reducing the impacts of disaster is high on the list of national priorities. The policy recognizes and acknowledges a wide range of vulnerable people including women, widows, children, visually, physically and mentally challenged, the elderly, and orphans; the sick; and those in need of psycho-social support, forensic/ health services, and other specialised needs/services during and after disasters. The policy makes provisions to enhance protection, safety and other needs of women and children in any disaster situation. In its monitoring and evaluation plan, the policy aims to integrate a gender and social inclusion lens in the monitor, evaluate, and analyse for the strategic proactive planning of DRR and throughout the management process of the disaster cycle. The policy is also linked to other legislations that target vulnerable groups in Kenya such as the Gender policy, Public Safety Act, Children's Act, HIV/Aids policy, Social Protection Policy, the Arid & Semi-Arid Lands Development Policy, National Peace Building and Conflict Management Policy. The policy also aims to mainstream disaster management education and build capacity of students at primary and secondary schools, colleges and universities and training colleges for uniformed forces and enhance capacity of vulnerable communities to withstand the adverse effects of disasters.

Out of the 155 DRR initiatives, identified and analyzed, 65 of them mentioned the word women. However, the women are further disaggregated into female-headed households, widows, single mothers, pregnant and lactating mothers who due to their multiple roles and responsibilities within the household and community, their meaningful engagement and participation is a critical ingredient in enhancing adaptive capacity and building resilience before and after a disaster event. This resonates well with the Sendai Framework that calls for promotion of leadership, capacity building and empowerment of women to enable them to prepare for and build their capacity after a disaster.

Understanding how gender relations shape the lives of women and men in Eastern Africa is critical to disaster risk reduction and management. This is because women's and men's different roles, responsibilities, and access to resources influence how each will be affected by different hazards, and how they will cope with and recover from disasters. In particular, unequal power relations between women and men mean that, despite the incredible resilience and capacity for survival that women often exhibit in

the face of disaster, they also experience a range of gender-specific vulnerabilities. This study found that national governments and other stakeholders are striving to strengthen gender equality and address poverty. Some of the DRR activities that targeted women before and after a disaster include:

- Provision of basic social services and security especially during conflicts, drought and floods
- Support for income generating activities
- Enhancing their skills and knowledge in resource management and sustainable livelihoods
- Capacity building to enhance their leadership capabilities
- To improve women's preparedness, response capabilities and recovery mechanisms
- Ensuring women and their children have access to clean water
- Training on nutrition especially for pregnant and breastfeeding mothers
- Counselling to relieve social and psychological stress

3.4.2 Children

In recent years, there has been calls to place children at the centre of efforts to reduce disaster risk. Reports indicate that children can, and do, play an active role in reducing disaster risks and therefore, protecting and engaging children before and during disasters should be an integral part of DRR and responses (Benson and Bugge, 2018). Since most of the children are expected to be in schools, UNESCO recommends promoting DRR through educational curriculum and programs (UNESCO/UNICEF, 2014). This will benefit not only the children, but their families, schools and wider communities (Hore et al. 2018). DRR initiatives should incorporate a child centered approach drawing from the notion that when children are empowered and supported, they can be better prepared to protect themselves and others, and also generate positive changes among their family and communities after a disaster (Hore et al. 2018; Benson and Bugge, 2018; UNESCO/UNICEF, 2014).

Children can both design and implement DRR initiatives to reduce risks and vulnerabilities (Hore et al. 2018).

Out of the 155 DRR initiatives identified, 55 of them mentioned children as target population.

DRR activities for children identified include:

- Establishment of school programs especially amongst the refugees and migrants
- Training teachers to prepare for disasters
- Training students to prepare for disasters
- Development of school curriculum on DRR to be taught to school children
- Training of emergency and relief staff on effective child protection responses in emergencies
- Providing students with the opportunity to continue their education during emergencies through provision of temporary classrooms (tents) and supplies
- Counselling children to relieve social and psychological stress
- Involving school attending children in food aid distribution and distribution of disaster-related materials, such as pamphlets and flyers to educate the community

Amongst the children, girls are specifically mentioned as a separate target group. The ages of the girls targeted ranges between 8-18 years. 21 of the DRR initiatives identified are targeting girls with the following activities:

- Provision of feminine sanitary products
- Training on safety measures before, during and after a disaster
- Training on hygiene practices especially for refugees and migrants

Case Study 7: Girls get equal: Responding to the needs of adolescent girls in refugee camps in Tanzania and South Sudan

Plan International is implementing a program called 'Girls get Equal' across 42 countries. Plan International works to strengthen communities' resilience and support the girl child's right to dignity and protection before, during and after disasters and conflicts. This is because girls are among the most at risk when disasters strike. Compounding effects of existing gender inequalities and discrimination and negative impacts of disasters, girls are more likely to drop out of school, suffer from violence and discrimination, marry early, become pregnant and lose their livelihoods. Additionally, girls take on adult responsibilities and roles during and after disasters.

Plan International supports girls' immediate needs and their rights by introducing girl-friendly spaces within the community and at school keeping them safe and allowing them to openly discuss key issues that affect them. The spaces are used by school attending girls, dropouts, pregnant or young mothers. Girls are provided with sanitary pads and training on sexual reproductive health and emotional support they need to recover from trauma.

Due to high dropout rates for girls during disasters, Plan International provides DRM measures before, during and after a disaster. For example, girls get quality formal and non-formal education, teachers are trained on DRM especially for girls, opinions and participation of girls in decision making is increased, provision of adolescent girl-friendly health information and services, to include mental health issues and sexual and reproductive health and rights and addressing gender-based violence in all its forms to improve security for adolescent girls.

3.4.3 The elderly

Ageing populations presents a challenge in Eastern Africa. Currently less than 5 percent of sub-Saharan Africa's population is aged 60 years, with projections of the elderly expected to rise to 10.4 percent of the total population by 2030 (UNPF, 2019). The rate of change will have significant implications for socio-economic conditions within sub-Saharan African countries and the challenge is heightened by the concurrent issues of increased disasters especially those that are weather related. Due to cultural practices,

care for the elderly continues in Eastern Africa, though tendencies of invisibility and marginalization of the elderly is emerging. During disasters, emergency response strategies and allocation of resources may be uneven, and the invisibility often results in the elderly being deprived of critical DRM resources. A study carried out by HelpAge International shows that less than 5 percent of humanitarian projects mentioned older people as a vulnerable group, and less than 1 percent included at least one activity that targeted older people (HelpAge, 2018). Additionally, older people are frequently sidelined from DRR training and other activities. 33 of the DRR initiatives specifically mentioned targeting the elderly in disaster preparedness and responses. However, the elderly are not disaggregated into male or female, which can lead to isolation and neglect for some of them especially women. Some of the activities that the elderly are involved in are:

- Provision of early warning information
- Training them to help their community in disaster preparedness and response
- Sharing their experiences with young children on how to cope with disaster situations
- Working as older volunteers after disasters strikes

Case Study 8: Intergenerational engagement between the elderly and youth in identifying needs and developing DRR strategies in Ethiopia

HelpAge International is working with the elderly to collect age-and gender disaggregated DRR qualitative and quantitative data aimed at building community resilience to drought in Ethiopia. In this community, old people have a wealth of knowledge on traditional strategies for managing drought that was getting lost they died and were not passing the knowledge to younger generation. To ensure that the elderly are not isolated and invisible, they are working alongside the youth to undertake risks assessment and DRR action planning. The elderly are able to share their traditional knowledge especially on experiences on livestock management, restocking of livestock and rangeland rehabilitation and combine with 'modern' technologies that the youth have learned in schools and colleges. The elderly play a critical role in identifying the most vulnerable as beneficiaries of the DRR activities, while prioritising interventions that would be most beneficial in building community resilience especially for women and widows.

3.4.4 People with Disability

Article 11 and 32 of the UN Convention on the Rights of PWD requires that PWD benefit from and participate in disaster relief, emergency response and DRR strategies (CRPD, 2007). However, due to stigma and various challenges that disability presents, PWD are often overlooked throughout the disaster management cycle, are seldom considered as important actors in disaster prevention and are excluded from the DRR decision making and planning processes (Gutnik and Roth, 2017; WCRWC, 2008). Yet, PWD are among the first category of victims of natural and human induced disasters (iDAD, 2014). They often do not receive early warnings and those that do receive, get the information too late. A

UN global study revealed that less than 25% of PWD are able to evacuate immediately without difficulty in the event of a sudden disaster, have someone to help them to evacuate and are aware of their community's disaster preparedness plan while only 14% are consulted during the preparation of disaster preparedness plans (UN, 2013).

PWD are not a homogenous group. It comprises of a wide range of people that cut across all other at-risk groups such as women, men, children, migrants, elderly and the youth.

43 DRR initiatives mentioned targeting PWD with the following activities

- Engaging PWD in planning DRM activities
- Empowering PWD through training on various DRM and responses
- Provision of disability equipment such as wheelchairs, walking sticks and hearing aids
- Building disability accessible infrastructure
- Training of emergency and relief staff on emergency aid and rehabilitation of PWD
- Creating self-employment through provision of credit to start up income generating activities.
- Developing special evacuation plans with the PWDs and engaging them in evacuation training.
- Training and creating awareness to the community of the situation of PWDs and what can be done

3.4.5 Indigenous people

Indigenous[6] people of Eastern Africa are often excluded in development and DRR processes. Within Eastern Africa, they reside in areas that are arid and Semi-arid, lands that are ecologically fragile with fewer opportunities, experience droughts that lead to food insecurities and lack access to early warning systems and information to reduce risk (UNESCO, 2018; Mamo, 2020; Izugbara et al. 2020; Kamanzi, 2019; Bahal'okwibale, 2017). These factors intensify disaster risks amongst the Indigenous people. The political landscape in Eastern Africa does not provide space for Indigenous people to participate in decision making processes and hence their needs and capacities to manage risks are often not taken into consideration (Jegede, 2015; Makoloo, 2015; ACHPR, 2005; Sigurdarson, 2009). The Sendai Framework underlines the importance of recognizing the roles and contributions of indigenous people in addressing disaster risk, particularly through their experiences and traditional knowledge (UNISDR, 2017). This is because Indigenous people are marginalized people, and the most likely to suffer serious and extreme impacts of disasters. Due to limited opportunities, the effects of disasters on indigenous people (especially the women, children and elderly) are far-reaching, on food security, education, mental and physical health.

6 Indigenous people are defined as "distinct social and cultural groups that share collective ancestral ties to the lands and natural resources where they live, occupy or from which they have been displaced (World Bank, 2020) such as Majang and Anuak in Ethiopia; Benet, Batwa, Karamojong and Basongora in Uganda; Ogiek, Sengwer, Yaaku Turkana and Samburu in Kenya.

Review of the 155 DRR initiatives found that 29 of them mention and target indigenous people. Some of the DRM interventions targeting indigenous people are:

- Establishing platforms for indigenous people to share traditional knowledge on disaster management
- Using participatory approaches to identify interventions and tackle disasters
- Advocacy programs to reduce girl child marriages and child soldiers
- Providing clean and safe water
- Building schools for children

3.4.6 Migrants

In 2019, UNHCR reported 3.6 million refugees and asylum seekers and by mid-2020, the Eastern Africa sub-region[7] hosted 7.7 million international migrants (UNHCR, 2020; UN DESA, 2020). Several factors are driving the migration including political tensions, conflicts (e.g., South Sudan, Ethiopia and Eritrea), extreme climatic events such as droughts and floods, food insecurity and poverty. The Sendai framework calls for governments to empower migrants in disaster risk management because they can *'contribute to the resilience of communities and societies, and their knowledge, skills and capacities can be useful in the design and implementation of disaster risk reduction'*. However, migrants who comprise of women, men, children and the youth, elderly and the poor are often ignored during DRR design and implementation. According to Guadagno (2015), these migrants face barriers to accessing early warning information, resources, and opportunities, which reduce their ability to prevent, mitigate, prepare for, cope with, and recover from natural disaster. Thus, they are often disproportionally affected by both natural and human induced disasters (Collins, 2013). Migrants who end up living in refugee camps are much more likely to be displaced by disasters because refugee camps are often located in remote areas with limited access by road and to infrastructure and the shelters cannot withstand natural disasters. For example, due to the floods of 2014 that destroyed roads to the camp, 47,000 refugees in Leitchuor camp in Ethiopia faced starvation because aid could not reach them (UNHCR, 2014).

Out of the 155 DRR initiatives identified, only 14 mention targeting migrants; Kenya (4), Ethiopia (2), South Sudan (5), Uganda (2) and Tanzania (1). Some of the DRR interventions that are provided to migrants by different organizations include:

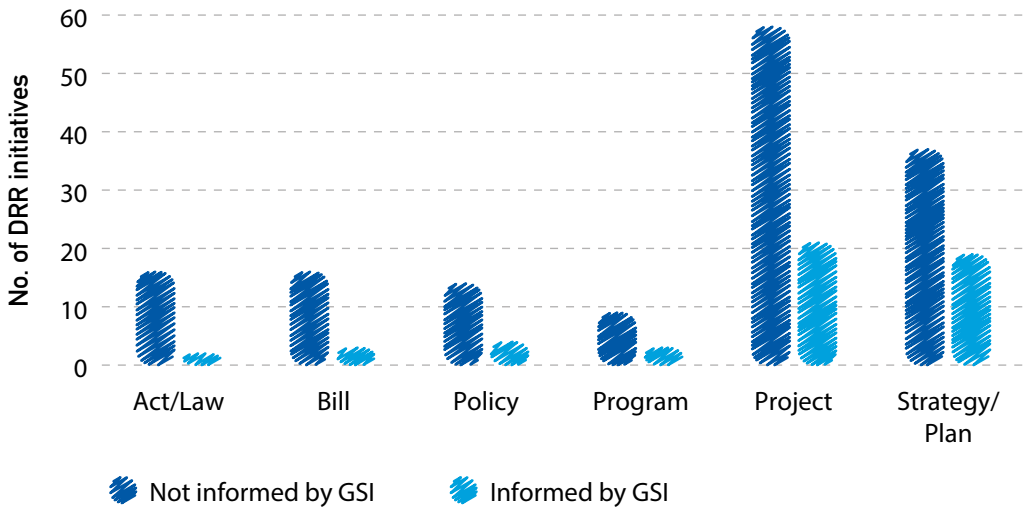
- Access to basic services and opportunities in camps
- Entrepreneurship/vocational training especially for women, PWD, youth and men
- Psychosocial counselling
- Life skills training
- Opportunities for children and adult education by establishing schools
- Empowering and creating the conditions for them to actively participate in DRR efforts

7 Statistics provided are from 18 countries, that is, Burundi, Rwanda, South Sudan, Uganda, Ethiopia, Eritrea, Djibouti, Kenya, Somalia, Malawi, Mozambique, the United Republic of Tanzania, Zambia, Zimbabwe Comoros, Madagascar, Mauritius and Seychelles

3.5 Integrating a gender responsive and socially inclusive lens into designing the DRR programs

Natural and human induced disasters affect men, women, children, PWD, the elderly and the Indigenous people differently. To address this, deliberate efforts must be put in place to ensure that everyone within the community participates and benefits equally from disaster risk reduction and recovery efforts. Gender responsive and social inclusive situational analysis or baseline is the first step in understanding the roles and responsibilities, and risk and vulnerability of each gender. This activity must be done before the design and roll-out of any specific DRR programme or project activities to ensure gender concerns are taken into consideration. Review of the DRR policies, programs, strategies and projects in Eastern Africa shows that 33.5% of them were informed by a gender and social inclusion situational assessment (Figure 1.16). This was identified in the introductory section of the DRR initiatives where mention of gender baseline analysis was used to inform the design of the DRR. None of the five surveillance tools was informed by a GSI analysis.

Figure 1.16: No. of DRR initiatives informed or not informed by GSI assessment (n=155)



Out of the 155 DRR policies, projects, strategies and programs identified, only 24.3% conducted a participatory process and included perspectives of men, women, children, PWD, the elderly and Indigenous people in DRR planning/steering committee. Participatory approach was assessed by reviewing which DRR initiatives were designed and implemented in conjunction with target beneficiaries and that the activities led to empowerment. This process encouraged beneficiaries to become involved in project/ program design and implementation. 8.4% of organizations implementing DRR initiatives hired a gender and social inclusion expert to collect, analyze and use sex-and gender disaggregated data in Rwanda, Uganda, Ethiopia, Kenya, Tanzania and Comoros.

The gender analysis conducted identified different roles and responsibilities that men, women, children, PWD, the elderly, and the indigenous people are involved in and used the data to inform the design and implementation of the DRR initiatives.

Capacity building on gender responsiveness and inclusion is essential to ensure that gender equality and social inclusion issues are effectively taken into account in DRR programs and project activities. Capacity building topics include:

- How to conduct a gender and social inclusion analysis as part of the disaster risk profiling
- How to address women's and men's needs within disaster risk reduction actions
- Gender responsive budgeting for activities specifically targeting women, children, PWD and the elderly

The national governments and stakeholders involved in the DRR projects and programs need gender competence in order to make it possible for them to integrate a gender and social inclusion perspective, from the initial analysis, to planning and setting objectives, in the implementation process and in monitoring and evaluation. The capacity-building efforts may also need to include stakeholders and beneficiaries.

A needs analysis of the type of capacity building which is necessary for different actors' needs to be carried out and a plan for implementation drawn up. Out of the 155 DRR, 28.5% included capacity building of the implementation staff and targeted beneficiaries as one of the activities.

Case Study 9: Community-driven isolation and contact tracing during epidemics in South Sudan

Communities, especially the elderly people have extensive knowledge of livestock and human local seasonal, endemic and epidemic diseases, their transmission, pathologies and symptomatic processes. Some of the diseases include tuberculosis, yellow fever, measles, cholera and sleeping sickness. Traditionally, communities in Aweil, South Sudan have tested methods of infectious disease management, isolation and hygiene practices and the interruption of surface viral transmission that are adaptable during disease emergencies. These practices became very useful to manage, prevent and interrupt transmission of the current COVID-19. For example, when a new disease breaks out, herbalists look at the symptoms and compare it with a past disease and how that disease was treated. While this is happening, all community members are advised to isolate in their homes and avoid sharing food and utensils between families. The sick are put in quarantine sites used to colloquially be known as 'the coughing house' and are cared for by an elderly woman.

Communities use different signals to show households that are under quarantine such as poles placed across the path, ashes sprinkled in a circle around the

contd.

quarantined household. In 1998, communities used these methods to contain breakout of yellow fever and cholera within a very short period of time. For example, the cholera of 1997, people organized rehydration salts, isolated infected people, buried their vomit and faeces, and used water and ash to wash people in contact with the sick. Traditionally, communities have extensive methods for case identification, contact tracing and minimizing surface transmission of viruses and bacteria, which became very useful during COVID-19 management. In Aweil, post-partum women and their babies were assigned specific cups and utensils, and discouraged from social gatherings for a month after birth to avoid COVID 19.

Lessons learnt from this community practices that can assist DRM is that a) tap into existing community epidemic management practices and histories, b) build community epidemiological knowledge that can support frontline caregivers.

3.6 Risk analysis and vulnerability profiling with a gender and social inclusion lens

Risk analysis and vulnerability profile means exploring the risks, vulnerabilities and capacities of different categories of people in society that can be impacted by a disaster. The inequalities and disadvantages faced by women, children, youth, elderly, migrants, PWD and indigenous people, particular their unequal access to resources, protection, decision-making and power means that they are more vulnerable to impacts of disasters. However, women, elderly and indigenous people also show remarkable resilience in the face of risk and disaster. Their knowledge of and responsibilities within the household and wider community can be critical in mobilizing communities to prepare for and to respond to disaster. Therefore, conducting a risk analysis and vulnerability profile with a gender and social inclusion lens will identify specific vulnerabilities to risk and disaster for men, women, children, youth, elderly, migrants, PWD and indigenous people, as well as aid in identification of their opportunities and coping strategies.

Out of the 155 DRR initiatives identified, 25.6% of them conducted a risk analysis and vulnerability profile. For example, Tanzania Emergency Preparedness and Response Plan (TEPRP) conducted a social and gender dimensions assessment and documented how rural women, youth, the elderly and men's livelihoods are affected by floods and drought. A program titled *'Community Managed Disaster Risk Reduction Approach in Managing Disaster in Uganda'*, conducted a gender-based differences in how decision-making power, ownership of, and access to assets influences how women and men respond to conflicts and ethnic violence. In Madagascar, a DRR project identified what sources of early warning information women, youth, PWD and the elderly have and how they use it to better prepare for a cyclone.

Case Study 10: Community resilience planning committees for disaster preparedness in South Sudan

South Sudan continues to face unprecedented levels of food insecurity, displacement of people, depletion of livelihoods and natural resources, intense and frequent climatic disasters including drought and floods. A project implemented by ACTED in collaboration with BRACED is working with communities especially women, youth and PWD to develop inclusive contingency plans to better prevent and respond to crises. Participation of vulnerable people is through formation of Community Resilience Planning Committees. The committees established Agro-Pastoral Field School (APFS) model in 27 villages (3,540 members) which engages and trains farmers and livestock keepers in climate resilient crop and livestock practices. The committees are also involved in participatory risk assessments and are collectively reaping the benefits of engaging in participatory disaster risk mapping and planning. Through a Cash for Assets activity about 3,500 households (including female-headed households, youth and widows) have set up Village Loans and Saving Association groups and have benefitted from cash transfers. The youth are involved in establishing dykes to prevent flooding and are rearing fish that they sell in the village (Source ACTED & BRACED: http://www.braced.org/

3.7 DRR initiatives addressing the needs of men, women, children, PWD, the elderly, indigenous people within strategic actions

The Sendai framework specifically target G calls for *'increasing the availability of and access to multi-hazard early warning systems and disaster risk information and assessments to people by 2030'* (UNISDR, 2015). Early warning systems must take into account gender differences thus reducing the need for women, the elderly and the Indigenous people to be 'rescued' (Fordham, 2011). In 1991 Bangladesh, early warning information about the cyclone and the subsequent floods was transmitted by men to men in public spaces. Women were not targeted, thus leading to more women dying than men (GFDRR, 2013; Ferris, 2010). On the other hand, no deaths were reported after Hurricane Mitch in Honduras because women were given early warning information (UNISDR, 2007). Therefore, engagement of women in early warning systems and other preparedness activities can go a long way in reducing the mortality rate amongst women, children and the elderly.

36.2% of the DRR initiative developed DRR actions in close consultation with target communities to integrate local knowledge and address the specific needs (both practical and strategic needs) of women, children, PWD, the elderly, migrants and indigenous people to access resources, assets and knowledge to be able to successfully take on new DRM approaches. In South Sudan and Eritrea, some of the DRR programs and projects

worked closely with target communities to ensure that the hard-to-reach categories of people, such as women, PWD, the elderly, and indigenous people have access to preparedness initiatives. 34.3% of the DRR initiatives made concerted efforts to identify the needs of and involve women, PWD, the elderly, and indigenous people in local DRM committees to increase their access to early warning messages and ensure that the most vulnerable people receive emergency relief. Composition of the DRM committees was done to ensure that the views of women, PWD, the elderly, and indigenous people were captured in institutional mechanisms for DRR planning and implementation. In Rwanda, during developing of the National Determined Contributions (NDCs), the government went as far as to provide leadership training especially for women who were part of the team that wrote the NDCs.

Case Study 11: African risk capacity's gender-responsive insurance payment for disaster in Africa

The African Risk Capacity (ARC), a specialized agency of the African Union was established to assist African governments to 'improve their capacities to better plan, prepare, and respond to extreme weather events and natural disasters'. This is done through mainstreaming a gender perspective throughout its operations, from ARC to communities that are hit by disasters. The ARC upholds the gender equality principle and systematically builds a gender perspective into its operations and policies with the goal of transforming DRM approaches to ensure gender equality for vulnerable women and men in Member States. ARC promotes identification of DRR actions for women and children and equal access to capacity building, mitigation and other adaptation initiatives. In 2021, ARC launched the Gender and Disaster Risk Management (DRM) platform (The Africa We Want) whose aim is to address the disproportionate impacts of weather-related and other natural disasters on vulnerable populations, which have resulted in devastating toll on lives and livelihoods.

In 2020, ARC distributed more than USD 61,000,000 in payouts for early responses and more than 2,100,000 vulnerable people assisted, of which 45% of the target population were women. In 2020, ARC paid Madagascar USD 2.13 million to cover anticipated losses to livelihoods of its vulnerable population from the crop failure. Since women and children provide most of the agricultural labor, 66% of the beneficiaries targeted women. ARC conducts gender mainstreaming capability building for the staff and national governments to enable them effectively integrate gender in their DRM processes. ARC also engages in sustained policy dialogue and advocacy for a gender transformative DRM policy environment across its member states. Rwanda, Kenya, Madagascar and Eritrea are members of the ARC.

3.8 Integrating gender and social inclusion lens into DRR response strategy including budgeting and M&E

Integrating a gender responsive and socially inclusive lens into DRR response strategy implies that gender-based differences and social exclusion issues are considered in the design of the policy, strategy, plan or programme, and gender equality is promoted in its response measures as well. Review of the collated DRR initiatives shows that only 33.8% of them were prepared using a collaborative approach based on inclusive consultation with a range of national, and sub-national stakeholders from government, private sector, civil society, NGOs, CBOs, and academic organisations. The overarching principles and DRR actions were informed by a gender analysis, vulnerability assessment and needs for different categories of people was carried out at community level. This is important because a gender responsive and socially inclusive DRR must start with a clear understanding of the community and their needs, and work from that knowledge to develop effective, and inclusive responses.

8.4% of the DRR initiatives had a gender specialist in the organizational staff team. The gender specialist carried out gender and risk analysis and acted as liaison with community members especially women and PWD and helped develop the GSI DRR plans and activities. The DRR initiatives were mainly projects and programs that created a staff position for a gender specialist to ensure that gender and social inclusion issues are integrated into DRR actions.

15.8% of the DRR initiatives developed a GSI communication method to reach men, women, children, PWD, the elderly and indigenous people. A good GSI communication method implies that gender stereotypes are not perpetuated and allows men and women to be on equal footing. Some of the good practices of GSI communication for DRR are; including perspectives of women, youth, the elderly and PWD in decision-making positions and including perspectives of women and men who challenge expected gender roles. For example, the project in northern Kenya trained women to be first responders during disasters. Their main responsibilities are to ensure that women, girls, and the elderly receive information on disasters and actively participate in DRM project activities. I n Rwanda, a NGO uses local women's organizations as an entry point to engage the hard-to-reach women such as widows, female-headed households.

22.9% of DRR initiatives identified used gender-sensitive indicators in their M&E frameworks to aid in tracking how different DRR measures or interventions impact the lives of men, women, children, PWD, the elderly and indigenous people (Table 1.5) The gender-sensitive indicators are also used to assess whether progress is made towards gender equality and if corrective measures are needed (i.e., numbers of men and women and their forms of participation, such as whether they hold decision- making positions, who takes up the resilience-enhancing practices and their perceptions of the success of the practice). For examples, Turkana County in Kenya has outlined a GSI monitoring and evaluation framework that comprehensively and explicitly integrates gender in their country monitoring and evaluation (M&E) systems. The framework provides guidance to ensure that gender is fully integrated throughout the M&E system for appropriate collection, compilation, analysis, dissemination, and use of gender data for decision-making.

Table 1.5: Gender-sensitive indicators for Disaster Risk Reduction in Eastern Africa

Expected results for DRR initiatives	Indicators
Make DRR a national priority	• The national DRR policy has a gender equity policy that supports women's full and equal participation in DRR planning and leadership opportunities. • Number of representatives with gender expertise who sit on the National and local DRR Platforms/ coordinating mechanisms. • DRR policies, plans and strategies are prepared based on sex-disaggregated data and gender analysis.
Improving risk information and early warning	• Numbers and percentages of disaster related databases with sex- disaggregated data. • Number of deaths, injuries and displacements caused by disasters, disaggregated by sex, age and hazards. • No, of women, elderly and PWD representatives consulted and contributing to vulnerability assessment and identification of DRR actions • Percentage of women and men who can swim or who have life saving and emergency skills. • Number and percentage of women and men who own land and other assets that can help them build resilience after a disaster. • Perception of risks from women, elderly and PWD living in hazard- prone areas included in the risk assessments and mapping. • No. of women, youth, men, elderly ad PWD with gender expertise who are part of the risk assessment teams

Defined as the *"application of gender mainstreaming in the budgetary process that involves conducting a gender-based assessment of budgets, incorporating a gender perspective at all levels of the budgetary process, and restructuring revenues and expenditures in order to promote gender equality* (EC, 2001), a GSI budgeting process is an important tool to improve the transparency, accountability, effectiveness and efficiency of the management of finances (UN Women, 2014). A GSI budgeting process also provides for a more equitable distribution of financial resources for men, women, children, PWD, the elderly and indigenous people (UN Women, 2014; UNDP, 2018) and an opportunity to systematically identify gender inequities and social exclusion attributes of DRR measures and allocating adequate resources to activities to address these inequities.

Review of the 155 DRR initiatives, only 9.4% of the initiatives mainstreamed a GSI budgeting process in their projects. This demonstrates that not much substantial progress has been made in budgeting for GSI interventions into disaster risk reduction processes. The DRR initiatives that included a GSI budgeting process had a separate budget line for gender-related actions, for example to conduct awareness-raising on the importance of including women, children, PWD, the elderly, Indigenous people and men as part of DRR decision-making bodies. These DRR initiatives are implemented in Ethiopia, Kenya, and Rwanda.

Case Study 12: Mainstreaming GSI into DRR governance structures in Kenya

The disaster landscape in Kenya is characterized by various natural hazards, particularly drought and floods. Other common hazards include landslides, epidemics, HIV/AIDS and human conflict. Over time, the frequency and intensity of disasters has increased due to a number of factors including climate change, widespread poverty and rapid population growth especially in the urban centers.

With support from UNDP, a national gender responsive DRR platform was established to support the Government in coordinating disaster issues at the national level. The principal disaster risk management institutions are the National Drought Management Authority (NDMA) and National Disaster Operation Center. All staff in the two institutions are trained on skills and knowledge in the various aspects of gender mainstreaming into DRR operations. A gender expert seconded from the Ministry of Gender forms part of the staff. The NDMA provides a contingency funding during emergencies for women, children, elderly and PWD. The institutions make deliberate efforts to ensure that both women, men, elderly, PWD, girls and boys participate and benefit equally from disaster risk reduction and recovery efforts. Gender analysis is done before the roll-out of any specific programme or project activities to ensure gender concerns are taken into consideration. To address historical marginalization and the burden of disaster impacts on women and indigenous people, some stand-alone disaster risk reduction and recovery projects are considered.

The two DRR institutions works with several partners to design and implement DRR interventions such as public and private sectors, civil society and grass root organizations. Communities, especially women and PWD who are direct beneficiaries of DRM activities actively participate in the design, implementation and monitoring of DRR projects. There is public participation in developing policy, guidelines and DRM information through various communication channels so that women, youth, PWD, indigenous and the elderly people can actively participate. The communication channels include local radios, local chief barazas, videos, religious places, social media, SMS and door-to-door campaigns. The institutions have developed an elaborate integrated and gender responsive monitoring and evaluation mechanism (UNDP, 2020).

STRENGTHENING OF GENDER-RESPONSIVE REGULATORY FRAMEWORKS, POLICIES AND INSTITUTIONS FOR DRR IN EASTERN AFRICA

The Eastern Africa sub-region is vulnerable to natural and human induced disasters such as cyclones, drought, earthquakes and floods. Every year a variety of disasters occur in Eastern Africa and these are becoming more prevalent (Molua et al. 2020). For example, since 2008, drought has claimed many lives with more than one third of the population affected in Eritrea, Kenya and Djibouti. The cyclones experienced in Madagascar and Comoros have had a devastating impact on the country and its people, including the displacements of over half a million people of which 55% are women, the destruction of homes, schools and health facilities (Saholiarisoa, 2018). Since 2013 conflicts in South Sudan has killed about 383,000 and nearly four million people have been internally displaced or fled to neighboring countries as refugees (CFR, 2020).

An estimated 31% of the displaced and refugees in South Sudan are children (UNHCR, 2020). More recently, the Tigray conflict in Ethiopia has claimed over 52,000 lives and more than 3 million (more than 45% are female) have been forced to flee their homes (Marks and Gebre, 2021; UN 2021). While still recovering from the various disasters, COVID-19 hit affecting the livelihoods and economies of Eastern Africa Countries (Gondwe, 2020). It will take years and sometimes decades to recover from such disasters. In some instances, recovery from economic loss cannot be recouped because of existing poverty levels, gender inequalities and limited access to quality services (CARE, 2019).

Before, during and after a disaster, the needs of girls, boys, women and men, PWD, and the elderly people are different and distinct. Women and girls are affected differently than men and boys, as such their vulnerabilities are often exacerbated by other factors such as age, disability, caste, ethnicity and/or religion. Gendered social norms, roles and responsibilities and persisting social structures contribute to heightened risks for children, adolescent girls, PWD, the sick, single women, female-headed households, pregnant and lactating women, elderly and indigenous people.

The Sendai Framework for Disaster Risk Reduction (SFDRR) commits to targeting the most vulnerable in situations of disasters especially, women, children and youth, PWD, the elderly, migrants and indigenous people. The SFDRR further stresses that the participation of people disproportionately affected by disasters (especially women and the poorest) in DRR is critical to effectively manage the disaster risk. Countries that are signatory to the Sustainable Development Goals (SDGs) have also committed to reach and transform the lives of women, girls and other people who are highly vulnerable to disasters. The UNISDR Strategic Framework (2016-2021) equally commits to making DRR gender responsive and socially inclusive, including persons with disabilities and targeting all stakeholder within DRR spaces. Additionally, the UNISDR strategic framework aims to enhance operational performance based on appropriate gender-sensitive structure and staffing.

Eastern Africa countries have enacted DRR legislations that are linked to SFDRR, SDGs and the UNISDR Strategic Framework. Therefore, it is important that the legislations place greater emphasis on gender responsive and socially inclusive DRR. Evidence from implementation of various policies, projects and programs in Eastern Africa, demonstrates that increasing women's participation and leadership in all economic sectors is critical for sustainable development (Agarwal, 2018; Dhatt et al 2017). Legislations and regulatory frameworks are therefore needed to build on and harness the knowledge of women and other socially excluded groups, identify their needs and actively engage in implementing DRR interventions.

Review of DRR legislations and regulatory frameworks in Eastern Africa shows that they are based on integrated and comprehensive procedures providing for prevention, warning, preparedness, management, relief, recovery and development measures. A total of 46 legislations were identified in the 10 Eastern Africa countries. Kenya had the highest number of legislations (29) due to the devolved system of governance. Uganda, Rwanda and Ethiopia each have 3 legislations, while Comoros and Tanzania have 2 each. The rest of the countries, that is Djibouti, Eritrea, Madagascar and South Sudan have one DRR legislation.

Despite that all the 10 countries recognizes the SFDRR and the SDGs, there is limited gender mainstreaming and social inclusion aspects in the DRR legislations. Using the criteria on Figure 13 for analyzing DRR initiatives with a GSI lens, out of the 46 legislations identified, only 32% of them mention the words, gender, gender mainstreaming/ integration, inclusion, women, youth, PWD, elderly, the poor, migrants, indigenous people and children (Figure 1.17).

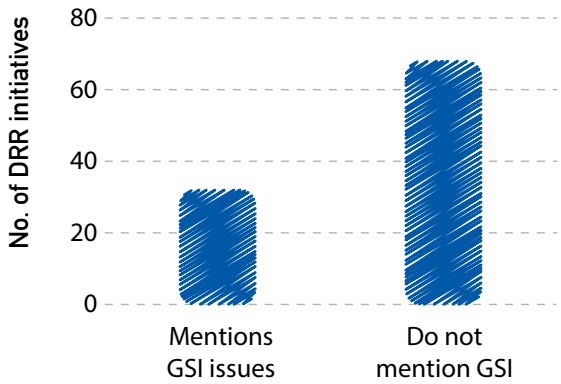


Figure 1.17: Percentage of DRR legislations that mention or do not mention GSI perspectives (n=46)

Out of the 32% that mention gender and social inclusion issues, 35.6% of them pledges to mainstream gender into DRM interventions and explicitly recognizes gender as an important component for successful implementation. These legislations emphasize on conducting a gender analysis, an engendered risk and vulnerability profiles capacity building and women and youth leadership, inclusion of traditional DRR knowledge, increased participation of women and other vulnerable groups and the collection and use of sex and age disaggregated data. The rest (67.4%) mention the words gender and women but have no clear implementation mechanisms provided to integrate a GSI into the DRR legislations.

In terms of institutions and implementing structures, all the national government institutions for implementing DRR are governed from the designated Ministry or Prime Minister's office. A permanent body or Institution exists for management, coordination, implementation and support of DRR programs and actions under the authority of the

Minister or Prime minister e.g., National Disaster Risk Management Commission and the Fire and Emergency Prevention and Rescue Authority in Ethiopia, and the National Drought Management Authority and the National Disaster Operation Center in Kenya. These institutions have the responsibility of implementing the DRM and post-disaster recovery policies, plans and strategies.

18% of the identified DRR legislations mention training of staff on skills and knowledge in the various aspects of gender mainstreaming into DRR operations. In terms of gender experts, only Kenya's policy recommends secondment of a gender expert from the Ministry of Public Service and Gender to support the institutions in mainstreaming gender and social inclusion into DRR. It is evident that GSI gaps exist in the current DRR legislations and policy frameworks. However, as Eastern Africa sub-region continues to experience disasters, there is an urgent need to integrate GSI into DRR, incorporate risk reduction measures in current and future plans. There is also an urgent demand to train and empower institutions, to be able to mainstream GSI into DRR and eventually eliminate pre-existing vulnerabilities and increase resilience towards future hazards and the effects of natural disasters.

ROADMAP FOR MAINSTREAMING GENDER-RESPONSIVE AND SOCIALLY INCLUSIVE ACTIONS INTO DRR POLICY DEVELOPMENT PROCESSES

The proposed roadmap is largely informed by the overarching Sendai Framework, SDGs, review of scientific literature on gender responsive and socially inclusive DRR; policies, projects and programs documents on DRR; and related reports from governments and development partners, that is, NGOs and CBOs. The roadmap aims to mainstream GSI into DRR policy development processes while at the same time strengthening the role of the national governments and other actors in addressing gender and social inclusion perspectives in risks and hazard preparedness (Figure 1.18).

A gender responsive and socially inclusive DRR provides important insights into the foremost significance of women, PWD, the elderly, IDPs and migrants in DRR and management, and their risks and vulnerabilities. The roadmap proposes key DRR actions that can be implemented at different levels, sub-national, national and regional levels to ensure resilient communities, build the enabling institutional environments that can promote GSI mainstreaming, promote the centrality of GSI for the DRR interventions and develop capacity that can strengthen national efforts for an inclusive and equitable adaptive, resilient and transformative economy.

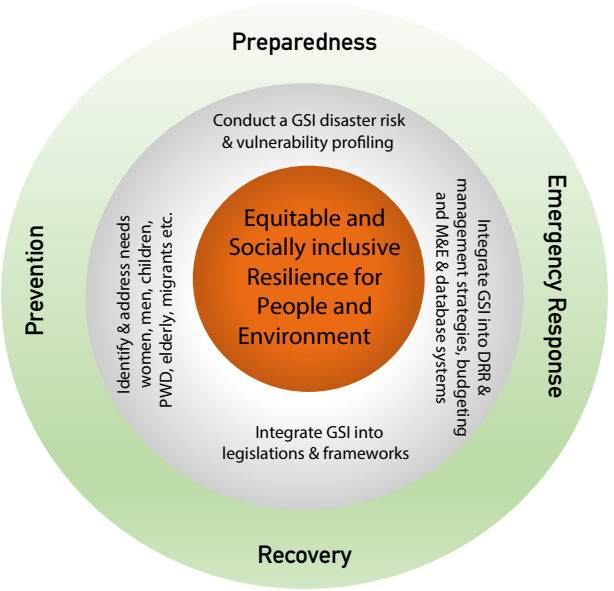


Figure 1.18: Roadmap for mainstreaming gender-responsive actions/ measures into DRR policy, program and project development processes

The roadmap is expected to:

- Enhance resilience to natural and human induced risks and shocks on the social, environmental, political and economic aspects of the economy
- Contribute to the strengthening of governance and institutional coordination for effective GSI implementation of the DRR interventions at sub-national, national and regional levels
- Identify and incorporate 'best practices' on DRR strategies that can reduce vulnerability, increase adaptive capacity, address specific risks related to each hazard, explore GSI specific opportunities in the context of each hazard

Figure 1.18 illustrates gender equality and social inclusion elements that need to be considered when designing national DRR policies. It is aligned to the Sendai framework, SDGs and some of the national DRR policies and strategies identified during this study. The inner most circle represents the overall goal of DRR and management policies, projects and programs. It aims at ensuring an equitable and socially inclusive resilience (capacity to absorb and recover from disasters) for the people and the environments in which they derive their livelihoods. The middle circle provides the four main areas that national governments can integrate GSI (see Table 6 for more details). The outer circle represents the four priority areas of DRR and management, which is understanding disaster risk, strengthening disaster risk governance to manage disaster risk, investing in disaster risk reduction for resilience and enhancing disaster preparedness for effective response and to "Build Back Better" in recovery, rehabilitation and reconstruction (UNISDR, 2015).

Some national governments and organizations have mainstreamed GSI into DRR strategies and policies. At the Eastern Africa regional level, IGAD's has a Regional Strategy and Action Plan for Mainstreaming Gender in Disaster Risk Management and Climate Change Adaptation (IGAD, 2020) and a Gender Strategy and Implementation Plan 2016– 2020 (2015). The gender strategy and implementation strategy are both aligned to the IGAD DRM strategy (2019), the Sendai Framework and the SDGs. At the national level, Uganda National Policy for Disaster Preparedness and Management acknowledges that women and children are most vulnerable to the effects of disaster and they bear the brunt of the disasters. The policy aims to conduct gender analysis and understand the implications of gender roles in disaster preparedness and management. Kenya's DRR policies and strategies mention gender equality and inclusion of different people such as women, youth, PWD and marginalized people (GoK, 2019). In so doing, Kenya's DRR plans are devolved to the Sub-national level to enable community participation. Equally, Ethiopia had decentralized her DRR strategies with the aim of strengthening households, communities and local authorities to manage and adapt to disasters and other risks, thus reducing their vulnerability, humanitarian and economic impact, as well as irregular migration and forced displacement (FDRE, 2013).

Table 1.6: Roadmap for ensuring equitable and socially inclusive resilience for people and environment before, during and after a disaster

Strategic Problem 1: Lack of evidenced based gender and social inclusion data on vulnerability and risks to inform policies, plans, programs and projects	
1. Conduct a gender responsive and socially inclusive disaster risk and vulnerability assessment/ profiling	1.1 Carry out gender and social inclusion analysis as part of the vulnerability and risk profile and collect sex and gender disaggregated data 1.2 Document the cultural and social dimensions of disaster management and responses (e.g., How are rural and urban women, widows, teen mothers affected by floods or droughts? 1.3 Document the age and gender-based differences/similarities in decision-making and power 1.4 Document ownership of and access to assets especially those needed for disasters prevention and preparedness

	1.5 Identify the different sources of information especially early warning information for different people/groups 1.6 Identify the existing coping strategies for different people/ groups 1.7 Document the different roles that women, youth, the elderly, migrants, refugees, girls, children, boys, PWD and men play in disaster preparedness, prevention, management, response and recovery 1.8 Document the different stakeholders involved in DRR and management and their mandates 1.9 Hire GSI experts to undertake the vulnerability and risk assessment with a GSI lens 1.10 Train the DRR team on gender responsive and socially inclusive DRR 1.11 Create awareness and strengthen the capacity of policy makers (from grassroot to national) to always ensure that gender equality and social inclusion is mainstreamed throughout the DRR processes
Strategic Problem 2: Lack of understanding as to who is the most vulnerable to the impacts of disasters and how to reach them	
2. Identify and address the needs of women, men, children, PWD, migrants the elderly, etc.	2.1 Identify the different vulnerable people/groups at different levels (community, sub-national, national) and in different locations (urban, rural and peri-urban) undertaking different livelihoods (farming, fishing, formal and informal employment, manufacturing etc. 2.2 Identify and address the needs and opportunities of all the different people/groups 2.3 With community members, establish community led DRR management committees that are gender balanced and socially inclusive 2.4 Strengthen the capacity of women, elderly PWD to be actively involved in the grassroot, sub-national and national DRR and management committees 2.5 Identifying NGOs, CBOs, religious groups, private sectors and other relevant stakeholders that are working on DRR and are representing the interests of women, children, PWD, youth, the elderly etc. 2.6 After identifying the hard-to-reach people (such as widows, extremely poor and the elderly), design equitable and socially inclusive DRR strategies with them. 2.7 Develop a sex and gender disaggregated database to document damage loss. This will assist in revising DRR and management strategies

Strategic Problem 3: Lack of equitable and socially inclusive policies, projects and programs that addresses the needs of different people/groups that are vulnerable to the effects of disasters	
3. Integrate GSI into legislations and frameworks	3.1 Develop and implement a gender and social inclusion DRR policy 3.2 If a DRR policy already exists that has some elements of GSI, develop and implement a GSI implementation framework to support the policy 3.3 Create awareness and/or capacity of the policy makers on how to design DRR policies with a GSI lens 3.4 National governments should ensure that gender equality and social inclusion is one of the guiding principles of the DRR policy or strategy 3.5 The vision, mission, objectives, outputs and outcomes of DRR projects and programs should outline how they will achieve gender equality and social inclusion especially for women of all ages, social and economic status. literacy levels in order to build their resilience 3.6 National governments should make a commitment to reduce the gender and social inclusion gap between women, youth, PWD, elderly, children, migrants, refugees and men by detailing actions to empower each and everyone 3.7 The DRR and management strategies should make a commitment to identify and finance specific interventions for women and girls in all social and economic spaces 3.8 The DRR policies and strategies should make commitments to include hard-to-reach people, women, youth, PWD, elderly, children, migrants, refugees and men throughout the decision-making processes 3.9 The DRR policies and strategies should make commitments to include hard-to-reach people, women, youth, PWD, elderly, children, migrants, refugees and men with DRR and management strategies and interventions 3.10 The DRR policies and strategies should increase their women and girls, PWD and the elderly's access to early warning messages through appropriate channels 3.11 The DRR plans should ensure that prevention, preparedness, recovery and response interventions are developed in close consultations with affected populations especially women and girls 3.12 The DRR plans should integrate traditional and local knowledge on DRR management identified during gender and social inclusion analysis 3.13 The DRR plans and strategies should aim to identify interventions that ensure increased access to resources and eliminate labor burdens especially for women, PWD, the elderly and girls 3.14 Develop a GSI checklist that policy makers can use to monitor implementation of DRR interventions at all stages 3.15 Develop a sex and gender disaggregated DRR digital database to enable policy makers monitor implementation of DRR interventions at all stages

Strategic Problem 4: Limited consideration of GSI perspectives in DRR strategies, budgeting and Monitoring and Evaluation systems	
4. Integrate GSI into DRR & management strategies, budgeting and M&E & database systems	4.1 National governments should ensure that GSI work is part of the DRR design and implementation plan 4.2 Develop GSI indicators (checklist) for implementing, monitoring and evaluating DRR plans and, 4.3 Build the capacity of governments officers and other relevant stakeholders on how to implement and monitor DRR plans with a GSI lens and use the GSI indicators (checklist) 4.4 Cultivate a gender sensitive and socially inclusive culture within the responsive Ministry, departments and institutions by conducting training and re-training programs to ensure that new staff are well versed in mainstreaming GSI into DRR 4.5 Ensure that the DRR plans, and interventions are informed by the gender and social inclusion analysis and, the vulnerability and risk assessment 4.6 Categorise allocation of financial and technical resources as follows: a) resources to address the gender inequalities and social exclusion, b) resources to address the promotion of gender equality, c) resources allocated towards capacity development for mainstreaming GSI in DRR, d) resources towards increased participation for women, youth, PWD and other vulnerable groups in DRR 4.7 Hire a GSI expert to work closely with the DRR team 4.8 Ensure that everyone in the society is represented, that is, women, youth, PWD, elderly in the DRR management committee 4.9 Organize DRR committee meetings suitable to all the public members e.g., different meetings for women, youth, elderly, civil society and private sector 4.10 Develop appropriate early warning and communication messages and channels to reach all the public especially the women, PWD and other vulnerable people 4.11 Monitor the DRR plans by using GSI indicators, to track how different interventions impact the lives of women, youth, children, men, PWD, girls, boys and different socio-economic groups 4.12 Use the GSI indicators (checklist) to assess whether progress is made towards gender equality and social inclusion and evaluate whether corrective measures are needed 4.13 Set up mechanisms for collecting feedback from women, youth, elderly, men, PWD and other vulnerable people 4.14 Identify 'best practices' case studies to identify who is benefiting the most from the DRR activities and scale it up

CONCLUSIONS

Reviewed literature shows that loss and damage due to disasters is on the rise in Eastern Africa and has grave consequences for the survival, dignity and livelihood of the citizens. This is more so amongst the women, men, children, people with disability, migrants, the elderly, youth, girls, IDPs, refugees and the poor where disasters are deepening and entrenching poverty, gender inequalities and social exclusion. Disasters, especially those related to climate change and political and ethnic conflicts are eroding most of the developmental gains made. This, compounded by increasing vulnerabilities related to changing demographic, unplanned urbanization especially within high risk zones, environmental degradation, geological hazards, competition for scarce resources and the impact of epidemics such as COVID-19 points to a future where disasters could increasingly threaten the economies of Eastern Africa countries and its population, especially the ones that are already vulnerable.

The complexity of disaster-induced problems require an engendered comprehensive and coordinated disaster risk reduction and management policies, projects and programs. This report identified various DRR policies, projects and programs (initiatives) being implemented across the ten countries in Eastern Africa. Findings show that most of the DRR initiatives do not have a gender and social inclusion lens. The few that have mainstreamed a GSI lens are ensuring that DRR interventions address the gender-differentiated needs of women, children, youth, PWD, the elderly, men, IDPs and the refugees and take measures to transform their lives. This means taking actions to address both immediate practical needs of women, children, youth, PWD, the elderly, men, IDPs, the refugees and their longer-term strategic interests. The actions also entail taking measures to ensure that women and girls are protected from violence, particularly since this threat is known to increase during and after disasters, both within and outside the home.

In conclusion, DRR initiatives, especially the policies and legislation framework should re-orient local, sub-national and efforts to address disaster in a more gender responsive and socially inclusive approach. The proposed roadmap constitutes the fundamental basis for achieving gender equality and social inclusion policy goal and promoting sustainable development through disaster prevention, preparedness, response and recovery.

Analysis of The Enabling Policies and Institutions for Artificial Intelligence and Citizen Science Applications in Disaster Risk Reduction in Eastern Africa

ABSTRACT

The Eastern Africa region is prone to weather-related and geological hazards that have happened in unexpected scale in the recent past. Floods in Kenya and Rwanda, drought in the Greater Horn of Africa, the 5.9 magnitude earthquake that hit North West Tanzania and, lately, COVID – 19 pandemic are some of the recent disasters whose impacts are still being felt in the region. One way of enhancing the overall awareness and responsiveness to disasters is to combine citizen science and artificial intelligence (AI) approaches, which would help bridge the distance, in time and space, between citizens and authorities in those crucial first few moments following the disasters. While technological advancement and innovation have created new opportunities for enhancing disaster resiliency and risk reduction, these technologies are limitedly used in Eastern Africa, hampering efforts for the development and implementation of state-of-the-art and sustainable disaster risk reduction (DRR) and preventive solutions. The objective of the study was to assess the extent to which existing regional and national DRR strategies, legal instruments, programmes and initiatives in Eastern Africa incorporate and use modern technologies (such as AI) and citizen science in disaster responses.

The study covered the following eleven countries: Comoros, Djibouti, Eritrea, Ethiopia, Kenya, Madagascar, Rwanda, Somalia, South Sudan, Tanzania, and Uganda. 41 policies/strategies and plans that are being implemented in the Eastern Africa region were reviewed and analysed through AI and citizen lens. Policy-related documents were sourced from the countries' DRR focal persons and online sources for analysis. UN level existing tools such as Capacity for Disaster Risk Initiative (CADRI) Capacity Assessment and Planning tool, and the Guide for Integrating DRR into Climate Change Adaptation (CCA) and United Nations Development Assistance Framework (UNDAF) guided further analysis. In recognition of the requirement for policy coherence across the 2030 agendas (Sendai Framework, the Sustainable Development Goals and Paris Agreement), the study also reviewed a number of 'development' and 'climate change adaptation' related policies and frameworks. The study also analysed institutions responsible for the design, implementation and scaling up of DRR technologies.

Droughts and floods were the most common natural hazards reported by the policy/strategy documents followed by epidemics. Landslides were reported in the Ethiopia, Kenya, Rwanda and Uganda policy/strategy documents. Cyclones were mentioned in Madagascar, Somalia and Djibouti documents while volcanic eruptions were prioritized in the policy documents of Djibouti, Ethiopia and Rwanda. The results showed that only five DRR Strategies/plans/policies are fully adopted and actively implemented in the region. These are Ethiopia (2013), Kenya (2017), Madagascar (2016), Djibouti 2005) and Rwanda (2013). With regard to CCA Strategies/plans/policies, drought and floods are the primary focus of the documents that are guided more systematically through sectoral coordination than the DRR Strategies/plans/policies. The results indicate that DRR is institutionalized with a dedicated agency responsible for the DRR functions with coordination mechanism involving a variety of stakeholders such as the UN, NGOs, line ministries, and donors. Generally, the institutions responsible for environment are coordinating the implementation of CCA policy/plans while DRR is implemented by institutions associated with the Prime Ministers' Office as in the Case of Uganda or a stand-alone Ministry of Disaster Management as seen in Rwanda. The main actors

reported in the documents are government line ministries from agriculture, water, forestry, energy, education and health sectors. A number of gaps, however, are notable in the frameworks that need to be highlighted. A number of the policies have yet to be updated as required by the Sendai Framework such as Uganda (2010) and Djibouti (2005) so that they can account for the current and emerging dynamics in disaster risks such as; urbanization, climate change, poverty, population growth; and, environmental degradation among others. The scope of hazards covered in some documents is narrow such as in Kenya's DRM policy while others have not accounted for the underlying drivers of the disaster risks. There is limited coherence of the DRR and CCA Strategies/plans/policies only recognizing that climate change is projected to increase the intensity and frequency of the disaster events but the documents fail to provide a mechanism for analysing the projected impacts from climate change.

The study has revealed that none of the documents refer to the use of citizen science and AI. Reference to use of technology such as Geographical Information System (GIS) is mentioned in a few documents such as the Disaster Risk Management Policy for Ethiopia. Generally, the CCA Strategies/plans/policies were found to have more references to gender than the DRR frameworks. Given that the DRR and CCA have inter linkages in addressing drought and floods that are prevalent in the region, there is need for greater coherence in their implementation.

INTRODUCTION

1.1 Background

Africa continues to have some of the world's fastest growing economies with Sub Saharan Africa being home to several of these countries. The continent has registered positive progress in many fronts in the last one and half decades including economic growth; increasing macroeconomic stability; a steady expansion of the private sector; advances in communication technology; and, progress towards gender equality and women empowerment[8]. Despite this positive narrative, Africa remains the most vulnerable continent to disasters, with nearly all nations in Eastern Africa among the most at risk[9]. The high vulnerability and exposure has been attributed to: rapid population growth; fast but poorly planned urbanization; environmental degradation; and, climate variability and change[10]. For instance, in early 2019, the region witnessed the most devastating disasters on record due to tropical cyclones Idai and Kenneth, which left behind over 1000 deaths, in addition to causing damages and destruction to assets and livelihoods[11]. Droughts, floods, earthquake, locust infestation and epidemics are also prevalent in the region. The COVID-19 Pandemic[12], which was declared a Public Health Emergency of International Concern by World Health Organization in early 2020, is another challenge the region is facing with enormous cascading socio economic impacts. All these are testimony to the continent's continued vulnerability to disasters.

The design and implementation of effective Disaster Risk Reduction Strategies is one of the tools the countries in Eastern Africa are using to combat recurrent and future disaster risks through multi hazard approach. This can be seen in prevention, preparedness, response and recovery as well as reconstruction. The Sendai Framework for Disaster Risk Reduction (SFDRR), which was adopted in 2015 along with the Sustainable Development Goals (SDGs) and the Paris Agreement, are mutually reinforcing and guiding countries to achieve sustainable development. The DRR strategies aim to reduce existing and future risks and achieve 'the substantial reduction of disaster risks and losses in lives, livelihoods and health in the economic, physical, social, cultural and environmental assets of persons and businesses, communities and countries[13]'. The SFDRR recognizes that DRR is crosscutting development agenda that needs coherence with other development frameworks, thereby requiring collaboration and cooperation with a wide range of stakeholders, including scientists and the local communities to help governments in its implementation. The importance of science and technology is recognized in the Sendai Framework in production of risk knowledge, information and solutions from inputs from various disciplines such as economics, social sciences, engineering and, health. It requires that the scientific and technology domains to work

8 UNDP Regional Programme Document (2018-2022)
9 Global Assessment Report, 2019
10 Global Risk Assessment Report, 2018 & UNDRR, 2020: Integrating Disaster Risk Reduction and Climate Change Adaptation in the UN Sustainable Development Cooperation Agreement
11 UNOCHA Cyclone Idai and Kenneth Situation Reports
12 Africa has recorded over 1 million cases and 21, 000 deaths as per WHO situation report of 6TH August 2020.
13 UNDRR, 2015: The Sendai Framework 2015-2030 has one goal, seven targets and four priorities for Action.

closely with governments as well as other stakeholders in developing and sharing usable and useful risk information. It further advocates for finding solutions needed to save lives, reduce disaster losses and achieve societal resilience.

The role of science and technology is clear in many parts of the SFDRR (see in detail paragraphs 25 (g); 27 (e), 28(a), 28(b), 28 (c), 31 (a), 31 (c), etc.). Some of the provisions for science and technology in the SFDRR include:

- Mobilization and coordination of existing scientific networks to strengthen evidence-base for implementation of SFDRR.
- To support campaigns and public education on DRR.
- Dissemination of risk information with use of best geo spatial technology
- Provision for methodologies and standards for risk assessment, disaster modelling and use of data.
- Contribute to update of the 2009 UNISDR terminology on DRR.
- Foster partnerships, periodically share progress on implementation of risk-informed policies, programs and investments.
- Promote coherence across systems related to sustainable development, CCA and DRR.
- Promote cooperation among academic, scientific and research entities and the private sector to develop new products to help reduce disaster risk.

Integrating science and technology in disaster response actions and enhancing capacities is therefore critical for building resilience.

1.2 Rationale for AI and citizen science in DRR

The natural hazards that materialise into disasters in the Eastern Africa region are mainly hydro-meteorological such as floods, drought, wildfires, storms and landslides. Additionally there is also Seismic risk, desertification, infrastructure failure, accidents, epidemics and land degradation - all of which have caused loss of lives, human displacements, economic losses and damage to livelihoods. The scale and intensity of these disasters is expected to escalate with climate variability and change as well as rapid population growth and poorly planned urbanization. This calls for concerted efforts to identify measures that reduce disaster risk, while preparing for and responding to disasters and climate change in a comprehensive manner.

One way of enhancing the overall awareness and responsiveness to disasters is to combine citizen science and artificial intelligent approaches, which would help bridge the distance, in time and space, between citizens and authorities in those crucial first few moments following the disasters. For quick and efficient response, as well as for recovery after any natural or artificial catastrophe, one of the most important things are accurate and reliable spatial data in real or near real-time. It is essential to know the location as well as to track and analyse passive and active threats to quickly identify the possible dangers and hazards. As technology evolves and advances, there is a broader spectrum of sensors that provide spatial data. For quicker and enhanced integration and analysis of data, AI tools are increasingly used which, in addition to immediate

rapid reactions, can help to make better and smarter decisions in the future. Such software algorithms that imitate human intelligence can help in generating conclusions from natural phenomena presented by spatial data[14]. Using AI in the data analysis can identify risk areas and determine future needs. While technological advancement and innovation have created new opportunities for enhancing disaster resiliency and risk reduction, these technologies are limitedly used in Eastern Africa, hampering efforts for the development and implementation of state-of-the-art and sustainable disaster risk reduction (DRR) and preventive solutions.

1.3 Objectives

The objective of the study was to assess the extent to which existing regional and national DRR strategies, legal instruments, programmes and initiatives in Eastern Africa incorporate and use modern technologies (such as AI) and citizen science in disaster responses. These findings will help develop a roadmap for integrating citizen science, AI and technology in DRR policy frameworks in Eastern Africa. The study also mapped institutions in charge of DRR in the targeted countries.

1.4 Definition of terminologies

1.4.1 Artificial Intelligence (AI)

AI may be defined as, "The ability to hold two different ideas in mind at the same time and still remain with the ability to function.[15]" It is a branch of computer science, which deals with the study, and design of intelligent agents that perceives its environment and takes actions, which maximize its chances of success by building computer programs that exhibit intelligent behaviour similar to human beings. AI includes the learning from experiences, reasoning for the decision-making, inference power and quick response. AI also must be able to take decisions based on priorities and tackle complexity and ambiguity. Machines programmed to carry out tasks, when carried out by humans would require intelligence, are said to possess artificial intelligence. AI has been used for example in weather forecasting by developing an intelligent weather-predicting module that incorporates weather/climate variables for analysis. An intelligent weather prediction is possible based on available data using AI learning techniques.

14 IviÐ, M. 2019. Artificial intelligence and geospatial analysis in disaster management. International Archives of the Photogrammetry, Remote Sensing & Spatial Information Sciences. Vol. XLII-3/W8, p161-166. 6p

15 Gyanendra Singh, Ajitanshu Mishra, Dheeraj Sagar (2013) an overview of Artificial Intelligence. SBIT Journal of Science and Technology

1.4.2 Citizen science

Citizen science refers to the engagement of the members of the public in data collection and analysis, as a collaborative effort with professional scientists[16]. It is a transdisciplinary collaboration between scientists and community volunteers, who are responsible for data collection and analysis to help in decision-making. For example, in many countries around the world, there is public education in collecting meteorological data and processing which has resulted in improved public awareness and risk knowledge. Recently it has been applied in Malawi to improve EWS where the public were involved in installation of rain gauges, trained in data collection and re-afforestation[17]. Citizens communicate the risk information using radios, Short Text Message, smart phones, emails and twitter among other channels.

The role of citizen science in promoting resilience to disasters is adequately recognized in the SFDRR 2015-2030 in two fronts. First, as an important source of wisdom on teaching the world on living with harmony with nature and second, on addressing the needs of the indigenous people who often are the most vulnerable, marginalized and threatened by disaster risks around the world. Indigenous knowledge is the basis of coping capacities that have helped local communities survive calamitous events over centuries[18]. Given that there is evidence of increasing frequency and intensity of hazards in Eastern Africa region driven by rapid urbanization and population growth, there is wisdom in recognizing the indigenous knowledge to solve local problems from disasters and climate change. Reliance on a balanced application of technological solutions and the indigenous knowledge presents a cost effective approach to tackling these risks.

16 Marchezini, V. et al., 2018: A review of studies on participatory Early Warning Systems: Pathways to support citizen science Initiatives

17 Marchezini, V. et al., 2018: A review of studies on participatory Early Warning Systems: Pathways to support citizen science Initiatives.

18 Shaw, R., et al. 2008: Indigenous knowledge in disaster risk reduction policy note. The policy note was discussed in the International Workshop in Kyoto in July 2008, followed by the Side Event in the Kuala Lumpur Ministerial Meeting in December 2008. Comments from all the participants in these events are highly acknowledged, with special reference to P. Dhar Chakrabarti, Jessica Mercer, Julie Dekens, Ilan Kelman, Derek Elias, Peter Bates and Christel Rose.

METHODOLOGY

2.1 The analytical framework for the study

The study covered the following eleven countries: Comoros, Djibouti, Eritrea, Ethiopia, Kenya, Madagascar, Rwanda, Somalia, South Sudan, Tanzania, and Uganda.

The two types of policy documents considered in this report are 'disaster risk reduction' and 'climate change adaptation'. In some instances 'Development' documents, where available, were also considered. 'Development', is the broadest of these categories, defined by the United Nations General Assembly as, 'a multidimensional undertaking to achieve a higher quality of life for all people.'[19] Development policies in the region often set the overarching policy direction that countries intend to adopt. 'Disaster Risk Reduction' (DRR) policies, plans or strategies are documents aiming at 'preventing new and reducing existing disaster risk and managing residual risk, all of which contribute to strengthening resilience.'[20] Climate Change Adaption (CCA) involves 'adjustments in ecological, social, or economic systems in response to actual or expected climatic stimuli and their effects or impacts.'[21] A number of parameters were utilized to analyse the policies, strategies, and initiatives (Table 2.1).

Table 2.1: Framework for the analysis of DRR policy frameworks and legal instruments

Dimension	Measurement
Type of framework	Act of Parliament, policy, strategy, plan or project document, full title of the framework.
Status of adoption	Draft/Design stage, implementation stage, actively implemented with mechanism established at national level for implementation.
Typology of disasters addressed by the framework	Hydro meteorological: floods, drought, etc. Epidemics: animal diseases, human diseases, etc. Geological: Tsunami, earthquake, landslides, etc. Environmental: Soil erosion, invasive weeds, etc.
Disaster cycle the policy is addressing	Mitigation, preparedness, response/relief or recovery and, reconstruction phase
AI and citizen science approaches	Identification of AI and citizen science approaches promoted by the policy/strategy/plan. Scope of AI approaches include: Geospatial technologies, remote sensing; open data; communication technologies, information-sharing technologies; etc. Suggestion of entry points for inclusion of the policy

19 See http://undocs.org/en/A/RES/51/240.
20 See https://www.undrr.org/terminology/disaster-risk-reduction.
21 See https://unfccc.int/topics/adaptation-and-resilience/the-big-picture/what-do-adaptation-to-climate-change-and-climate-resilience-mean.

Dimension	Measurement
Institutional landscape	Mapping and analysis of main actors engaged in DRR and their capacity needs for scientific organization including using AI and science-evidenced approaches. Institutions and where available the AI and citizen science approaches promoted for effective DRR by the stakeholders. Type of institutions would be government, NGO, UN agency, private, research organization, or academia. Institutional sectors include: Water and sanitation; agriculture and food security; energy; health; environment and climate change; Disaster management; and, tourisms.

The documents were sourced from the countries' DRR focal persons and online sources. UN level existing tools such as CADRI Capacity Assessment and Planning tool, and the Guide for Integrating DRR into CCA and UNDAF guided further analysis. In recognition of the requirement for policy coherence across the 2030 agendas (Sendai Framework, the Sustainable Development Goals and Paris Agreement), the study also reviewed a number of 'development' and 'climate change adaptation' related policies and frameworks. Climate Change and Adaptation policy frameworks and programs from the eleven countries were also analysed through the AI lens owing to the intersectionality of a number of activities between the two fields. The study also analysed institutions responsible for the design, implementation and scaling up of DRR technologies. These included government ministries and departments, civil society and private institutions operating at global, regional, sub-regional, national and sub-national levels.

RESULTS AND DISCUSSION

3.1 Overview of the policy and institutional landscape in the region

A total of 40 policies/strategies and plans that are being implemented in the Eastern Africa region were reviewed and analysed through AI and citizen lens across the DRR, CCA and planning sectors. The total number of DRR strategies were 15 (37.5%), CCA were 21 (52.5%) and 'planning' had four (0.1%) documents. Droughts and floods were the most common natural hazards reported by the policy/strategy documents followed by epidemics. Landslides were reported in the Ethiopia, Kenya, Rwanda and Uganda policy/strategy documents. Cyclones were mentioned in Madagascar, Somalia and Djibouti documents while volcanic eruptions were prioritized in the policy documents of Djibouti, Ethiopia and Rwanda (See Appendix 3 for details).

The results showed that only five DRR Strategies/plans/policies are fully adopted and actively implemented in the region. These are Ethiopia (2013), Kenya (2017), Madagascar (2016), Djibouti (2005) and Rwanda (2013) (See Appendix 2 for details). With regard to CCA Strategies/plans/policies, drought and floods are the primary focus of the documents that are guided more systematically through sectoral coordination than the DRR Strategies/plans/policies. Given that DRR and CCA have interlinkages in addressing drought and floods that are prevalent in the region, there is need for greater coherence in their implementation. Generally, the institutions responsible for environment are coordinating the implementation of CCA policy/plans while DRR is implemented by institutions associated with the Prime Ministers' Office as in the Case of Uganda or a stand-alone Ministry of Disaster Management as seen in Rwanda. The main actors reported in all the documents are government line ministries from agriculture, water, forestry, energy, education, health, sectors.

3.2 Country analyses

3.2.1 Comoros

The Comoros is small Island State with an estimated population of about 750,000 people. Like many Small Island States (SIS), The Island of Comoros is particularly vulnerable to the effects of climate change manifested in the form of temperature rise, sea level rise, intense tropical cyclones, floods and ocean acidification. The ambitious INDC of Comoros seeks to reduce Green House Gas (GHG) emissions in 2030 by 84 % compared to the emissions projected same year accordance to reference year. The activities to cut down these GHG emissions requires investment of about USD 675 million with government committed to pump about 10% from the national budget. The climate change (CC) mitigation and adaptation measures are expected to contribute to poverty reduction and sustainable development while providing adequate solutions to CC challenges in the country. The Ministry of Production, Environment, Energy and Industry and Handicrafts coordinates the implementation of CC actions in the Comoros. The only identified document for Comoros was the country's Intended Nationally Determined Contribution (INDC, 2015). The INDC seeks to cut emissions in the Comoros by 85 % in 2030. With

limited capacity of the nation, much of the investments for the mitigation actions will come from development partners. The INDC of the Comoros is based on its accelerated Growth and Sustainable Development Strategy. The overall objective of the INDC is to contribute to poverty reduction and sustainable development while providing adequate solutions to CC challenges

3.2.2 Djibouti

DRR/M measures in Djibouti are coordinated through the National Strategy for Risk and Disaster Management (Loi Portant Politique Nationale de Gestion des risques et des Catastrophes), promulgated in 2005. The Ministry of Interior and Decentralization provides overall DRR/M coordination in the country. The strategy creates three inter-connected committees governing DRR/M, namely the Inter-ministerial Committee, made up of various existing ministries; the Inter-sectoral Technical Committee; and, the Regional Disaster Management Committee, which brings together provincial disaster authorities, as well as creating a DRM secretariat to coordinate DRM efforts. The scope of natural hazards the strategy addresses include droughts, earthquake, floods, epidemics, accidents, environmental degradation, fires and volcanic eruptions. The strategy identifies a number of vulnerability factors exacerbating the impact of these disasters such as land degradation, urbanization, poverty, weak infrastructure and conflicts. There is no reference to the use of AI nor technology in the fight against disasters in the country.

While Djibouti has not yet developed a NAP governing its approach to climate change adaption, it has committed, through its 2005 NAPA, to introduce climate change adaptation strategies. Djibouti's NAPA (like its 2015 INDC) makes commitment to developing a holistic approach to climate change, including through coordination-focused institutional planning aimed at increasing resilience.[22] It also commits to better managing pastoralism and agro-pastoralism through the creation of agro pastoral perimeters, and clear routes for pastoral movement.[23] One of its three core components moreover aims at improving Djibouti's response to the risks posed by those hydrological disasters exacerbated by climate change. However, there is no mention of use of citizen science and AI nor use of technology in this framework. Policy documents identified for Djibouti include:

- National Strategy for Risk and Disaster Management (2005) - National DRR strategy creating a disaster risk management framework. Mainly aimed at setting out which institutions and ministries are responsible for disaster risk reduction and response.
- National Adaptation Program of Action (2015) - Brief NAPA setting out the broad structure of Djibouti's response to climate change. Aims to strengthen institutional capacity and coordination in responding to climate change; improve water management; improve responses to the hydrological risks exacerbated by climate change

22 Government of Djibouti MHUE 'Soutien à l'adaptation au changement climatique des communautés rurales en régions montagneuses de Djibouti' (2005) at p. 1.

23 'Le développement du pastoralisme et de l'agropastoralisme par la création de périmètres agro-pastoraux, le renforcement des périmètres existants à l'aide d'équipements solaires, la mise en défens, la création de 2 pastorétums' Ibid at p. 2.

3.2.3 Ethiopia

Ethiopia's DRM policy that was adopted in 2013 documents main hazards that are affecting the country which are floods, droughts, human and livestock diseases and forest fires with earthquakes and volcanos as minor. It points out that the frequency and intensity of these hazards has escalated because of climate change, poorly planned urbanization, high population growth and poverty. The Federal Republic of Ethiopia has fully institutionalized the DRR in the country, which is spearheaded by the National Disaster Risk Management Council (NDRMC). A national DRM policy for Ethiopia aligned to the global HFA is being implementing to reduce disaster risks in Ethiopia. The country has an active national multi stakeholder DRR platform that is operational. A parliamentary caucus on DRR is active in the country to coordinate and advocate on various DRR issues among the policy makers. For proper implementation of the policy, the following sectors and line ministries are involved: Federal government of Ethiopia, the ministries of agriculture, health, environment and forestry, water and irrigation, education, mines, urban development and defense. The Federal National Disaster Risk Management Council (NDRMC) in the Prime Minister's Office has the overall mandate to coordinate DRR/M in the country in collaboration with the line ministries and other stakeholders. Regions, Woredas and the local zones are required to undertake various activities from monitoring to response to disasters. The Disaster Management Council, chaired by the Prime Minister provides the overall leadership of DRR/M in Ethiopia. There is no reference to use of science and technology including citizen science in the policy but there is mention on the involvement of the citizens and women in DRR/M in Ethiopia.

With regard to CCA, Ethiopia has a National Adaptation Plan (NAP), developed in 2018, that identifies agriculture, industry, urban, water, transportation, power and forestry as the most vulnerable sectors to climate change.[24] In convergence with the DRR/M policy, NAP-Eth posits that droughts, floods, livestock diseases, human epidemics, pest infestation, hailstorms and wild fires are major climate –induced hazards that have affected millions of Ethiopians since 1965 with the worst being the 1983 drought that killed over 300,000 people.[25] To bolster socio economic resilience in the country, the NAP seeks to ensure Ethiopia mainstreams climate change adaptation into the country's long-term development plans and sectors including disaster risk management.

The overall coordination of NAP-Eth falls under the ministry of Environment, Forest and Climate Change (EFCCC). The ministry works in tandem with the ministries of Agriculture and Natural Resource, Livestock and Fishery Development; Industry; Water, Irrigation and Electricity; Transport, Ministry of Housing and Urban Development and other sectors, commissions/ agencies, research and academic institutions, NGOs, CSO, and private sector actors at federal and regional levels. The Prime Minister's Office provides overall inter-ministerial coordination in the country including up to the Woredas, with a communication plan targeting all segments of society including scientists, youth and women. Use of geo-referenced data sets on GIS layers linking project sites with outcomes, the use of knowledge products as well as use of gender-disaggregated data is emphasized in the document.[26] The plan seeks to address only drought and floods.

24 Government of Ethiopia 'National Adaptation Plan' (2019) at p. 5.
25 NAP Ethiopia P.18
26 P 39

Ethiopia has the following development, DRR and climate change related policies:

- Disaster Risk Management Policy-Eth (2013) - Drought, floods, epidemics, fire and pest infestation among others are mentioned as the most serious hazards causing disasters. The frequency and intensity of these hazards is projected to escalate with climate change, rapid and poorly planned urbanization, high population growth and poverty.
- National Adaptation Plan–NAP-Eth (2019) - NAP-Eth seeks to strengthen the country's adaptation strategy and create a climate resilient development. Agriculture, forestry, water, energy, Transport, urban, industry, health and education are the prioritized sectors. It aims to strengthen holistic integration of CCA in Ethiopia's long-term development pathway, supported by effective institutions and governance structures, finance for implementation and capacity development and strengthened systems for disaster risk management and integration among different sectors.
- Ethiopia's Nationally Determined Contributions (NDC) - Ethiopia's NDC contains targets of reductions in the net greenhouse gas emissions by 2030. The report also contains initiatives to reduce the vulnerability of its population, environment and economy to the adverse effects of climate change, based on the CRGE, all of which are likely to trigger human mobility within and outside the country

3.2.4 Kenya

Kenyan's DR/M policy was adopted in 2017 while the accompanying legislation is due for debate in the National Assembly. The policy documents a comprehensive list of disasters in the country including drought, floods, landslides, sandstorms, thunderstorms, windstorms and epidemics. Others are infrastructure failure, accidents, fire, terrorism, conflicts and environmental degradation.[27] Resources for implementing DRR and roles of stakeholders including the county governments are provided in the policy. It provides mechanisms for proactive management of risks through mitigation, preparedness and early response to crises.[28] Besides resources for DRR/M, a coordination mechanism and allocation of roles and responsibilities to various stakeholders including the county governments are provided in the policy. Overall coordination of DRR/M in Kenya is under the National Disaster Operation Centre (NDOC) under the ministry of Interior while the National Drought Management Authority (NDMA) in the Ministry of Devolution, coordinates drought risk management matters in the country. The role of other government sectors and ministries is clearly spelt out in the policy and it does not refer to use of science and technology including citizen science in building resilience in Kenya.

Kenya has several policies, strategies and legal frameworks that are guiding climate change actions. These are: the National Climate Change Strategy (2008); National Climate Change Action Plan (2018-2022); National Climate Change Act (2016); National Climate Change Policy (2018); National Climate Change Fund Act (2018); and, National Adaptation Plan and National Adaptation Programme of Action among others. Generally,

27 P 19
28 P 7

these frameworks acknowledge the reality of Kenya's changing climate, its vulnerability and the consequences thus calling to urgently develop mitigation and adaption measures.

Kenya's NAP documents past drought impacts from 1983 to 2011/2012 period that have led to devastating socio-economic consequences including disaster displacements29. In these periods, government and stakeholders provided humanitarian assistance to about 16 million people affected by the droughts over the 1998-2011 period. All the ASAL counties, which constitute 80 per cent of Kenya's land mass, are listed as high-risk or drought prone areas. Flood is another hazard recognized in NAP Kenya with Tana River, Western Kenya, Kano plains, urban areas and some ASAL counties most at risk and with fatalities constituting about 60 per cent of disaster victims and triggering losses of about 5.5 per cent of GDP. The floods are reported to damage critical infrastructure such as roads, bridges, water pipes, housing and power lines all of which can trigger displacement of populations.

The NCCAP Kenya (2018-2022) proposes a comprehensive institutional framework with defined roles of the stakeholders in the context of a devolved government system that includes the establishment of a National Climate Change Council domiciled in the Office of the President, a Climate Change Directorate under the ministry responsible for climate affairs, and a Technical Advisory Committee within the proposed Directorate[30]. Application of science and technologies as enablers of adaptation and mitigation actions is fully recognized in NCCAP. There is reference to promotion of gender responsive technologies related to information services, clean energy and climate services by various research organizations to strengthen resilience31. However, there is no specific reference to use of citizen science or artificial intelligence in implementation of these policies. Climate change and DRR-related policies and strategies found are in Table 2.2.

Table 2.2: Policies and strategies related to DRR & CCA in Kenya

Policy/Strategy	Description of the policy documents
National Disaster Risk Management Policy (2017)	The policy requires key sectors to mainstream DRM into their sectors such as education, health, agriculture and food security. It provides mechanisms for proactive management of risks through mitigation, preparedness and early response to crises.
National Drought Management Authority Act (2016)	The Act establishes the National Drought Management Authority and defines its duties and powers. The Authority shall be a body corporate based in Nairobi, but the Authority may establish offices in other counties. The functions of the Authority shall include, among other things: exercise overall coordination over all matters relating to drought management including implementation of policies and programmes relating to drought management.

29 P 20
30 P 8
31 P 104

Policy/Strategy	Description of the policy documents
Climate change Response Strategy (2010)	Kenya's National Climate Change Response Strategy was the first national policy document on climate change. It seeks to advance the integration of climate change adaptation and mitigation into all government planning, budgeting, and development objectives
Climate Change Act (2016)	The objective of the Climate Change Act is to "Enhance climate change resilience and low carbon development for sustainable development of Kenya." The Act establishes the National Climate Change Council (Section 5), Climate Change Directorate (Section 9), and Climate Change Fund (Section 25).
Climate change Policy (2018)	The National Climate Change Framework Policy aims at ensuring the integration of climate change considerations into planning, budgeting, implementation, and decision-making at the National and County levels, and across all sectors.
National Climate Change Action Plan (NCCAP) (2018-2022)	Kenya's second five year NCCAP was adopted in 2018 in fulfilment of the Climate Change Act that requires the country to periodically develop action plans to support mainstreaming of climate change actions into development pathways. NCCAP seeks to advance Kenya's development by providing mechanisms to achieve low carbon climate resilient development in key priority sectors.
National Adaptation Plan (2015-2030)	Kenya's National Adaptation Plan 2015-2030 (NAP) was submitted to the UNFCCC in 2017. NAP provides a climate hazard and vulnerability assessment, and sets out priority adaptation actions in the 21 planning sectors in MTP II. It adopts institutional structures set out in the Climate Change Act - the high level National Climate Change Council and Climate Change Directorate to coordinate adaptation actions.
National climate change fund Act (2018)	The National Climate Finance Policy promotes the establishment of legal, institutional, and reporting frameworks for access to, and management of climate finance. The goal of the policy is to further Kenya's national development goals through enhanced mobilization of climate finance that contributes to low carbon climate resilient development goals.
Kenya's Nationally Determined Contribution (NDC) (2016)	Kenya's NDC as required by the Paris Agreement of the UNFCCC commits the country to ensure enhanced resilience to climate change towards the attainment of Vision 2030 by mainstreaming climate change into the MTPs and implementing mitigation and adaptation actions. The mitigation contribution "seeks to abate its GHG emissions by 30% by 2030 relative to the BAU scenario of 143 MtCO2eq." Achievement of the NDC is subject to international support in the form of finance, investment, technology development and transfer and capacity development.

3.2.5 Madagascar

Madagascar has a DRR/M that was adopted in 2016 coordinated by the National Council for Risk and Disaster Management in the Prime Minister's Office in collaboration with other government sectors and stakeholders. The Prevention and Management Unit of Emergencies (CPGU) provides permanent Technical Secretariat Services to the National Council of Risk and Management. The major hazards the policy addresses includes cyclones, flooding, drought, locust invasion and fires which aggravate the pre-existing vulnerabilities. The policy recommends use of experts from different fields to develop tools for diagnostic risk analysis and the development of multi risk maps of different regions drawn from local universities such as University of Madagascar and Ankatso University.

The policy has established a National Platform for DRR that provides avenue for stakeholders to engage and share experiences and knowledge in terms of good experiences and lessons learned. Among the agencies, allocated roles by the strategy include the line ministries, UN agencies, NGOs and development partners. The policy allocates various roles and responsibilities to these sectors and line ministries to implement specific risk reduction measures in line with the Sendai Framework. There is no specific reference to use of artificial intelligence and citizen science in the implementation of the strategy. The country is in the process of developing the NAP through a participatory and inclusive process spearheaded by the Ministry of Climate Risk Management. Climate change and DRR-related policies and strategies found include:

- National Management Strategy of Risks and Disasters (2016-2030) - The Strategy, 'Stratégie Nationale de Gestion des Risques et des Catastrophes 2016-2030' was endorsed in 2016 and runs up to 2030. It is aligned to the Sendai Framework and seeks to address a range of hazards including cyclones, drought, floods, earthquake and epidemics among others.

3.2.6 Rwanda

On average, Rwanda's economy grew by 6.1 per cent between 2013 -2020 with key sectors showing resilient growth in the backdrop of global economic recession and turbulence. Among the many challenges that contributed to slowing of economic growth in Rwanda was climate change and disasters[32]. The Vision 2050 commits to integrate a number of crosscutting themes including gender, disability and social inclusion, HIV and AIDS, and disaster management, environment and climate change[33].

Rwanda's National Disaster Risk Management Plan endorsed in 2013 seeks to strengthen DRR systems in the country in order to preserve life and reduce suffering associated with disasters by providing timely early warning and information to populations at risk on potential hazards. The Plan focuses on the following hazards: drought, floods, mass movements, terrorism, fires, animal and human diseases, earthquake, volcanic activity and industrial and technological accidents[34]. The Ministry of Disaster Management and Refugees affairs (MIDIMAR) provides overall coordination and implementation of the

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33 ix
34 P 11

policy in the country supported by relevant government sectors, UN systems, NGOs and academia[35]. In recognition of the shared responsibility of DRR, the policy allocates specific roles to various sectors and stakeholders such as MIDIMAR (storms and heavy rains), health (epidemics), Trade & Industry (industrial accidents) and food insecurity/ famine to agriculture among others. The role of the UN system, Red Cross/Red Crescent and NGOs is recognized as well in the document.

On gender considerations, the policy requires the support of gender working group to support integration of gender into all DRR actions and commits to develop guidelines on mainstreaming it into DRR operations. In particular, the policy seeks to *"Increase women's participation in programme and project coordination and secure equal access to relief assistance between men and women; Increase awareness of the public, governmental institutions, development partners and media on gender sensitive vulnerabilities and capacities in disasters and gender specific needs and concerns in disaster risk reduction and management; Ensure women and men's equal access to early warning systems and, to; Build and enhance the capacities of professional communities and pertinent national institutions to enable gender mainstreaming into all development sectors[36]."*

On use of science and technology, there is some references on its application by MIDIMAR in its application in damage and loss assessments in "planning to establish a Disaster Management Information System (DMIS), which aims at setting up GIS hazard maps for Rwanda's common natural hazards. A disaster database will allow data on hazard type, damage caused and mortality and morbidity to be recorded by disaster event.[37]"

The NAP of Rwanda mentions landslides, food insecurity, flooding, droughts, soil erosion and increasing temperatures as the key impacts of climate change in the country. It is led by Rwanda's Ministry of Environment in partnership with Rwanda Environment Authority (REMA). To adapt to the changing climate, the following sectors are prioritized: sustainable food production; soil erosion; afforestation; integrated pest management; vector based disease prevention; integrated water resource management; disaster risk reduction programmes; irrigation and, improved forest management.

Climate change and DRR-related policies and strategies found include:

- National Disaster Risk Management Plan (2013) - Under the overall leadership of the Ministry of Disaster Management and Refugee Affairs (MIDIMAR), the policy focuses on addressing all hazards and vulnerabilities in the country. The plan is aligned to the Hyogo Framework of Action (HFA) with discussions on going on how to update it to the current Sendai Framework. Focuses on 12 hazards among them are droughts, epidemics, accidents, floods and mass movements. There is wide involvement of stakeholders from government sectors, UN systems and NGOs.

35 P 26
36 P. 35
37 P. 46

- Rwanda National Adaptation Plan (2017) - Rwanda NAP seeks an integrated adaptation approach to promote national social, economic and ecosystem adaptation initiatives and building the capacity of the government. The ministry of Environment supported by Rwanda Environmental Authority (REMA) implements the plan. Food security, DRR, soil conservation and improved land use management are some of the targeted sectors for adaptation.
- Rwanda NAPA (2006) - Rwanda's National Adaptation Plan of Action that was promulgated in 2006 according to UNFCCC seeks to develop long-term adaption measures to climate change in the country. The Ministry of Environment supported by partners from government, UN system, NGOs and academia implements it. The NAPA targets enhancing adaptive capacity in vulnerable sectors such as agriculture, lands, water resources, forestry and health with a list of 40 potential options for investment.

3.2.7 Somalia

The draft Disaster Risk Management policy developed based on the approach set out in the Strategic Plan; while still in the early stages of development, the policy addresses a wide range of hazards, which include droughts, floods, cyclones, storms, and geophysical hazards.[38] The Federal Government of Somalia has mandated the Ministry of Humanitarian Affairs and Disaster Management (MHADM) to provide overall leadership of DRR in the country.

Due to protracted conflicts and weak state institutions, Somalia depends largely on UN systems and NGOs to coordinate and implement a number of DRR/M initiatives in the country. It encourages close collaboration of all federal and national government institutions to work together in developing risk reduction measures. In particular, the policy points out *'there is no formally agreed government membership or representation at the Cluster level coordination. Moreover, the funding process is often long and assistance takes a long time before it reaches the local community. Access to many districts is still restricted due to conflicts and responses do not reach all affected communities'.* However, there is no reference on the use of science and technology in DRR and role of citizens as well as gender is limited.

While Somalia is yet to submit a NAP through UNFCCC processes, it previously tendered NAPA and INDC under the overall coordination of the Prime Minister's Office. A NAP development programme has been in place since 2017 with assistance from various UN agencies. The major hazards addressed in the document include droughts, floods, storms and loss of biodiversity. The Ministry of Natural resources is responsible for overall coordination with other stakeholders with significant support from UNDP Country Office owing to weak institutional capacities in the government. The document

38 Government of South Sudan 'Draft National Disaster Risk Management Policy' (2016) at p. 34.

has no reference to citizen science nor application of science and technology in CCA. DRR-related policies and strategies found include:

- National Development Plan 2020 – 2024 (2019) - Comprehensive development policy based on extensive consultations (summarized in the final policy document). Structured around four development pillars, and linked to international and regional development frameworks, as well as other Somali laws.
- Draft National Disaster Management policy (2017) - Draft policy currently under revision. Sets out institutional, legal and policy context, as well as mechanisms for preparing for and responding to disasters. Includes chapter on 'policy outcomes and institutional mechanisms for delivery', and on monitoring and evaluation.
- National Adaptation Program of Action (2016) and INDC (2015) - After detailing the climate change risks facing Somalia, the NAPA provides a 'framework for an adaption programme', outlining possible adaptation initiatives, and implementing a monitoring structure. Somalia's INDC sets out policies for mitigating the effects of climate change, highlighting especially water use management and the use of indigenous knowledge.

3.2.8 South Sudan

Developed under the rubric of South Sudan's 'Vision 2040' (introduced in 2011 following independence), there have been various instantiations of the country's national development framework, with the latest National Development Strategy (NDS) aimed at 'consolidating peace and stabilising the economy' due to run until June 2021.[39] The Ministry of Humanitarian Affairs and Disaster Management is providing overall leadership in DRR in the country. The 2019 Disaster Risk Management Strategic Plan, due to be revised at the end of 2020, sets out South Sudan's disaster risk profile, and gives some indication of its approach to disaster risk reduction and management. The hazards documented to address in the plan include floods, drought, epidemics, bush fires, technological disaster, conflicts and accidents among others.

A clear institutional arrangement and coordination mechanism that brings various actors to support implementation of the plan under Ministry of Humanitarian Affairs and Disaster Management is documented. They include: Civil Society Organizations and governmental Organizations; South Sudan's Red Cross; Academic, scientific, research and technological institutions and networks; Community leaders; Indigenous groups; Faith-Based Organizations; Persons with disabilities; Children and youth; Women's groups; development partners; Private sector; Professional associations and Media and social media networks and practitioners. Both the policy and Strategy addresses the following hazards, namely, floods, drought and trans-boundary animal diseases, both crop pests and diseases and bush fires. The policy refers to use of science-based early warning systems at all levels of society. However, there is no recognition on use of citizen science, application of artificial intelligence in the implementation of the policy and refers to protection of vulnerable persons including women.

39 Government of South Sudan 'National Development Strategy' (2018) at p. 1.

South Sudan's National Adaptation Programme of Action, published in 2016, recognises that 'disasters have contributed to the economic and social challenges including displacement of people', and that climate change plays a role in exacerbating the intensity of natural hazards such as floods and droughts.[40] The NAPA, which is coordinated by the ministry of environment, highlights the need for coordination between developments; climate change and disaster risk reduction policies, and identifies the collection of better data as a 'key adaptation need'.[41] There is limited recognition on role of science and technology in the implementation of the plan.

DRR-related policies and strategies found include:

- National Development Strategy 2018 – 2021 (2018) - National Development Strategy agreed following outbreak of violence in 2015 and subsequent peace accord, but functions under the 2011 South Sudan's 'Vision 2040'. Structured around six 'strategic deliverables': Create enabling conditions for and facilitate the voluntary return and integration of displaced South Sudanese; develop appropriate laws and enforce the rule of law; ensure secure access to adequate and nutritious food; silence the guns; restore and expand the provision basic services; and restore and maintain basic transport infrastructure.
- National Strategy for Disaster Risk Management in South Sudan (2019) - Gives extensive 'disaster risk profile' for South Sudan. Provides brief direction for future DRM policy, based on regional and international frameworks.
- Draft National Disaster Risk Management Policy (2016) - Draft policy built around nine 'pillars of DRM', including developing institutional capacity; preparedness and timely intervention; traditional mitigation and coping capacity; and post integration recovery and stabilization. Also sets out a regulatory framework for disaster risk reduction and management, and provides mechanisms for monitoring and evaluation.
- National Adaptation Programme of Action (2016) - Sets out the approach to climate change adaptation in South Sudan. Aims to identify potential adaptive activities; build capacity; and create public awareness.

3.2.9 Tanzania

The government of Tanzania has a Department of Disaster Management as the lead agency in coordinating DRR. It has a disaster management Act 2015 and additional management regulations to guide implementation of DRR in the country. However, a national multi-stakeholder DRR platform to coordinate roles and responsibilities of various stakeholders does not exist in Tanzania. The National Drought and Food Security Steering Committee, the Inter-Governmental Technical Committee on Drought and Food Security established under regulation, county drought and food security committee and development partners in Tanzania are recognized for proper coordination of the Act. The Disaster Management Act clarifies the composition and functions of these structures. There are no provisions on use of AI and citizen science in the Act.

40 Government of South Sudan 'Climate Change - National Adaptation Programme of Action' (2016) at p. 34.
41 Ibid at p. 20.

3.2.10 Uganda

Uganda's development is driven by Vision 2040 and the Third National Development Plan (2020- 2024), guiding the country to achieving its development aspirations. Vision 2040 recognises that climate change, manifested in the form of frequent droughts, floods, landslides and food insecurity among others has had devastating economic consequences, and is likely to impact on human mobility as well.[42] Among other strategies, the Vision seeks to develop both mitigation and adaptation measures to strengthen the country's resilience to climate change, hence reducing the risk of displacement. It further posits that male and female farmers have been affected because of erratic rainfall, frequent droughts and pest infestation. In particular, it notes that, "The impacts of climate change (droughts, floods, storms, heat waves and landslides) will most likely reduce the benefits derived from the natural resource base and this will have serious consequences on agricultural production, food security, forests, water supply, infrastructure, health systems, incomes, livelihoods and overall development."[43]

Uganda's DRM policy was developed in 2010 with the goal of strengthening institutions and mechanisms that will reduce the vulnerability of the people, livelihoods and assets to disasters through systematic disaster prevention, mitigation, preparedness and management. The National Disaster Preparedness Strategic Plan 2018-2022 is operationalizing the policy with key actions focusing on supporting the National Integrated Early Warning System (NIEWS), conducting hazard and risk profiling and strengthening the National and District Emergency Coordination Centres (NECOCs). The Department of Relief, Disaster preparedness and Management in the Prime Minister's Office is lead agency in coordinating DRR in Uganda in collaboration with stakeholders. A national multi stakeholder DRR platform exists in Uganda drawn from UN, NGOS, academia and, government line ministries. A parliamentary caucus on DRR is active in the country to advocate on various DRR issues among the policy makers.

A number of disasters prevalent in Uganda are mentioned in the report including drought, landslides, floods, earthquakes, epidemics, accidents and environmental degradation.[44] Risk mapping, strengthening scientific research, improving land use, promoting awareness on risks and integrating DRR into sectors are planned for and are critical in addressing displacement risk as well. An overarching institutional, coordination arrangement, and a funding strategy are elaborated in the policy. The roles of various stakeholders, under the leadership of the directorate of disaster preparedness in Prime Minister's Office, are documented which includes Prime Minister's office, ministries of – agriculture, animal industry and fisheries, health, water, transport, environment, defense, internal affairs, etc. However, the policy does not refer on use of science-based measures in the implementation of the policy.

42 Government of Uganda 'Uganda Vision 2040' (2007) at p. 10.
43 Government of Uganda 'Second National Development Plan' (2015) at p. 100.
44 Government of Uganda 'Disaster Risk Management Policy' (2010) at p. 6

Uganda is pursuing a range of climate change related policy frameworks including but not limited to: a NAP, NAPA, INDC, Climate Change Policy and sectoral plans. Uganda's NAPA was developed with the purpose of achieving the Millennium Development Goals (that expired in 2015) and the country's development objectives as were enshrined in the then active PEAP (2004). The NAPA, the NAP and CC policy, in coherence with the development frameworks, indicates that climate change will escalate the frequency and intensity of disasters such as droughts, floods, heat waves and landslides, noting that displacement may result. Notable consequences of these include water scarcity for livestock and human consumption, loss of livestock productivity, food insecurity and economic losses, all of which can trigger human mobility. There is no specific reference on use of artificial intelligence and citizen science in implementation of these climate change related frameworks to address these monumental challenges.

Climate change and DRR-related policies and strategies found are in Table 2.3.

Table 2.3: Synopsis of Uganda's frameworks

Name of the policy/strategy	Synopsis of the policy documents
Uganda Vision 2040 (2007)	Uganda's Vision 2040 is the country's long-term development blueprint that provides for development paths and strategies to operationalize Uganda's Vision statement, which is "A Transformed Ugandan Society from a Peasant to a Modern and Prosperous Country within 30 years". The 2040 vision identifies oil and gas, tourism, ICT, business, abundant labor force, trade, water resources, industrialization and agriculture among others as the key enablers to the planned economic growth. Climate change manifested in the form of droughts, floods and disease epidemics is mentioned to have serious socio economic impacts.
Uganda's Third National Development Plan (2015/16-2019/2020)	Uganda's Vision 2040 is implemented in a series of 5-year development plan. The 2015/16-2019/2020's goal is aligned to the Vision and reveals general progress in economic growth driven by agriculture and tourism as the key sectors. Key achievements were recorded in poverty reduction, reduction in under five child mortality, improved life expectancy, access to electricity, transition rate, ICT, etc.
National Policy for Disaster Preparedness and Management (2010)	The Republic of Uganda passed the DRM policy in 2010 with a goal of strengthening institutions and mechanisms that will reduce the vulnerability of the people, livelihoods and assets to disasters through systematic disaster prevention, mitigation, preparedness and management. The policy explicitly allocates hazard-specific roles and responsibilities of the MDAs such as agriculture, water, UNMA, health, education, lands and housing, etc. Discussions to align the policy to the Sendai Framework for disaster risk reduction is ongoing.

Name of the policy/strategy	Synopsis of the policy documents
Uganda's National Disaster Preparedness Strategic Plan 2018-2022	The National Disaster Preparedness Strategic Plan 2018-2022 seeks to operationalize the policy with key actions geared at supporting the National Integrated Early Warning System (NIEWS), conducting hazard and risk profiling and strengthening the National and District Emergency Coordination Centres (NECOCs). The Department of Relief, Disaster Preparedness and Management in the Prime Minister's Office (OPM) is the lead agency in coordinating DRR in Uganda in collaboration with stakeholders. A national multi stakeholder DRR platform exists in Uganda drawn from UN, NGOS, and academia and government line ministries.
Uganda Climate Change Policy(2012)	Climate change policy is guiding the country's move towards long-term low carbon climate resilient transformation. The goal of the policy is to ensure a harmonized and coordinated approach towards low carbon climate resilient pathways. The overall objective is to ensure all stakeholders in Uganda address climate change impacts and their causes by promoting a green economy. The policy highlights the benefits of low carbon climate resilient pathways such as improving the adaptive capacity of the poor and vulnerable populations such as the poor, men and women who depend on climate sensitive livelihoods and are more impacted.
Nationally Determined Contributions, (NDC) Uganda's (2015)	Uganda is a signatory to the Paris Agreement of the UNFCCC, which requires parties to develop NDC that spells out how to reduce national emissions and adapt to climate change. Under adaptation, the country submits to reducing vulnerability and addressing adaptation to climate change in relevant sectors including disaster risk management. Under the mitigation contributions, the document puts across the estimated potential cumulative impact of the policies and measures are set to reduce the national greenhouse gas emissions by 22% in 2030 compared to the BAU.
National Adaptation Programme of Action, Uganda (2007)	Uganda's NAPA was developed with the purpose of achieving the Millennium Development Goals that expired in 2015 and the country's development objectives as was enshrined in the PEAP (2004). The NAPA indicates that climate change will escalate the frequency and intensity of droughts, floods, heat waves and landslides. Notable consequences of these include water scarcity for livestock and human consumption, loss of livestock productivity, food insecurity and economic losses. Prioritized adaptation interventions targeted land use, forestry, water, policy, legislation, and infrastructure.

3.3 Regional analyses

3.3.1 East African Community (EAC)

Of the IGAD member states, Kenya, South Sudan and Uganda are also member of the East African Community. Under its discussion of the 'social sectors' of its overall development policy, The EAC's Development Strategy 2016-17 to 2020-21 mentions the positive effects of the EAC Treaty Article 104 and the region's Common Market Protocol. The EAC's Disaster Risk Reduction and Management Act passed by the EAC Parliament in 2016, specifically states that 'Partner States shall grant entry and temporary residence to citizens of another Partner State which has been affected by disaster.'[45] While the EAC's Climate Change Master Plan has limited mention on use of citizen science and AI, it does note that 'climate change induced disasters including floods, landslide and famine' 'may induce mass migration of families and animals'.[46] Climate change and DRR-related policies and strategies found include:

- Disaster Risk Reduction and Management Act (2016) - Disaster Risk Reduction Act passed by regional parliament setting out institutional and substantive approach to DRR.
- EAC Climate Change Master-Plan (2015) - Sets out long-term climate change vision – framework for other regional climate change strategies and polices.
- Climate Change Strategy (2011) - Sets out the EAC's key climate change adaptation and mitigation imperatives – to be accompanied by Climate Change Policy, currently being drafted.

3.3.2 Intergovernmental Authority on Development (IGAD)

The agreement that established IGAD has twenty areas of cooperation and four grounding pillars, all aimed at achieving ten overarching objectives. One of the ten objectives addresses drivers of displacement in the region. The strategy seeks to assist efforts of Member States to collectively combat drought, other natural and man-made hazards, and their consequences'.[47] The major hazards identified are drought, floods, landslides, seismic risk, epidemics, pest infestation, Tsunami and accidents among others. The IGAD Regional DRM Strategy envisions a region where lives, assets and livelihoods are safeguarded from adverse effects of natural and human-made hazards, with the goal of achieving "substantial reduction of disaster risk and losses in lives, livelihoods and health and in the economic, physical, social, cultural and environmental assets of persons, businesses, communities and countries."[48] There is some reference on use of science and technology in understanding disaster risk but it does not document use of AI and citizen science.

The current IDDRSI strategy (2019-2024) has eight pillars around which prioritized programs are developed. The IDDRSI strategic plan recognises that the region, which is predominantly arid to semi-arid, has been experiencing increased extreme climate events which, together with diminished productivity and conflicts, have contributed to

45 s 13(2) Disaster Risk Reduction and Management Act (2016).
46 EAC 'Climate Change Master Plan' (2015) at p. 111.
47 P. 3
48 P. 12

great human suffering including widespread hunger, food insecurity and human mobility and displacement. In support of science, research and knowledge management, the strategy seeks to improve utilization of scientific knowledge through adaptive research, application and the integrated management of technology and innovations to help achieve the objective of addressing vulnerability of communities. On the pillar on human capital, the strategy seeks to support gender equality, women empowerment and social inclusion.

The IGAD Regional Climate Change Strategy projects increasingly mixed pattern in wet and dry conditions in much of the IGAD region. It posits that climate change is likely to present a serious threat to stability and sustainability of development due to pressure from extreme climate/weather events such as droughts and floods, noting that displacement can be one of the results. It particularly points out that 'women in urban areas face climate risks due to poor quality housing and exposure to floods and other climatic hazards.'[49] The strategy seeks to promote gender equality and empowerment of women as well as ensuring mitigation and adaptation measures work for both men and women in the region. There is some reference to use of science and technology in mitigation and adaptation in the document. IGAD Climate Prediction and Application Centre (ICPAC) is coordinating and implementing DRR activities as well as the CCA matters.

With regard to science and technology, the strategy emphasizes *'The necessary scientific capital can be built by increasing the men and women trained in science, the human capital upon whom the creation of new knowledge and its practical application depends on. In this connection, there is need to strengthen the centers of research which are principally the universities, colleges and research institutes in the region, which provide the environment conducive for scientific research and development (R&D) activities, the overall goal of which is to gain and apply knowledge, covering pure research, applied research and development. Pure research is curiosity oriented, undertaken to advance knowledge for its own sake; applied research is carried out in anticipation that its results will be useful to technology; and development is concerned with transforming technological knowledge into concrete operational hardware[50]'.*

Climate change and DRR-related policies and strategies found include:

- IGAD Regional DRM Strategy (2019) - Substantive DRM strategy. Envisions a region where lives, assets and livelihoods are safeguarded from adverse effects of natural and human-made hazards.
- IGAD Regional Climate Change Strategy (2018) - The purpose of the IGAD Regional Climate Change Strategy is to provide a framework for an integrated and coordinated mechanism that will guide member states in addressing the challenges and harnessing the opportunities associated with climate change. The key objective is to strengthen adaptive capacity and resilience to climate change and extreme weather events in an integrated manner across all sectors and society in the region.

49 P. 17
50 P. 26

- IGAD Drought Disaster Resilience and Sustainability Initiative (2019) - IDRSSI is a holistic plan aimed at building resilience of vulnerable communities to effects of recurrent drought and contribute to achieving sustainable development in the IGAD region. The 2019-2024 plan serves as a common framework on which regional and national programmes are built to enhance drought resilience.

POTENTIAL ENTRY POINTS FOR INTEGRATING AI IN DRR FRAMEWORKS

While this research has shown limited integration of citizen science and AI in the reviewed policy frameworks, there is compelling evidence that demonstrates that application of science and technology as well as gender considerations is critical in providing solutions to reduce losses and damages associated with disasters across the globe. There has been sufficient recognition of role of science and technology by the global DRR frameworks over the years including the Yokohama Strategy, the Hyogo Framework and the current Sendai Framework. Given the increasing trend in damages and losses from natural hazards that is being aggravated by climate change and other socio economic variables in Eastern Africa, there is urgent need to ensure citizen science and AI as well as gender considerations are fully incorporated and applied in DRR measures. There is also a need to recognize the good knowledge assets in the form of indigenous knowledge that already exists in local communities and equally benefit from the advances that current science offers.

4.1 Recent applications of AI that Eastern Africa region would leverage on:

4.1.1 Weather forecasting and hazard monitoring

By considering maximum temperature, minimum temperature and rainfall datasets, Artificial Intelligence has been used to make intelligent weather prediction. Minimum temperature and rainfall for a sampled number of days were analysed and a prediction is analysed using machine learning techniques[51]. An accurate prediction of next day's weather of more than 90% has been possible using simple linear regression model. This demonstrates that AI aided by machine learning technologies has potential of making accurate prediction than traditional weather forecasting methods. In the unlikely event of an extreme event being predicted, a preparedness and response mechanisms is developed to avert loss of lives and destruction of properties. This technique needs to be promoted to enhance effective response induced by natural hazards and extreme weather events to reduce losses and contribute to the achievement of SDGs.

4.1.2 AI and emergency management in USA

The United States of America suffered 242 natural disasters' between 2005 and 2015 causing loss of lives and massive destruction of property[52]. Storms registered the deadliest and most destructive disasters recording 134 events. Other disasters included the following, in order from the highest number to the lowest: 51 flood

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52 EMDAT, 2018

incidents, 37 fires, 9 extreme temperature periods, 6 droughts, 4 earthquakes and 1 landslide[53]. In 2015 flood disaster alone caused property damages of up to USD 1.3 Billion with over 12,000 Americans affected from one specific flood incident. Fire-related cases are responsible for over $2 billion in damages and 6 deaths in 2015. A particular wildfire that occurred in Northern California affected a whopping 7,302 people. Drones, robots and sensors have been used in the USA to provide accurate and timely information concerning the characteristics of the disaster scene and aid early response to the incidents. This technology allows rescue teams for example, to have a good understanding of the topography of the disaster scene and the extent of damage to a building. The technologies such as drones have been used to find victims trapped in debris allowing rescue workers to get to them quickly thereby saving lives.

4.1.3 Social media and crowdsourcing for emergency management

Advances in use of the social media applications by use of SMART phones is transforming disaster and response management landscape in Africa. Social media use during emergencies produces a million of tweets and photos that would be leveraged for disaster management to improve effective response and reduce losses. In Australia for example, the government is monitoring the social media as a key source of data for coordinating and managing emergency management to obtain information of evolving situation[54]. This therefore considers the affected population as a key source of information from the social media platforms thereby facilitating flow of information from and to the affected communities. By including the citizens into the platforms, either by providing information about the disaster or as volunteers for performing specific tasks, they are able to extract global knowledge and trigger a response based on the local information.

4.1.4 Use of AI chatbot in disaster management

The occurrence of natural disasters is inevitable but the effects arising from the impacts can be reduced or prevented. A major weakness in disaster management is due to lack of information by response teams to guide disaster-affected populations on critical real-time life saving measures. There is usually high demand of accurate information that is required to be provided by response teams in real-time to the citizens efficiently and quickly in order to save lives. Employing a proportionate number of persons to meet these needs is a critical challenge for emergency managers and governments.

Chatbots have been developed to interact with the natural language of the disaster affected populations to handle the many requests and respond in real time to emergency information. They are adaptable for utilization in a variety of applications

53 THE BENEFITS & CHALLENGES OF USING ARTIFICIAL INTELLIGENCE FOR EMERGENCY MANAGEMENT: ACCESSED FROM: HTTPS://SAFETYMANAGEMENT.EKU.EDU/BLOG/THE-BENEFITS-CHALLENGES-OF-USING-ARTIFICIAL-INTELLIGENCE-FOR-EMERGENCY-MANAGEMENT/ ON 09.12.20202.

54 https://www.researchgate.net/publication/269693590 Crowdsourcing Tools for Disaster Management: A Review of Platforms and Methods

such as desktops, web app, mobile app or integration to social media platforms such as WhatsApp. Some of the benefits that accrue from the Chatbot use include:

- Ensure access to government or response teams' information with greater transparency
- Accelerated access of information free from communication and information gaps
- Assist governments to gather analytics of how many people are being helped and their safety status, as chatbots voluntarily get in touch with users who interacted
- Effective resolve or action on critical requests without waiting for a human agent
- Offer agility to responsiveness by bringing disaster management data together
- Ensured utilization of push notifications to send real-time updates and procedures
- AI-powered chatbots study behaviour and can take action based on an interaction, like calling emergency services or response team

Other recent useful applications of AI in disaster and emergency management include:

a) **Qatar Computing online tool:** A free online tool developed by Qatar Computing Research Institute. It uses machine learning to automatically detect tweets relating to particular crisis. The tool helps mobilize agencies and volunteers during disasters and emergencies.
b) **1CONCERN:** This is an AI tool that produces a complete and accurate picture of the Emergency Operation Centre to support resource mobilization and allocation. It helps to determine areas that would be most affected by disasters.
c) Application of AIDRR in Nepal earthquake 2015

Box 1: Use of technology in earthquake response

A massive earthquake of 7.8 magnitude occurred 21 miles Southeast of Lamjung, Nepal in April 2015. 72 hours after the first quake, 3,000 volunteers across 70 countries were mobilized using AIDR technology. The volunteers tagged the crisis related tweets and photographs. AIDR used the tagged tweets and photographs to identify urgent needs, damage to infrastructure and resource deployment needs.

Some of the potential entry points are aligned to the four priorities of the Sendai Framework (Table 2.4)

Table 2.4: The key DRR elements and entry points across the four priority areas of the Sendai Framework

Sendai Framework Priority are	Key elements	Entry points for citizen science and AI
Understanding disaster risk	• Hazard and risk mapping • Training, education and awareness creation • Research, science and technology • Leveraging use of indigenous knowledge and multilingualism	- Application of geospatial technology in hazard and risk profiling in the countries - Promoting DRR education and science in higher institutions of learning - Promoting indigenous knowledge
Strengthening Disaster risk governance	• DRR policy development and implementation at national and local levels • National DRR platforms and coordination mechanisms • Strengthening DRR institutions	- Evidence to support development of gender sensitive DRR polices
Investing in disaster risk reduction	• Mobilise and allocation of resources for DRR • Mainstreaming DRR into sectors and plans • Urban risk management • Insurance and other risk transfer mechanisms • Social protection measures	- Use of ICT in cash transfer mechanisms - Use of mobile phones in cash transfer for social protection
Enhancing disaster preparedness for effective response and build back better	• Contingency planning and plans • Early warning systems • Response mechanisms • Recovery and rehabilitation	- Exploring use of SMART phones in hazard monitoring, prediction and communication - Application of Artificial intelligence, robots and sensors in hazard monitoring - Use of SMART phones for mobilization of volunteers and communication - Development of mobile Apps for accurate understanding of the disaster scene and mobilization of resources and agencies

CONCLUSIONS AND RECOMMENDATIONS

This study has shown that eleven countries in the Eastern Africa Region (Djibouti, the Comoros, Eritrea, Ethiopia, Kenya, Rwanda, Madagascar, Somalia, South Sudan and Uganda) have developed their DRR/M strategies and frameworks in response to the global commitments to combat disaster risks in a comprehensive and holistic manner. A number of these frameworks are being developed in line with the Sendai Framework for DRR (SFDRR) such as in Somalia and Sudan while others (e.g. Kenya and Madagascar) have recently adopted their strategies. Target E of the SFDRR, which is a quantitative measure, seeks to increase the number of countries with national and local DRR strategies. A ten-point scale is supporting monitoring the progress countries are making to achieve Target E. The degree of alignment largely reflects the quality of the strategies. The total number of DRR strategies were 15 accounting for 37.5% while for CCA were 21 accounting for 52.5 % while 'planning' had four documents.

With regard to CCA Strategies/plans/policies that were reviewed, drought and floods are the primary focus of the documents that are guided more systematically through sectoral coordination than the DRR Strategies/plans/policies. Given that the DRR and CCA have inter linkages in addressing drought and floods that are prevalent in the region, there is need for greater coherence in their implementation. Generally, the institutions responsible for environment are coordinating the implementation of CCA policy/plans while the DRR is implemented by institutions associated with the Prime Ministers' Office as is the Case in Uganda or stand-alone ministry of disaster management as seen in Rwanda and Somalia. The main actors reported in all the documents are government line ministries from agriculture, water, forestry, energy, education, health, sectors.

The findings further show that DRR has been fully institutionalized with dedicated agency responsible for the DRR functions with coordination mechanism involving a variety of stakeholders such as the UN, NGOs, line ministries and donors. The frameworks have identified a number of hazards and disaster risks that are prevalent in the countries and the mitigation, prevention and preparedness measures for these risks. Prominent natural hazards identified in the reports are droughts, floods, cyclones, landslides, epidemics and storms, most of which are hydro meteorological. These hydro meteorological hazards and other extreme weather and climate events are projected, with higher certainty that they are likely to increase in frequency, intensity and unpredictability due to the global changing climate. This needs coherence in the DRR/M and CCA fields to strengthen collaborative resilience building to climate and disaster risks and it is for this reason the study examined the CCA frameworks too.

The findings revealed that only five DRR Strategies/plans/policies are adopted fully and hence actively being implemented in the region. These are Ethiopia (2013), Kenya (2017), Madagascar (2016), Djibouti (2005) and Rwanda (2013) (See Appendix 2 for details). Besides, a number of gaps, however, are notable in the frameworks that need to be highlighted. A number of the policies have yet to be updated as required by the Sendai Framework such as Uganda (2010) and Djibouti (2005) so that they can account for the current and emerging dynamics in disaster risks such as urbanization, climate change, poverty, population growth and environmental degradation among others. The scope of

hazards covered in some documents is narrow such as in Kenya's DRR/M policy while others have not accounted for the underlying drivers of the disaster risks. There is limited coherence of the DRR and CCA Strategies/plans/policies only recognizing that climate change is projected to increase the intensity and frequency of the disaster events but the documents fails to provide a mechanism for analysing the projected impacts from climate change.

The study has revealed that none of the documents refer to the use of citizen science and AI. Gender considerations are referenced in documents from Uganda, Rwanda and Madagascar but the extent of gender inequality as a factor contributing to vulnerability to disasters and risk reduction is not well addressed in the documents. Reference to use of technology such as Geographical Information System (GIS) is referenced in a few documents such as the Disaster Risk Management Policy for Ethiopia. Generally, the CCA Strategies/plans/policies were found to have more references to gender than the DRR frameworks.

A number of recommendations can be drawn based on these observations:

i. There is urgent need to support the countries in Eastern Africa to update their DRR/M policies and frameworks in a comprehensive and holistic manner in line with the Sendai Framework Target E. As countries make progress to develop their national and sub national DRR plans and strategies, effort should be made to ensure they integrate AI and citizen science in their frameworks. A complementary annex on AI and citizen science to the countries that have already developed their DRR strategies in line with the Sendai Framework would help integrate their application to advance effective implementation of DRR measures including disaster response.
ii. The DRR/M policies and frameworks should have coherence with the CCA frameworks to address the emerging risks emanating from climate change to support societal resilience in a holistic manner. Most of the DRR and CCA frameworks lack coherent and mechanism for a holistic integration into the development frameworks. This document seeks to promote linkages between the two fields to build resilience by leveraging on the existing expertise; experience; processes and, funding opportunities as envisioned in the SDGs.
iii. Updating gender sensitive risk informed policy frameworks in the Eastern Africa region should be prioritized and should consider the use and application of citizen science and technology. AI policy toolkit should be developed to support countries formulate risk-informed and gender sensitive AI applications in collaboration with the academia, the private sectors and, governments.
iv. Strengthening capacities and raising public awareness and understanding on the use and application of AI in disaster management including response should be prioritized with active engagement of the media, private sector and, research organizations.

APPENDICES

Appendix I: Recent disasters and their effects in the ten countries in Eastern Africa

Country	Type of disaster	Impacts
Comoros	Cyclone/ Flood	**2019** • On 24th April and 2nd-5th December 2019, Cyclone Kenneth and Tropical Cyclone Belna respectively passed through threatened Anjouan (population: 38,944), Mohéli (population: 50,854) and Ngazidja Island (Grand Comore), • Entire Comoros national territory was affected by heavy rainfall and strong winds. • Tropical Cyclone Belna affected 2,996 people, of which 978 were male, and 2018 were female. There were 3 and 9 male and female fatalities (IFRC, 2020). A total of 2,655 people (699 male and 1956 female) were displaced from their homes (IFRC, 2020). • Besalampy and Soalala experienced a shortage of safe drinking water, as some water points and wells had been submerged. This created a crisis for women and girls who had to wade through muddy waters to collect water from emergency water points • Storms widely damaged schools, farming, and residential infrastructure nationally. • 345,130 people were affected (142,413 male and 202,717 female), with 185,880 needing immediate multisectoral assistance while Cyclone displaced 19,372 people. • The cyclone also destroyed 3,818 houses and partial destruction of 7,013 houses. • 63% of food crops were damaged, 35 % of cash crops and 34% of fruit trees, and 2,055 cattle were destroyed. • The cyclone also damaged 465 classrooms, including 213 that were destroyed. • The area of Anjouan has the greatest loss from flooding due to cyclones, with an average annual loss of $1.3 million. • The 100-year loss direct loss to Comoros from flooding is $10 million.
	COVID-19	**2020** • There are 3,473 confirmed cases with 142 deaths[55]. • Schools were closed

55 Communiqué #10 : Couvre feu". Stop Coronavirus.km (in French). Accessed on Feb 3, 2021

Country	Type of disaster	Impacts
Djibouti	Cyclone/ Flood	**2019** • On 21st November, Djibouti experienced heavy rains, which triggered flash floods across the country. • Approximately Over 30,000-40,000 families (150,000-250,000 people) were somewhat affected, 200,000 people (21% of the total population) were affected (and 120,000) require immediate relief support, while about 10 people (7 children) were reportedly killed. • From November 2019, around 250,000 people were somewhat affected countrywide (26% of the population), and 150,000 (including migrants and refugees) required immediate humanitarian assistance. • Widespread destruction of infrastructure, homes, and livelihoods resulting from flooding, made access to affected areas more difficult. **2018** • Tropical Cyclone Surge left a trail of widespread flooding, destruction of infrastructure, homes, and livelihoods[56]. • About 50 % of Djibouti City, where an estimated 150,000 people live, was severely affected by flash floods and heavy rainfall. • The government estimates that some 5,000-10,000 families (25,000-50,000 people) were affected. • 16 school buildings were damaged by flooding • Exams for 135,000 students were postponed while schools were cleared of water and cleaned. • 500 square meters along the seashore were contaminated by oils which, negatively impacted fishery • Vulnerable groups affected were children, widows, the elderly and the disabled due to limited mobility and/or inability to repair their damaged homes. • 15% of the Djibouti population is female-headed households who are mostly widowed and heavily affected than the rest of the population. • Cases of unaccompanied children who are at risk of insecurity were reported • 1,865 shelters housing 9,350 people (3567 were male and 5783 were female) sustained extensive damages • 630 households (3,150 people) were displaced as a result of the flooding. • The cyclone heavily impacted 4,500 people (2022 male and 2478 female) living in the Damerjog IDP camp.

56 UN. 2018. Cyclone Sagar and subsequent flash floods. Humanitarian Needs Assessment Report. Accessed on Feb 4, 2021 from https://reliefweb.int/sites/reliefweb.int/files/resources/Djibouti%20Humanitarian%20Assessment%20Sagar%20Cyclone%20-%20May%202018.pdf

Country	Type of disaster	Impacts
Eritrea	Flood	**2013 and 2020** • Heavy rainfall and the damaging of a significant diversion canal in the Hashenkit area caused flooding that destroyed 20 residential houses • More than 49,065 people were affected by flooding in the Afar region in 2020 • There is no data on the number of male and female affected
	Drought	• Every three to five years, Eritrea suffers a drought. • These natural disasters destroy crops, kill livestock, and drive food insecurity across the country. • There is no data on the number of male and female affected
	Desert locust invasions	**2020** • Around 1150 hectares of land were infested with desert locust swarms • 12,600 members of the military and the farming community participated in practical training programs with a focus on Desert Locust management and pesticides safety
Ethiopia	Landslide	**2018** • Landslides caused by heavy rains killed 22 people in Tullu Gola kebele of Nansebu woreda in West Arsi zone, Oromia region. • At least seven injured people were hospitalized, while 53 people (21 men and 32 female) were displaced and required immediate food, shelter, and non-food item support. • At least 23 people in the Sidama zone and nine people in the Gamo Gofa zone of the Southern Nations Nationalities and Peoples were injured. • Over 50,000 households were displaced due to flooding nationwide.
	Flood	**2018** • The country experiences flash flood incidences in Afar (Awsi), Oromia (Arsi, East Shewa, East and West Hararge zones), and Somali (7 zones) regions. • More than 35 displacement incidents were reported during April alone, displacing 170,760 people. • Floods destroyed more than 15,643 houses and 12,911 hectares of farmland and damaged 76 health facilities, mostly health posts, and at least 123 schools were interrupted. • Flooding in the Somali region affected 43,887 families/households (263,322 people), of which 25,238 households (151,428 people) were displaced. • Houses, crops, and livestock were reportedly washed away, leaving people displaced and homeless.

Country	Type of disaster	Impacts
	Drought	**2019** • Severe droughts in early 2019 left at least 8.3 million people in need of food due to delayed long rains. • Vulnerable groups continuously suffered consecutive years of drought as food security situation deteriorated while the numbers in need were exacerbated by internal mass displacement due to inter-communal violence – affecting some 2.6 million. **2017** • 1.3 million people of which 64% were children, were displaced due to conflict and drought. • About 5.6 million people in Ethiopia required emergency food assistance in 2017. • About 2.7 million children, pregnant and lactating mothers were in dire need of supplementary feeding. • About 9.2 million people needed support to access safe and clean drinking water. • About 1.9 million agro-pastoral households needed livestock support. • Over 300,000 children between 6-59 months were treated for severe acute malnutrition • Disease outbreaks, a large-scale loss of livelihood assets, and displacement were experienced.
	Violence	**2018-2019** • The latest inter-communal violence has displaced nearly 960,000 from April to July 2018. • By 2019, over 3 million internally displaced persons (IDPs) had been reported
Kenya	Flood/ Landslide	**2019** • Floods frequently occur in Kenya, and on average, 150,000 people and around 200 education and healthcare facilities are affected by river flooding each year. • Floods led to the death of about 132 people, and a further 17,000 had been displaced and affected approximately 330,000 people across the county. • Croplands and irrigation infrastructure, such as pumps and pipes, were extensively damaged. • About 28% of the total crop in Turkana was destroyed. In other counties, the loss of cropland was as follows: 10,000 acres in Tana River, 12,355 acres in Embu, Kitui, and Makueni, 200 acres in Narok, 1,507 acres in Taita Taveta, and about 4,500 acres in Kilifi.

Country	Type of disaster	Impacts
		• Health facilities, schools, markets, and roads were destroyed, affecting access to health and education, the supply of food commodities and medical provisions, and food prices. • Approximately 3,700 small livestock were lost across Wajir, Tana River, Garissa, and Marsabit. • Women, children, and the elderly experienced deteriorating health conditions due to waterborne diseases and poor sexual health. • Landslides affect over 350 people per year, causing displacement of people and damages of about 1.5 million USD.
	Drought	• Kenya experiences drought on a cyclic basis. The major ones coming every ten years, and the minor ones happen almost every three to four years. • Drought increases vulnerability to food security and poor livestock productivity among the pastoralists and small-scale farmers (30 % of the country's total human population) who depend on rain-fed agriculture. • On average, around 5.5 people (including acutely malnourished children, pregnant and lactating mothers) are in dire need of food, lack access to clean water, and experience unusually high food prices each year. **2019** • More than two million Kenyans were staring at a food crisis, unusually high food prices, and worrying levels of malnutrition, especially in the Counties of Turkana, Marsabit, Baringo (East Pokot), Wajir, Garissa, Tana River, and Isiolo **2017** • About 2.7 million people were food insecure, with 357,285 acutely malnourished children, pregnant and lactating mothers. • High levels of malnutrition were prevalent among children, and elderly across the arid and semi-arid lands. • Approximately 3.0 million people lacked access to safe and clean water. • Insecurity linked to resource-based conflicts worsened. • Unusually high food prices and worrying levels of malnutrition.

Country	Type of disaster	Impacts
	Earthquake	• Damaging earthquakes are infrequent. However, around 90,000 people could experience at least light ground shaking every 50 years. Structural damage could cause death. • Most affected areas include Southwestern and Northwestern parts of Kenya
	Volcano	• Around 1.3 million people are potentially exposed, especially in the Menengai volcano in the rift valley
	Crop Pest	• Fall Armyworm and African Armyworm infestations continued to threaten crops in marginal agricultural counties, further worsening the next harvest prospects. • Locusts infested 175,000 hectares of crop and pastureland, upsetting the livelihoods of nearly 164,000 households.
Madagascar	Cyclone/ Flood	• On average 1.5 cyclones affect Madagascar annually, the highest number in Africa, and each robust cyclone on average affects 700,000 people[57] • In 2019, Cyclone Kenneth and Idai hit the northern part of the country, causing widespread devastation, flooding and displacement. • Due to significant poverty and instability caused by complex conflict dynamics, women, men, boys, and girls have limited resilience to withstand the shock of a cyclone[58] • The most affected groups were female-headed households, pregnant and lactating women, people with disabilities, the elderly, and boys and girls. • Entrenched gender inequalities within the communities contribute to women and girl's high vulnerability to cyclones. • After the cyclone disaster, women and girls are subjected to food insecurity, increased risk of gender-based violence[59], disruption and displacement of supportive social structures and relations

57 OCHA, 2020. Humanitarian Snapshot. Accessed on Feb 23, 2021 from https://reliefweb.int/report/madagascar/madagascar-humanitarian-snapshot-december-2020

58 Center for Strategic and International Studies event discussing social, political and religious conflict drivers: https://www.csis.org/events/understanding-extremism-northern-mozambique

59 CARE Rapid Gender Analysis A Commitment to Addressing Gender and Protection Issues in Cyclone- and Flood-Affected Malawi, Mozambique and Zimbabwe: https://reliefweb.int/sites/reliefweb.int/files/resources/Regional-RGA-Cyclone-Idai- 29032019.pdf

Country	Type of disaster	Impacts
		• Schools and educational materials were damaged, and teaching was disrupted. • Literacy rates are much lower among women than men due to high school dropout rates for girls, early marriage and early pregnancy that occur after disasters.
	Drought	**2015 and 2018** • Severe drought conditions in November 2017 to April 2018 during rainy season led to nearly dry dams in many parts of southern Madagascar. • According to the Crop and Food Security Assessment (CFSAM) of August 2018, rainfall deficits and fall armyworm attacks significantly impacted food production levels (particularly staple crops such as maize and cassava), while compromising access to food for the majority of households. Data shows 1.3 million people suffered a food crisis due to droughts.
	Flood/ Landslide	**2020** • At least 6 deaths and widespread damage. • 4 people died in Antananarivo (central Madagascar), and approximately 400 were affected while several buildings were destroyed, including the University of Antananarivo. While in Andapa Municipality (north-east Madagascar), 2 people died as a result of flooding. • Following widespread floods and landslides across several areas; Alaotra Mangoro, Analamanga, Betsiboka, Boeny, Melaky, and Sofia regions, 13 people were confirmed dead. • Heavy rainfall and floods caused by a tropical cyclone affected about 107,000 people, including more than 16,000 displaced, and caused at least 31 deaths in Madagascar. • The estimation of infrastructure damage is as follows: 67 public schools were destroyed, 28 public schools partially destroyed, 18 schools were used as evacuation centres.
	Malaria outbreak	**2011-2012 and 2020** • Above-average malaria outbreak was reported in some part of the country[60]

60 Arambepola, R., Keddie, S.H., Collins, E.L. et al. Spatiotemporal mapping of malaria prevalence in Madagascar using routine surveillance and health survey data. Sci Rep 10, 18129 (2020). https://doi.org/10.1038/s41598-020-75189-0

Country	Type of disaster	Impacts
		• Infections were higher in 6–14-year-old children, in rural areas and amongst the low-income populations[61]
	Crop pest attack	**2013** • The country faced a locust attack in 2013
Rwanda	Flood/ Landslide	**2018** • 3.34% of the country's population is living in areas considered very high susceptibility, 11% at high susceptibility, and 25% at moderate susceptibility. • About 14% of the exposed population comprises children aged ←20 years and elderly aged →64 years. • Exposure of health facilities to landslides is high at 43% (or a total of 23,426 health facilities) exposed at varying levels of susceptibility. • A total of 147, 827 schools are exposed to landslides at varying susceptibility levels. • On 3rd March 2018, around 5,000 households (25,000 people) were affected by the floods, of which 4,750 people from 950 households were directly affected. At least 24 people (200 in four months) were killed due to floods and landslides triggered by the heavy rain.
	Drought	• Agricultural exposure to drought is apparent mostly in the eastern province. The districts of Kayonza, Kirehe, and Gatsibo are areas of primary concern since the exposure of cultivated areas, and crop production is consistent in these districts from moderate to very high susceptibility. • Bananas, cassava, and Irish potato are the main crops that are affected by drought.
South Sudan	Flood	**2019** • Considerable flooding triggered population movement and displacement in three (3) counties. • The floods resulted in substantial destruction of houses and road networks. • Livelihoods of 10,892 households were destroyed[62] . • An estimated 100 fedans of crops have been destroyed, with other hundreds of cattle heads reportedly dead.

61 Kesteman et al. 2016. Multiple causes of an unexpected malaria outbreak in a high-transmission area in Madagascar Malar J (2016) 15:57

62 OCHA, 2019. South Sudan: Humanitarian Snapshot (November 2019). Accessed on Feb 4, 2021 from https://reliefweb.int/report/south-sudan/south-sudan-humanitarian-snapshot-november-2019

Country	Type of disaster	Impacts
	Drought	**2018** • Conflict and severe 2018 droughts have created a disastrous situation leaving 7.1 million people in need. • Based on drought reoccurrences, some 6.9 million people close to 60% of the population are currently dire need of food security, with an estimated 50,000 people in famine-like conditions. • Malnutrition levels remain critical, with some 860,000 children under five estimated to be severely malnourished.
	Violence	• Approximately 1.67 million people were displaced internally within South Sudan (displaced since 2014 to end of 2019) mainly due to national conflict (62%), communal clashes (20%), and natural disasters (15%). • Additionally, 2.2 million South Sudanese refugees were living in other countries, mostly in Sudan, Ethiopia, Kenya, and the Democratic Republic of Congo.
Tanzania	Flood	**2019** • Floods caused a significant impact leading to damage of properties and livelihoods and putting the affected population at risk. • A total of 1215 households (HH) were displaced (from the 1560 HH affected). There was also widespread destruction of physical infrastructure, particularly roads and bridges. **2018** • In Arusha, 548 households were displaced due to the floods, and 203 houses were damaged[63]. • In Dar es Salaam, about 2,151 households were displaced, 42 houses and 21 latrines wholly collapsed, and 342 houses were severely damaged • 191 households were displaced, and 225 houses damaged on the island of Zanzibar,
	Droughts	• Droughts affect rain-fed agriculture production (both crop and livestock) • Consistent droughts result in food insecurity and a shortage of clean drinking water. • On average, about 5.5 million people (10% of the total 2016 Population) are annually affected by droughts under the present climate.

63 DARMAERT & TRCS assessment. 201).

Country	Type of disaster	Impacts
Uganda	Flood and landslide	**2019** • Bududa District's landslides caused six (6) deaths and injured 27 persons (13 males & 14 females). • 80 households were displaced (480 people) • Flash floods damaged houses of 111 households, with a population of 426 persons. • The floodwaters destroyed crops, merchandise, animals, and properties worth millions of shillings. • On average, at least 45,000 people, relatively few (around 40) education and healthcare facilities are affected. • School-going children, youth, sick people, the elderly, men, and women are directly affected. • Floods damaged houses and crops adjacent to it.
	Drought/ High temperature	• On average, around 4.5 million people are affected by food insecurity and water scarcity each year. • Areas in the Southeast, North-eastern, and central regions of Uganda are prone to drought.
	Earthquake	• Earthquakes are common on the western border where active seismic exist. • Around 150,000 people could experience at least a light ground shaking at least once every 50 years.
	Volcano	• A quarter of a million people are exposed to volcanic hazards. • Around 44,000 are exposed with a potential total replacement of $400 million, of which $57 million in education and health facilities.

Appendix II: Framework for analysis for a gender-responsive and social inclusiveness of disaster risk reduction

Actions	Measurement
Integrating a Gender responsive and socially inclusive lens into designing the DRR policy, strategy, program or project	• Recognizing that risk and vulnerability have a gender and social inclusion dimension, for example, that men, women, children, PWD, the elderly, Indigenous people differ in relation to disasters and this should guide all work related to DRR planning and implementation. • Include perspectives of men, women, children, PWD, the elderly, Indigenous people in planning/steering committee. • Hire a gender and social inclusion expert to collect, analyze and use sex-and gender disaggregated data. • Capacity build the staff with knowledge and skills to integrate GSI in their work.
Conducting a risk analysis and vulnerability profile with a gender and social inclusion lens	• Documents the different roles and responsibilities that men, women, children, PWD, the elderly, Indigenous people play in different sector of the economy. • Assesses the social and gender dimensions of the risks addressed in the DRR policy, strategy/plan. For example, how are rural women and men's livelihoods affected by a specific hazard? How could gender-based differences in decision-making, power and ownership of/access to assets lead to different abilities to respond to hazards? What kinds of information do women, youth, PWD have and need to better prepare for hazards? What does this imply in terms of differences in vulnerability and coping capacity?
Integrating gender equality and social inclusion among the guiding principles	• Pledges to include men, women, children, PWD, the elderly, Indigenous people in DRR decision-making processes and in action implementation. • Makes a commitment to reduce the gender gap by detailing actions to empower women, children, PWD, the elderly, Indigenous people and meet the different priorities to disasters. • Including, within the vision of the plan, the achievement of equality and inclusion between men, women, children, PWD, the elderly, Indigenous people in order to build their resilience.

Actions	Measurement
Addressing the needs of men, women, children, PWD, the elderly, Indigenous people within Strategic Actions	• Involving women, PWD, the elderly, Indigenous people in local DRR management committees and in related training to increase their access to early warning messages. • Identifying stakeholders that represent the views of women, children, PWD, the elderly, Indigenous people in institutional mechanisms for DRR planning and implementation. • Developing DRR actions in close consultation with target communities to integrate local knowledge and address the specific needs (both practical and strategic needs) of women, children, PWD, the elderly, Indigenous people to access resources, assets and knowledge to be able to successfully take on new approaches. • Designing DRR measures to ensure that hard-to-reach groups, such as women, PWD, the elderly, Indigenous people will have access to preparedness initiatives.
Integrating GSI lens into DRR response strategy including budgeting and M&E	• Defining who will be responsible to ensure that gender and social inclusion issues are integrated into DRR actions e.g., include gender specialists in the teams or committees who liaise with communities or develop the DRR plans. • Monitoring the DRR plan, by including gender-sensitive indicators, to track how different interventions impact the lives of men, women, children, PWD, the elderly, Indigenous people and assess whether progress is made towards gender equality and if corrective measures are needed (i.e. numbers of men and women and their forms of participation, such as whether they hold decision- making positions, who takes up the resilience-enhancing practice and their perceptions of the success of the practice). • Including separate budget lines for gender-related actions, for example to conduct awareness-raising on the importance of including women, children, PWD, the elderly, Indigenous people and men as part of DRR decision-making bodies. • Identifying gender-responsive communication methods to reach men, women, children, PWD, the elderly, Indigenous people (i.e. train women responders, collaborate with local women's organizations).

Appendix III: Disaster profiles of Eastern African countries

Hydro meteorological induced hazards such as drought, cyclones, floods, landslides, soil erosion and some epidemics among others are the most prominent in the Eastern Africa region. Climate change is projected to exacerbate the frequency and intensity of these natural hazards in the region, leading to increased disaster risk and derailment of sustainable development. Thus, the culminating disasters pose a serious challenge to Africa's economic growth and achievement of the sustainable development agenda. There is high-risk index in the Eastern Africa countries with South Sudan and Somalia leading with an index of over 8, while the Comoros and Djibouti has the lowest, highlighting the vulnerability of the region to the impact of disasters that is being exacerbated by climate variability and change. Djibouti, Eritrea, Ethiopia, Kenya, Rwanda, Somalia, South Sudan and Tanzania all show increasing trend in risk index over the 2015-2020 period. Countries with highest risk index are in the order of Somalia, South Sudan, Kenya, Ethiopia and Madagascar with The Comoros having the lowest index.

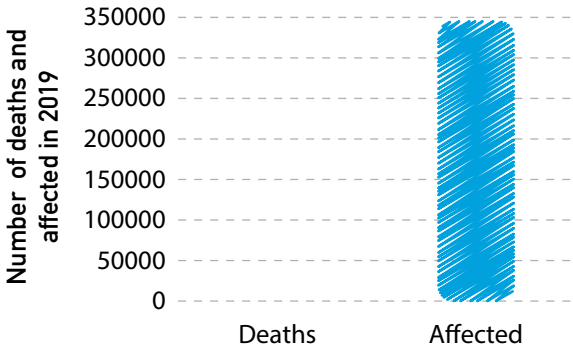
The risk index of the Eastern Africa Countries

Country	2015	2016	2017	2018	Rank
The Comoros	3.7	2.6	3.7	3.6	11
Djibouti	2.8	2.7	4.1	3.7	10
Eritrea	2.2	2.5	4.2	4.5	9
Ethiopia	5.3	5.4	5.6	5.5	4
Kenya	4.8	4.8	6.1	5.8	3
Madagascar	3.4	4.9	5.0	5.0	5
Rwanda	2.3	2.6	4.9	4.3	8
Somalia	8.6	8.8	8.9	8.9	1
South Sudan	7.0	8.0	8.2	8.3	2
Tanzania	4.0	2.7	5.0	4.8	7
Uganda	6.2	3.5	5.0	4.9	6

(Source: INFORM Index statistics)

Comoros

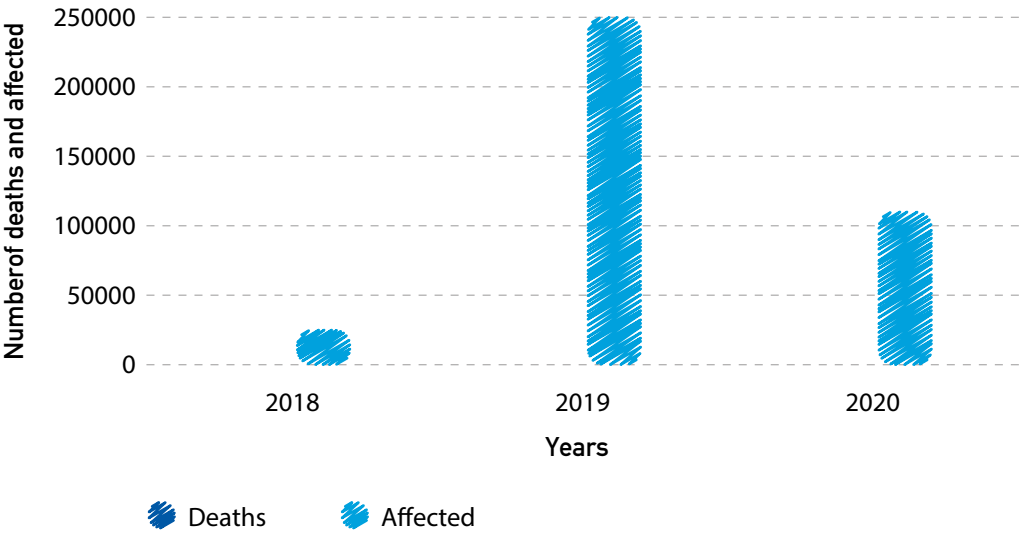
Annually, Comoros experiences nearly USD 5.7 million direct losses from earthquakes, floods, and tropical cyclones (UNDRR, 2016). Tropical cyclone is the most significant risk of the three disasters causing 64% average loss per year, followed by flooding, which accounts for 35% (UNDRR, 2016), affecting the 80% of the residential sector. The average annual direct loss from flooding is $2.0 million (WHO, 2019). Flood prone areas include Anjouan, Ouani, Comore, Moheli, and Grande Comore regions. Wind hazard occurs in the Anjouan region's southeast regions. Storm surge is greatest along the southern and eastern coasts of the country. Comoros is seismically active. However, damage from the earthquake is not common. The average annual direct loss from earthquakes is $99,000 (Lemoine et al. 2020).



Number of deaths and affected from disasters, Comoros 2015-2020 (EMDAT)

Djibouti

Djibouti has a very high degree of risk to natural hazards making it highly vulnerable to floods, droughts, heatwaves, and earthquakes (Razack, et al. 2019). Drought events are further exacerbated by climate change. Rising sea-level rise poses a significant threat to the country's coastline and increases the risk to port infrastructure and tourism along the coast (Razack, et al. 2019). 33% of the population lives in high hazard risk zones, and 35% of the economy is chronically vulnerable to floods and drought (World Bank, 2021). The country is expected to become hotter and drier in projected future climates (Girvetz et al. 2019). Sea level rise is projected and is expected to contribute to loss of agricultural land, infrastructure, and urban settlements (Kireyev, 2018).



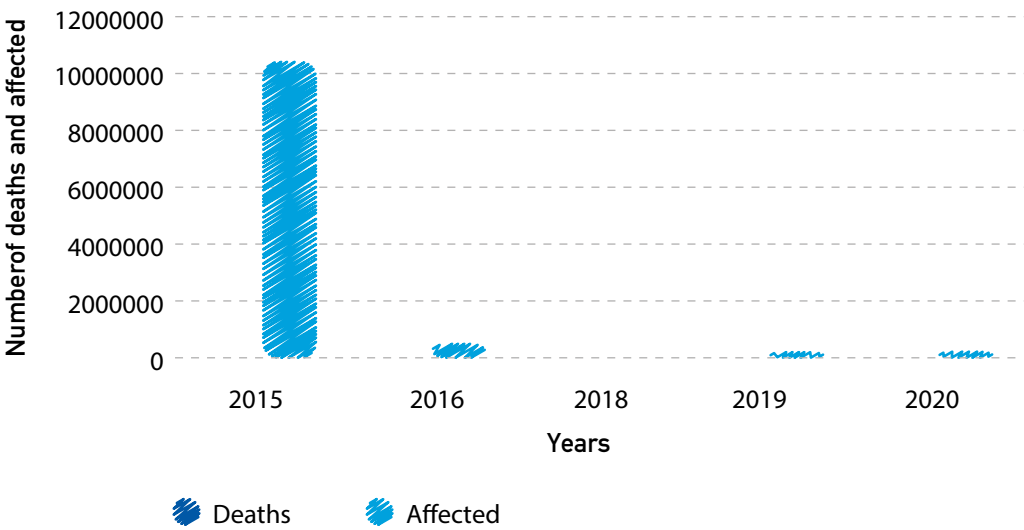
Number of mortalities and the affected from disasters, Djibouti 2015-2020 (EMDAT)

Eritrea

Conflicts, floods, droughts, earthquakes, volcanic, disease epidemics and desert locust infestations afflicts Eritrea (WHO, 2019a). These natural disasters destroy crops, kill livestock, and drive food insecurity across the country ((WHO, 2019a). Eritrea also suffers a drought every three to five years constraining the economy (FAO, 2015). Refugees escaping from Somalia (2,426 refugees) and other countries is adding extra stress on the economy (Human appeal, 2018).

Ethiopia

Ethiopia is severely threatened by disasters induced by drought, floods, conflicts and other natural and human induced hazards. In the last 10 years, disasters have, in varying degrees, occurred every year. These have cost the Ethiopian government heavily in terms of both human lives and resources. Ethiopia shows a high vulnerability to drought conditions and records the highest number of droughts in the region. The areas worst hit have been on the border between Ethiopia-Djibouti, northern-Kenya, central and south Somalia, and Eritrea. The drought conditions in Ethiopia have a significant impact on food security, leaving more than 2.6 million people in need of emergency assistance (WHO, 2019.). The worst hits are the pastoralist in the southern and eastern regions where most communities are dependent on the rain-fed pastoral systems.

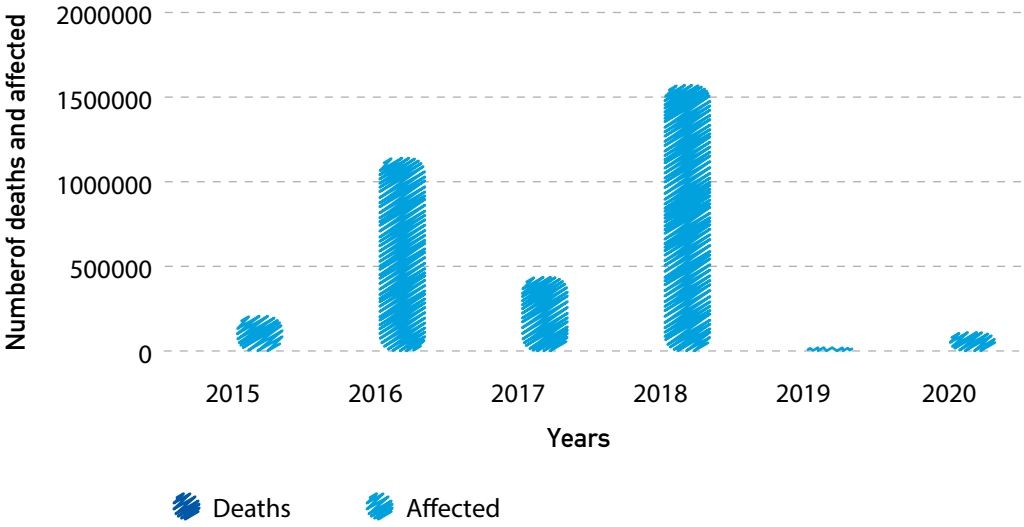


Number of deaths and affected from disasters, Ethiopia 2015-2020 (EMDAT)

Madagascar

Annually, Madagascar experiences over 100 million USD direct losses from earthquakes, floods, and tropical cyclones (UNDRR 2016). Tropical cyclones and associated floods, storm surges and winds are by far the most significant risks, accounting for 98% of the annual average loss (UNDRR 2016). Tropical cyclones are common in the Southwest

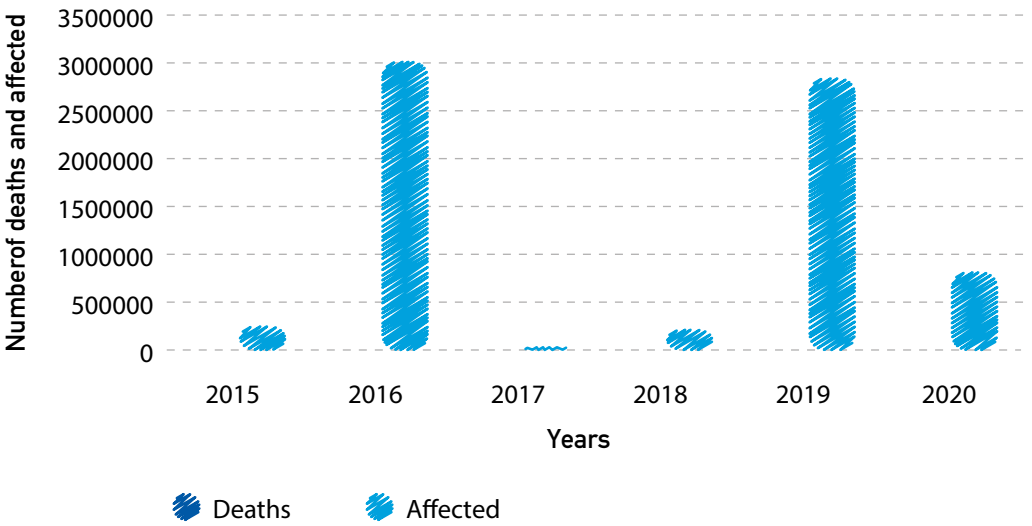
Indian Ocean region, the Northern half of Madagascar, particularly in the coastal region. Floods are experienced in the extreme north of the country, northern section, and southern zone along the eastern and western sections. Earthquakes are frequent but generally of low to moderate magnitude in local areas with active seismic such as Antananarivo, Mahajanga, and Toliary and Antsiranana. The highest loss occurs in the Toamasina region, which experiences nearly 30% of the average annual losses from the three disasters combined (UNDRR, 2016). Madagascar and the entire Indian Ocean region is at risk of a tsunami (UNDRR, 2016).



Number of deaths and affected from disasters, Madagascar 2015-2020 (EMDAT)

Kenya

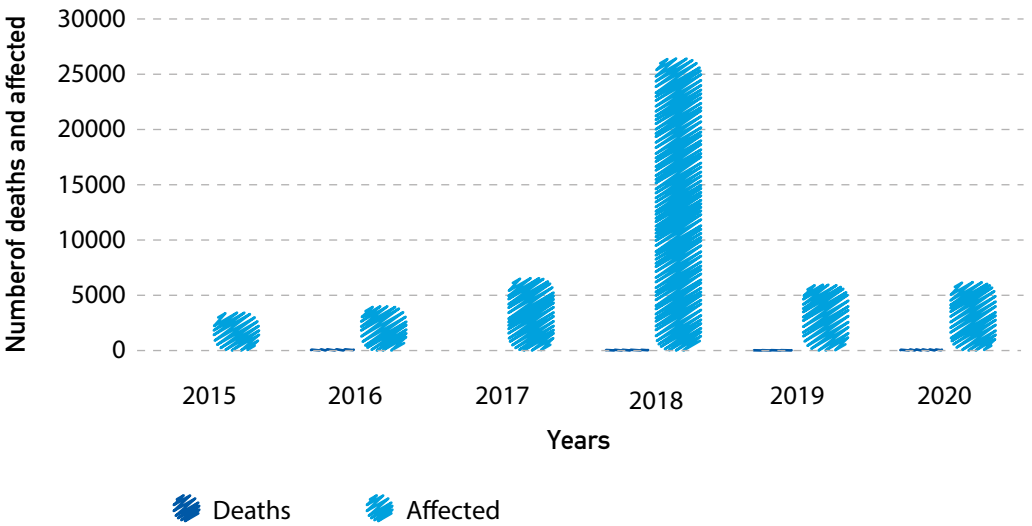
Most parts of Kenya experience river floods which are slow onset and mostly predictable. However, the Kenyan government is inadequately prepared to deal with the impacts of disaster events (Nyakundi et al. 2010). Some parts of the Western and Coastal areas experience more severe floods that destroys crops, livestock and homes over vast areas. The country also registered a high death toll. Thousands of people living in the lowlands are forced to move to higher grounds or to temporary shelters. The problem has been perennial each time, taking back years of development and costing the government millions of shillings in reconstruction and recovery (WHO, 2019). A much smaller number of people are at risk of earthquakes, conflicts, landslides, and volcanic activity. Projected changes in climate-related changes are expected to increase droughts and floods in Kenya that will negatively affect the increasing population and expanding economy. To deal with disasters, the Kenyan government has enacted DRR legislations at national and sub-national level that are focussed on disaster preparedness and risk management.



Number of deaths and affected from disasters, Kenya 2015-2020 (EMDAT)

Rwanda

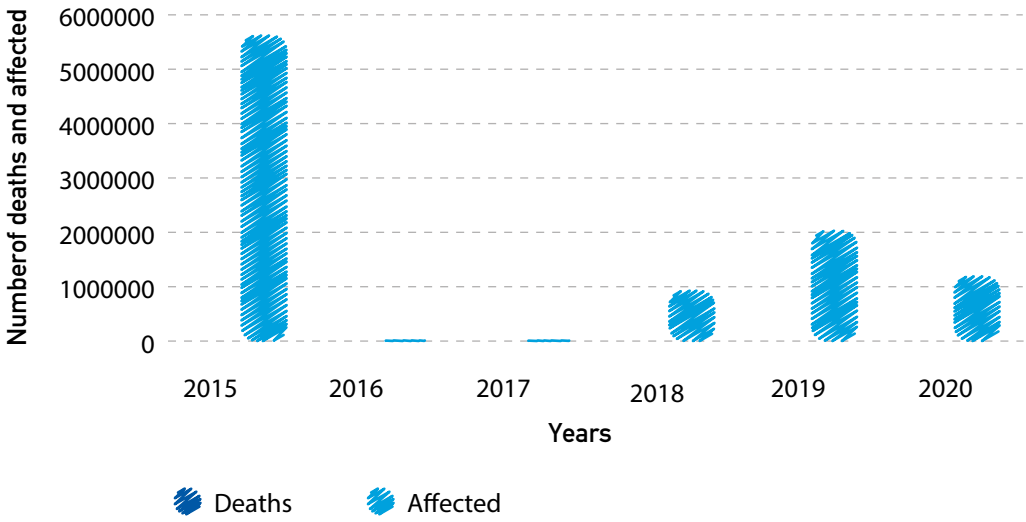
Rwanda has limited disaster cases resulting from natural hazards but has sometimes experienced localized floods, strong winds, landslides, earthquakes and droughts that sometimes culminate in losing lives and property and people's displacement (MIDIMAR, 2015). The effects of the 1994 Rwanda genocide are still felt today, especially amongst adults who were children at that time (HRW, 2003). There are also disasters resulting from disease epidemics, road accidents, forest fires, and social conflicts that affect men, women, children, the elderly, the poor, and female-headed households (MIDIMAR, 2015). Disasters have had significant environmental and socio-economic impacts, posing a serious threat to livelihoods, food security, and economic growth (MIDIMAR, 2015).



Number of deaths and affected from disasters, Rwanda 2015-2020 (EMDAT)

Somalia

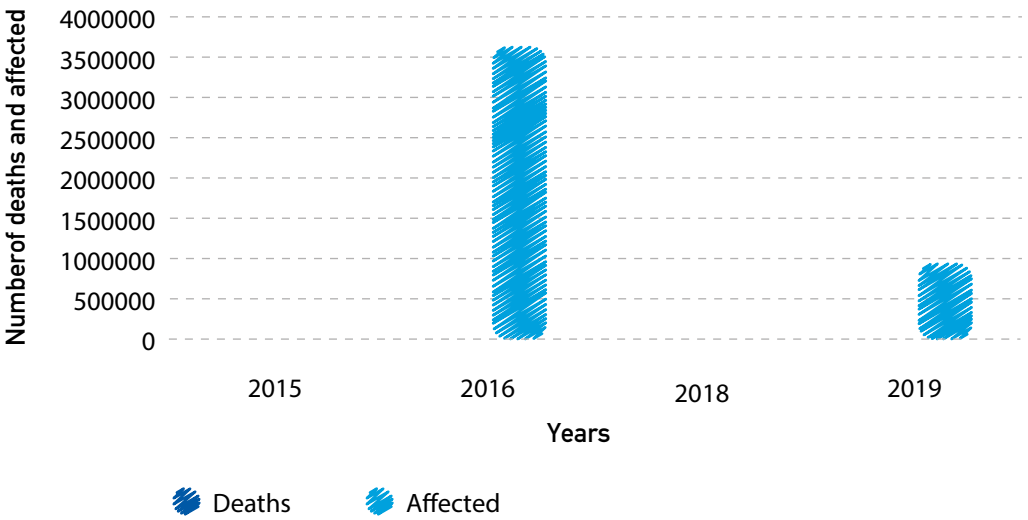
The Federal Republic of Somalia is located in the Horn of Africa bordering Ethiopia to the west, Djibouti to the Northwest, Gulf of Eden to the north and Kenya to the Southwest. Somalia has the longest coastline in Africa with a rugged terrain consisting of mainly plateaus, plains and highlands. The weather is hot and dry most of the year with periodic monsoon winds. Rainfall is generally irregular and unreliable. The arid and semi-arid lands cover much of the country where pastoralism is the main socio-economic activity. According to UNDP, Somalia has an estimated population of over 15 million people, majority of who are youths. It has suffered for nearly three decades from instability and internal strife worsened by Al-Shabaab insurgency that has killed thousands of people and displaced hundreds of thousands in Somalia and spilled over to neighbouring countries such as Kenya and Uganda. The country faces significant risk from natural hazards and weak government institutions that has contributed to over 10 million people being affected by disasters between 2015-2020.



Number of deaths and affected from disasters, Somalia 2015-2020 (EMDAT)

South Sudan

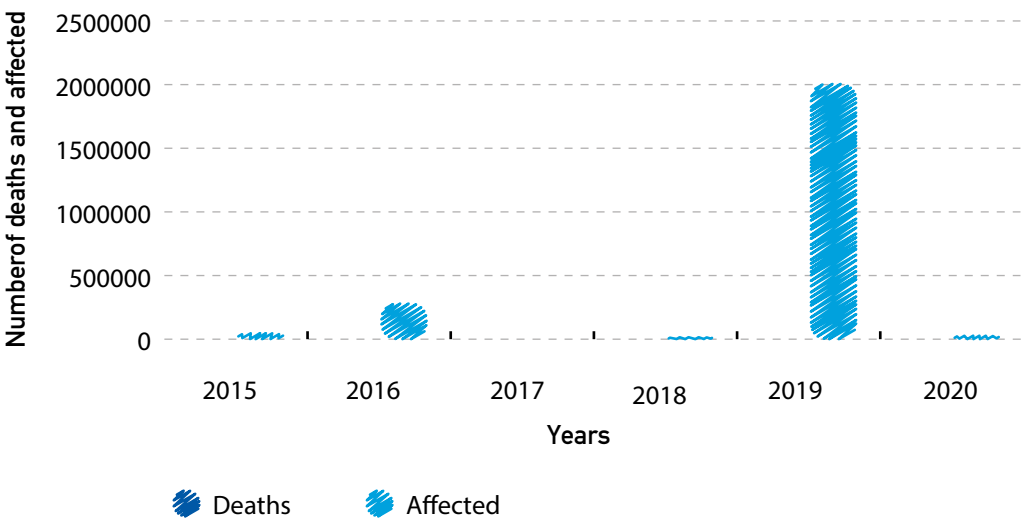
Conflicts, floods, drought, storms and wildfires cause widespread damage across South Sudan. For example, the conflict and severe droughts of 2018 left 7.1 million people in need of emergency response (Anyadike, 2019). Recurring drought events affects about 60% of the population (Nimir and Elgizouli, 2017). Malnutrition levels are critical, with about 860,000 children under the age of five estimated to be severely malnourished (UNICEF, 2019).



Number of deaths and affected from disasters, South Sudan 2015-2020 (EMDAT)

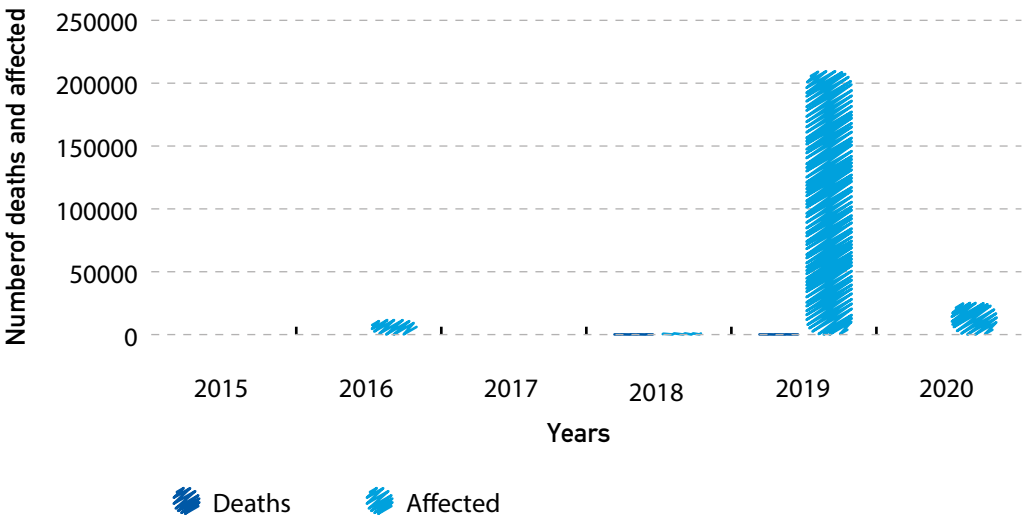
Tanzania

Tanzania experiences two major hazards: floods and droughts. Floods affects about 0.26% of the country's total population (UNISDR, 2018). Under future climate conditions, this percentage is expected to increase to 32% (UNISDR, 2018). The most affected sectors are agriculture (crop and livestock) and transport sectors, which results in food insecurity, shortage of clean drinking water and damaged infrastructure. For example, in 2019 uninterrupted rainfall caused serious flooding in the city of Dar es Salaam leading



Number of deaths and affected from disasters, Tanzania 2015-2020 (EMDAT)

to displacement of 1,215 households, 1,560 homes swept away and destroyed roads and bridges (Bird, 2019). The loss was estimated between US$107-227 million (Bird, 2019). This is a recurring event as similar incidents occurred in 2009, 2010, 2011, 2014, 2015, 2017 and 2018 (Elia, 2018).



Number of deaths and affected from disasters, Uganda 2015-2020 (EMDAT)

Uganda

Water scarcity and floods pose a significant and recurring risk to Uganda. Drought is a recurrent hazard in Uganda, with the recent drought events occurring in 2010 and 2017 affecting areas near Lake Victoria and in the northeast. The arid and semi-arid regions of Uganda in the north and high population concentration in and around Kampala are susceptible to hydrological drought. Drought has had significant negative impacts on the economy and food security, although the impact is not as profound as in Ethiopia, South Sudan and Eritrea. On average, around 10% of the population experiences water scarcity each year with millions of people affected substantially higher in drier years. The 2017 drought left one million people in urgent need of food assistance (FAO, 2017). The most significant flood potential occurs during and following the most intense and sustained rainfalls in the March to May rainy season. Over 1000 flood events coupled with 480 deaths, 50,000 hectares damaged cropland, over 4 million indirectly affected people, and over 20,000 people have been evacuated or relocated since 2011 (Winsemius et al. 2018). Averagely, 45,000 people are affected by floods each year (WHO, 2019). A much smaller number of people are at risk of earthquakes, landslides, and volcanoes. A landslide on the slope of Mt Elgon in 2010 killed over 350 and relocation of up to 500,000 people (WHO, 2019). Earthquakes in active seismic areas like Western Uganda pose danger to infrastructure.

Appendix IV: List of identified DRR initiatives in the ten countries in Eastern Africa

Country	Initiative	Title of initiative	Status	Level of GSI integration[64]	Amount of funding (USD)
Comoros	Project	Strengthening Infrastructure Resilience in the Comoros	Ongoing	1	300,000
Comoros	Project	Support to Comoros damage assessment from cyclone Kenneth	Ongoing	2	99,948
Comoros	Program	Disaster risk profiling of Comoros	Ongoing	1	Unavailable
Comoros	Project	Comoros Post-Kenneth Recovery and Resilience Project	Ongoing	2	45,000,000.00
Comoros	Strategy/ Plan	The Arab strategy for disaster risk reduction	Ongoing	1	Unavailable
Comoros	Strategy/ Plan	Disaster Risk Management in the Islands of the Indian Ocean	Closed	1	Unavailable
Comoros	Strategy/ Plan	National Determined Contributions	Ongoing	2	Unavailable
Djibouti	Project	Strengthening Djibouti's National Response Capacity to Natural Hazards	Ongoing	1	600,000
Djibouti	Project	Drought Post Disaster Needs Assessment	Closed	3	119,982.00
Djibouti	Project	Pursuing low climate adaptation disaster risk reduction in Djibouti	Closed	1	2,700,000.00

64 Level 1: No reference to gender responsive and social inclusion: Level 2: Gender responsive and social inclusion mentioned in overall objectives but absent from subsequent implementation levels; Level 3: Gender responsive and social inclusion clearly presented as one relevant entry point in relation to main objective, but absence of clear road map leading to implementation; Level 4: Gender responsive and social inclusion included in action plan, but absence of clear earmarked resources for implementation; Level 5: Gender responsive and social inclusion included in DRR initiative from objective to action plan, with clear resources identified for implementation

Country	Initiative	Title of initiative	Status	Level of GSI integration[64]	Amount of funding (USD)
Djibouti	Strategy/ Plan	National Determined Contributions (NDCs)	Ongoing	1	Unavailable
Eritrea	Strategy/ Plan	Support the Return of IDPs & Expellees to Communities of Origin or New Resettlement	Closed	2	60,975,000
Eritrea	Strategy/ Plan	National Determined Contributions (NDCs)	Ongoing	2	Unavailable
Eritrea	Project	Crisis Prevention & Recovery	Closed	1	60,975,000
Ethiopia	Policy	National policy and strategy on disaster risk management	Ongoing	3	Unavailable
Ethiopia	Policy	Policy and Institutional Framework for Effective Disaster Risk Management in Ethiopia	Ongoing	3	Unavailable
Ethiopia	Program	Disaster Risk Management Strategic Programme Investment Framework	Ongoing	3	Unavailable
Ethiopia	Program	Enhancing Urban Resilience in Addis Ababa, Ethiopia	Closed	1	Unavailable
Ethiopia	Project	Decentralisation of Disaster Risk Management in Ethiopia	Ongoing	1	40,968,825.00
Ethiopia	Project	Capacity Building in Post Disaster Needs Assessment	Closed	1	46,682

Country	Initiative	Title of initiative	Status	Level of GSI integration[64]	Amount of funding (USD)
Ethiopia	Project	Building Capacity for Woreda Disaster Risk Reduction and Climate Change Adaptation	Ongoing	4	744,051
Ethiopia	Project	Disaster Risk profiling Ethiopia	Ongoing	1	Unavailable
Ethiopia	Strategy/ Plan	Local Disaster Risk Reduction Planning	Closed	2	66,737.44
Ethiopia	Strategy/ Plan	Ethiopia Drought Risk Management	Closed	4	Unavailable
Ethiopia	Strategy/ Plan	National Determined Contributions (NDCs)	Ongoing	3	Unavailable
Ethiopia	Strategy/ Plan	National Adaptation Plan (NAPs)	Ongoing	2	Unavailable
Ethiopia	Project	Battling Hunger in Ethiopia	Closed	1	Unavailable
Kenya	Act/Law	Tana River County Disaster Risk Management Act	Ongoing	1	Unavailable
Kenya	Act/Law	Garissa County Emergency Fund Act	Ongoing	1	Unavailable
Kenya	Act/Law	Samburu County Disaster management Act	Ongoing	2	Unavailable
Kenya	Act/Law	West Pokot County Disaster Management Act	Ongoing	1	Unavailable
Kenya	Act/Law	Embu County Emergency Fund	Ongoing	1	Unavailable
Kenya	Act/Law	Kwale County Disaster Management Fund Act	Ongoing	2	Unavailable
Kenya	Act/Law	Nyeri County Emergency Fubd Act	Ongoing	1	200000

Country	Initiative	Title of initiative	Status	Level of GSI integration[64]	Amount of funding (USD)
Kenya	Act/Law	Makueni County Emergency Fund	Ongoing	5	Unavailable
Kenya	Act/Law	Meru County Disaster Management Act	Ongoing	1	Unavailable
Kenya	Act/Law	Kilifi County Disaster Management Act	Ongoing	1	Unavailable
Kenya	Act/Law	Nandi County Disaster Management Act	Ongoing	1	Unavailable
Kenya	Act/Law	Kakamega County Disaster Management Regulations	Ongoing	2	Unavailable
Kenya	Act/Law	Bomet County Disaster and Emergency Management Act	Ongoing	1	Unavailable
Kenya	Act/Law	Kajiado County Disaster Management Act	Ongoing	1	Unavailable
Kenya	Act/Law	Kisumu County Disaster and Emergency Management Act	Ongoing	1	Unavailable
Kenya	Act/Law	Kisii County Disaster Management Act	Ongoing	1	Unavailable
Kenya	Bill	Nairobi City County Disaster and emergency management Bill	Ongoing	1	Unavailable
Kenya	Bill	Vihiga County Disaster Management Bill	Ongoing	1	Unavailable
Kenya	Bill	Bungoma County Emergency Fund Bill	Ongoing	1	Unavailable
Kenya	Bill	Taita Taveta County Emergency Fund Bill	Ongoing	2	Unavailable

Country	Initiative	Title of initiative	Status	Level of GSI integration[64]	Amount of funding (USD)
Kenya	Bill	Kitui County Emergency Fund Bill	Ongoing	2	Unavailable
Kenya	Bill	Isiolo County Emergency Fund Bill	Ongoing	1	Unavailable
Kenya	Bill	Wajir County Disaster Management Bill	Ongoing	1	Unavailable
Kenya	Bill	Trans Nzoia County Disaster and Emergency Management Bill	Ongoing	1	Unavailable
Kenya	Bill	Mombasa County Disaster preparedness and emergency management bill	Ongoing	1	Unavailable
Kenya	Bill	Siaya County Disaster management bill	Ongoing	1	Unavailable
Kenya	Bill	Nakuru County Disaster and Emergency Management Bill	Ongoing	1	Unavailable
Kenya	Bill	Kericho County Disaster Management Bill	Ongoing	1	Unavailable
Kenya	Bill	Busia County Disaster Management Act	Ongoing	2	Unavailable
Kenya	Bill	Homa Bay County Disaster and Emergency Management Act	Closed	2	Unavailable
Kenya	Bill	Baringo County Disaster Management Bill	Ongoing	1	Unavailable
Kenya	Bill	National Disaster Management Authority Bill in Kenya	Ongoing	3	Unavailable

Country	Initiative	Title of initiative	Status	Level of GSI integration[64]	Amount of funding (USD)
Kenya	Policy	National policy for Disaster Management in Kenya	Ongoing	3	340000000
Kenya	Policy	Laikipia County Disaster Risk Management Policy	Ongoing	1	Unavailable
Kenya	Policy	Turkana County Disaster Risk Management Policy	Ongoing	1	Unavailable
Kenya	Program	Disaster risk profiling	Ongoing	1	Unavailable
Kenya	Project	Disaster Risk Management Project	Closed	1	305000
Kenya	Project	Drought Recovery Project	Ongoing	1	200000
Kenya	Project	Refugee Host Community Project	Closed	2	709036
Kenya	Project	Effective governance for disaster risk reduction in Kenya	Ongoing	1	1,000,000
Kenya	Project	Kenya Integrated Climate Risk Management Project	Ongoing	3	110,000.00
Kenya	Project	Strengthening Local Resilience to Climate Change and Conflict in Kenya	Ongoing	4	100,000
Kenya	Project	TA Kenya - Fortifying Institutional, Planning and Policy Frameworks to Manage Climate and Disaster Risk	Ongoing	2	400,000
Kenya	Project	Devolution and Locally-Led Disaster Risk Management	Ongoing	2	424,844

Country	Initiative	Title of initiative	Status	Level of GSI integration[64]	Amount of funding (USD)
Kenya	Project	Climate Resilience of Kenya's Coastal Communities	Ongoing	1	250,000
Kenya	Project	Integrating Resilience into Urban Infrastructure and Services in Nairobi Metropolitan Region	Ongoing	1	199,932
Kenya	Project	Fortifying Institutional, Planning and Policy Frameworks to Manage Climate and Disaster Risk	Ongoing	1	400,000
Kenya	Project	Post Election Violence (PEV) Livelihoods Recovery Project	Closed	2	694,044.12
Kenya	Project	Kenya Integrated Climate Risk Management Project	Ongoing		254,675.05
Kenya	Strategy/ Plan	Narok County Flood Early Warning Communication Strategy	Ongoing	1	Unavailable
Kenya	Strategy/ Plan	National Adaptation Plan (NAPs)	Ongoing	5	Unavailable
Kenya	Strategy/ Plan	National Determined Contributions (NDCs)	Ongoing	5	Unavailable
Kenya	Strategy/ Plan	Kalobeyei Integrated Socioeconomic Development Plan (KISEDP)	Closed	3	Unavailable
Madagascar	Policy	Madagascar Disaster Risk Management Policy	Ongoing	2	61,700,000.00

Country	Initiative	Title of initiative	Status	Level of GSI integration[64]	Amount of funding (USD)
Madagascar	Program	Madagascar's Efforts to Reduce Disaster Risk	Ongoing	2	61,700,000.00
Madagascar	Program	Training to incorporate disaster and risk reduction into educational plans and strategies in Madagascar	Ongoing	1	Unavailable
Madagascar	Project	Natural Disasters and Social Protection Systems in Madagascar	Ongoing	2	100,000
Madagascar	Project	Building Urban Resilience in Greater Antananarivo, Madagascar	Ongoing		500,000
Madagascar	Project	Adapting Madagascar's Safety Net Programs to Climate Change	Ongoing	3	250,000
Madagascar	Project	Social Resilience in Southern Madagascar-Inclusive Community Resilience Initiative	Ongoing	3	850,000
Madagascar	Project	Reducing the effects of hazards and protected from damage for sustainable development	Ongoing	1	Unavailable
Madagascar	Project	Effective measures to build resilience in Africa to adapt to climate change	Closed	1	Unavailable
Madagascar	Project	Law and Regulation to Supports Disaster risk reduction	Ongoing	1	Unavailable

Country	Initiative	Title of initiative	Status	Level of GSI integration[64]	Amount of funding (USD)
Madagascar	Project	Supporting disaster prevention and risk management in Antananarivo, Madagascar	Closed	2	Unavailable
Madagascar	Project	Support the Establishment of a Technical Centre for Disaster Risk Reduction and Climate Change Adaptation	Closed	1	897,399
Madagascar	Strategy/ Plan	National Disaster Risk Management Strategy	Ongoing	1	Unavailable
Madagascar	Strategy/ Plan	National Determined Contributions (NDCs)	Ongoing	2	Unavailable
Madagascar	Project	Tracking public investments for disaster reduction and recovery	Ongoing	1	471,000,000.00
Regional	Policy	Climate Change Policy, Strategy and Master Plan	Ongoing	2	Unavailable
Regional	Program	Promoting effective resilience investment delivering peace, agriculture led growth and socio-economic transformation in the Horn of Africa	Ongoing	3	1,000,000,000.00
Regional	Program	African Disaster Risk Financing Initiative	Ongoing	5	Unavailable
Regional	Project	Regional Disaster Risk Reduction capacity building project	Closed	1	Unavailable

Country	Initiative	Title of initiative	Status	Level of GSI integration[64]	Amount of funding (USD)
Regional	Project	Mitigating Ethnicity, Land and Conflict in Eastern Africa	Closed	2	391,135.00
Regional	Project	Reducing displacement risk in the Greater Horn of Africa: A baseline for future work	Ongoing	1	Unavailable
Regional	Project	Disaster risk reduction for resilience and sustainable development in the Arab region	Ongoing	1	Unavailable
Regional	Project	Regional Disaster Resilience and Sustainability Program	Closed	1	Unavailable
Regional	Project	Catastrophe Risk Profiling and Financing Initiative	Closed	2	1,269,077
Regional	Project	Regional Risk Financing Framework for Agriculture and Food Security in Southern Africa	Ongoing	3	364,000
Regional	Project	Strengthening Disaster Prevention Approaches in Eastern Africa - (STEDPEA)	Ongoing	1	1,000,000.00
Regional	Strategy/ Plan	Protocol on Environment and Natural Resources Management	Ongoing	1	Unavailable
Regional	Strategy/ Plan	East Africa Community Peace and Security Strategy	Ongoing	3	Unavailable

Country	Initiative	Title of initiative	Status	Level of GSI integration[64]	Amount of funding (USD)
Regional	Strategy/ Plan	National coordination mechanisms, legal frameworks and national plans for disaster risk reduction in Africa	Closed	1	Unavailable
Regional	Strategy/ Plan	Aqaba declaration on disaster risk reduction in cities	Ongoing	1	Unavailable
Regional	Strategy/ Plan	International Red Cross Plan	Closed	3	2,188,902.00
Regional	Strategy/ Plan	Regional Strategy for Integrated Disease Surveillance and Response	Ongoing	1	Unavailable
Rwanda	Policy	Environment and Climate Change Policy	Ongoing	2	Unavailable
Rwanda	Policy	The National Disaster Management policy	Ongoing	2	Unavailable
Rwanda	Project	Development of Comprehensive Disaster Risk Profiles for Enhancing Disaster Management	Closed	1	652,221.00
Rwanda	Project	Green Growth and Climate Resilience National Strategy for Climate Change and Low Carbon Development	Ongoing	2	Unavailable
Rwanda	Project	Disaster Risk Reduction and Prevention in Rwanda	Closed	2	52,635.00
Rwanda	Project	Public Investment Planning for Disaster Risk Reduction	Ongoing	2	224,111,773.00

Country	Initiative	Title of initiative	Status	Level of GSI integration[64]	Amount of funding (USD)
Rwanda	Project	Building National and Local Capacities for Disaster Management in Rwanda	Ongoing	2	3,710,249.00
Rwanda	Strategy/ Plan	National Disaster Risk Management Plan (NDRMP)	Ongoing	1	Unavailable
Rwanda	Strategy/ Plan	National Development Plan of Rwanda	Ongoing	2	Unavailable
Rwanda	Strategy/ Plan	National Determined Contributions (NDCs)	Ongoing	1	Unavailable
South Sudan	Program	Disaster Risk Management (DRM) programme	Ongoing	2	Unavailable
South Sudan	Project	Transforming Communities through investment in Disaster Risk Reduction	Ongoing	1	Unavailable
South Sudan	Project	Reducing hunger and malnutrition and promoting food production in Cueibet County, South Sudan	Ongoing	1	Unavailable
South Sudan	Strategy/ Plan	MHADM strategic plan	Closed	1	Unavailable
South Sudan	Strategy/ Plan	National Disaster Management Strategic Plan for South Sudan	Ongoing	2	Unavailable
South Sudan	Strategy/ Plan	New National Disaster Risk Management Strategy for South Sudan	Ongoing	1	Unavailable

Country	Initiative	Title of initiative	Status	Level of GSI integration[64]	Amount of funding (USD)
South Sudan	Strategy/ Plan	Community-Based Disaster Risk Management Planning	Ongoing	2	Unavailable
South Sudan	Strategy/ Plan	National Determined Contributions (NDCs)	Ongoing	1	Unavailable
Tanzania	Policy	The Disaster Management Act	Ongoing	1	Unavailable
Tanzania	Policy	Zanzibar Disaster Management Policy	Ongoing	1	Unavailable
Tanzania	Project	Strengthening Drought Resilience in Tanzania	Ongoing	1	200,000
Tanzania	Project	Floods Post Disaster Needs Assessment	Ongoing	1	50,000
Tanzania	Project	Ramani Huria Initiative	Ongoing	1	Unavailable
Tanzania	Project	Strengthening Tanzania's Disaster Response Project (STDRP)	ongoing	2	Unavailable
Tanzania	Project	Disaster Management	Ongoing	1	Unavailable
Tanzania	Strategy/ Plan	Building Disaster Resilience to Natural Hazards in Sub-Saharan Africa regions, countires and communities	Ongoing	1	Unavailable
Tanzania	Strategy/ Plan	Disaster Risk Reduction	Ongoing	1	Unavailable
Tanzania	Strategy/ Plan	Tanzania Emergency Preparedness and Response Plan (TEPRP)	Ongoing	3	Unavailable
Tanzania	Strategy/ Plan	National Determined Contributions (NDCs)	Ongoing	2	Unavailable

Country	Initiative	Title of initiative	Status	Level of GSI integration[64]	Amount of funding (USD)
Tanzania	Strategy/ Plan	Tanzania Disaster Communication Strategy (TDCS)	Closed	2	Unavailable
Uganda	Policy	The National policy for disaster preparedness and management	Closed	2	Unavailable
Uganda	Policy	A Guide to conflict and disaster risk management in educational institutions in Uganda	Closed	1	Unavailable
Uganda	Policy	The National Policy for Disaster Preparedness and Management	Closed	2	Unavailable
Uganda	Project	Governance of disaster risk reduction and management in Uganda	Closed	1	Unavailable
Uganda	Project	Building Urban Resilience in Uganda	Ongoing	1	200,000
Uganda	Project	Strengthening Capacities for Disaster Risk Management and Resilience Building project	Closed	1	3,968,708.00
Uganda	Project	Disaster risk management and oil production in Uganda	Closed	1	Unavailable
Uganda	Project	Community Managed Disaster Risk Reduction Approach in Managing Disaster in Uganda	Ongoing	1	Unavailable

Country	Initiative	Title of initiative	Status	Level of GSI integration[64]	Amount of funding (USD)
Uganda	Project	Making Cities Resilient: Supporting Cities In Uganda Towards The Development Of Local Disaster Risk Reduction Strategies	Ongoing	1	Unavailable
Uganda	Strategy/ Plan	Risk Assessment and Resilience Action Plan	Ongoing	2	950,000
Uganda	Strategy/ Plan	National Determined Contributions (NDCs)	Ongoing	2	Unavailable
Uganda	Project	Disaster Risk Reduction And Climate Change Adaptation Programme (DRR & CCA)	Ongoing	2	Unavailable
Uganda	Project	Agriculture Development For Enhanced Livelihoods Programme (AGRID)	Closed	2	Unavailable

Appendix V: Institutional and coordination mechanisms for DRR/M in Eastern Africa

Country	Name of institution dedicated for DRR/M	Name of the national DRR/M policy/ Strategy framework	Is there national multi stakeholder Platform?
The Comoros	To be determined	To be determined	To be determined
Djibouti	Ministry of Interior and Decentralization	National Strategy for Risk and Disaster Management	Not determined
Eritrea	Not determined	Not determined	Not determined
Ethiopia	National Disaster Risk Management Commission	National Disaster Risk Management Policy, 2015	Yes

Kenya	National Disaster Operation Centre	National Disaster Management Policy & Bill 2018(Draft)	Yes
Madagascar	The National Council for Risk and Disaster Management (CNGRC)	Stratégie Nationale de Gestion des Risques et des Catastrophes (2016)	Yes
Somalia	Ministry of Humanitarian Affairs and Disaster Management	Disaster Management Policy, 2017	No
South Sudan	Ministry of Humanitarian Affairs and Disaster Management	National Disaster Management Strategy, 2019	Yes
Rwanda	Ministry of Emergency Management	National Disaster Management Policy, 2012	No
Tanzania	Office of the Prime Minister	Disaster Management Act, 2015	No
Uganda	Office of the Prime Minister	National Policy for Disaster Preparedness and Management	Yes

Appendix VI: Status of the DRR/M policies framework

Country	Name of the DRR policy document	Adoption status and year
The Comoros	Not determined	Not determined
Djibouti	National Strategy for Risk and Disaster Management (2005)	Adopted 2005 under revision
Eritrea	Not determined	Not determined
Ethiopia	Disaster Risk Management Policy-Eth (2013)	Adopted 2013
Kenya	National Disaster Risk Management Policy (2017)	Adopted 2017
Madagascar	National Management Strategy of Risks and Disasters (2016-2030)	Adopted 2016
Somalia	Draft National Disaster Management policy (2017)	Draft (2017)

South Sudan	National Strategy for Disaster Risk Management in South Sudan (2019)	Draft of 2019
	Draft National Disaster Risk Management Policy (2016)	Draft of 2016
Rwanda	National Disaster Risk Management Plan (2013)	Adopted 2013
Tanzania	National Disaster Management Act 2015	2015
Uganda	National Policy for Disaster Preparedness and Management (2010)	Adopted 2010 but under revision

Appendix VII: Major hazards addressed in the DRR policy frameworks documents

Country	Major hazards in the DRR related policy documents
The Comoros	Volcanic eruptions, drought, flash floods and landslides
Djibouti	Droughts, earthquake, floods, epidemics, accidents, environmental degradation, fires and volcanic eruptions
Eritrea	Not determined
Ethiopia	Floods, droughts, landslides, human and livestock diseases and forest fires with earthquakes and volcanos as minor
Kenya	Drought, floods, landslides, sandstorms, thunderstorms, windstorms and epidemics. Others are infrastructure failure, accidents, fire, terrorism, conflicts and environmental degradation
Madagascar	Cyclones, flooding, drought, locust invasion and fires
Somalia	Droughts, floods, cyclones, storms, and geophysical hazards
South Sudan	Floods, drought and trans-boundary animal diseases, but crop pests and diseases and bush fires
Rwanda	Drought, floods, mass movements, terrorism, fires, animal and human diseases, earthquake, volcanic activity and industrial and technological accidents
Tanzania	Not determined
Uganda	Drought, landslides, floods, earthquakes, epidemics, accidents and environmental degradation

Appendix VIII: Hazards addressed in the CCA policy frameworks documents

Country	Major hazards in the policy documents
The Comoros	To be determined
Djibouti	Drought, floods, storms and sea level rise
Eritrea	To be determined
Ethiopia	Floods and droughts
Kenya	Drought and floods
Madagascar	Floods, sea level rise, hurricanes, epidemics, and drought
Somalia	Drought, storms and floods and biodiversity loss
South Sudan	Drought, floods, storms
Rwanda	Landslides, food insecurity, soil erosion, floods
Tanzania	To be determined
Uganda	Droughts, floods, landslides and heat waves

Appendix IX: Climate Change Adaptation related policy frameworks

Country	Name of the CCA related policy document	Responsible Agency	Adoption status and year
The Comoros	Intended Nationally Determined Contribution (INDC, 2015)	The Ministry of Production, Environment, Energy, Industry and Handicrafts	Adopted 2015
Djibouti	Initial Nationally Determined Communication (INDC)	Ministry of Habitat and Environment	2015
Eritrea	Not determined	To be determined	Not determined
Ethiopia	National Adaptation Plan	Ministry of Environment, Forest and Climate Change	Adopted 2019
Kenya	National Adaptation Plan	Ministry of Environment	Adopted 2015
Madagascar	National Adaptation Plan	Ministère de l'Environnement et du Development Durable (Ministry of Environment and Sustainable Development- MEDD)	In process

Country	Name of the CCA related policy document	Responsible Agency	Adoption status and year
Somalia	National Programme of Action (NAPA), 2013	Ministry of Natural Resources	Adopted 2013
South Sudan	National Adaption Programme of Action (NAPA, 2016)	Ministry of Environment	Adopted 2016
Rwanda	National Adaption Programme of Action (2016)	Ministry of Environment and Rwanda Environment Authority (REMA)	Adopted 2016
Tanzania	To be determined	To be determined	To be determined
Uganda	Intended Nationally Determined Contribution (INDC, 2015)	Ministry of Water and Environment	Adopted 2015

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Toward Gender-responsive and Technology-oriented Disaster Management in Eastern Africa

This publication (1) highlights Disaster Risk Reduction (DRR) best practices and climate actions to extreme climate-related events; (2) assesses the extent to which regional and national DRR strategies and programs incorporate AI and gender perspectives in their DRR measures; (3) assesses the institutional landscape, the roles and responsibilities of DRR stakeholders; and (4) elucidates the status of DRR initiatives with a gender and social inclusion lens.

We are hopeful that the findings of the publication will influence policy decisions that drive investments for effective use of innovations in AI, citizen science and gender-responsive actions that can enable disaster resiliency in Member States.

From
the People of Japan

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