

UNITED REPUBLIC OF TANZANIA

VICE PRESIDENT'S OFFICE



**NATIONAL DROUGHT PLAN
(2025-2030)**

2025

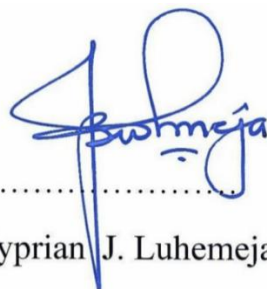
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Eng. Cyprian J. Luhemeja

PERMANENT SECRETARY

ABBREVIATIONS

| | |
|----------|--|
| CSOs | Civil Society Organizations |
| DMD | Disaster Management Department |
| ENSO | El Niño Southern Oscillation |
| EWS | Early Warning System |
| FAO | United Nations Food and Agriculture Organization |
| FEWS NET | Famine Early Warning Systems Network |
| ITCZ | Inter-Tropical Convergence Zone |
| IWRM | Integrated Water Resources Management |
| LGAs | Local Government Authorities |
| LTPP | Long Term Perspective Plan |
| NAP | National Adaptation Plan |
| NBS | National Bureau of Statistics |
| NBSAP | National Biodiversity Strategy and Action Plan |
| NCCRS | National Climate Change Response Strategy |
| NCCSC | National Climate Change Steering Committee |
| NCCTC | National Climate Change Technical Committee |
| NDP | National Drought Plan |
| PMO-DMD | Prime Minister's Office – Disaster Management Department |
| TEPRP | Tanzania Emergency Preparedness and Response Plan |
| TMA | Tanzania Meteorological Authority |
| UNCCD | United Nations Convention to Combat Desertification |
| URT | United Republic of Tanzania |
| VPO | Vice President's Office |
| WMO | World Meteorological Organization |
| WRI | World Resource Institute |
| WSDP | Water Sector Development Programme |
| ZCCSC | Zanzibar Climate Change Steering Committee |

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1.0 INTRODUCTION

1.1 Background

Drought is a natural and recurring phenomenon that occurs when an area experiences a prolonged period of unavailability or low rainfall, leading to significant water shortages. Unlike sudden natural disasters, drought develops slowly and quietly, often persisting for months or even years before its effects become fully visible. Although it is a natural event, its frequency and severity are increasingly influenced by climate change and environmental degradation.

Drought has far-reaching impacts that cut across multiple sectors of the national economy. Communities that depend on rain-fed agriculture are particularly vulnerable, as reduced rainfall limits soil moisture, suppresses crop growth, diminishes yields, and reduces pasture availability for livestock. These effects extend beyond the immediate drought-affected areas due to the interconnected nature of livelihoods, markets, and landscapes. Water availability is a central driver of social and economic activities, and when rainfall declines, the production of goods and services is disrupted, ultimately affecting incomes, food security, and national development.

Beyond agriculture, drought stresses natural ecosystems, lowers water levels in rivers and reservoirs, increases the risk of wildfires, and places pressure on domestic and industrial water supplies. Availability of water and wide-ranging consequences make drought one of the most damaging natural hazards. Understanding how drought forms and how it affects communities and ecosystems is therefore essential for building resilience and safeguarding sustainable development in Tanzania.

The availability of water resources varies greatly across the country due to geophysical factors as well as seasons of the year. Rainfall variations across the country are commonly known as areal rainfall distribution of which is in the form of rainfall patterns or modes. Tanzania has two main rainfall modes within its sovereign borders. These are (i) uni-modal, which occur from November to April and is experienced in the southern, southwest central, southwest and western parts of the country and (ii) bimodal, which occur from October to December and March-May; occurring in the north, the northeastern and northern coastal parts of the country as indicated in **Figure 1**. From these patterns, in general, a large part of the country receives rainfall that varies from 550 to 1000mm per annum in the central part of the country, except for highlands and other parts of the extreme south and west where it experiences rainfall between 1400 – 2000mm per year, as indicated in **Figure 2**.

In many regions of central and northern Tanzania, lives and livelihoods have continued to suffer from periodic weather-related stress, especially from below normal rainfall. Among the major regions which have been frequently affected by drought conditions in Tanzania are some parts of the northern and central regions including Arusha, Manyara, Shinyanga, Simiyu, and Dodoma (**Figure 1**). Most of these areas have semi-arid characteristics which share the same ecological zone with drought-prone areas of East Africa.



Figure 1: Tanzania rainfall pattern (Source: TMA, 2025)

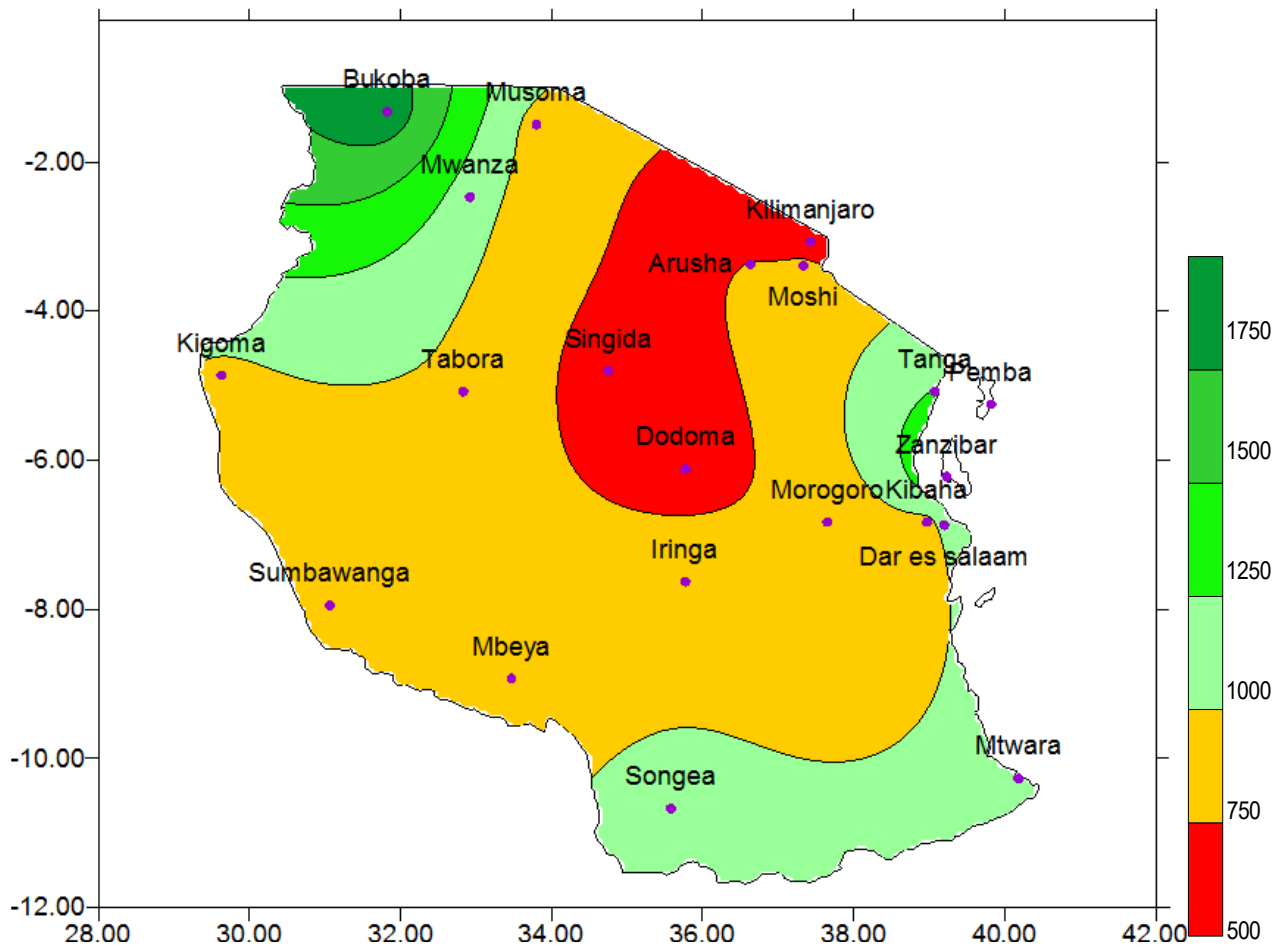


Figure 2: The spatial of reliability for the annual mean rainfall 1991-2020 (Source: TMA, 2025)

1.2 Purpose of the Plan

The main purpose of this National Drought Plan (NDP) is to provide an effective framework for instituting a coordinated inter-agency approach towards managing drought risks in the country. The NDP is intended to contribute to the protection of Tanzania’s land, water and other environmental resources from over-use and drought management ensuring the provision essential ecosystem services as well as safeguarding Tanzania’s food security. The drought plan is mainly anchored on three pillars of drought risk reduction so as to provide a practical way of organizing multiple actions by different actors in the country. These pillars are: (1) instituting and implementing a drought monitoring and early warning system, (2) responding to droughts through addressing vulnerability and risk assessment, and (3) establishing a sound recovery mechanism that entails instituting measures that facilitate and enhance the quick rebound of livelihoods after drought shocks.

On other ends, the Tanzania Emergency Preparedness and Response Plan (TEPRP) of 2012 and The National Disaster Management Strategy (NDMS) of 2022 outlines a wide range of hazards and disasters, including fire outbreaks, landslides, floods, earthquakes, droughts and plagues. These plan and strategy provide general guidance on disaster management; it does not offer a specific approach or interventions for individual hazards such as drought. Thus, this National Drought Plan (NDP) is meant to complement the established TEPRP and NDMS, with clear, focused interventions that will be implemented on drought management in Tanzania.

1.3 Objectives of the Plan

The overall objective of the Pan is to enhance national capacity in drought resilience through integrated actions for drought preparedness. The plan will help to boost the resilience of the people, communities and ecosystems against droughts.

Specific objectives of the Plan are to:

- (i) outline a framework for research on drought-related conditions in a timely and systematic manner;
- (ii) formulate the principles for declaring drought emergencies and triggering various mitigation and response activities;
- (iii) establish criteria for monitoring and tracking drought emergencies and triggering various mitigation actions;
- (iv) propose an institutional framework and organizational delivery system that ensures learning between and within levels of government and civil society as well as defining the roles and responsibilities of key individuals, organizations, and stakeholders.
- (v) identify mitigation actions that can be taken to alleviate vulnerabilities to drought risks and impacts.
- (vi) establish a set of procedures to continually evaluate and exercise the plan and periodically revise it, so that it will stay responsive to the needs of the communities.
- (vii) identify principal activities, groups (i.e. marginalized groups), or areas most at risk and develop mitigation actions and programs that reduce drought vulnerabilities.

1.4 Scope

The Plan covers the United Republic of Tanzania (Tanzania Mainland and Zanzibar). It provides an overview of drought characteristics, monitoring and forecasting systems and early warning mechanisms. It also provides guidance on impact and vulnerability assessments, communications and response coordination, actions, drought mitigation and preparedness strategies, as well as organizational roles, responsibilities and key recommendations.

CHAPTER TWO

2.0 OVERVIEW OF DROUGHT IN TANZANIA

Drought remains one of the most significant climate-related challenges for Tanzania. While it cannot be eliminated, proactive planning, early warning and sustainable resource management can reduce its impacts. Integrating drought management into national development and climate resilience strategies is key to safeguarding livelihoods, ecosystems and the economy.

Tanzania's climate is largely influenced by the Inter-Tropical Convergence Zone (ITCZ), which brings seasonal rains the "long rains" (Masika) mainly from November to May and the "short rains" (Vuli) from October to December. Thus, drought as a prolonged period of dry condition on the natural environment is largely related with the ITCZ orientation within the country.

2.1 Country Profile

2.1.1 Geographical Location

Tanzania is located south of the Equator in East Africa, lying mostly between latitudes 1° and 12°S, and longitudes 29° and 41°E. It is actually a merger of 2 states: the mainland, formerly known as Tanganyika and Zanzibar Island. Tanzania constitutes a total area of 945,087 km² of which the dryland surface area is 883,749 km² (881,289 km² mainland and 2,460 km² in Zanzibar) and 59,050 km² of inland water bodies and part of the Indian Ocean. Tanzania shares borders with Kenya and Uganda to the North; Tanzania and Malawi to the South-West, Mozambique to the South; Burundi, Rwanda, and the Democratic Republic of Congo to the West; and the Indian Ocean to the East. The capital city of Tanzania is Dodoma and the official languages spoken in Tanzania are Swahili and English. The "shilingi" (or shilling in English) is the national currency.

2.1.2 Main Physical Features

Tanzania has a variety of physical features extending from a narrow Coastal belt of the Western Indian Ocean with sandy beaches to an extensive plateau with altitude ranging from 1000 to 2000 meters above mean sea level (mamsl). The plateau is fringed by narrow belts of highlands, including Mount Meru (4,566 mamsl), Mount Kilimanjaro (5,895 mamsl) the highest mountain in Africa. Tanzania has several freshwater bodies, including Lake Tanganyika, the longest and deepest freshwater lake in Africa; Lake Victoria, the largest freshwater lake in Africa; and Lake Nyasa (**Figure 3**). The country also has numerous large

rivers draining into nine drainage basins as indicated in **Figure 3**). The major rivers include Rufiji, Kagera, Mara, Ruaha, Pangani, Ruvuma and Malagarasi.

Tanzania landcover comprise a variety of vegetation types such as Bushy and Savannah vegetations that is fringed by a narrow belt of forested highlands, the Itigi thickets, the Masai Steppes, the Miombo woodlands. These vegetation types form the dominant land cover in the mainland while the Mangrove systems is found along the coast. These ecosystems are famous habitats for a variety of wildlife.



Figure 3: Tanzania Basin Water Boards orientation and internal boundaries (Source: MoW, 2025)

2.1.3 Climatic Condition

The climate in the country is diverse as a result of proximity to the ocean and inland lakes and the wide altitudinal range of which the latter governs temperature range. It is characterized by two main rain seasons namely the long rains (Masika) and the short rains (Vuli) which are associated with the southward and northward movement of the Inter-Tropical Convergence Zone. The Masika begins in the mid of March and end at the end of May, while the Vuli rains begin in the middle of October and continues to early December. The northern part of the country (including areas around Lake Victoria Basin, North-Eastern Highlands and the Northern Coast) experience a bimodal rainfall regime. Central, South and Western areas have a prolonged unimodal rainfall regime starting from November, continuing to the end of April.

In general, annual rainfall varies from 550 mm in the central part of the country up to over 2000 mm in some parts of south-western highlands. Most of the country area receives less than 1,000 mm, except the Highlands and parts of the extreme South and West where 1,400 mm to 2,000 mm per annum is expected. The average rainfall in the central regions is around 600 mm per annum.

Temperature varies according to the geographical location, relief and altitude. Along the Coast and in the offshore islands, the average temperature ranges between 27°C and 29°C, while in the Central, Northern and Western parts temperatures range between 20°C and 30°C. Temperatures are higher between the months of December and March (when the sun is directly over the Equator) and coolest during the months of June and July (when the sun is on the sub-polar Northern tropic of Capricorn). In the Southern highlands and mountainous areas of the North and Northeast, temperature occasionally drops below 15°C at night.

Agriculture is one of the largest land uses in the country, of which 45 million hectares are arable land. Only 23% of the available arable land or 10.1 million hectares is under cultivation. There is however a potential to maximise production through intensification, land expansion and irrigation. The major food crops produced in Tanzania are rice, maize, cassava, sorghum, millet, wheat, beans, potatoes, and bananas while main cash crops are cashew nuts, tobacco, coffee, tea, cotton and sisal.

The last population and housing census was in 2022 of which the population was estimated to be 61,741,120 - with a population growth rate of 3.2%. The population is expected to double in the next 22 years. Male population makes about 49% and women 51% of the total population of the United Republic of Tanzania. According to the last census, population of citizens living in urban areas was 21,544,623 whereas in rural settings was 40,196,497.

2.1.4 Water Supply and Demand

Water resources is one of the critical inputs in economic development of the country. It influences the performance of the agricultural sector, which employs 61.1% of the workforce and accounts 26.2% of the country's GDP and approximately 65% of the foreign exchange earnings. Agriculture accounts for approximately 65% of the industrial sector's raw resources.

Tanzania adopted Basin Management Approach for water resource management in the 1980s when the country was divided into nine basins through an Act of Parliament No.10 of 1981, which was an amendment of the Principal Act No. 42 of 1974. Early in 1995, a comprehensive review of Tanzania's water resources policies and institutions was carried out by the Government in collaboration with the World Bank and DANIDA where nine river basins were established. These basins are Pangani, Wami/Ruvu, Rufiji, Ruvuma, Lake Nyasa, Lake Rukwa, Lake Tanganyika, Lake Victoria and Internal drainage and are governed through River Basin Water Boards which are responsible for regulating and planning water resources within the basin borders.

About 50% of the surface runoff drains directly to the Indian Ocean through the main rivers i.e. Pangani, Wami, Ruvu, Rufiji, Mbwemkuru, Matandu and Ruvuma. The remaining 50% drains into surface water bodies on the northward into Lake Victoria, westward into Lake Tanganyika, southward into Lake Nyasa and finally into the Zambezi and then into a number of drainage basins which have no outlet to the sea (URT, 2012). Lake Victoria, Lake Nyasa and Lake Tanganyika are riparian international water bodies which are shared with neighbouring countries.

According to the country's Water Sector Status Report of 2015, the current available annual renewable water resources in Tanzania is about 126,262 million Cubic Meters (MCM) per year which is equivalent to an average of 2,330 m³/capita/yr which is above the global Falkenmark Water Stress Indicator of 1700 m³/capita/yr. However, this is deemed to decrease as a result of continued development efforts, climate change as well as increase in population as indicated in **Figure 4**. It is thus projected that, by 2030, Tanzania will be under water stress.

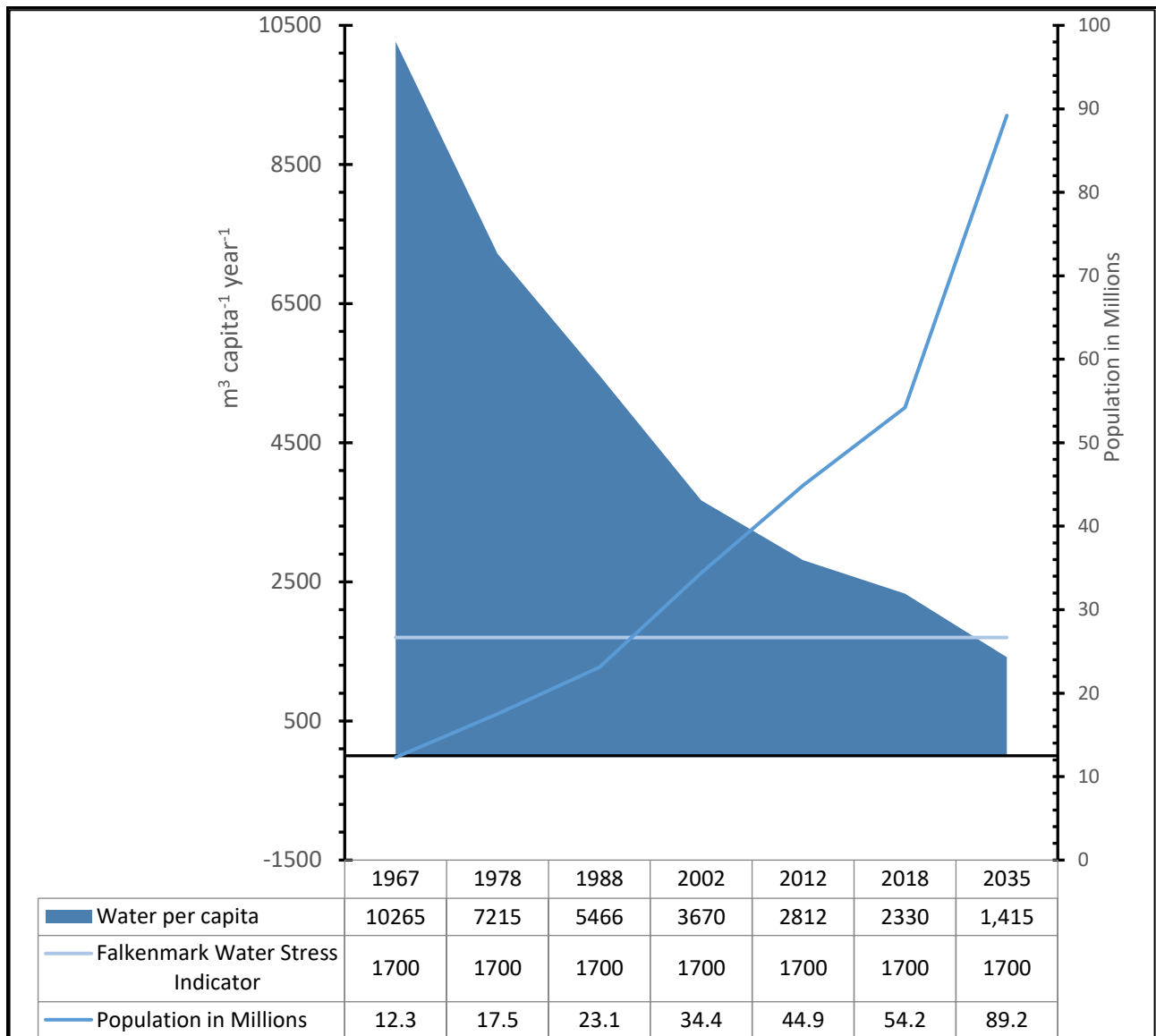


Figure 4: Trend of Tanzania per capita annual renewable water resources with increase in population (1967 to 2018): (Source: Water Sector Status Report 2020)

Nevertheless, there exists huge spatial variation of renewable water resources across the country, notably in the river basins as indicated in **Figure 5**. Five out of nine river basins indicated in **Figure 5** bears a Falkenmark Water Stress Indicator of below the threshold of 1700 m³/capita/yr and hence currently under water stress.

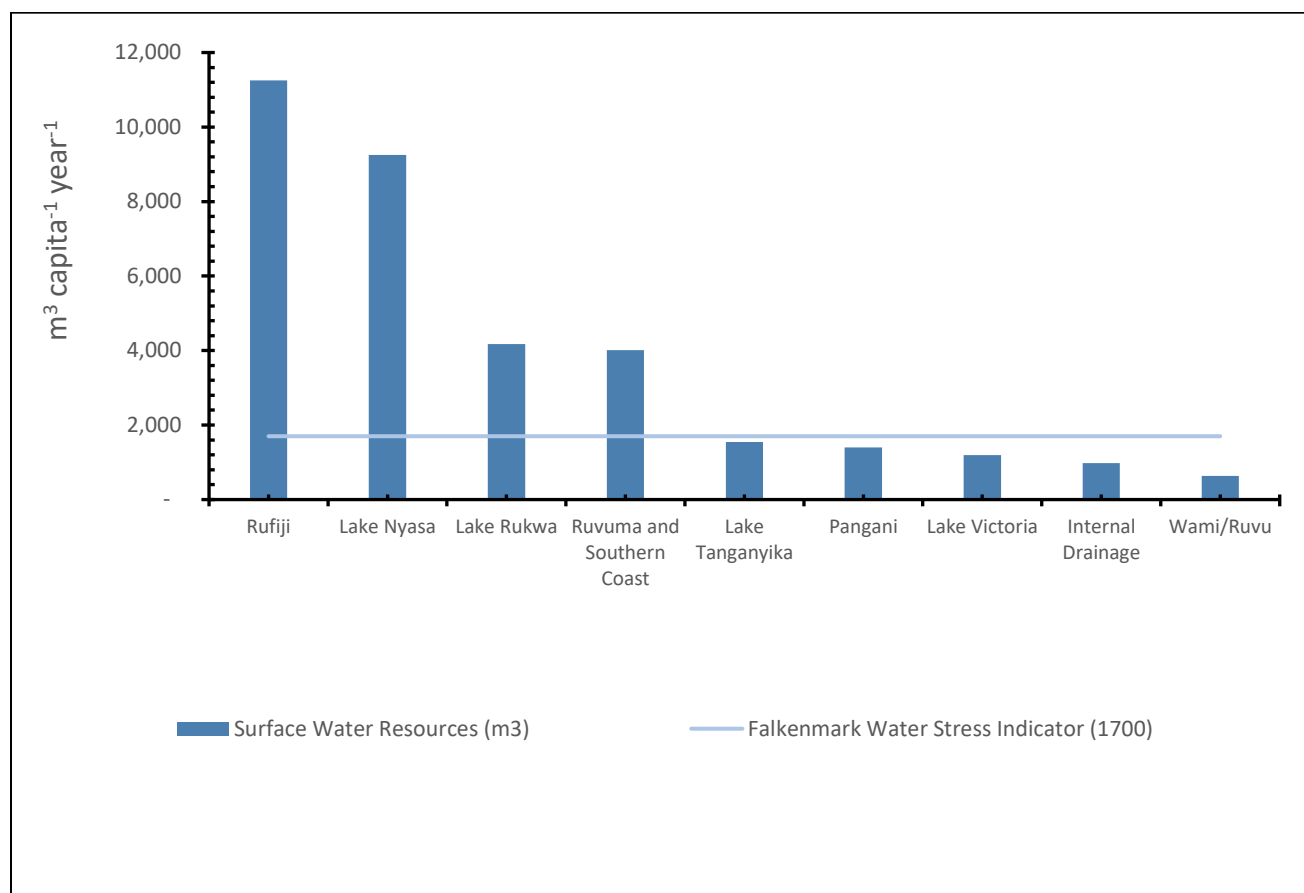


Figure 5: Annual renewable water resources per capita in Tanzania basins – 2018
(Source: Water Sector Status Report 2020)

2.1.5 Water Quality

i) Surface Water Quality

Water quality varies significantly across the country due to various factors, including underlying geological formations and inherent anthropogenic activities. In semi-arid regions, such as Singida, Dodoma, Tabora, Shinyanga, and Arusha, continue to experience challenges of colour and high Turbidity levels, especially during the rainy season. In addition, rivers flowing in the fluoride belt (Kilimanjaro, Arusha, Singida, and Shinyanga regions of the rift valley and extending to the Pangani and Internal Drainage basins) have naturally high fluoride concentrations. Water quality in Lake Victoria is relatively poor as a result of high turbidity and nutrient levels, leading to frequent blooms of blue-green algae and infestations of water weeds. There have been ongoing concerns of local instances of toxic contamination from industrial wastes and mining activities around the lake. Generally, Lake Tanganyika and Nyasa have good water quality except in the vicinity of urban areas, where effluent and stormwater cause local contamination.

ii) Groundwater resources

The availability of groundwater resources in Tanzania varies across the country. Groundwater development has continued to be on a small scale, mainly focusing on shallow groundwater for domestic uses. Only in a few localities in the country, for instance, in Dodoma region, groundwater serves as the main source for municipal water supplies and irrigation purposes. In general, quality of groundwater is good, thus making the resource available for both domestic and industrial use.

The main challenge with the quality of groundwater is the high concentration of fluoride and salinity, which may exceed 14mg/l in some localities. However, corrosive groundwater has been noticed to occur in the Southern regions, i.e. Lindi and Mtwara, especially in areas along the coast as a result of seawater intrusion triggered through over-pumping of aquifers.

2.1.6 Water Resources Utilization

It is estimated that 89% of the total freshwater resource in Tanzania is being used for irrigation purposes, 10% for domestic uses and 1% for industrial purposes. Water demand for hydropower generation has been categorized as non-consumptive use, except for the considerable amount of water being lost through evaporation from the reservoirs. It is noteworthy that the flow requirements for hydropower generation depend on the installed capacities at the power plants, which are mostly located in areas within the basin that restrict other uses upstream.

2.2 Drivers of Drought

Drivers of drought are the enhancers of a prolonged period of dryness in the natural climate. Drought is generally driven by one or a combination of different drivers, such as *climatic, hydrological, land and human factors*, which influence how much water is available compared to how much is needed. These drivers are co-engaging in a feedback loop style, where extreme temperatures lead to higher evaporation, which then causes even drier soils. On the other hand, drier weather conditions may lead to less vegetation than less transpiration, which may prompt less rainfall in that area, thereby raising the possibility of drought.

a) Climatic/Meteorological Drivers

These are mainly patterns of weather and climate, and they are natural cause of drought. The climatic drivers include temperature increase (where the hotter conditions raise the evaporation and evapotranspiration rates, and losses in soil moisture. Below normal rains or lack of rainfall is another sub-factor. This happens when rainfall is significantly below normal for a period of time over a specific area. Changes in atmospheric circulation is also a critical

inclusion where phenomena like southern oscillation index, El Nino, La nina or jet stream shifts may alter rainfall patterns, which in the end may lead to drought.

b) Hydrological drivers

The hydrological drivers are the ones that relate to how water moves and stored in the landscape. These can be narrated based on low river flows and reservoir levels, where prolonged dry periods reduce stream flows and surface water, declining ground water, where the insufficient recharge or extreme use of aquifers worsens drought impacts. Furthermore, the reduced soil moisture is another key inclusion of hydrological drivers, where the dry soils limit plant growth and may intensify soil surface heat through a feedback loop (i.e. extreme dry soil leads to hotter surface, which leads to extreme evaporation, then drought).

c) Land and environmental drivers

These are the actors on the earth's surface; they can be sub-grouped into land cover change, where urbanization, deforestation and agriculture can alter how water is absorbed or evaporated. Wetlands loss and soil degradation are other sub-factors of land drivers where loss of or erosion of organic matter reduces the soil's ability to retain moisture and wetland buffer against drought by storing and slowly releasing water.

d) Human and socio-economic drivers

These drivers are not the direct players or causatives of drought rather amplify the drought effects or make regions more vulnerable to drought. Population growth and urban expansion, for example, increase water demand, which can, in the long run, contribute to the intensification of the effect of drought. Overuse of water resources for different uses such as irrigation, industry or domestic use, poor water management such as inefficient storage, distribution or poor policies that do not account for variability, are among the key factors under this sub-section.

2.3 Drought Historical Occurrence

Tanzania has experienced numerous drought episodes including in 1973–1975: severe drought in central and northern regions causing widespread crop failure, in 1996–1997: drought linked to El Niño–Southern Oscillation (ENSO) anomalies, in 2003, 2005, 2009 and 2017: notable national droughts impacting water and food security and in 2021–2023: prolonged dry spells in northern and coastal zones, affecting agriculture, hydroelectric power generation, and pastoral livelihoods. These recurrent events highlight the increasing frequency and intensity of droughts in the United Republic of Tanzania.

Among of the regions in the United Republic of Tanzania, that are highly affected are Dodoma, Singida, Shinyanga, Manyara, Simiyu, Arusha, and parts of Tabora and Kilimanjaro, while the regions of Morogoro, Tanga, and parts of Mwanza and Mara are moderately affected. The less affected regions are the Southern Highlands including Mbeya, Iringa and Ruvuma and coastal areas with more reliable rainfall due to different factors.

2.4 Impacts of Drought

Impacts of drought are diverse in terms of areas, sectors, area of operation, lifestyle and the like. In agriculture and Food Security, over 70% of Tanzania's population depends on rain-fed agriculture (NBS 2022), drought leads to crop failure, livestock deaths, and food shortages, reducing maize, sorghum, and millet production, which severely affects national food reserves.

Water Resources: Rivers, lakes, and reservoirs experience reduced water levels in some Hydroelectric generation especially from Kidatu and Mtera Dams led to power shortages, and Rural communities face increased distances to fetch water. However, following the completion and operation of Julius Nyerere Hydropower Station (JNHPP), the Tanzania's largest energy project in East Africa, with a capacity of 2,115 MW, has improved the availability of electricity in the country.

Livelihoods and Economy: Livestock herders migrate in search of water and pasture, sometimes causing conflicts with farmers, rural incomes decline, and poverty levels rise, and drought-related shocks contribute to inflation and economic slowdowns.

Environment and Ecosystems: Drought accelerates land degradation, soil erosion, and desertification, and wildlife habitats shrink, leading to migration and biodiversity loss.

2.5 Policy and Institutional Response

The United Republic of Tanzania, through agencies or sectors such as Tanzania Meteorological Authority (TMA), the Prime Minister's Office – Disaster Management Department (PMO-DMD), the Ministry of Agriculture, the Ministry of Water, and other multisectoral players, coordinates drought monitoring, early warning, and response. The coordination is enabled among other tools through different sector policies, such as the National Climate Change Response Strategy of 2021, the Disaster Management Policy of 2004, the National Adaptation Plan of 2025, all promote early warning systems, climate-smart agriculture and community resilience.

2.6 Current and Future Outlook

Tanzania, through its sectors such as TMA, uses Climate models to project increased variability of rainfall and more frequent droughts in parts of Tanzania, especially the central and northern zones. To manage the drought issues, the government of the United Republic of Tanzania has now developed the National Drought Plan.

CHAPTER THREE

3.0 POLICY AND LEGAL FRAMEWORKS

Tanzania has several policy and legal frameworks that address the management of drought with broader national goals of enhancing water security, reducing disaster risks, conserving natural resources, promoting sustainable economic growth, and strengthening resilience to climate change. These frameworks form the foundation for national drought planning and risk reduction, and understanding the specific provisions that directly or indirectly support drought preparedness, mitigation, and response for strengthening the country's overall resilience.

These efforts include the ratification and adoption of the UNCCD Convention in 1997, followed by the implementation of various activities under the Convention and related initiatives, such as the formulation of the National Environmental Policy of 2021; the Environmental Management Act, Cap. 191; Zanzibar Environmental Management Act No. 3 of 2015; Tanzania Development Vision 2050, Long-Term Perspective Plan 2025-2050; Zanzibar Development Vision 2050, Development of sectoral policies; Strategies and plans, including National Adaptation Plan of 2025; National Action Programme to Combat Desertification of 2014; National Environmental Masterplan for Strategic Interventions of 2022; Zanzibar Development Plan of 2021; and Blue Economy Policies for Zanzibar of 2022 and for Tanzania Mainland of 2024.

3.1 National Development Frameworks

i) Tanzania Development Vision 2050

The Tanzania Development Vision 2050 emphasizes sustainable development, climate resilience, and the effective management of natural resources as foundational pillars for achieving long-term prosperity. The Vision also recognizes that climate change and environmental degradation, including recurrent droughts, pose significant threats to food security, water availability, energy production, and overall economic stability. As such, it underscores the importance of integrating environmental sustainability and climate adaptation into all sectors of development planning to reduce vulnerability to drought and its associated impacts.

A central element of Vision 2050 is sustainable water and land resource management. The Vision calls for the development of robust infrastructure for water storage, irrigation, and conservation to ensure a reliable water supply during dry periods. It also promotes investment in climate-smart agriculture and technologies that enhance productivity while minimizing dependence on erratic rainfall. By doing so, the Vision aims to strengthen national

capacity to cope with drought conditions and secure food and livelihood sustainability for communities, particularly those in arid and semi-arid regions.

Additionally, the Vision promotes energy diversification and environmental conservation as part of building a climate-resilient economy. It highlights the need to protect forests, wetlands, and watersheds—natural ecosystems that play a critical role in mitigating drought by maintaining the hydrological cycle and reducing land degradation. The Vision's emphasis on renewable energy, particularly hydropower and solar, also aligns with adaptive strategies to manage the impacts of fluctuating water levels caused by prolonged droughts.

Lastly, the Tanzania Development Vision 2050 calls for inclusive and knowledge-driven adaptation. It envisions strengthening research, early warning systems, and community-based climate adaptation initiatives to improve preparedness and response to drought. By integrating environmental management, innovation, and resilience-building into its long-term goals, the Vision establishes a pathway toward sustainable socio-economic transformation that can withstand and adapt to the challenges of recurrent droughts and climate variability.

ii) Zanzibar Development Vision 2050

The Zanzibar Development Vision 2050 relates to drought through its commitment to achieving environmental sustainability, climate resilience, and sustainable resource management as integral components of socio-economic transformation. The Vision recognizes that climate-related challenges, including drought, pose significant threats to water availability, food security, energy generation, and livelihoods, particularly in an island setting like Zanzibar, where natural resources are limited. Therefore, the Vision underscores the need to build resilience against drought and other climate-induced risks as a prerequisite for achieving long-term sustainable development.

A central aspect of the Vision is its focus on sustainable water resource management. It calls for the improvement of water infrastructure, promotion of rainwater harvesting, protection of groundwater sources, and investment in desalination and water recycling technologies. These measures aim to ensure reliable access to clean water even during prolonged dry periods. By integrating efficient water-use strategies across sectors—such as agriculture, tourism, and domestic supply the Vision seeks to mitigate the adverse impacts of drought on the population and the economy.

The Vision also links agriculture and food security with climate adaptation. It emphasizes the promotion of climate-smart agriculture, irrigation systems, and drought-tolerant crops to reduce dependence on unpredictable rainfall. This approach enhances productivity, ensures a steady food supply, and protects the livelihoods of farmers who are most affected by drought conditions. Additionally, the Vision advocates for the conservation of forests and

coastal ecosystems, which play vital roles in maintaining soil moisture, regulating water cycles, and preventing land degradation natural processes that buffer the effects of drought.

Furthermore, the Zanzibar Development Vision 2050 highlights the importance of climate change adaptation, renewable energy, and environmental governance. It calls for strengthening institutional frameworks for disaster risk reduction and establishing early warning systems to anticipate and manage drought occurrences. By integrating drought resilience into its environmental, economic, and social objectives, the Vision aims to create a climate-smart and sustainable Zanzibar capable of withstanding and recovering from the adverse effects of drought while ensuring inclusive and equitable growth.

iii) The Long-Term Perspective Plan 2025-2050

The Tanzania Long-Term Perspective Plan 2025–2050 focuses, among other things, on building a climate-resilient and sustainable economy that effectively addresses environmental challenges such as water scarcity, land degradation, and food insecurity. The Plan recognizes that drought is one of the most critical climate-related risks threatening Tanzania’s long-term development goals, particularly in the agriculture, water, energy, and health sectors. To mitigate these risks, the LTPP emphasizes the integration of climate adaptation and natural resource management into national planning and economic transformation efforts.

One of the key areas where the LTPP connects to drought is through sustainable agricultural development and irrigation expansion. The Plan promotes investment in modern irrigation systems, rainwater harvesting, and efficient water-use technologies to reduce dependence on unreliable rainfall. It envisions transforming agriculture from being rain-fed and vulnerable to drought into a more resilient, productive, and technology-driven sector that ensures food security and supports industrial growth. This aligns with broader goals of poverty reduction and rural development in drought-prone regions.

The LTPP also emphasizes sustainable water resources and energy management as critical components of drought resilience. It calls for the protection of watersheds, forest ecosystems, and wetlands to maintain water flows and prevent the severe impacts of prolonged dry spells on hydropower generation and domestic water supply. The plan supports investments also in alternative and renewable energy sources, including solar and wind, to reduce overdependence on hydropower, which is often disrupted during drought periods.

The LTPP underscores the importance of climate adaptation governance and early warning systems to improve preparedness and response to drought events. It promotes data-driven decision-making, research on climate change impacts, and institutional coordination across sectors. By linking environmental sustainability with economic transformation, the plan

positions drought management and climate adaptation as central to achieving a resilient, inclusive, and sustainable national development pathway.

iv) Zanzibar Development Plan 2021– 2026

The ZDP recognizes that climate change has unprecedented implications for where people can settle, grow food, build cities, and rely on functioning ecosystems for the services they provide. In many places, temperature changes are already putting ecosystems under stress and affecting human well-being. Impacts of climate change extend well beyond an increase in temperature, affecting ecosystems and communities around the world. Things that we depend upon and value such as water, energy, transportation, wildlife, agriculture, ecosystems, and human health are experiencing the effects of a changing climate. This five-year development plan outlines interventions and key actions to be taken to deal with issues of environment and climate change

3.2 National Policies

Tanzania has several existing plans and policies aimed at enhancing food and water security, reduce risks associated with natural disasters, conserve natural resources, increase national wealth, and increase the nation's resilience to climate change all of which are directly relevant to National drought planning and risk reduction. This Chapter aims at reviewing the contribution of relevant policies on articulating the preparedness and resilience in prevention and combating drought and risk reduction in Tanzania.

i) The National Environment Policy of 2021

The National Environment Policy of 2021 recognizes drought as one of the major environmental challenges intensified by climate change and unsustainable resource use in Tanzania. The policy acknowledges that droughts lead to water scarcity, crop failure, loss of biodiversity, and reduced ecosystem productivity, all of which threaten livelihoods and national development. In response, the policy emphasizes the need to strengthen climate change adaptation and mitigation measures, including sustainable land and water management practices that enhance the country's resilience to drought. It promotes integrated approaches to managing natural resources such as soil, forests, and water catchments to maintain ecosystem balance and reduce the vulnerability of communities to prolonged dry conditions.

The policy highlights the importance of early warning systems and disaster risk reduction as tools for minimizing the adverse effects of drought. It calls for improved environmental monitoring, data collection, and forecasting to enable timely responses to climate induced

hazards. By integrating drought monitoring into national planning processes, the policy ensures that both government institutions and local communities are better prepared to manage water scarcity and food insecurity during drought events. The policy also promotes the development of sustainable water supply systems, such as rainwater harvesting, groundwater recharge, and watershed restoration, to ensure continuous water availability even in drought prone regions.

Additionally, the National Environment Policy of 2021 advocates for public awareness, research, and community participation in environmental conservation as part of long-term drought resilience. It encourages the adoption of sustainable agricultural practices, reforestation programs, and ecosystem restoration initiatives that enhance soil moisture retention and mitigate the effects of drought. The policy also aligns with global frameworks such as the Paris Agreement and the Sustainable Development Goals (SDGs), reinforcing Tanzania's commitment to addressing drought through integrated environmental management and climate action. Overall, the policy provides a holistic framework for reducing drought vulnerability by promoting sustainable ecosystems, adaptive capacity, and resilience across all sectors of society.

ii) The Zanzibar Environmental Policy of 2013

The Zanzibar Environmental Policy of 2013 recognizes the critical role of sustainable environmental management in mitigating the impacts of prolonged dry periods. The policy acknowledges that drought contributes to water scarcity, reduced agricultural productivity, loss of biodiversity, and degradation of natural resources, which in turn threaten livelihoods and food security. To address these challenges, the policy emphasizes integrated natural resource management, including the protection of watersheds, soil conservation, and sustainable land use practices, to maintain ecological balance and enhance resilience to drought.

The policy also highlights the importance of water resource management and conservation as a strategy to reduce vulnerability to drought. It encourages the adoption of measures such as rainwater harvesting, groundwater recharge, wetland conservation, and sustainable irrigation practices, particularly in drought-prone areas. By promoting efficient use and management of water resources, the policy seeks to ensure that both human and environmental needs are met even during periods of limited rainfall.

The policy emphasizes community participation, awareness, and capacity building in environmental stewardship as key tools for drought resilience. Local communities are encouraged to engage in activities such as reforestation, catchment protection, and sustainable agricultural practices that help retain soil moisture and reduce land degradation. The policy also supports research, monitoring, and early warning systems to track

environmental changes and guide timely interventions. Overall, the policy links environmental conservation directly to drought mitigation, providing a framework to protect ecosystems, sustain water availability, and strengthen community resilience against the adverse effects of drought.

iii) The National Water Policy of 2002, Version of 2025

The National Water Policy of 2002 (Version of 2025) recognizes drought as one of the major challenges affecting Tanzania's water resources and socio-economic development. The policy acknowledges that recurrent droughts have caused severe losses in crops and livestock, reduced river flows, and diminished water levels in reservoirs, thereby threatening food and water security as well as hydropower generation. By identifying drought as a critical issue, the policy integrates strategies to enhance resilience and ensure sustainable water resource management during periods of scarcity.

To address these challenges, the policy emphasizes the preparation of drought monitoring and mitigation plans in collaboration with key institutions such as the Tanzania Meteorological Authority (TMA) and other relevant agencies. This approach aims to strengthen Early Warning Systems and improve the country's capacity to anticipate and respond effectively to drought events. The integration of monitoring and planning mechanisms ensures that drought management becomes an integral part of water resource governance rather than an emergency response measure. In addition, the policy calls for strengthening and streamlining procedures and guidelines for reviewing water allocations during droughts. This ensures that limited water resources are managed efficiently and fairly when scarcity occurs. By prioritizing essential uses such as domestic consumption and maintaining environmental flows, the policy helps reduce conflicts among competing water users and safeguards critical sectors from the worst effects of drought.

Moreover, the policy promotes the adoption of rainwater harvesting technologies, particularly in semi-arid areas, as a reliable alternative source of water during dry seasons. Encouraging local communities to engage in rainwater harvesting not only enhances water security but also reduces dependency on over-stressed surface and groundwater sources. In this way, the policy provides a clear and practical framework for integrating drought preparedness, mitigation, and adaptation into Tanzania's overall water management strategy.

iv) Zanzibar Water Policy of 2004

The Zanzibar Water Policy provides a framework for ensuring the sustainable use, development, and conservation of water resources across the islands. The policy promotes integrated water resources management (IWRM), which is essential for preparing and responding to drought conditions. Through IWRM, Zanzibar aims to monitor rainfall patterns,

groundwater levels, and water use to anticipate droughts and take early preventive measures. The policy further emphasizes the need to develop drought-resilient water systems such as boreholes, rainwater harvesting facilities, and small dams, which can help maintain water supply during dry spells.

A key aspect of the Zanzibar Water Policy is the promotion of water conservation and efficiency. During drought periods, these measures help reduce water wastage and ensure that limited supplies are prioritized for essential uses, such as drinking and sanitation. The policy encourages efficient irrigation technologies, recycling of treated wastewater, and awareness campaigns to promote responsible water use among communities. Protecting water sources is another vital component of the policy that directly supports drought resilience. It calls for the protection and rehabilitation of catchment areas, wetlands, and groundwater recharge zones through afforestation and soil conservation efforts. These actions help sustain natural water storage and maintain base flows in rivers and springs, which are critical during prolonged dry periods.

The policy also underscores institutional and community involvement in water management, recognizing that effective drought management requires local participation. By involving communities, water user associations, and local authorities in decision-making, the policy enhances local capacity to respond to droughts through water rationing and equitable distribution. Furthermore, the policy integrates climate change adaptation strategies, acknowledging that droughts are becoming more frequent and severe due to climate change. It promotes the development of climate-resilient infrastructure, alternative water sources such as desalination, and the establishment of early warning systems for drought prediction and response.

To strengthen preparedness, the policy supports emergency and contingency planning for drought situations. This includes creating strategic water reserves, developing emergency supply mechanisms, and ensuring that critical sectors such as health, education, and households have continuous access to water even during extreme droughts. Additionally, the policy prioritizes research, data collection, and monitoring to track hydrological and meteorological trends, enabling evidence-based decisions for drought mitigation. By supporting research on drought-resistant crops and water-efficient technologies, the policy aligns water management with agricultural and Environmental sustainability.

v) The National Agriculture Policy of 2013

The National Agriculture Policy of 2013 focuses on promoting the development and adoption of improved Agricultural technologies and practices to ensure food security at both national and household levels. Although Tanzania is endowed with vast areas of arable land, agriculture remains heavily dependent on rainfall, making it highly vulnerable to drought due

to irregular and unpredictable rainfall patterns. To address this challenge, the policy emphasizes the importance of irrigated agriculture as a reliable safeguard against drought. Irrigation not only enhances food security but also supports poverty reduction by enabling smallholder farmers to engage in productive and profitable farming, particularly through the cultivation of high-value crops such as vegetables and fruits.

The policy outlines a clear separation of roles between the public and private sectors, where the private sector takes the lead in agricultural production, agro-processing, and marketing, while the government focuses on policy formulation, coordination, and regulation. In this context, the policy promotes the establishment of institutions responsible for managing irrigation and water use at the local level, including irrigators' associations and water user groups. It also advocates for the construction of dams and rainwater harvesting infrastructure to ensure a dependable water supply for agriculture both within and beyond project areas. These initiatives align with the broader objectives of the policy by enhancing agricultural productivity and serving as key adaptation measures to drought in the sector.

Furthermore, the policy acknowledges the gender-related impacts of drought on agricultural activities and outlines specific strategies to address them. These include improving coordination of environmental early warning and monitoring systems, enhancing adaptation measures to mitigate drought effects, and ensuring the efficient use of renewable natural resources. The policy also emphasizes increasing public awareness of agriculture's potential role as a carbon sink, which contributes to climate change mitigation and reduces drought risks. Additionally, it promotes the enforcement of environmental laws and regulations aimed at minimizing drought-related problems arising from agricultural practices, thus strengthening the sector's resilience to climate variability.

vi) The National Livestock Policy of 2006

The National Livestock Policy of 2006 recognizes drought as one of the major challenges affecting livestock production and pastoral livelihoods in Tanzania. The policy acknowledges that drought leads to severe shortages of pasture and water, resulting in livestock mortality, reduced productivity, and economic losses for pastoral and agro-pastoral communities. To address these challenges, the policy emphasizes the need for sustainable management of rangelands and water resources to ensure continuous availability of feed and water even during dry periods. It promotes practices such as pasture conservation, rotational grazing, and the establishment of strategic water points to enhance the resilience of the livestock sector to drought.

The policy highlights the importance of improving livestock infrastructure and services to mitigate the impacts of drought. This includes the development of livestock watering systems such as boreholes, dams, and rainwater harvesting structures to ensure reliable water

sources throughout the year. The policy also supports the establishment of feed reserves and the use of crop residues and agro-industrial by-products as alternative feed sources during drought periods. Furthermore, it encourages the introduction of early warning systems and drought preparedness plans to enable livestock keepers to respond promptly to emerging threats. By strengthening veterinary and extension services, the policy also ensures that livestock health is maintained during droughts, minimizing losses and supporting recovery.

Moreover, the policy promotes institutional collaboration, community participation, and research as key components of drought resilience. It calls for cooperation among government institutions, local authorities, and livestock communities to manage rangelands and water resources effectively. The policy also encourages research and dissemination of technologies that improve drought resistance, such as drought-tolerant fodder species and improved livestock breeds. By integrating these strategies, the policy not only aims to safeguard the livelihoods of livestock-dependent communities but also contributes to national food security and economic stability during and after drought periods.

vii) The National Land Policy of 1995 2023 Edition

The National Land Policy of 1995, 2023 Edition emphasizes sustainable land management as a key strategy for mitigating the impacts of prolonged dry periods. The policy recognizes that unsustainable land use, deforestation, and land degradation contribute to reduced soil fertility, diminished water retention, and increased vulnerability to drought. By promoting efficient and sustainable land use planning, the policy aims to maintain soil moisture, protect catchment areas, and enhance the resilience of agricultural and pastoral systems to water scarcity.

The policy also highlights the importance of integrated land and water management in drought-prone areas. It encourages practices such as afforestation, reforestation, soil conservation, and the protection of wetlands and riparian areas, which help regulate local microclimates and improve groundwater recharge. These measures are critical for sustaining agricultural productivity, supporting livestock, and ensuring reliable water availability during dry seasons.

Additionally, the policy promotes community involvement and institutional coordination in land management to reduce vulnerability to drought. Local communities, government institutions, and other stakeholders are encouraged to participate in planning, monitoring, and implementing land use practices that conserve natural resources and reduce land degradation. By integrating drought considerations into land governance, the policy helps safeguard livelihoods, enhance food security, and build resilience against the adverse impacts of drought.

viii) The National Land Policy of Zanzibar of 2018

The National Land Policy of Zanzibar of 2018 relates to drought by emphasizing sustainable land use and management as essential strategies for reducing vulnerability to prolonged dry periods. The policy recognizes that improper land use, land degradation, and deforestation exacerbate drought impacts by reducing soil fertility, water retention, and the natural capacity of ecosystems to support agriculture and water availability. By promoting sustainable land management practices, the policy seeks to maintain productive soils, protect catchment areas, and enhance resilience to water scarcity.

The policy also highlights the importance of integrated land and water resource management to mitigate the effects of drought. It encourages measures such as afforestation, reforestation, soil and water conservation, and the protection of wetlands and riparian areas. These interventions help improve groundwater recharge, maintain ecosystem services, and sustain agricultural and pastoral activities during dry periods, thereby reducing the socio-economic impacts of drought on communities.

Furthermore, the policy promotes community participation and institutional coordination in land governance. Local communities, government agencies, and other stakeholders are encouraged to actively engage in land use planning, monitoring, and conservation initiatives that support sustainable resource management. By linking land management with drought preparedness and adaptation strategies, the policy contributes to enhancing food security, safeguarding livelihoods, and building resilience against the adverse effects of drought in Zanzibar.

ix) The National Forest Policy of 1998

The National Forest Policy of 1998 recognizes the critical role that forests play in maintaining water cycles, regulating climate, and reducing the vulnerability of ecosystems and communities to prolonged dry periods. The policy acknowledges that deforestation and unsustainable land use practices contribute to environmental degradation, loss of soil moisture, and reduced rainfall, all of which intensify the impacts of drought. To address this, the policy promotes sustainable forest management aimed at conserving and expanding forest cover as a natural means of mitigating drought effects.

Additionally, the policy emphasizes afforestation, reforestation, and community-based forest management (CBFM) as key strategies for drought prevention and adaptation. These initiatives increase vegetation cover, which improves rainfall infiltration, reduces surface runoff, and enhances local microclimates, making ecosystems more resilient to drought. The policy also supports the establishment of forest reserves and catchment forests to protect water sources that are vital for agriculture, domestic use, and livestock during drought.

periods. By involving local communities in forest conservation and sustainable use, the policy ensures that people who depend on forest resources are also active participants in efforts to prevent and mitigate drought impacts.

Furthermore, the policy links forest management to climate change adaptation and environmental sustainability, acknowledging that forests act as carbon sinks and help regulate temperature and precipitation patterns. It encourages research, education, and awareness programs on the importance of forests in reducing drought risks and sustaining livelihoods. Overall, the policy contributes to drought resilience by promoting forest conservation, restoring degraded lands, and ensuring that forest ecosystems continue to provide essential services that buffer Tanzania against the adverse effects of drought.

x) The National Health Policy of 2017

The National Health Policy of 2017 put emphasis on protecting public health from environmental and climate related risks, including those caused by prolonged dry conditions. The policy recognizes that drought has direct and indirect impacts on human health such as malnutrition, water borne diseases, poor sanitation, and food insecurity which arise when water and food supplies become scarce. In response, the policy underscores the need to strengthen environmental health and disease prevention systems, ensuring that communities have access to safe water, adequate nutrition, and proper hygiene even during drought periods. It promotes the integration of health considerations into disaster risk management and climate change adaptation strategies to reduce vulnerability to drought-related health challenges.

Moreover, the policy calls for intersectoral collaboration between the health sector and other key sectors such as water, agriculture, environment, and disaster management to address the broader determinants of health during droughts. By working jointly, these sectors can ensure coordinated responses for instance, through improved food security programs, water quality monitoring, and emergency medical interventions in drought affected areas. The policy also encourages the development of early warning and surveillance systems for monitoring diseases that are likely to increase during droughts, such as cholera, diarrheal diseases, and respiratory infections caused by dust and poor air quality.

Additionally, the policy emphasizes community awareness, capacity building, and resilience as essential elements of drought preparedness. It promotes health education programs that teach communities about safe water handling, nutrition during food shortages, and the importance of maintaining hygiene in times of scarcity. The policy also supports the strengthening of health infrastructure and services in drought prone areas to ensure continuous access to care during crises. In summary, the policy integrates drought

management into the broader health agenda by focusing on prevention, preparedness, and resilience building to safeguard public health against the adverse effects of drought.

xi) National Energy Policy of 2015

The National Energy Policy of 2015 acknowledges the strong interconnection between water availability and energy production, particularly hydropower, which forms a significant portion of Tanzania's energy mix. Droughts reduce river flows and water levels in reservoirs, directly impacting hydropower generation and causing energy shortages. The policy therefore emphasizes the need to diversify energy sources and promote alternative and renewable energy options, such as solar, wind, and biomass, to reduce reliance on hydropower and enhance energy security during periods of water scarcity.

The policy also provides for the importance of efficient water and energy management as a strategy to mitigate the effects of drought on the energy sector. It encourages the development of infrastructure for energy production that is less vulnerable to water shortages, including small scale hydropower projects with efficient water use, solar mini-grids, and energy storage systems. By integrating water resource planning with energy production, the policy aims to ensure that droughts do not severely disrupt electricity supply, particularly to critical sectors such as health, agriculture, and industry.

The policy promotes research, innovation, and technology adoption to enhance resilience against drought related energy challenges. This includes supporting the development of energy efficient technologies and the use of alternative fuels that reduce dependency on water intensive energy sources. The policy also underscores the need for public awareness and stakeholder engagement, ensuring that communities and industries adopt energy saving measures and participate in sustainable energy management practices. Overall, the policy links drought to energy security and provides strategies to reduce vulnerability by promoting diversification, efficiency, and sustainability in the energy sector.

xii) National Land Policy, 1995

The National Land Policy of 1995 aims at developing a coherent and comprehensive framework that defines land tenure and enable proper management and allocation of land in urban and rural areas. Among other things, the policy is designed to foster the protection of land resources from degradation, for sustainable development.

Land degradation is one of the key environmental challenges facing the country and the world at large. This has been a great concern in all developing countries where most of the communities depends directly or indirectly on environmental and natural resources for their survival. Among other consequences caused by land degradation (i.e improper land

management) includes food insecurity, loss of biodiversity, and desertification. Thus, the policy has highlighted the need for addressing drought in the country.

Droughts being one of the major drivers of national food and water insecurity, affecting agricultural production and access to food and water. Thus, the promotion of proper land management practices has been emphasized as they are expected to offer opportunities for mitigating the effects of drought and more generally, refocusing actions on proactive drought management.

xiii) National Disaster Management Policy of 2004

The National Disaster Management Policy of 2004 identifies drought as one of the major natural hazards that threaten Tanzania's socio-economic development, food security, and livelihoods. The policy recognizes that drought can cause severe water and food shortages, livestock losses, and increased vulnerability of communities, particularly in arid and semi-arid regions. To address these impacts, the policy emphasizes the need for preparedness, early warning systems, and coordinated response mechanisms to reduce the adverse effects of drought on vulnerable populations.

The policy promotes intersectoral coordination and institutional collaboration in managing drought as a disaster. It calls for government agencies, local authorities, and relevant stakeholders to work together in planning, implementing, and monitoring drought mitigation strategies. This includes establishing drought monitoring systems, disseminating timely information to communities, and ensuring that relief measures such as food aid, water supply, and veterinary services are efficiently delivered to affected areas. By fostering coordination, the policy aims to minimize duplication of efforts and ensure a rapid and effective response to drought events.

The policy emphasizes community participation, capacity building, and risk reduction strategies as key components of drought resilience. Communities are encouraged to adopt sustainable water management practices, crop and livestock adaptation measures, and other preparedness actions to reduce their vulnerability. The policy also supports public awareness campaigns, research, and training programs to strengthen local knowledge on drought management. Overall, the policy integrates drought into the broader national disaster management framework, ensuring that preventive, mitigative, and adaptive measures are systematically implemented to protect lives, livelihoods, and resources.

xiv) Zanzibar Disaster Management Policy of 2011

The Zanzibar Disaster Management Policy of 2011 is closely related to drought as it identifies drought as one of the key natural hazards that threaten the islands' water supply, agriculture, and food security. The policy acknowledges that prolonged dry periods lead to reduced water availability, crop failure, livestock losses, and increased vulnerability of communities, particularly in rural and semi-arid areas. It emphasizes the need for proactive planning and preparedness measures to minimize the socio-economic and environmental impacts of drought.

The policy highlights the importance of early warning systems and monitoring mechanisms to detect drought conditions in advance. By collaborating with institutions such as the Tanzania Meteorological Authority and other relevant agencies, the policy seeks to ensure timely dissemination of information to communities, local authorities, and sectoral stakeholders. This enables coordinated actions such as water rationing, allocation prioritization, and emergency response to reduce the adverse effects of drought on households and critical sectors.

Furthermore, the policy promotes community engagement and capacity building in drought risk reduction. It encourages local participation in managing water resources, adopting drought resilient agricultural practices, and implementing small-scale water conservation measures such as rainwater harvesting. The policy also emphasizes the integration of drought preparedness into broader disaster management strategies, ensuring that mitigation, response, and recovery efforts are systematically planned. Overall, the policy provides a framework for reducing vulnerability, enhancing resilience, and protecting livelihoods and essential services during drought events in Zanzibar.

xv) The National Irrigation Policy of 2010

The National Irrigation Policy of 2010 recognizes irrigation as a key strategy for reducing the vulnerability of agriculture to irregular and insufficient rainfall. The policy acknowledges that drought negatively affects crop production, livestock feed availability, and food security, particularly in rain-fed agricultural areas. By promoting efficient and sustainable irrigation systems, the policy aims to provide a reliable water supply for crops and livestock even during prolonged dry periods, thereby minimizing the adverse effects of drought on agricultural productivity and rural livelihoods.

The policy emphasizes the development of infrastructure for water storage, distribution, and management, such as dams, canals, and reservoirs, to ensure a dependable water supply for irrigation purposes. It also promotes the adoption of modern and water-efficient irrigation technologies to optimize water use and reduce wastage, particularly in arid and semi-arid

regions prone to drought. These measures help farmers maintain stable crop yields and livestock productivity despite fluctuations in rainfall, thereby enhancing food security and income generation.

Moreover, the policy encourages institutional coordination, stakeholder participation, and capacity building to strengthen drought resilience. This includes establishing water user associations and local irrigation management institutions to ensure equitable water allocation, monitoring, and maintenance of irrigation schemes. By integrating irrigation planning with drought preparedness and natural resource management, the policy contributes to sustaining agricultural production, improving livelihoods, and building long-term resilience against the impacts of drought in Tanzania.

xvi) The National Fisheries Policy of 2015

The National Fisheries Policy of 2015 addresses the impacts of reduced water availability on aquatic ecosystems, fish production, and the livelihoods of communities dependent on fisheries. Drought can lead to lowered water levels in rivers, lakes, and reservoirs, reduce water quality, and disrupt breeding habitats for fish, which in turn affects food security and income for fisherfolk. The policy emphasizes the need for sustainable management of water resources in fisheries areas to maintain ecosystem balance and ensure continued fish production during periods of low rainfall.

The policy promotes the development of adaptive strategies and infrastructure to cope with the effects of drought on fisheries. This includes constructing water storage facilities, improving pond and reservoir management, and implementing measures to maintain water quality and quantity for aquaculture. By ensuring that fish habitats are protected and water resources are efficiently used, the policy helps sustain fish stocks and supports the resilience of both inland and coastal fisheries to drought conditions.

Additionally, the policy emphasizes community participation, research, and monitoring as key elements in building drought resilience. Communities, local authorities, and fisheries institutions are encouraged to engage in sustainable fishing practices, monitor water levels, and adopt adaptive aquaculture techniques that mitigate the adverse effects of drought. Through these measures, the policy integrates fisheries management with broader drought preparedness and environmental conservation efforts, safeguarding livelihoods, food security, and ecosystem health during dry periods.

xvii) The Zanzibar Fisheries Policy of 2022

The Zanzibar Fisheries Policy of 2022 relates to drought through its emphasis on climate change adaptation, sustainable resource management, and ecosystem resilience in the fisheries and aquaculture sectors. The policy recognizes that drought and other climate-related challenges have significant impacts on Zanzibar's water resources, marine ecosystems, and coastal livelihoods. Prolonged dry periods can reduce freshwater inflows, alter coastal and marine environments, and affect fish breeding habitats—posing a threat to food security and the sustainability of fisheries. Consequently, the policy integrates drought resilience as part of its broader strategy to ensure the long-term productivity and sustainability of the fisheries sector.

One of the key ways the policy addresses drought is through the promotion of sustainable aquaculture and water-use efficiency. It encourages the development of aquaculture systems that rely on efficient water management, such as integrated fish farming and the use of brackish or recycled water where possible. By doing so, the policy aims to diversify fish production, reduce dependency on natural water bodies affected by drought, and maintain fish supply during dry periods. This approach also supports livelihoods and economic stability among fishing communities during times of water scarcity.

The policy also emphasizes the protection and conservation of aquatic ecosystems, including mangroves, seagrass beds, and coral reefs, which play vital roles in maintaining ecological balance and mitigating the effects of drought. Healthy ecosystems help regulate coastal hydrology, reduce salinity intrusion, and preserve habitats that are critical for fisheries sustainability. Through ecosystem-based management and enforcement of environmental regulations, the policy ensures that natural habitats remain resilient against drought-induced stress.

Furthermore, the policy highlights the importance of climate adaptation, research, and community participation. It promotes the integration of climate and drought risk management into fisheries planning and supports the establishment of early warning systems to help coastal communities prepare for changing weather and water conditions. By fostering awareness, building institutional capacity, and encouraging sustainable practices, the policy strengthens Zanzibar's ability to adapt to drought impacts while safeguarding marine biodiversity, food security, and livelihoods dependent on fisheries resources.

xviii) The Zanzibar Agricultural Sectoral Policy of 2002

The Zanzibar Agricultural Sectoral Policy of 2002 addresses the vulnerability of agriculture to irregular and insufficient rainfall, which can severely impact crop production, livestock, and food security. The policy recognizes that much of Zanzibar's agriculture relies on rain-fed systems, making it highly susceptible to prolonged dry periods. To mitigate these risks, the policy emphasizes the need for drought preparedness and adaptation measures, including the promotion of irrigation, water harvesting, and other water management practices to ensure a more reliable and consistent water supply for farming activities.

The policy also highlights the importance of sustainable land and water management in drought-prone areas. By encouraging soil and water conservation practices, the rehabilitation of degraded lands, and the protection of watersheds, the policy seeks to enhance soil moisture retention and reduce the negative impacts of drought on agricultural productivity. These measures support both crop and livestock production and contribute to maintaining food security and rural livelihoods during dry periods.

Likewise, the policy promotes community participation and institutional coordination in managing agricultural resources under drought conditions. Farmers, local authorities, and relevant government agencies are encouraged to work together in planning, implementing, and monitoring drought adaptation strategies. This includes establishing early warning systems, providing extension services, and supporting the adoption of drought-resilient crops and farming techniques. Overall, the policy integrates drought management into agricultural development planning, aiming to strengthen the resilience of Zanzibar's agricultural sector to climate variability and prolonged dry spells.

xix) The Wildlife Policy of Tanzania of 2007

The Wildlife Policy of Tanzania of 2007 recognizes that prolonged dry periods pose significant risks to wildlife, ecosystems, and the livelihoods of communities that depend on natural resources. Drought reduces water availability, depletes forage, and disrupts habitats, leading to decreased wildlife populations, migration conflicts, and increased human-wildlife interactions. The policy emphasizes the need for sustainable management of wildlife and their habitats to maintain ecological balance and ensure the survival of species during periods of water and food scarcity.

The policy also promotes water and habitat conservation measures as strategies to mitigate drought impacts. This includes protecting wetlands, rivers, and other critical water sources, as well as establishing artificial water points, game corridors, and buffer zones to support wildlife during dry periods. By maintaining access to water and forage, these measures help reduce mortality, support breeding, and preserve biodiversity under drought conditions.

Furthermore, the Wildlife Policy encourages community participation, research, and institutional coordination in managing wildlife resources in the face of drought. Local communities, wildlife authorities, and conservation organizations are engaged in monitoring wildlife populations, managing human-wildlife conflicts, and implementing adaptive strategies such as supplementary feeding or controlled water provision. By integrating drought preparedness into wildlife management, the policy strengthens ecosystem resilience, safeguards biodiversity, and ensures the sustainability of wildlife-based livelihoods and tourism, even during periods of prolonged dry conditions.

xx) The National Gender and Women's Development Policy of 2023

The National Gender and Women's Development Policy of 2023 recognizes that climate-related hazards, such as prolonged dry periods, disproportionately affect women and girls, particularly in rural and agricultural communities. Drought exacerbates challenges related to water scarcity, food insecurity, and livelihood disruption, which often increase the workload for women, who are primarily responsible for water collection, food production, and household care. The policy emphasizes the need to integrate gender considerations into climate adaptation and disaster management strategies, ensuring that women have equitable access to resources, information, and decision-making processes during drought events.

The policy also promotes capacity building, resilience, and participation of women in drought preparedness and response initiatives. By supporting women's involvement in water management, sustainable agriculture, and natural resource conservation, the policy aims to empower women to implement local adaptation measures, such as rainwater harvesting, drought-resilient farming practices, and alternative livelihood options. This approach not only strengthens household and community resilience but also ensures that women's specific needs and vulnerabilities are addressed during drought periods.

Similarly, the policy highlights the importance of institutional support, research, and public awareness in addressing the gendered impacts of drought. It encourages the collection of sex-disaggregated data on climate impacts, the promotion of women-led initiatives in environmental and agricultural management, and the integration of gender-sensitive strategies in national and local drought mitigation programs. By linking gender equality with climate adaptation, the policy ensures that women are active participants in building resilient communities capable of coping with the adverse effects of drought.

3.3 National Legislations

i) The Constitution of the United Republic of Tanzania, 1977

The Constitution of the United Republic of Tanzania of 1977 relates to drought through its fundamental principles that promote sustainable development, environmental protection, and the welfare of citizens. Although the Constitution does not explicitly mention drought, it provides a strong legal foundation for addressing its causes and impacts. The Constitution emphasizes the duty of both the government and citizens to protect natural resources and the environment, recognizing that the sustainable management of land, water, and forests is essential for national development and human well-being. This obligation directly relates to drought mitigation and adaptation efforts, as effective environmental stewardship helps prevent land degradation, water scarcity, and ecosystem loss.

Article 9 of the Constitution outlines fundamental objectives and directive principles of state policy, requiring the government to direct its policies toward ensuring that natural resources are harnessed, preserved, and applied for the common good. This includes taking measures to safeguard the environment against destruction and degradation, which are key contributors to drought vulnerability. Through these provisions, the Constitution mandates the state to adopt sustainable land and water management practices that ensure resilience to drought and other climate-related disasters.

Additionally, the Constitution guarantees the right to life and well-being, which inherently includes access to essential resources such as food, clean water, and a healthy environment. During drought periods, these rights become particularly critical as livelihoods, food production, and public health are threatened. Therefore, the government's constitutional duty to protect citizens' welfare obliges it to implement drought preparedness, water conservation, and climate adaptation measures.

Furthermore, the Constitution promotes decentralization and participatory governance, empowering local authorities and communities to manage natural resources and respond to environmental challenges such as drought. By embedding accountability, citizen participation, and equitable resource distribution, the Constitution provides a governance framework through which drought resilience can be effectively integrated into national and local development policies. In essence, the Constitution of 1977 serves as the supreme legal basis for sustainable environmental management and the protection of citizens from the socio-economic hardships associated with drought.

ii) The Environmental Management Act Cap. 191

The Environmental Management Act, Cap. 191 provides a legal framework for the sustainable management and protection of natural resources, which are critical in mitigating the impacts of prolonged dry periods. The Act recognizes that improper land use, deforestation, wetland degradation, and unsustainable water management increase vulnerability to drought by reducing soil moisture, groundwater recharge, and ecosystem resilience. By promoting sustainable environmental practices, the Act helps ensure the availability and quality of water resources, protect ecosystems, and maintain ecological balance during periods of water scarcity.

The Act also emphasizes the importance of environmental impact assessments, monitoring, and regulation to prevent activities that could worsen drought conditions. This includes regulating water abstraction, controlling land degradation, and enforcing measures for conservation of forests, wetlands, and watersheds. These provisions help maintain natural buffers against drought, safeguard water supplies for human and agricultural use, and reduce the risk of desertification and ecosystem collapse.

The Act promotes community participation, awareness, and institutional coordination in managing environmental resources. It encourages local communities, government agencies, and other stakeholders to engage in sustainable practices such as reforestation, soil and water conservation, and watershed management, which enhance resilience to drought. By integrating drought considerations into environmental governance, the Act strengthens adaptive capacity, supports sustainable livelihoods, and mitigates the socio-economic and ecological impacts of drought in Tanzania.

iii) The Zanzibar Environmental Management Act, No. 3 of 2015

The Zanzibar Environmental Management Act, No. 3 of 2015 establishes a legal framework for the sustainable management and protection of natural resources, which are critical for mitigating the impacts of prolonged dry periods. The Act recognizes that unsustainable land use, deforestation, wetland degradation, and poor water management exacerbate drought by reducing soil moisture, groundwater recharge, and ecosystem resilience. By promoting conservation and sustainable resource use, the Act helps maintain water availability, protect ecosystems, and reduce the vulnerability of communities to drought.

The Act also emphasizes environmental monitoring, impact assessment, and regulation to prevent activities that could worsen drought conditions. This includes controlling land degradation, protecting watersheds, conserving wetlands, and regulating water abstraction. These measures help maintain natural buffers against drought, safeguard water supplies for human, agricultural, and livestock use, and support ecosystem health during dry periods.

In addition, the Act promotes community participation, stakeholder engagement, and institutional coordination in managing environmental resources. Local communities, government agencies, and other stakeholders are encouraged to engage in sustainable practices such as reforestation, catchment protection, and soil and water conservation, which enhance resilience to drought. By integrating drought considerations into environmental governance, the Act strengthens adaptive capacity, supports sustainable livelihoods, and mitigates the socio-economic and ecological impacts of drought in Zanzibar.

iv) The Disaster Management Act, No. 7 of 2015

The Disaster Management Act, No. 7 of 2015 provides a legal and institutional framework for the prevention, preparedness, response, and recovery from disasters, including climate induced hazards such as prolonged dry periods. The Act recognizes drought as a slow onset disaster that can significantly impact water availability, food security, livelihoods, and economic development. It mandates the government and relevant authorities to develop early warning systems, contingency plans, and mitigation strategies to minimize the adverse effects of drought on vulnerable communities.

The Act also emphasizes coordination among institutions and stakeholders in managing drought risks. Government agencies, local authorities, non-governmental organizations, and community groups are required to work together in monitoring drought conditions, disseminating timely information, and implementing response measures such as water rationing, emergency food distribution, and livestock support programs. This integrated approach ensures that resources are used efficiently and that affected populations receive timely assistance.

Furthermore, the Act, promotes community involvement, capacity building, and resilience as key components of drought management. Communities are encouraged to participate in planning, preparedness, and adaptation activities, including sustainable water use, soil and water conservation, and climate-resilient agricultural practices. By linking drought management to national disaster management systems, the Act provides a comprehensive framework to reduce vulnerability, protect livelihoods, and enhance the resilience of Tanzanian communities to the socio economic and environmental impacts of drought.

v) The Zanzibar Disaster Risk Reduction and Management Act No. 1 of 2015

The Zanzibar Disaster Risk Reduction and Management Act No. 1 of 2015 provides a legal and institutional framework for managing disasters, including slow onset hazards such as prolonged dry periods. The Act recognizes drought as a major threat to water availability, food security, livelihoods, and economic development in Zanzibar. It mandates the

government and relevant authorities to implement risk assessment, early warning systems, and contingency planning to anticipate drought impacts and reduce vulnerability among affected communities.

The Act emphasizes coordination and collaboration among institutions and stakeholders in drought management. Government agencies, local authorities, community organizations, and other stakeholders are required to work together to monitor drought conditions, disseminate timely warnings, and implement mitigation and response measures. These measures may include water rationing, provision of emergency water and food supplies, and support for affected farmers and livestock keepers, ensuring that responses are timely, efficient, and equitable.

In addition, the Act promotes community engagement, capacity building, and resilience enhancement in addressing drought risks. Communities are encouraged to adopt sustainable water management practices, participate in environmental conservation, and implement drought-adaptive agricultural and livelihood strategies. By integrating drought preparedness, mitigation, and adaptation into the broader disaster risk reduction framework, the Act strengthens Zanzibar's ability to reduce the socio-economic and environmental impacts of drought, safeguarding both livelihoods and essential services.

vi) The Tanzania Meteorological Authority Act, Cap. 157 R.E 2023

The Tanzania Meteorological Authority Act, Cap. 157 R.E. 2023 establishes a strong institutional and legal framework for weather and climate monitoring, early warning, and information dissemination, which are critical for drought prediction, preparedness, and mitigation. The Act empowers the Tanzania Meteorological Authority (TMA) to provide accurate, timely, and reliable meteorological and climatological data to support national efforts in managing drought risks and minimizing their socio-economic impacts.

A central function of the Act is to ensure that climate and weather information is integrated into decision-making processes across key sectors such as agriculture, water, energy, health, and disaster management. By generating and sharing seasonal forecasts, rainfall trends, and drought outlooks, the TMA helps communities, farmers, and policymakers plan and implement adaptive measures such as adjusting planting schedules, conserving water resources, and preparing for low rainfall seasons. This proactive approach strengthens national resilience to drought and enhances food and water security.

The Act also supports early warning systems and disaster risk reduction mechanisms. It mandates the TMA to collaborate with relevant institutions, including the Disaster Management Department and local authorities, to issue drought alerts and advisories that enable early response actions. Such coordination ensures timely interventions such as water

rationing, livestock relocation, or activation of relief programs to protect lives and livelihoods before drought conditions intensify.

Furthermore, the Tanzania Meteorological Authority Act emphasizes research, capacity building, and climate services development to enhance understanding of drought dynamics and improve long-term adaptation planning. By promoting investment in modern meteorological technologies, data collection networks, and public awareness, the Act strengthens Tanzania's ability to monitor climatic variability and respond effectively to drought risks. In essence, the Act serves as a cornerstone for drought management by linking scientific climate data with policy, planning, and community action helping the country anticipate, adapt to, and mitigate the adverse effects of prolonged dry periods.

vii) The Water Resources Management Act, Cap. 331, R.E. 2023

The Water Resources Management Act, Cap. 331 R.E. 2023 provides a legal and institutional framework for the sustainable management, allocation, and protection of water resources, which is critical during periods of water scarcity. The Act recognizes that drought reduces water availability for domestic, agricultural, industrial, and environmental purposes, threatening livelihoods, food security, and economic activities. By promoting integrated water resources management (IWRM), the Act ensures that water use is coordinated across sectors and that scarcity is managed efficiently to minimize the adverse effects of drought.

The Act emphasizes water allocation, monitoring, and contingency planning as essential tools for drought preparedness. It mandates the establishment of systems to track water availability, regulate abstraction, and prioritize allocation during dry periods, ensuring that critical needs, such as drinking water, irrigation, and ecological flows, are met. By defining clear roles and responsibilities for water authorities, users, and communities, the Act enables timely interventions and equitable distribution of limited water resources during drought events.

The Water Resources Management Act also promotes community participation, conservation, and infrastructure development to enhance resilience to drought. Local communities, water user associations, and government institutions are encouraged to engage in water harvesting, storage, groundwater recharge, and catchment protection initiatives. Through these measures, the Act links sustainable water management with drought mitigation, supporting long-term water security, environmental sustainability, and the resilience of communities and ecosystems to the impacts of prolonged dry periods.

viii) The National Irrigation Act Cap. 435 R.E. 2023

The National Irrigation Act, Cap. 435 R.E. 2023 provides a legal framework for the development, regulation, and management of irrigation systems, which are critical for sustaining agricultural production during periods of water scarcity. The Act recognizes that drought can severely disrupt rain-fed agriculture, reduce crop yields, and threaten food security, particularly in arid and semi-arid regions. By promoting efficient and sustainable irrigation practices, the Act ensures that farmers have reliable access to water for crops and livestock, helping to mitigate the adverse effects of drought.

The Act emphasizes planning, allocation, and regulation of water for irrigation as essential tools for drought resilience. It mandates the establishment of mechanisms for equitable water distribution, water use monitoring, and prioritization of critical agricultural areas during dry periods. Through these provisions, the Act ensures that limited water resources are used efficiently, reducing conflicts among users and maintaining agricultural productivity under drought conditions.

Similarly, the Act promotes community participation, capacity building, and infrastructure development to strengthen drought preparedness. Water user associations and local institutions are encouraged to manage irrigation schemes, maintain infrastructure, and adopt water-saving technologies such as drip irrigation and water storage facilities. By linking irrigation management with drought mitigation strategies, the Act enhances food security, supports livelihoods, and builds long-term resilience to the impacts of prolonged dry periods.

ix) The Land Act Cap. 113 R.E 2023

The Land Act, Cap. 113 R.E. 2023 provides a legal framework for sustainable land use and management, which is essential for reducing vulnerability to prolonged dry periods. The Act recognizes that improper land allocation, land degradation, and unsustainable farming practices exacerbate drought impacts by reducing soil fertility, water retention, and the natural capacity of ecosystems to support agriculture and livestock. By regulating land use and promoting sustainable practices, the Act helps maintain productive soils, protect catchment areas, and enhance resilience to water scarcity.

The Act emphasizes integrated land and water management as a strategy to mitigate drought effects. It encourages measures such as soil and water conservation, afforestation, reforestation, and protection of wetlands and riparian zones. These practices improve groundwater recharge, maintain soil moisture, and support sustainable agricultural and pastoral activities during dry periods, thereby reducing the socio-economic impacts of drought on communities.

Likewise, the Act promotes community participation and institutional coordination in land governance to strengthen drought resilience. Local communities, government authorities, and other stakeholders are encouraged to engage in planning, monitoring, and implementing land use practices that conserve natural resources and prevent land degradation. By integrating drought considerations into land management, the Act contributes to food security, sustainable livelihoods, and long-term ecological stability in drought-prone areas.

x) The Village Land Act Cap. 114 R.E 2023

The Village Land Act, Cap. 114 R.E. 2023 provides a legal framework for the management and use of village lands, which is critical for sustaining agriculture, water resources, and community livelihoods during periods of water scarcity. The Act recognizes that improper land use, overgrazing, and land degradation at the village level increase vulnerability to drought by reducing soil fertility, water retention, and the productivity of natural resources. By promoting sustainable and community-based land management, the Act helps villages protect catchment areas, conserve soils, and enhance resilience to prolonged dry periods.

The Act emphasizes community participation and local governance in land allocation and management as key strategies for drought mitigation. Village councils and land committees are empowered to regulate land use, oversee natural resource conservation, and implement soil and water conservation practices. This ensures that village lands are used efficiently and sustainably, reducing the negative impacts of drought on agriculture, livestock, and water availability.

Moreover, the Act encourages integration of land and water management with climate adaptation strategies. Communities are supported in adopting measures such as afforestation, reforestation, water harvesting, and protection of wetlands and riparian zones. By linking village-level land governance with drought preparedness, the Act strengthens food security, supports sustainable livelihoods, and enhances the capacity of local communities to cope with the socio-economic and environmental challenges posed by drought.

xi) The Land Use Planning Act Cap. 116 R.E 2023

The Land Use Planning Act, Cap. 116 R.E. 2023 relates to drought by providing a legal framework for systematic and sustainable land use planning, which is critical for reducing vulnerability to prolonged dry periods. The Act recognizes that unplanned or unsustainable land use, including deforestation, overgrazing, and encroachment on water catchments, can exacerbate the effects of drought by reducing soil moisture, groundwater recharge, and agricultural productivity. Through effective land use planning, the Act promotes the protection of critical ecosystems, catchment areas, and agricultural lands to maintain resilience against water scarcity.

The Act emphasizes zoning and land use regulation as strategies for drought mitigation. By guiding settlement patterns, agricultural activities, and natural resource management, the Act ensures that land is used efficiently and sustainably, reducing land degradation and conserving soil and water resources. This contributes to maintaining food security, livestock production, and water availability during periods of low rainfall.

In addition, the Act promotes community involvement, stakeholder coordination, and climate-sensitive planning. Local authorities, planners, and communities are encouraged to integrate drought preparedness and adaptation measures into land use plans, such as establishing green belts, protecting wetlands, implementing water harvesting, and promoting sustainable farming practices. By linking land use planning with drought resilience, the Act helps safeguard livelihoods, support sustainable development, and enhance the capacity of communities and ecosystems to withstand prolonged dry periods.

3.4 National Strategies and Plans

It is acknowledged that the earth's atmosphere is not limited to the boundaries of a nation. The protection of the atmosphere must, therefore, be a Global effort (IUCN, 2015). There are several international conventions formulated for the purpose of protecting the atmosphere. These include the Vienna Convention on Protection of the Ozone Layer and its Montreal protocol as well as the United Nations Framework Convention on Climate Change (UNFCCC), which largely addresses the emissions of greenhouse gases in the atmosphere leading to Climate Change. In this regard, there is need for concerted efforts at global, regional and national scales to enhance the ratification and implementation of these conventions for the benefit of mankind. This should go hand in hand with undertaking assessment studies in order to continuously develop and review plausible mitigation measures at different scales. As part of the national effort to implement the global goals, there are several strategies and plans in place. These include: -

i) National Environmental Masterplan for Strategic Interventions (2022-2032)

The Tanzania National Environmental Master Plan for Strategic Interventions (2022–2032) provides a long-term framework for addressing environmental challenges that linked to or worsened by prolonged dry periods. The plan recognizes drought as one of the key climate-related threats affecting Tanzania's water resources, agriculture, energy production, and ecosystems. It highlights the link between drought, land degradation, deforestation, and unsustainable water use, and sets out strategic interventions aimed at enhancing environmental resilience and sustainable resource management to reduce the severity and impacts of drought.

One of the plan's major priorities is the sustainable management of water and land resources, which are directly linked to drought mitigation. It promotes integrated water resources management (IWRM), watershed protection, expansion of irrigation and rainwater harvesting, and conservation of wetlands and forests to ensure reliable water availability even during dry periods. These interventions are designed to strengthen the country's adaptive capacity and safeguard livelihoods dependent on climate-sensitive sectors such as agriculture and livestock.

The Master Plan also emphasizes ecosystem restoration and climate change adaptation as central strategies for drought resilience. It supports reforestation, afforestation, and sustainable land-use practices to improve soil moisture retention, enhance groundwater recharge, and reduce desertification. Furthermore, it integrates drought-related measures into national and local planning processes, ensuring that development projects consider water efficiency, environmental protection, and climate variability.

Further, the plan promotes institutional coordination, research, and public awareness to enhance drought preparedness and response. It calls for improved data collection on water availability, early warning systems, and community-based natural resource management initiatives. By linking environmental conservation with climate adaptation, the plan provides a comprehensive approach to managing drought risks, protecting ecosystems, and fostering sustainable development in Tanzania.

ii) The National Climate Change Response Strategy 2021-2026

The Tanzania National Climate Change Response Strategy (NCCRS) 2021–2026 relates directly to drought by recognizing it as one of the most severe and recurring climate change impacts affecting the country's economy, environment, and communities. The strategy identifies increasing frequency and intensity of droughts as a major threat to water resources, agriculture, livestock, energy generation, and food security. It therefore provides a framework for building national and local resilience through adaptation, mitigation, and sustainable resource management to reduce the vulnerability of people and ecosystems to prolonged dry conditions.

The strategy prioritizes adaptation measures in drought-prone sectors, particularly agriculture, water, and energy. It promotes the adoption of drought-tolerant crop varieties, efficient irrigation systems, and rainwater harvesting technologies to ensure water and food security during dry periods. Additionally, it emphasizes the protection and restoration of watersheds, wetlands, and forest ecosystems, which are vital for maintaining water availability and mitigating the effects of drought. These actions aim to enhance the adaptive capacity of rural communities that rely heavily on climate-sensitive livelihoods.

Moreover, the strategy underscores the importance of strengthening early warning systems, climate information services, and disaster preparedness to manage drought risks effectively. It calls for improved coordination between government institutions, research bodies, and local authorities to enhance drought forecasting, data sharing, and timely response. This proactive approach allows for better planning and reduces the economic and social costs of drought disasters.

In addition, the strategy integrates climate change adaptation and drought resilience into national development planning and financing mechanisms. It encourages investment in green infrastructure, community-based adaptation programs, and capacity-building initiatives that promote sustainable land and water management. By mainstreaming drought considerations into climate policy and development priorities, the strategy ensures that Tanzania is better equipped to prevent, withstand, and recover from the adverse effects of recurrent droughts while promoting sustainable growth and environmental sustainability

iii) The National Agroforestry Strategy II (2024-2031)

The National Agroforestry Strategy II (2024–2031) positions agroforestry as a key climate adaptation and mitigation measure that enhances resilience to prolonged dry periods while promoting sustainable land and water management. The strategy recognizes that drought poses a major threat to Tanzania’s agricultural productivity, food security, and rural livelihoods particularly in semi-arid and degraded regions. By integrating trees into farming systems, the strategy aims to improve soil fertility, conserve moisture, restore degraded land, and stabilize local microclimates, thereby reducing the vulnerability of farming communities to drought.

One of the core objectives of the strategy is to enhance ecosystem resilience through sustainable land use practices. Agroforestry helps retain soil moisture, reduce evaporation, and increase water infiltration, which are vital for maintaining crop yields during dry spells. The strategy promotes drought-tolerant tree species and mixed cropping systems that can withstand water scarcity while providing food, fodder, fuelwood, and income. This approach not only ensures year-round productivity but also reduces pressure on natural forests, which are critical for maintaining regional water cycles and mitigating drought impacts.

The strategy also emphasizes climate change adaptation and water resource conservation as key priorities. It calls for integrating agroforestry into watershed and catchment management programs to protect water sources, reduce runoff, and enhance groundwater recharge. These practices contribute directly to drought mitigation by maintaining water availability and ecosystem health. Additionally, agroforestry buffers communities against climate shocks by diversifying income sources and promoting sustainable natural resource use.

Furthermore, the strategy supports capacity building, research, and community participation to strengthen drought resilience. It promotes the dissemination of knowledge and technologies on climate-smart agroforestry practices, supports local innovation, and encourages collaboration among government institutions, NGOs, and local communities. By aligning agroforestry interventions with national climate policies and adaptation plans, the strategy serves as a practical tool for addressing the root causes and impacts of drought, ensuring sustainable livelihoods, ecosystem restoration, and long-term environmental stability across Tanzania.

iv) National Forest Policy Implementation Strategy (2021 - 2031)

The National Forest Policy Implementation Strategy (NFPIS) is an instrument for implementing the National Forest Policy of 1998. The strategy was prepared in accordance with the recommendations of the policy evaluation report and the expiry of the National Forest Programme of 2010. Its preparation considers macroeconomic and social policy development, as well as other related policies, such as land, agriculture, beekeeping, wildlife, and environment, which depend on each other.

The strategy guides in enhancing the sustainable supply of forest products and services by maintaining sufficient forest area under effective management through strengthening the management of natural forest resources to maintain carbon stocks, and promoting stakeholders' engagement in tree regeneration and tree growing in plantation forests and woodlots. Further, it guides in enhancing ecosystem stability through conservation of forest biodiversity, water catchments and soil fertility, which can be achieved through the establishment and management of forest reserves for biodiversity conservation.

All these efforts contribute to strengthening forest biodiversity conservation, protecting water sources, and improving soil fertility, which supports the natural systems that store water, regulate climate, and maintain ecosystem productivity. All these actions reduce drought risks, enhance national resilience, enabling the communities to access forest goods and services even during prolonged dry periods.

v) National Biodiversity Strategy and Action Plan (NBSAP)

The Tanzania National Biodiversity Strategy and Action Plan (NBSAP) recognizes that biodiversity conservation plays a crucial role in enhancing ecosystem resilience and mitigating the impacts of prolonged dry periods. The NBSAP acknowledges that drought contributes to biodiversity loss through habitat degradation, reduced water availability, and increased pressure on ecosystems from human activities such as overgrazing and deforestation. By promoting the sustainable management of natural resources, the NBSAP seeks to maintain healthy ecosystems that can better withstand and recover from the effects of drought.

The strategy emphasizes the conservation and restoration of critical ecosystems such as forests, wetlands, and rangelands that act as natural buffers against drought. These ecosystems help regulate water cycles, recharge groundwater, maintain soil moisture, and reduce land degradation. Through initiatives like afforestation, watershed protection, and sustainable land use planning, the NBSAP supports measures that directly contribute to drought mitigation and water security, especially in arid and semi-arid regions.

Furthermore, the NBSAP promotes integration of biodiversity conservation into national and local development planning, linking ecosystem health to climate change adaptation and drought resilience. It encourages the adoption of ecosystem-based adaptation (EbA) approaches, which use biodiversity and ecosystem services to reduce vulnerability to drought. This includes supporting community-based natural resource management and promoting traditional knowledge in managing landscapes prone to water stress.

Similarly, the NBSAP highlights the need for research, monitoring, and institutional collaboration to strengthen the understanding of the link between biodiversity and drought. By fostering data-driven decision-making, public awareness, and inter-sectoral coordination, the strategy ensures that biodiversity conservation contributes effectively to building resilience against drought. In essence, the Tanzania NBSAP aligns biodiversity protection with drought adaptation, ensuring sustainable ecosystems that support livelihoods, water security, and ecological stability in the face of climate variability.

vi) National Adaptation Plan (NAP) (2025)

The Tanzania National Adaptation Plan (NAP) of 2025 recognizes drought as one of the most significant climate-induced hazards threatening the country's economy, ecosystems, and livelihoods. The Plan acknowledges that recurrent and prolonged droughts have increasingly affected agricultural productivity, water availability, energy generation, livestock production, and food security. In response, the NAP provides a comprehensive framework for reducing drought vulnerability and strengthening national resilience through climate change adaptation planning and implementation across all key sectors.

The NAP emphasizes sectoral adaptation measures aimed at mitigating the impacts of drought, particularly in agriculture, water, livestock, and natural resources management. It promotes the adoption of drought-resilient crop varieties, expansion of irrigation and water-harvesting systems, protection of catchment areas, and sustainable rangeland management. These actions are designed to ensure reliable water and food supplies during dry periods and to support the livelihoods of communities most at risk.

The NAP focuses on institutional coordination, early warning systems, and climate information services as essential components of drought preparedness and response. It calls for improved meteorological monitoring, data sharing, and integration of drought early-warning systems into national and local planning to enable timely decision-making and resource allocation. This helps communities and institutions anticipate drought conditions and implement proactive measures to minimize losses.

In addition, the Tanzania NAP underscores the importance of mainstreaming drought adaptation into national and local development planning. It encourages investment in climate-resilient infrastructure, capacity building, and financing mechanisms to support drought adaptation initiatives. By integrating drought considerations into long-term climate strategies, the NAP ensures that Tanzania transitions from reactive drought response to proactive adaptation, building a more sustainable and resilient society in the face of climate variability.

vii) National Action Programme to Combat Desertification (2014-2018)

The Tanzania National Action Programme to Combat Desertification (2014–2018) was developed in line with the United Nations Convention to Combat Desertification (UNCCD) to address the root causes and impacts of land degradation and recurrent droughts in the country. The programme recognizes that drought and desertification are interlinked environmental challenges that threaten Tanzania's agricultural productivity, water resources, biodiversity, and livelihoods particularly in arid and semi-arid regions. It therefore provides a framework for promoting sustainable land and water management to reduce vulnerability to drought and restore degraded ecosystems.

The programme emphasizes soil and water conservation, afforestation, and sustainable agricultural practices as core strategies to mitigate the effects of drought. It promotes community-based land management initiatives, water harvesting, and the use of drought-tolerant crops to enhance productivity and resilience. By improving soil fertility, conserving moisture, and reducing erosion, these measures help maintain the ecological balance and sustain livelihoods even during periods of prolonged dry conditions.

Additionally, the National Action Programme underscores the importance of institutional coordination, research, and capacity building in managing drought and land degradation. It calls for strengthened collaboration among government institutions, local communities, and development partners to implement drought-mitigation activities effectively. The programme also encourages the integration of drought and desertification issues into national development and poverty-reduction strategies, ensuring that long-term planning considers the risks associated with water scarcity and ecosystem degradation.

Overall, the Tanzania National Action Programme to Combat Desertification (2014–2018) serves as a key policy tool for building drought resilience through sustainable land use, community empowerment, and ecosystem restoration. By tackling the underlying drivers of desertification, it contributes directly to reducing the frequency and severity of drought impacts across the country.

CHAPTER FOUR

4.0 COORDINATION STRUCTURE AND RESPONSIBILITIES FOR DROUGHT MANAGEMENT

4.1 Coordination

The Vice President's Office (VPO), serving as the UNCCD National Focal Point, will provide overall coordination, oversight, and policy guidance for the implementation of the National Drought Plan (NDP). The VPO plays a central role in strengthening national capacity for drought preparedness, climate resilience, and coordination among ministries, agencies, and development partners. In Zanzibar, the First Vice President's Office (FVPO) will oversee and guide implementation of the NDP in alignment with national priorities.

To enhance cross-sectoral collaboration on Mainland Tanzania, two key mechanisms facilitate stakeholder coordination: The National Climate Change Steering Committee (NCCSC) which provides high-level policy direction, strategic oversight, and inter-ministerial coordination, and National Climate Change Technical Committee (NCCTC) which brings together technical experts from ministries, agencies, academia, the private sector, and civil society to harmonize sectoral inputs, consolidate evidence, and advise on technical aspects of implementation.

Zanzibar has parallel structures, the Zanzibar Climate Change Steering Committee (ZCCSC) and the Zanzibar Climate Change Technical Committee (ZCCTC), which ensure coordinated policy direction and technical alignment with their Mainland counterparts.

Sector ministries and agencies will be responsible for implementing NDP priorities within their respective mandates. Sector Environmental Coordinators will oversee implementation, monitoring, and reporting at the sector level.

Local Government Authorities (LGAs) will incorporate NDP priorities into local development plans and implement context specific drought preparedness and response actions. LGAs will also lead community engagement particularly targeting women, youth, pastoralists, and coastal communities, to ensure that interventions are locally appropriate, inclusive, and responsive to community needs.

4.2 Assignment of Responsibilities

Table 1: Assignment of responsibilities for the implementation of the NDP

| Ministry/ Institution | Responsibilities |
|---|---|
| Ministry responsible for Regional Administration and Local Government Authorities | <ul style="list-style-type: none"> • Oversee and coordinate regional administration and local government authorities to ensure accountability and effective governance and service delivery. • Coordinate regional and district plans on disaster prevention and mitigation, including drought, ensuring they align with national strategies. |
| Ministry responsible for Planning | <ul style="list-style-type: none"> • Coordinate formulation of socio-economic development frameworks, articulating economic issues and coordinating investment. • Support integration of drought resilience into national development strategies, monitor overall progress, and ensure alignment with national goals. |
| Ministry responsible for the Environment | <ul style="list-style-type: none"> • develop and coordinate implementation of national environmental policies and strategies, including the National Action Programme to Combat Desertification and National Climate Change Response Strategy, which provide the framework for addressing drought. • facilitate climate change vulnerability and impact assessments to inform planning and interventions in drought-prone areas |
| Ministry responsible for Disaster Management | <ul style="list-style-type: none"> • provide overall coordination for all disaster management activities including prevention, preparedness, response and recovery at national, regional and district levels. • formulate, review and ensure the implementation of national disaster management policies, strategies, and plans • ensure effective early warning systems are in place. |
| Ministry responsible for Agriculture | <ul style="list-style-type: none"> • formulate, coordinate, monitor and evaluate the implementation of agriculture related policies • promote climate-resilient agriculture, sustainable land and natural resources management and agricultural extension services for smallholder farmers. |
| Ministry responsible for Water | <ul style="list-style-type: none"> • coordinate implementation of the national water policy and ensure sustainable development and management of water |

| Ministry/ Institution | Responsibilities |
|--|---|
| | resources and provide clean and safe water and sanitation services |
| Ministry responsible for Finance | <ul style="list-style-type: none"> responsible for mobilizing resources, establishing innovative financing mechanisms, overseeing budget allocation for drought resilience and exploring drought insurance schemes and other financial risk transfer instruments |
| Ministry responsible for Livestock and Fisheries | <ul style="list-style-type: none"> formulate and implement policies for the development of the livestock and fisheries sectors mitigate the adverse impacts of drought on livestock and fisheries resources and enhance sector resilience |
| Ministry responsible for Energy | <ul style="list-style-type: none"> develop and implement policies, plans and programs related to energy and petroleum resource management to ensure efficient, cost-effective, reliable and quality services in an environmentally friendly manner diversify the national energy mix to build resilience against climate shocks and drought |
| Ministry responsible for Natural Resources and Tourism | <ul style="list-style-type: none"> develop and implement policies promoting climate-resilient tourism and overseeing the sustainable use of wildlife, forest and cultural heritage resources. mitigate the ecological impacts of drought and enhance long-term resilience of natural and cultural resources |
| Other Ministries, Departments and Agencies (MDAs) | <ul style="list-style-type: none"> formulate strategies and plans for disaster risk management in their respective sectors. establish national and international partnerships for technical cooperation and resource mobilization. |
| Local Government Authorities | <ul style="list-style-type: none"> promote social development and public service delivery, facilitation of maintenance of law and order and promotion of local development under participatory process. coordinate, plan and implement activities to combat drought at the district level. |

| Ministry/ Institution | Responsibilities |
|------------------------------------|--|
| Academic and Research Institutions | <ul style="list-style-type: none"> • provide scientific expertise, conduct research on drought impacts and solutions, and contribute to the development of innovative technologies and practices. |
| Private Sector | <ul style="list-style-type: none"> • leverage expertise, innovation, and funding to proactively manage drought risks and build long-term resilience. • opportunities for private sector engagement in drought resilience include investments in water infrastructure, climate-smart agriculture technologies, renewable energy solutions and insurance services. |
| Civil Society Organizations | <ul style="list-style-type: none"> • promote awareness and mobilize community action; and advocate for inclusive and sustainable policies. • raise awareness on the implementation of drought risk reduction policies and practices, particularly at the community level. |
| Media | <ul style="list-style-type: none"> • support public awareness raising and facilitating exchange of information and dissemination of early warning. • Inform and educate the public and facilitate strengthening of drought-resilient local communities |
| Development Partners | <ul style="list-style-type: none"> • provide technical assistance, financial support and facilitate knowledge exchange in drought management best practices. |

5.0 DROUGHT MONITORING, FORECASTING AND IMPACT ASSESSMENT

5.1 Overview

Droughts, like any other natural disaster, have always had adverse impacts on humanity and hence any effort towards developing capacities to monitor their potential occurrence in advance is highly commendable. Prior knowledge on severity and possible coverage of droughts makes it possible to prepare and institute response plans in advance. Even though there is no Drought Policy in the country, the Government has been using existing agencies and or established frameworks (cf. Chapter 3), notably Tanzania Meteorological Authority, is instituting drought early warning mechanism through its weather forecasting portfolio. TMA has been providing daily, monthly and seasonal weather forecasts of which is the foundational base in drought monitoring and generating appropriate early warning to various sectors in the country. It is of paramount importance to monitor drought since, droughts are one of the more costly natural hazards on a year-to-year basis; their impacts are significant and widespread, affecting many economic sectors and people at any one time. The hazard footprints of (areas affected by) droughts are typically larger than those for other hazards, which are usually constrained to floodplains, coastal regions, storm tracks or fault zones.

Tanzania Meteorological Authority produces dekadal (10 days) and monthly weather bulletins. A dekadal bulletin gives a 10day summary of synoptic overview of rainfall, agrometeorological and hydrometeorological impacts and weather outlook of the next dekadal. On the other hand, a monthly weather bulletin provides a synoptic and weather summary on temperature, sunshine hours, satellite derived indices e.g. Normalized Difference Vegetation Index (NDVI), wind speed, a brief on agrometeorological and hydrometeorological conditioning as well as expected synoptic and rainfall situation for the next month.

Nevertheless, the weather forecast does not provide a broad overview of nature, extent, and cost of droughts to the different sectors of the economy and how it may affect the livelihoods of the people. Such subsequent analysis, after obtaining weather forecast, forms part of risk assessment of which requires a coordinated approach within and across sectors. It requires internalizing and domesticating the weather forecasts within sectors with the view to generate requisite information on potential preparatory measures that need to be in place in response to a potential drought. In this regard, the World Meteorological Organization (WMO) and Global Water Partnership (GWP) in collaboration with all national meteorological agencies in the world, have adopted different drought indices that intuitively describe the nature and severity of droughts in different sectors as part of inculcating risk assessment in the weather

forecast. The indicators and indices herein this plan discussed, provide options for identifying the severity, location, duration onset and cessation of conditions resulted by droughts.

5.2 Drought Monitoring Indicators and Indices

According to WMO & GWP (2016), drought indicators are hydrological, meteorological, or biophysical variables such as precipitation, streamflow, temperature, groundwater and water storage levels, and soil conditions that describe the drought conditions. The type of impact(s) relevant in a particular drought monitoring and early warning context is often a crucial consideration in determining the selection of drought indicators.

Therefore, drought indices are computed numerical representations of drought severity, often calculated using combinations of meteorological, hydrological, or biophysical indicators. Severity refers to the departure from normal of an index. The threshold for severity can be set to determine when a drought has begun, when it ends and geographic area affected. The indices are essential in providing quantitative information on the severity, timing, duration, and extent of the drought. Information on onset and anticipated end of a drought is essential because drought impacts can be highly variable depending on when moisture shortages occur in relation to other factors. Given the fact that droughts are independent events that occur as a result of abnormal weather conditioning, it is possible to use such indices to estimate the probability of their occurrence and severity from historical data.

In this case, such drought indices help to provide a baseline for monitoring and risk assessment. However, the World Meteorological Organization Commission for Agricultural Meteorological has been conducting a progressive survey by sending requests to different national meteorological and hydrological services to provide information on national progress reports in agriculture and meteorology. The aim of such an undertaking is to obtain a preliminary list of representative drought indices that are being used or available to a particular country's meteorological authority. From the survey conducted from 2010 to 2014, it was found that Tanzania Meteorological Authority has continued to test and apply various drought indices including the Standardized Precipitation Index (SPI) and Percent of Normal Precipitation (PNP) in monitoring the drought impact and occurrences. The subsequent section provides a summary of various indices used for monitoring droughts.

i) Standardized Precipitation Index (SPI)

The Standard Precipitation Index (SPI), developed by McKee et al. (1993), is a widely used attribute designed to showcase the precipitation shortfall for multiple timescales. It is designed to be an indicator of drought that recognizes the importance of time scales in the analysis of water availability and water use. A drought event occurs any time the SPI is continuously negative, with severe droughts reaching an extreme intensity of -2.0 or less. The drought event ends when the SPI becomes positive as indicated in **Table 2**. Each

drought event, therefore, has a duration defined by its beginning and end, and an intensity for each month that the drought event continues. The positive sum of the SPI for all the months within a drought event can be termed as the drought’s “magnitude”. On short timescales, the SPI is closely related to soil moisture, while at longer timescales, the SPI can be related to groundwater and reservoir storage. In this case, the index can be used to estimate 1 to 2-month precipitation shortfall for meteorological drought, 1 to 6-month shortfall for agricultural drought.

Table 2: Probability of recurrence of drought event described by the Standardized Precipitation Index (Source: WMO, 2012).

| SPI | Category | Number of times in 100 years | Severity of event |
|--------------------|------------------|------------------------------|-------------------|
| 2.0+ | Extremely wet | NA | NA |
| 1.5 – 1.99 | Very wet | NA | NA |
| 1.0 – 1.49 | moderately wet | NA | NA |
| -.99 to .99 | near normal | NA | NA |
| 0 – .99 | Mild dryness | 33 | 1 in 3 years |
| -1.0 - 1.49 | Moderate dryness | 10 | 1 in 10 years |
| -1.5 - 1.99 | Severe dryness | 5 | 1 in 20 years |
| -2.0 or less | Extreme dryness | 2.5 | 1 in 50 years |

The SPI can be compared across regions with markedly different climates because it quantifies observed precipitation as a standardized departure from a selected probability distribution function that models the raw precipitation data. One of the advantages of the index is its simplicity and ability to identify the beginning and the end of drought events of which is important for making necessary preparatory and drought contingency plans. Despite its apparent strength, SPI has the disadvantage of only being able to quantify precipitation deficit based on preliminary data of which keeps on changing as the period of record increases.

ii) Percent of Normal Precipitation (PNP)

This is a simple statistical formulation that expresses, in percentage, the ratio between the actual precipitation and the average or normal precipitation in a location on a given time scale (Lima et al, 2019). The normal precipitation is computed as an average of 30 years. According to WMO Integrated Drought Management Programme, the countries that have tested and applied this index globally are Bosnia and Herzegovina, Democratic Republic of the Congo, Iran, Pakistan, Tanzania, and the USA. The simplicity of the index allows

comparing any time period for any location as it can be computed on a daily, weekly, monthly, seasonal, and annual timescales, which suits many user needs (Hayes, 2006).

One of the challenges in using the PNP index is the potential confusion on using average precipitation of an area instead of computing normal precipitation for 30 years. In addition, it is a challenge to use PNP index to compare different geographical locations with different climate regimes especially those with defined wet and dry seasons. It is good to note that the choice or use of indicators or indices in monitoring and or forecasting drought occurrences as well as assessing their impacts is a localized process that takes into account regional and national circumstances. Some of the factors that have been considered in selecting suitable indices or indicators include availability of spatio-temporal data, technical capacity as well as nuances of the climatic, social, economic, and environmental conditions. There are other indices and indicators that are available for monitoring and forecasting droughts to which TMA could easily adapt. Some of these indices are as described below.

a) Palmer Drought Severity Index (PDSI)

The Palmer Drought Severity Index (PDSI) uses available temperature and precipitation data in estimation of relative dryness (Dai et al., 2019). It is a standardized index that ranges from -10 (dry) to +10 (wet). The PDSI has practically been successful in quantifying long-term droughts. Given the fact that it uses available temperature data and a physical water balance model, it can capture the basic effect of global warming on drought through changes in potential evapotranspiration (Alley, 1984). Despite its strength, PDSI has some limitations such as lack of multi-time scale features that are available in other indices such as SPI, hence making it difficult to correlate with specific water resources like reservoir storage level and runoff. In addition, PDSI works under timescale of approximately nine months, hence creating a lag in identifying drought conditions based on a simplification of the soil moisture component within its computation framework.

b) Standardized Precipitation-Evapotranspiration Index (SPEI)

The Standardized Precipitation Evapotranspiration Index (SPEI) is an extension of the widely used Standardized Precipitation Index (SPI). This was designed to take into account both precipitation and potential evapotranspiration (PET) in determining drought occurrence (Vicente-Serrano et al., 2015). The SPEI differs from SPI in the sense that it captures the main impact of increased temperature on water demand. Also, in areas with limited data of precipitation and temperature, the SPEI can be estimated with the simple temperature-based Thornthwaite method for computing potential evapotranspiration (PET). In this method, those variables which are found to affect the PET - such as solar radiation, surface humidity, and wind speed are neglected (Vicente-Serrano et al., 2015; Dai et al., 2019). Figure 6 shows a SPEI map for Tanzania, for current and future climate conditions based on climate change analysis.

Current climate condition 1979 - 2018

Future climate condition 2051 - 2100

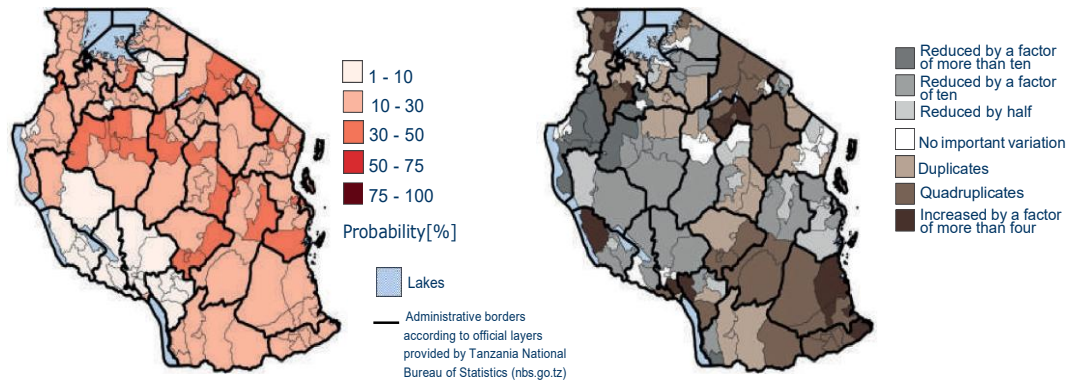


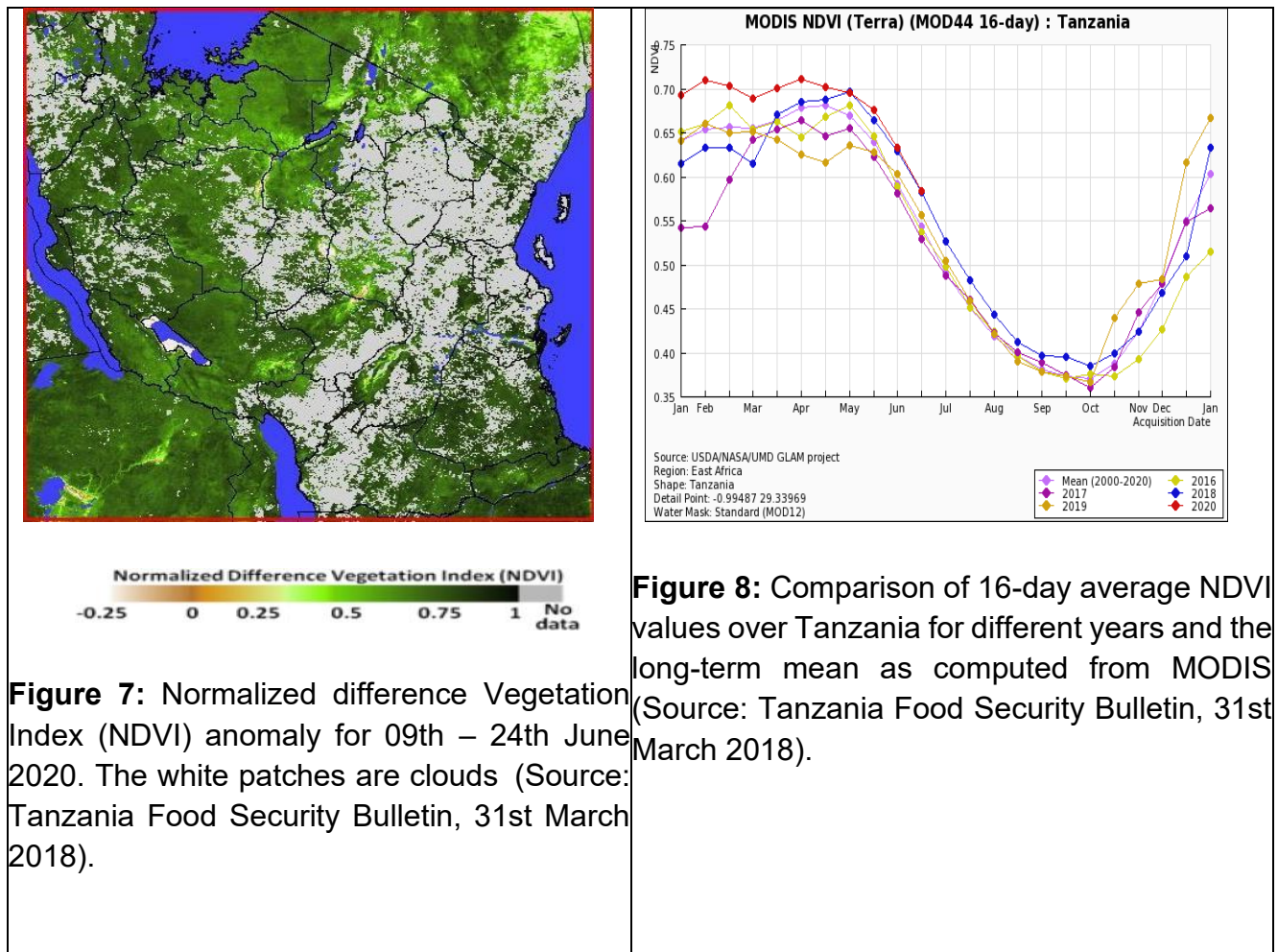
Figure 6: Maps showing analysis of drought risks and vulnerable administrative areas in Tanzania (Source: Disaster – Drought risk Profile in Tanzania, 2018)

It can be noted that the probability of droughts is the highest in the semi-arid great rift valley of Tanzania. This is particularly important for areas dependent on overland flows from rainfall events for replenishing water supplies e.g charco dams, earth dams etc. However, the main limitation of this index is its massive data requirements compared to SPI. Also, it is sensitive to the methods of calculating potential evapotranspiration (PET) and the requirement of long data series (30-50 years) of which enables the sampling of natural variability in the data series (Vicente-Serrano, 2015).

c) Normalized Difference Vegetation Index (NDVI) and Land Surface Temperature (LST)

Globally, the Normalized Difference Vegetation Index (NDVI) is the most used indicator for monitoring drought at different spatial scales ranging across landscapes. The NDVI and Land Surface Temperature (LST) have been applied in various numbers of water and climate-related projects or researches, especially in drought monitoring. Normalized Difference Vegetation Index, computed from remote sensed satellite images, is used to quantify vegetation cover by measuring the difference between near-infrared (which vegetation strongly reflects) and red light (which vegetation strongly absorbs). The range of NDVI is -1 to $+1$, whereby the higher value of NDVI refers to healthy and dense vegetation while lower NDVI values show sparse or withered vegetation as indicated in **Figure 7** and **8**.

Many studies have found that there is a strong negative correlation between Land Surface Temperature and NDVI during drought periods and that a time series of the quotient LST/NDVI is a rapid indicator of drought at country and any spatial unit e.g. region, province level in tropical areas (McVicar and Bierwirth, 2001). The main challenge with NDVI, like any other surface fluxes retrieved from satellite images, is cloud contamination. It is a challenge to retrieve desired remotely sensed fluxes from satellite images that are contaminated with clouds. Continuous presence of clouds is a common phenomenon in the skies of many tropical countries such as Tanzania and hence there are always the possibility of not being able to retrieve desired fluxes for the entire country – but only areas which are cloud free as captured during satellite overpass time.



d) Aridity Anomaly Index (AAI)

This index was developed by the India Meteorological Department (IMD) (Svoboda et al., 2016). It uses a real-time drought index in the water balance process. The computation can be done on a weekly or two weekly basis in which the actual aridity for such a period, as compared to the normal aridity for that period, is estimated. The positive values indicate moisture stress while the negative values indicate a surplus of moisture. AAI uses temperature, wind, and solar radiation values as inputs in computing the actual evapotranspiration and potential evapotranspiration. The method is often applied in assessing the drought impacts in agriculture particularly in tropics where defined wet and dry seasons are part of the climate regime - despite its inability to be applied for a long-term or multi-seasonal event.

e) Effective Drought Index (EDI)

Effective Drought Index (EDI) was developed by Byun and Wilhite in 1996. The index uses daily precipitation data to develop and compute various parameters such as Daily mean Effective Precipitation (DEP), Effective Precipitation (EP), and standardized value of DEP. These indices can be used to identify the onset and cessation of water deficit periods and widely applied for operational monitoring of both meteorological and agricultural droughts. The index is also helpful in identifying the onset, cessation, and duration of drought events. Despite its strength, EDI does not have direct integration with the impact of temperature on droughts because of dependence on precipitation only as input in its computation.

f) Standardized Streamflow Index (SSFI)

This metrics is well described by Telesca and others as the difference in streamflow from mean to standard deviation. **Figure 9** shows a map of SSFI for Tanzania based on climate change analytics – for current and future climate scenarios. The index uses monthly streamflow values and the methods of normalization associated with SPI. SSFI can also be computed using both observed and forecasted streamflow information providing a perspective on high and low flow periods of which are associated with drought and floods respectively. The main input in the computation of this index is streamflow data on a daily or monthly timescale. It is essentially applied in monitoring the hydrological conditions at multiple timescales and can easily be derived using the freely available SPI computational program. The latter is easy to use as it has only a single input variable that allows for gaps in data series. The weakness of this index is that it only accounts for streamflow in the context of monitoring drought, without taking into account other dynamics that influence occurrence of droughts.

Current 1979 - 2018

Future 2051 - 2100

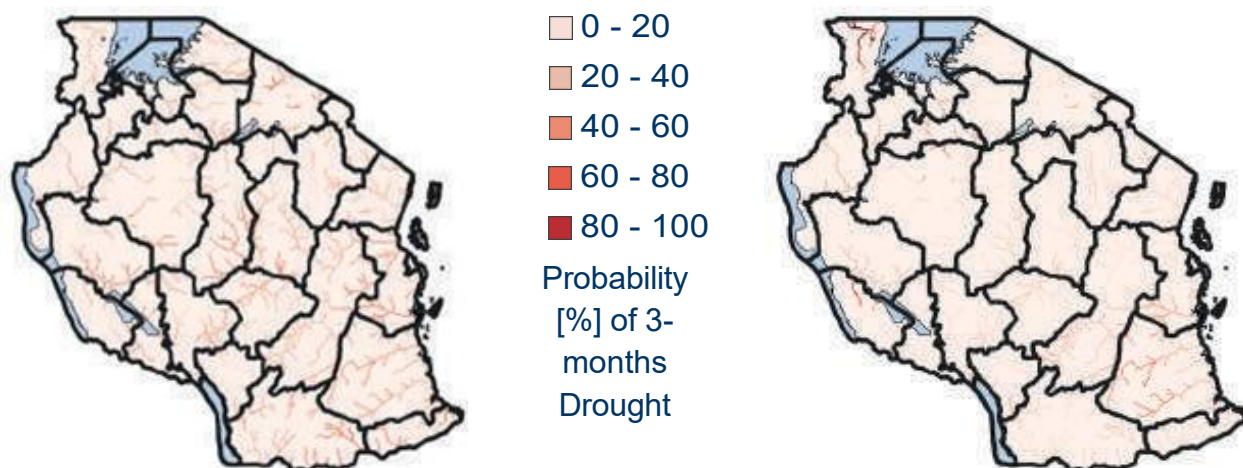


Figure 9: Depiction of existing and predicted climate condition portrayed by Standardized Streamflow Index (Source: Disaster – Drought profile in Tanzania 2018)

g) Weighted Anomaly Standardized Precipitation (WASP)

This index was developed by Lyon in 2004 to monitor precipitation in the tropical regions within 30 degrees from the equator. It uses gridded monthly precipitation data on a 0.5° by 0.5° resolution and is based on 12-month overlapping sums of the weighted, standardized monthly precipitation anomalies. WASP is mainly used in wet tropical regions to monitor developing drought, taking into account the defined wet and dry periods in the climate regime. It is a useful index for monitoring droughts that affect agriculture and other related sectors. The index is user friendly as it uses precipitation as a single input allowing for simple computations. Despite its simplicity, the WASP does not work well in desert regions.

h) Enhanced Vegetation Index (EVI)

The development of the Enhanced Vegetation Index (EVI) was an integral effort by the Moderate Resolution Imaging Spectroradiometer (MODIS) Land Discipline Group of NASA to improve on Normalized Difference Vegetation Index (NDVI) of which are both global-based vegetation indices. EVI was developed as an alternative vegetation index to address some of the limitations of NDVI. The establishment of this index aimed at providing consistent spatial and temporal information regarding global vegetation. Nevertheless, several environmental factors such as atmospheric conditions and soil background may produce errors in these indices as it causes noise in calibration, particularly in hilly areas. The topographic effect is another very important factor, especially when the indices are used in areas of rough terrain. In this case, as the spatial resolution increases, the effects of

topography may decrease or even disappear. The EVI has high resolution and good global coverage though it does not separate the drought stress from other inherent stresses. NDVI and EVI data sets are currently distributed for free by the USGS Land Processes Distributed Active Archive Center (LP DAAC).

i) Vegetation Drought Response Index (VegDRI)

The index integrates concepts from both the remote sensed NDVI and the climate-based drought index approaches to produce 1-km resolution global maps that characterize the intensity and spatial pattern of drought-induced vegetation stress over large areas. In the VegDRI approach, the 1-km resolution NDVI images provide detailed spatial patterns of vegetation conditions, which are analysed in combination with dryness information represented in the climate-based drought index data to identify and characterize the intensity and spatial extent of drought conditions. Biophysical parameters such as the land cover type, soil available water holding capacity, irrigation status, and ecological setting of an area are also analysed because these environmental attributes can influence specific climate-vegetation interactions.

The 1-km VegDRI maps depict more spatially detailed, drought-specific information related to vegetation than traditional drought monitoring tools. In addition, this information is freely available at relevant spatial and temporal scales of which is useful to decision-makers at local to the national level.

j) Water Requirement Satisfaction Index (WRSI)

This index was developed by the Food and Agriculture Organization (FAO) of the United Nations to monitor and investigate crop production in famine prone parts of the world. Additional work to develop this index was done by the Famine Early Warning Systems Network (FEWS-Net). The index was established for monitoring crop performance during the growing season based on available water for the crop as estimated from satellite images. The parameters used in computing the index are obtained from crop development models, crop coefficients and satellite data (Verdin & Klaver, 2002). The strength of this index is based on its high spatial resolution and good spatial coverage over all terrains. Despite its strength, the index does not consider other stress-related factors other than available water and hence one of its weaknesses. Moreover, the satellite-based rainfall estimates have a degree of error that affects the results of the crop models used and subsequent computation of evapotranspiration (Verdin & Klaver, 2002).

k) Global Integrated Drought Monitoring and Prediction System (GIDMaPS)

Global Integrated Drought Monitoring and Prediction System is an index developed to provide drought information based on multiple drought indicators. According to Hao et al., (2014), the system provides meteorological and agricultural drought information based on, multiple satellite and model-based precipitation and soil moisture data sets. GIDMaPS comprises a near real-time monitoring component and a seasonal probabilistic prediction module.

The data sets used in computing the index include historical drought severity data from the monitoring component of the probabilistic seasonal forecasts from the prediction module of the system. The probabilistic forecasts help in providing essential information for drought early warning. GIDMaPS data sets are a significant progress in enhancing current capabilities especially in generating new data sets for global drought assessment and early warning (Hao et al., 2014).

l) Global Land Data Assimilation System (GLDAS)

The Global Land Data Assimilation System (GLDAS) was developed by the National Oceanic and Atmospheric Administration (NOAA) with the aim to ingest satellite and the ground-based observational data products. It uses advanced land surface modelling and the data assimilation techniques to generate optimal fields of land surface states and fluxes (Rodell et al., 2004). Data assimilation techniques for incorporating satellite-based hydrological products, including soil moisture, water equivalent, surface temperature, and leaf area index, are also being used to constrain and improve the model outputs. A high- quality, global land surface fluxes provided by GLDAS support several current and proposed weather and climate prediction, water resources applications, and water cycle investigations. Different projects conducted under this initiative has led to generation of massive archive of modelled and observed, global, surface meteorological data, parameter maps, and other outputs. The resolution ranges from 1-degree to 0.25-degrees, starting from 1948 to present simulations of the NOAA products (Rodell et al., 2004).

5.3 Current Monitoring, Data collection, Forecasting and Early warning

Currently, Tanzania has no centralized drought monitoring system. However, individual agencies, institutions, and ministries have their own monitoring system using various appropriate tools, data and information system to run and or operationalize their localized systems. The central and local governments, institutions, agencies, and NGOs have continued to collect data that is relevant to their responsibilities. For instance, the Ministry of Agriculture and Food Security through Crop Monitoring and Early Warning Unit collects

information and data on pests, rainfall for crops production, crops status as well as any externalities that might affect national food security. Such information is normally shared in different forms including the monthly Food Security Bulletin as presented in **Figure 10**.

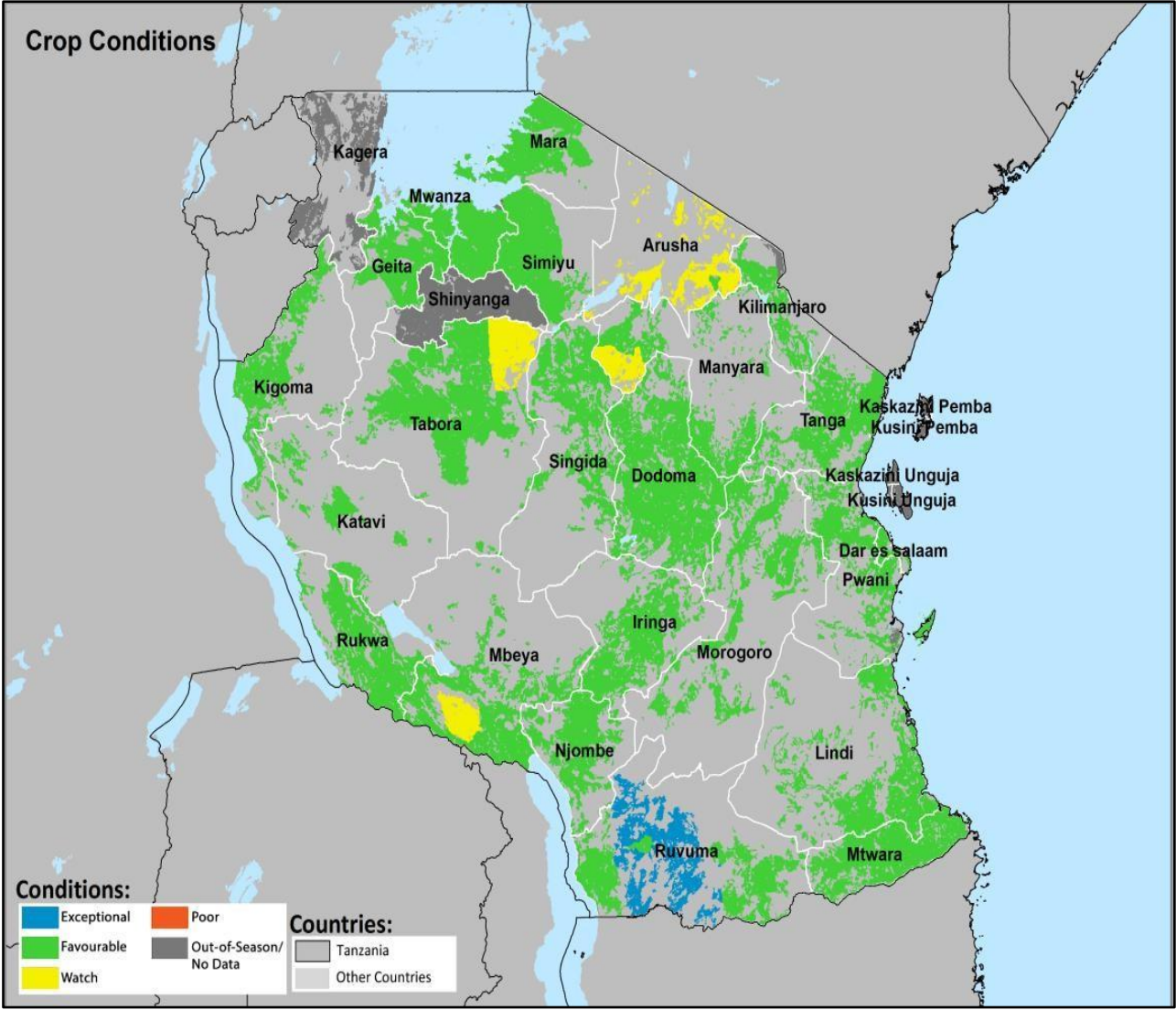


Figure 10: A synthesis of crop conditions in Tanzania as of 31st March 2018 (Source: Tanzania Food Security Bulletin, 31st March 2018)

TMA is responsible for providing information on weather and climate as part of early warning on drought and floods while the National Bureau of Statistics (NBS) is the custodian of all data sets in the country and disseminates the same and or generated statistical analytics thereof to the public on a more regular basis. Early Warning System in droughts, basically intends to track, assess and deliver relevant information concerning climatic, hydrological and water supply conditions and trends. In the sense of tracking, assessing and delivering relevant information on drought indicators, the objective is to provide timely information in

advance of, or during, the early onset of drought to prompt action (via threshold triggers) within a drought risk management plan as a means of reducing potential impacts.

Tanzania has different Early Warning Systems (EWS) to monitor various hazards. These EWSs can be categorized into government and non-governmental managed systems. Government managed systems include the Tanzania Meteorological Authority (TMA); Food Security Department under Ministry of Agriculture and Food Security, Seismology Unit under the Ministry of Energy and Minerals, the Emergency Preparedness and Response Unit (EPRU) under the Ministry of Health and Social Welfare as well as Disaster Management Department under the Disaster Management Agency in the Prime Minister's Office. The Non-governmental EWS includes Famine Early Warning System Network (FEWS-Net) which is the provider of early warning and analysis on food security in different countries including Tanzania. FEWS- Net was established with the aim to provide decision-makers with evidence-based analysis on status of food security in respective countries.

5.4 Drought Severity in Relevant Sectors

The most vulnerable sectors to droughts in Tanzania are the natural resources and agriculture sectors of which comprise crop production, water resources, wildlife, livestock, health, and forestry. Crop production, water resources, livestock, and wildlife are directly affected by droughts through water scarcity. It is worth noting 80% of Tanzania's population is employed in the agricultural sector and hence any disruptive incidences, including drought, have a direct and indirect effect on the country's economy (URT-TCAR, 2016).

The impact of droughts on forests and its ecosystem is diverse. It could manifest in form of deforestation as a result of neighbouring communities exploiting forest resources for survival. Droughts could also lead to withering of forests as well as increased incidences of forest fires.

5.5 Approaches For Drought Monitoring, Guide to Early Warning and Assessment

The monitoring of drought through the clarified indicators, the guiding of early warning and assessment may be done by the application of mainly three methods, the use of single indicator/index, multiple indicators/indices and composite or hybrid indicators. It is important to take a note on the role of indices and indicators in a drought and Early Warning System within an overall drought risk management strategy. These approaches provide useful triggers to help direct decision-makers and policy makers towards proactive risk management. It is important to note that, triggers are specific values of an indicators or index that initiate and/or terminate each level of a drought plan and associated mitigation and emergency management responses.

6.0 DROUGHT RISK AND VULNERABILITY

6.1 Overview

Drought risk is mainly referred to the possibility of drought to cause impact(s) on biodiversity (including people), environment and economy potential, while drought vulnerability describes the extent to which communities, ecosystems, or systems are susceptible to harm from drought itself. Drought risk and vulnerability are well taken onboard by considering main factors such as exposure, likelihood and severity of occurrence, and vulnerability on drought risk, and socio-economic conditions (i.e. income levels, dependence on rain-fed agriculture), adaptive capacity (i.e. availability of water storage, irrigation systems, early warning systems), environmental conditions (i.e. land degradation, soil quality) and institutional capacity (i.e. policies, governance, disaster management structures) on drought vulnerability

Generally, drought risk measures the possibility and potential consequence of drought and the extent of how fragile or easily impacted the system or community is from drought is checked through the vulnerability. Through drought risk and vulnerability, this plan will be used by government and other institutions or agencies for mitigation, resilience-building, and early warning strategies.

6.2 Drought Risk Assessment

A drought risk assessment is a basis for establishing effective drought monitoring and early warning systems. It provides important information for setting priorities and developing actions that help to prevent drought and mitigate drought impacts. Vulnerability assessment is important for the following reasons:

- i) It identifies the communities and sectors that are at risk from drought. Drought management plans, policies and risk mitigation measures can then be effectively designed, tailored and prioritized toward the communities and sectors that are at great risk;
- ii) Identifying vulnerable communities and sectors is a pre-cursor to developing drought preparedness, monitoring, early warning response systems.
- iii) Serves as an important learning and knowledge gathering exercise by improving the understanding of human and natural processes that add to drought vulnerability and community resilience.
- iv) Provides important insights into community groups that may be marginalized such as women, children, the elderly and sick, the landless, and indigenous communities.

A consistent and well-coordinated risk assessment is utmost encouraged in order to manage drought impacts. Generally, drought risk and vulnerability assessments go hand in hand. A drought risk assessment encompasses the vulnerability assessment by including information about the drought hazard independent of the sectors and communities potentially impacted by drought. Defining the conceptual framework for vulnerability assessment helps to ensure there is clarity of definitions and the assessed aspects of drought vulnerability. Such an approach helps to guide the selection of indicators and variables for assessment. The climate change adaptation and mitigation scientific literature has documented vulnerability framework of which could be adapted across board. Mathematically, drought risk can be calculated by the following relations (Adger, 2006):

Drought risk = Vulnerability (V) x Hazard (H)

Whereby vulnerability (V)= Exposure (E) + Sensitivity (S) – Adaptive Capacity (AC)



where:

- i) Exposure (E) is the degree to which communities and ecosystems experience stress from drought;
- ii) Sensitivity (S) is the degree to which communities and ecosystems are modified or affected by perturbations such as a change in climatic conditions brought about by the onset of drought; and
- iii) Adaptive Capacity (AC) is the ability of communities and ecosystems to evolve in order to accommodate environmental hazards or policy change and to expand the range of variability with which it can cope, including the ability to take advantage of opportunities, or to cope with the consequences.
- iv) Hazard (H) is the probability of drought occurrence which is calculated by the indicators and indices developed for the drought monitoring and early warning systems.

6.3 Framework for Drought Vulnerability Assessment

In order to perform risk assessment and estimation of impact of a drought disaster, three subsystems namely; hazard, vulnerability, and exposure have continued to be assessed using the climate change approach. In this regard, the climatic anomalies and indices related to droughts such as average temperature, average rainfall, and average evaporation can be used to represent the condition of the hazard of a particular area. Similarly, the vulnerability can be assessed by land-use change, while the exposure to drought can be assessed from socioeconomic, demographic and farming systems conditions (Chou et al., 2019). **Table 3** shows an example of a methodological framework for drought vulnerability assessment.

Table 3: Example of a methodological framework for drought vulnerability assessment

| | | | | |
|---|---|---|---|--|
| Definitions, components and conceptual framework of drought vulnerability |  | Variable selection and normalization |  | Model validation |
| Five capitals (natural, social, human, financial, manufactured); exposure, sensitivity; adaptive capacity | | Data describing aspects of the economy, society, climate, natural and modified ecosystems | | Variable weighting and aggregation; sensitivity analysis; comparison to other indicators |

(Modified from Naumann et al., 2014)

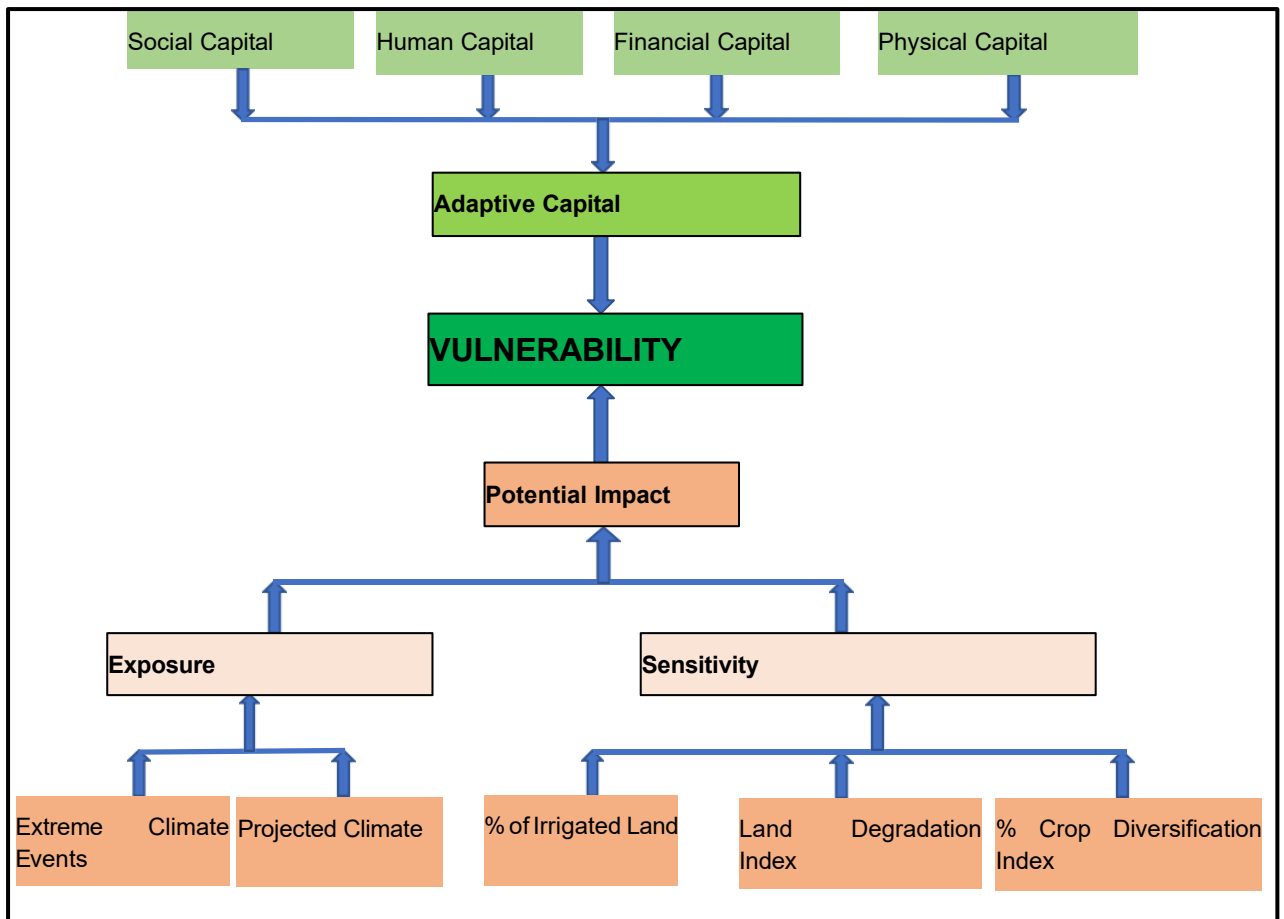


Figure 11: Conceptual framework indicating the contribution of different indicators to drought vulnerability assessment (Modified from Gbetibouo et al., 2010).

Generally, vulnerability assessments should be integrative and comprehensive and incorporate different dimensions of the society i.e. social, economic, physical, environmental, and institutional. Variables describing drought, such as spatial extent, probability of occurrence (from historic drought events), projected frequencies under climate change, and intensity are often used to estimate exposure. For estimating sensitivity, variables describing the system of interest (e.g. agriculture) are needed, such as dependency on water resources, extent of land degradation, population densities, and diversification of income sources. For estimating adaptive capacity, variables describing the five capitals (natural, social, human, financial, manufactured) are needed. The variables used to describe exposure, sensitivity and the adaptive capacity of Tanzania’s social, human, financial, manufactured and natural capital would ideally be spatially explicit and of high resolution.

According to FAO (2003) over the last 5 decades, East African countries have experienced at least one major drought per decade of which indicates an increase in frequency and intensity of droughts in the region. For example, the country experienced two major droughts in the last two decades (2008–2009 and 2010 – 2011). **Figure 12** shows drought risk areas.

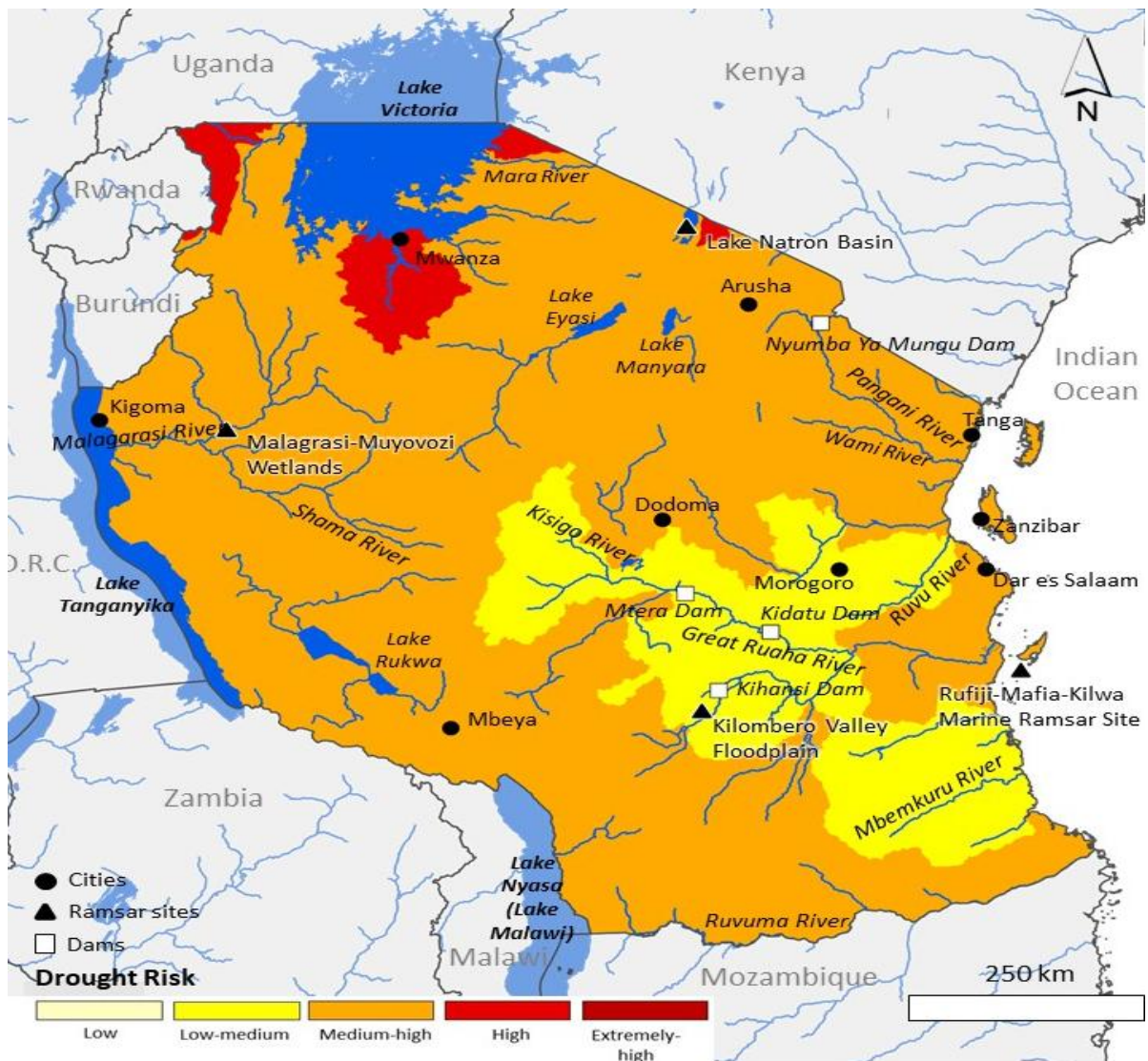


Figure 12: Drought risk areas in Tanzania (Source: WRI, 2019)

6.4 Factors Contributing to Drought Vulnerability in Tanzania

There are various factors that have continued to increase vulnerability of different sectors and communities to droughts. These are:

- i) *Poverty*: It is estimated that more than 34% of the population in Tanzania has an income that is below the basic needs' poverty line (MAFC, 2014). Poor households are more vulnerable to disasters than households with relatively high incomes. This is because poor households have insufficient financial resources for purchasing supplies in anticipation of a drought or disaster event or for buying services and materials during or even after a drought. As a result, the impact of droughts, like any other disaster, is likely to affect the poor disproportionately, including higher mortality rates.

- ii) *Gender*: Women headed households in Tanzania are more likely to have a difficult time during drought recovery than male-headed households, due to sector-specific employment, lower incomes, limited access to inputs, and family care responsibilities.
- iii) *Urban/Rural settings*: the lower income of people in rural areas influences their vulnerability to drought as they depend much on locally-based natural resource extraction economies such as fishing, livestock grazing, and rainfed agriculture.
- iv) *Education*: the education status of the people influences the resilience to drought risk effects. The higher the educational attainment, the more likelihood of greater lifetime earnings and ability to comprehend and respond to externalities. However, lower education attainment generally affects people's ability to understand risks, warning information, and access to recovery pathways.
- v) *Special needs groups*: special needs groups such as the elderly, children, and disabled in Tanzania are more vulnerable to drought due to their challenges in mobility.

6.5 Risks and Vulnerability to Women and Children

The risks and vulnerability to women from droughts are often similar to what children experience in the society during such events. Below are examples of how women are more vulnerable to droughts than men in the United Republic of Tanzania.

- i) Drought adaptation capacity varies between men and women, or between different ages. For example, children, elders and women are more vulnerable compared to men (youth). Normally, the adaptive capacity of women is low due to several factors such as low education levels, low economic status, lack of skills, and lack of access to assets. These factors have not been gender-neutral in the society.
- ii) The reduction in the availability of natural resources especially in rural areas has often been affected by drought in Tanzania as it reduces access to water, trees, timber, fuelwood, and medicine plants. The reduction in these resources affects mostly women in rural areas as they have to walk long distances to fetch valuable natural resources to support the family. As a result, it increases their work burden, limited time available for food production and preparation, and has also reduced their participation in income-generating activities as well as educational opportunities. In addition, children especially girls are more vulnerable as they are likely to be forced to miss classes in order to fetch water for the households.

iii) Drought Resilience and Adaptation in Tanzania

According to Drought Resilience, Adaptation and Management Policy (DRAMP) Framework (Crossman, 2018), there are three pillars of drought risk reduction i.e:

- (a) Instituting and implementing drought monitoring and early warning systems
- (b) Assessing drought risk and vulnerability
- (c) Implementing requisite measures to limit impacts of drought and better respond to drought

Tanzania has undertaken various initiatives in assessing adaptive measures against drought events. One of the measures taken was the preparation of Tanzania National Adaptation Programme of Action (NAPA) which was part of the overall integrated plans, policies, and programmes for sustainable development at the national level. Despite the fact that the NAPA was mainly driven by adaptation to climate change, it has the requisite attributes for addressing droughts. During the formulation of NAPA, vulnerability assessments were performed across key sectors *i.e. Agriculture, Energy, Forestry and Wetlands, Health, Human Settlements, Coastal, Marine, and Freshwater resources*. After identification of vulnerabilities in each sector, key adaptation options and strategies to best address those vulnerabilities were developed. The work was conducted through consultation from national, regional, and district levels and forms part of the existing frameworks for adaptation to droughts in Tanzania.

Nevertheless, any framework aimed at enhancing adaptation to drought e.g. DRAMP, is designed to fulfill the following goals:

- i) Reduce exposure to drought;
- ii) Reduce vulnerability to drought;
- iii) Increase resilience to drought risk;
- iv) Transformation - alter fundamental attributes of social, economic and ecological systems;
- v) Prepare, respond and recover from drought; and
- vi) Transfer and share drought risks - distribute risks among a wider section of society to include those who benefit directly and indirectly from robust drought risk management.

7.0 DROUGHT COMMUNICATION AND RESPONSE ACTIONS

7.1 Overview

Reducing the impact of drought on the community requires effective and timely communication from the onset of the drought to enable appropriate actions to be taken in a timely manner across all stakeholders. In Tanzania, all disaster management activities are managed under the Prime Minister's Office - Disaster Management Department (DMD). The DMD receives funds from national budget for relief response and recovery only after disasters occur. Cognisant is made to the fact that there have been various efforts by different stakeholders notably Development Partners in instituting drought mitigation and preparedness measures in Tanzania. In this regard, this Drought Management Plan is meant to add value to existing efforts by providing a platform for coherent and coordinated approach in addressing droughts in the country by elaborating potential management pathways on both preparedness and recovery segments of droughts.

In this drought plan, emphasis has been given to highlighting and defining protocols that describe from whom, where and when information on drought is availed to the public and how the response to drought event has to be coordinated. This includes coordination of all stakeholders, whether they are government agencies, the private sector or the general population in Tanzania. All have a responsibility to communicate and respond appropriately as a drought unfolds and conditions worsen or otherwise. Thus, the aim of this chapter is to analyse and present specific details and requisite actions for communicating and responding to drought as well as advancing and enhancing public understanding, awareness and preparation for drought.

As highlighted in previous chapters, and other citable literature, droughts have always manifested in form of scarcity of water resources, precipitation, temperature, stream flow, soil moisture, reservoir, ground water levels, lake levels, evapotranspiration rates, and melting of snow peaks e.g. Mount Kilimanjaro Snow leading to diverse rippling effects across sectors. In this regard, all response actions are geared towards addressing the impacts of water or moisture stress in the ecosystem. In this regard, the drought communication and response have been designed to begin with providing an awareness on level of scarcity of water resources and or soil moisture while maintaining a progressive curve on response actions across other sectors.

7.2 Communication Objectives

There are three main objectives for instituting effective communication before, during and after a drought event. These are:

- i) Maintain a level of drought awareness for all sectors with regards to scarcity of water resources and or soil moisture in a given jurisdiction area.*

This can be done by providing technical information regarding e.g. rainfall patterns, available water resources, low flow demands etc. The technical information is normally derived from risk ranking assessments by different sectors and actors e.g. Food Security Department in Ministry of Agriculture, Water Basin Boards on available water resources and competing demands, the Tanzania Meteorological Authority (TMA) on rainfall patterns etc. In this case, informed decisions by respective sectors e.g. by Water Basin Boards on revising water allocation protocols

- ii) Provide a conduit for national and local governments to provide technical information to communities regarding drought management protocols as well as enable gathering and channelling of information from communities back to mandated agencies e.g. the Disaster Management Department.*

Progress in making and implementing wise decisions on drought is made when well-articulated information is shared across sector e.g. ministries, agencies, and other user groups that are at the forefront of managing drought. The approach encourages and enables the continued participation of Drought Response Working Groups to network and develop decision-making strategies with other local interest groups and stakeholders.

- iii) Define and communicate effectively measurable targets in response to each drought severity level.*

These targets indicate both adaptation and mitigation measures that need to be put in place in order to achieve the targets for each drought severity level for different sectors and communities. For example, in extreme situations of drought, water use may severely be restricted to human needs only. The government may also order the culling of livestock in order to reduce overgrazing as well as minimize losses. In such cases, it is important to communicate to all stakeholders what the public may experience if such adaptation or mitigation measures are not taken. It is also acknowledged that, during droughts, this objective is time-sensitive, especially if the drought is prolonged. For example, if livestock keepers know in advance the potential impacts of drought on their livestock, they will heed the advice to cull their livestock on time in order to avoid selling emaciated stocks at a later stage of which the latter attracts low prices.

7.3 Drought Response Levels

Drought, unlike other hazards or disasters, develops slowly and progresses over a span of time from months to years. The severity of any drought event is more pronounced towards the tail end where scarcity of water resources and or soil moisture is at the peak. However, severity of any drought at any time is tagged to the existing resource-base at its onset e.g. amount and quality of pastures at the onset of drought, amount of water resources, conditions of crops or livestock etc. In this regard, the response to drought, at any given time, is informed and guided by amount and quality of available resources and forecasted lead-time to its cessation. This calls for a differential stepwise approach in managing the levels of drought severity that inherently develop from onset to cessation. In analysing and establishing drought severity levels, different scientific indicators are used. Among these indicators includes indices described in **Chapter 5** which are based on precipitation, seasonal runoff for river basins and stream flow. Knowledge on drought severity levels is essential in streamlining requisite communication on prevailing conditions as well as risk assessment and response across the country.

Four drought response levels, discussed herein, forms a pragmatic approach that provides targeted interventions based on drought severity; with Level 4 response being interventions for a worst-case scenario. It is interesting to note that, the cessation of a drought can be experienced at any response level – when water resources are replenished and or soil moisture stress is eliminated. Drought response, of which is guided and informed by level of severity, can be implemented through the following four levels and as summarized in **Table 4**.

Level 1: Normal (Green): Conditions are normal and there is sufficient water or moisture to support ecosystem and socio-economic needs. Emphasis is focused on preparedness and taking action in advance of droughts in order to increase the readiness of all sectors and communities when it inevitably occurs.

Level 2: Dry (Yellow): Conditions are dry and the first indications of potential water scarcity (i.e. low water levels in dams, rivers and wells) and withering of vegetation as a result of soil moisture stress are recognized. Emphasis is on stewardship of available resources and voluntary conservation of the same (i.e. water resources, pastures and forests) through education, communication and planning.

Level 3: Very Dry (Orange): Conditions are becoming very dry. Potentially serious ecosystem or socio-economic impacts are possible and minor impacts may already be occurring. Emphasis continues to be on voluntary conservation but increasing use of restrictions to access resources e.g. water and pastures may be imposed by relevant agencies.

Level 4: Extremely Dry (Red): Conditions are extremely dry and there is insufficient supply of relevant resources e.g. water resources, food supplies, pastures, etc. to meet

community or ecosystem needs. There are progressively more severe and widespread socioeconomic impacts and more are expected. Voluntary measures and increasing use of restrictions continue but may be augmented by regulatory responses by the national as well as local government including the use of authorities provided under the various Acts of parliament and other supporting legislation.

Table 4: Summary of a general framework for drought response levels

| Level | Conditions | Significance | Objective | Target |
|------------------|------------------------|--|--|---|
| 1. Green | Normal conditions | There are enough water resources and moisture to meet human and ecosystems needs | Preparedness | The ongoing management or conservation of community resources including water and pastures. |
| 2. Yellow | Dry conditions | First indicators include reduced resources (water, pastures, withering of crops, onset of emaciation of livestock especially cattle) with a potential supply problem | Voluntary conservation | Minimum 10% reduction on use of resources. |
| 3. Orange | Very dry conditions | Potentially serious socioeconomic or ecosystem impacts are possible | Voluntary conservation and restrictions | Minimum additional 20% reduction of use of available resources to a minimum total of 30% |
| 4. Red | Extreme dry conditions | Available resources (water, soil moisture and pastures) insufficient to meet ecosystem requirements and socioeconomic development | Voluntary conservation with restrictions and regulatory response | Maximum reduction and control on use of resources and enforced by regulations |

7.4 Drought Communication Protocol

The National Disaster Preparedness and Response Plan (2022) has highlighted a wide range of hazards and disasters, including fire outbreaks, landslides, droughts and plagues but also the Tanzania National Disaster Management Strategy (2022-2027) and National Disaster Communication Strategy (2022) provide detailed insights on how to address each disaster. In this section, a detailed communication approach on dissemination of relevant information in pursuit of managing droughts in Tanzania is expounded.

The successful implementation of the national drought plan depends largely on the timely dissemination of clear and precise information from relevant agencies to the public for the period preceding, during, and following the drought event. Official procedures of drought communication between stakeholders in various sectors such as the national and local government, monitoring agencies as well as the general population in the community are highly required. Timely and effective information and communication enable people to access services or make the best guided decisions for themselves and their communities. When people are given an opportunity to voice their opinion and provide feedback, it enhances their sense of well-being, helps them adapt to the challenges they face, and better enables them to take an active role in their recovery. The effective and timely communication that involve users are essential for reducing the severity of drought impacts and thus protecting the environment. **Table 5** shows a communication matrix for managing droughts in Tanzania. This matrix has been adapted and modified from the existing Tanzania Emergency Preparedness and Response Plan where the draught component has been expounded to cover requisite aspects of communication thereof.

Table 5: Stakeholder and drought communication protocol (modified from TEPRP, 2012)

| STAKEHOLDERS | COMMUNICATION ACTION |
|---|--|
| Tanzania Disaster Relief Committee (TANDREC), Vice President's Office (VPO), Food Security Information Team (FSIT), Disaster Management Authority (DMA) | <ul style="list-style-type: none"> • Continuously monitor to establish intra-seasonal droughts, early warning • Drought monitoring and advising the government on the country's drought status |
| Farmers, Herders | <ul style="list-style-type: none"> • Report on drought status to local authorities • Crop, livestock and natural environment status and condition |
| District Officers, Red Cross, Local authority, DMA, Tanzania Meteorological Authority (TMA) | <ul style="list-style-type: none"> • Organize and communicate weather and environmental data from stakeholders • Advise relevant authorities |
| Ministry of Agriculture, PMO, DMA | <ul style="list-style-type: none"> • Recommends drought declaration • Mitigation and Preparedness actions |

| | |
|--|---|
| President of United Republic of Tanzania | <ul style="list-style-type: none"> • Declares State of Disaster (Drought) |
| Tanzania Meteorological Authority (TMA) | <ul style="list-style-type: none"> • Provides drought early warnings • Inform stakeholders on drought severity and progress |
| UN-FAO, MoW, NGO's | <ul style="list-style-type: none"> • Drought mitigation measures and practices • Preparedness strategies |
| Media | <ul style="list-style-type: none"> • Provides drought early warnings • Informs stakeholders on drought progress |
| Local Authorities, Education institutions, social groups | <ul style="list-style-type: none"> • Resource conservation and preservation measures • Sustainable livelihood strategies |

7.5 Communication Channels and Tools

During drought onset, various communication channels and tools are employed. These are used to disseminate information about drought management in the country. Among these channels and tools are:

- i) Print media: newspapers, magazines, newsletters, leaflets, brochures, pamphlets, road banners, roll-up banners, posters, billboards
- ii) Electronic media: documentary, interactive website, text messages, social media. The latter (social media) has a wide range of options in the market today e.g. WhatsApp and Facebook which are very effective in reaching the masses at the same time in both rural and urban areas.
- iii) Direct stakeholder engagement: meetings, workshops, symposia, drama, dances, songs, storytelling, poetry, exhibits/displays, roadshows and school clubs
- iv) Social marketing, advertising and broadcasting: newspapers, radio, TVs and phone calls.
- v) Video clips or sign language.

Thus, it essential to ensure that the mechanisms for disseminating relevant drought information through radio, TVs, cell phones and other forms of communication should be established to ensure communities receive and understand requisite information and take necessary precautionary measures in managing droughts. **Table 6** highlights some of the communication channels and potential target audience.

Table 6: Communication channels approach matrix (Adopted and modified from TEPRP, 2012)

| Target Audience | Communication channels | Other approaches | Advantages | Disadvantages |
|--------------------------|--|-------------------------|--|--|
| Rural communities | Social media, Radios, phone calls, posters, TV, leaflets, brochures, meetings, dances and drama, Storytelling, school clubs, helpline, community radio stations, music, and comedies | Megaphones (mobile van) | <ul style="list-style-type: none"> • Radio: reaches large number of people at the same time. Fast and immediate reach • Phone calls: fast, direct however, sometimes have limited reach. • Social media: an effective way of reaching the masses at the same time | <ul style="list-style-type: none"> • Radio: seasonality usage -not everyone has access to radios at all times • Radio owners/editors sometimes limit/control content, thus limiting access to the channels. Also, it requires finances. • Phone calls -not all can be able to read and operate phones (depending on where the phone analogue or smart phone), it could be expensive to many in rural areas and lack of electricity in some rural areas could be a challenge in charging their phones. Sometimes network failure due to bad weather condition, far to reach areas. • Social media – requires one to have a smart phone and access to internet of which could be a challenge in many rural areas. Poor network availability, high internet cost. |

| Target Audience | Communication channels | Other approaches | Advantages | Disadvantages |
|--|---|----------------------|---|---|
| | | | <ul style="list-style-type: none"> • Posters- easy to distribute messages, can be edited with pictures for those who cannot read. | <ul style="list-style-type: none"> • Posters- prone to vandalism and defacing. Require high production and distribution cost. |
| Urban communities | Socio media, Radios, phone calls, posters, television, leaflets, brochures, meetings, dances and drama, Storytelling, school clubs, helpline, social marketing, and advertising: newspapers, radio, TVs | Public announcement. | <ul style="list-style-type: none"> • Phones, Radio/TVs- has a wide coverage • media is a well-established conduit for reaching the masses at the same time in urban areas | <ul style="list-style-type: none"> • Radio & TVs-electricity (there are frequent blackouts during droughts) • High cost to air advertisement. • Not many watch televisions on a frequent basis |
| Policy makers, development partners and international community | Social media, Newspapers, television, radios, websites, workshops/meetings, leaflets, brochures, policy briefs, reports | Lobbying, meetings | <ul style="list-style-type: none"> • Social media is a well-established conduit for reaching the masses at the same time in urban areas • Newspapers: Easily accessed by many • Collaboration: Strengthened partnership between Government and International community | <ul style="list-style-type: none"> • Negative attitude on content of some newspapers as perceived by some politicians • Political influence (radios and TVs) • Procedural requirement in policy makers that require official communication and response to be in signed hard copies (documents) e.g. letters and memos |

| Target Audience | Communication channels | Other approaches | Advantages | Disadvantages |
|--------------------------|--|------------------------------|-----------------------------------|---|
| The media | Press conferences, workshops, interactive website, social media, breakfast debates and media dialogue. | Meetings and press briefings | Effective informed reporting | <ul style="list-style-type: none"> • Requires adequate financial resources, preparations and time management |
| Drivers of agenda | Newspapers, television, radios, workshops/meetings, leaflets, brochures, trainings. breakfast debates and media dialogue | Meetings | Proper coordination of capacities | <ul style="list-style-type: none"> • Financial resources |

7.6 Declaration of Drought Conditions in Tanzania

Tanzania Meteorological Authority is the primary national organ responsible for collecting, analysing and validating weather data before disseminating to respective stakeholders as well as using the same to make forecasts and generate early warning information. It is recognized that integration of data analysis and decision making is essential in the process of identifying and pronouncing the onset of a drought.

In this case, where an emergency situation e.g. drought aggregates or escalates to a disaster that requires extraordinary measures, the Tanzania Disaster Relief Committee shall recommend to the Prime Minister that a state of emergency be declared for an area or the whole of Tanzania mainland. The Tanzania Disaster Relief Committee will be updated regularly on the status of drought in the country. In case of a severe drought in the country, and after having satisfactory data about the drought onset in the country, the Committee will advise the President who will then declare the drought as a disaster and mandate the national Disaster Management Agency and its organs to respond to the drought condition. At this point, the Prime Minister's Office will be responsible for the overall supervision of the drought response strategies and relevant task forces (**Annex 1**).

CHAPTER EIGHT

8.0 DROUGHT PREPAREDNESS AND MITIGATION STRATEGIES

8.1 National Action Plan

As part of the efforts to address and combat the negative effects of drought in the country, different interventions, strategies and activities are designed. The plan highlights different issues including challenges, proposed actions, actors including ministries, departments, agencies and individuals among relevant sectors. A detailed action plan is as indicated in *Annex 1*. Much as gender mainstreaming is part of the drought preparedness and mitigation strategies, this plan describes how gender mainstreaming will take place in section 8.2. In addition, a financing mechanism is described under section 8.3 of this chapter.

8.2 Gender Mainstreaming

Drought and disaster pose a threat to many communities especially women, youth, elders, vulnerable communities, marginalized and people with special needs. Being cognizant of the vulnerability of these groups, Tanzania has integrated gender issues into policies, plans, strategies, programs and projects. Moreover, the country has developed a Gender Mainstreaming action plan to emphasize the importance of social inclusion and gender mainstreaming and provide strategic direction on how gender issues should be integrated. **Table 7** highlights examples of actions towards social inclusion and gender mainstreaming in different sectors in the country.

Drought and related disasters pose significant risks to many communities, particularly women, youth, older persons, marginalized groups, vulnerable populations, and people with special needs. Recognizing the heightened vulnerability of these groups, Tanzania has integrated gender and social inclusion considerations into national policies, plans, strategies, programmes, and projects. To strengthen this commitment, the country has developed a Gender Mainstreaming Action Plan, which underscores the importance of social inclusion and provides strategic direction on how gender issues should be systematically integrated across sectors. The Action Plan serves as a guiding framework to ensure that drought mitigation and preparedness efforts are responsive, equitable, and inclusive. Table 7 provides examples of actions undertaken across various sectors to advance social inclusion and gender mainstreaming in the country.

Table 7: Examples of Gender mainstreaming and Actions across sectors

| Priority Area | Action involving women |
|--------------------|--|
| Agriculture | Community-based adaptation initiatives that enhance women's access to reliable water resources, thereby supporting sustainable food production, household well-being, and daily livelihood activities. |

| | |
|--------------------------------------|---|
| Water | Empower women in urban and rural areas to harvest rainwater for domestic use where wells are contaminated, expensive, or not accessible |
| Health | Establish and strengthen/maintain links between women groups, most vulnerable and local authority health officers to share information on the development of diseases and curative measures |
| Energy | Investment in research into new gender-sensitive energy technologies including clean cooking energy sources |
| Forests/REDD+ | Identify existing benefit-sharing schemes such as carbon credit mechanisms in and outside Tanzania to establish best practices for women |
| Integrated Coastal Management | Prioritization of coastal women's groups in the provision of loans and credits for accessing appropriate technologies, with emphasis on seaweed farming, fish farming, and aquaculture |

8.2.1 Climate Change and Gender

Climate change affects men and women differently due to the existing gender roles as shaped by norms, cultures and traditions. Given the predominance of women engagement in climate sensitive sectors including water, agriculture and energy, the gender impacts of climate change are already apparent and reported in many different parts of the country. The most reported incidences include increased women burden on household chores such as walking longer distances to fetch water due to drying of shallow wells and seasonal rivers/springs, increased farming tasks due to frequent droughts, and family health care due to increased diseases from climate related extreme weather events. It has also been reported that there is an increased duties for family care owing to men's migration to urban areas in search of new jobs and income-generating opportunities after abandoning traditional activities such as farming, fishing and livestock keeping. It is therefore important that gender mainstreaming and social inclusion be given an upper hand of consideration in addressing drought and disasters in the country.

Climate change affects men and women differently due to existing gender roles shaped by social norms, cultural practices, and traditions. In Tanzania, women are predominantly engaged in climate-sensitive sectors such as water, agriculture and energy, making them disproportionately affected by the impacts of climate variability and drought. Evidence from various parts of the country indicates that climate change has already intensified gender-specific vulnerabilities.

Commonly reported impacts include: -

- i) Increased workload for women, particularly in household responsibilities such as walking longer distances to fetch water as shallow wells, springs and seasonal rivers dry up.
- ii) Greater labour burden in agriculture, as frequent droughts reduce productivity and require more time and effort for farm management.
- iii) Heightened responsibilities for family health care, as climate-related extreme weather events contribute to a rise in climate-sensitive diseases.
- iv) Increased caregiving duties, as men migrate to urban areas in search of alternative income after abandoning traditional livelihoods such as farming, fishing and livestock keeping.

These realities highlight the need for strong gender mainstreaming and social inclusion in drought preparedness, mitigation and disaster response efforts. Ensuring that gender considerations are integrated into policies and interventions is essential for building equitable resilience across communities.

8.2.2 Priority Actions for Gender Mainstreaming

One of the key functions of this National Drought Plan (NDP) is to mainstream gender and social inclusion in all facets of drought management processes including decision making, formulation of policy and regulations, capacity building, awareness creation as well as service delivery. Given the differentiated impacts of drought on women, men, youth, people living with disabilities, and other vulnerable groups, it is essential that gender-responsive approaches are systematically integrated throughout the NDP cycle. Amongst the strategic actions (recommendations) that need to be in place to address the gender gap in the NDP are:

- i) Involving women in local Drought risk management committees and in related training to increase their access to early warning information.
- ii) Identifying stakeholders that represent the views of rural women, vulnerable and marginalized groups in institutional mechanisms for Drought risk reduction planning and implementation.
- iii) Developing new agricultural practices in close consultation with target communities to integrate local knowledge and address the specific needs (both practical and strategic needs) of women and men to access resources, assets, and knowledge to be able to successfully take on new approaches.
- iv) Considering the time use and existing workloads of men and women to avoid creating additional work burden, particularly for women, elderly and people with special needs.
- v) Designing gender-responsive measures to ensure that hard-to-reach groups, such as women and youth heads of households, will have access to drought preparedness initiatives.

In order to institutionalize the above-mentioned measures, the following gender-focused activities form part of the Drought Risk Reduction (DRR) implementation plan:

- i) Defining who will be responsible in ensuring that gender issues are integrated into DRR activities, for example, including gender specialists in relevant teams or committees responsible for engaging communities in developing the Drought Risk Reduction plans.
- ii) Monitoring the implementation plan by including gender-sensitive indicators so as to track how different interventions impact the lives of different socio-economic groups over given time frames. Such an approach is meant to assess whether progress is made towards gender parity and if corrective measures are needed (i.e. enhancing gender representation and formation of participation e.g. whether there is gender consideration in decision-making positions, who takes up or implements resilience-enhancing practice and their perceptions of the success of the practice).
- iii) Including separate budget lines for social inclusion and gender-related actions e.g. to conduct awareness-raising on the importance of including both women and men as part of drought risk reduction decision-making bodies.
- iv) Identifying effective gender responsive communication methods for reaching out to both men and women (e.g. training women extension officers, collaboration with local women's organizations, incorporating targeted messages on gender equality in awareness-raising campaigns on drought risk reduction in desired sectors such as agriculture).

8.3 Financing National Drought Plan

The National Drought Plan needs to have defined financing mechanisms to ensure its sustainable implementation. Financing climate and disaster management involves domestic public finance, international public finance, private finance and carbon markets sources. Finance is critical to addressing hazards, including droughts, because large-scale investments are required to significantly reduce impacts, notably in the key sectors such as Water Resources, Agriculture, Parks and Wildlife, Fisheries, and Forestry. According to the principle of Multilateral Agreements such as UNCCD and UNFCCC, developed countries are to provide financial resources to assist developing countries in implementing the objectives of the Agreements. It is important for all governments and stakeholders to understand and assess the financial needs developing countries have so that such countries can undertake activities to address climate change hazards including droughts.

The Government recognises the needs for financial resources to respond on disaster risks such as drought by developing The National Disaster Risk Financing Framework (DRFF) 2025/26–2030/31 which aims to enhance response capacity, ensure fiscal stability, and protect citizens. The DRFF follows its core principles such as timely funding, risk layering, efficient disbursement, adaptive capacity building, and multi stakeholder engagement. It also aligns with national priorities like Tanzania Development Vision 2050 and international commitments, including the SDGs, Sendai Framework and The Paris Agreement.

Tanzania has employed a variety of ex-ante and ex-post mechanisms to mobilize financing for the disaster response and early recovery. Ex-ante financing instruments include risk retention instruments like the National Disaster Management Fund (NDMF), Contingency Fund, Road Fund, Railway Infrastructure Fund, and National Food Reserve under the National Food Reserve Agency (NFRA); while risk transfer instruments include catastrophic bonds, insurance and social protections schemes like Productive Social Safety Net (PSSN). Ex-post financing instruments include budget re-allocations, external assistance, and post disaster support programs.

For the purpose of ensuring sustainable environmental management, the government of Tanzania has created sustainable mechanisms that will enable the country to access the international public climate funds as well as to use its own public resources expeditiously.

Furthermore , at the international level, it is envisaged that one way of funding the National Drought Plan is through Global Mechanism under the UNCCD, the multilateral funds under the UNFCCC (e.g., GCF, LDCF, SCF) and Bilateral cooperation funds (e.g. DANIDA,, German International Climate Initiative, Global Facility for Disaster Reduction and Recovery, Nordic Climate Facility, World Bank Climate Investment Funds and World Bank Pilot Program for Climate Resilience).

The Global Mechanism (GM) under the UNCCD supports Parties in translating the Convention into action and achieving Land Degradation Neutrality at the national level. GM provides advisory services, promotes partnerships, demonstrates innovations, increases the effectiveness and efficiency of existing financial mechanisms, seeks to attract and channel investments from innovative financial sources such as climate change funds, private sector operations, and micro-finance, and translates cutting-edge knowledge into tailored, country-level action. The GM works with country Parties to the UNCCD and a broad variety of international and regional partner institutions to enhance their understanding of new financing modalities and make sustainable land management (SLM) a priority in the country's domestic budget allocations.

9.0 RECOMMENDATIONS AND IMPLEMENTATION ACTIONS

9.1 Priority Implementation Actions

This plan recommends an array of actions that are required to effectively anticipate, and address drought risks and impacts at multiple scales in Tanzania. This includes all the major pillars of drought actions and principally the change in a paradigm shift from the traditional approach of responding to drought as a crisis to managing it as a risk. The following are among the recommendations that form part of the planning process:

- i) Formulate and implement the National Drought Management Policy.
- ii) Constitute the Drought Clusters at Central and Local government levels.
- iii) Undertake a baseline study to quantify the extent and severity of land degradation and desertification in all regions and mitigate the effects of drought in Tanzania.
- iv) Integrate and enhance scientific and indigenous drought monitoring and early warning systems.
- v) Strengthen the capacity of disaster management units in all institutions so as to sensitize the public and policymakers on the socio-economic impacts of desertification and drought.
- vi) Review the National Land-use and planning Acts to ensure that it contributes to the goals of the National Drought Plan.
- vii) Strengthen the capacity of the Department of Environment (Drought and Desertification) at Vice President's Office to effectively co-ordinate activities for combating drought and desertification.
- viii) Promote gender-differentiated sustainable land management best practices.
- ix) Strengthen the synergy between the Department of Environment (Drought and Desertification), Department of Forestry, and other relevant agencies.
- x) Enhance environmental sustainability and promote Land Degradation Neutrality (LDN).
- xi) Translate the National Drought Plan into Kiswahili language to enable more people to comprehend and understand it.

9.2 Future Update and Revisions of the Plan

The impact of a drought is influenced by the state of livelihood and socioeconomic vulnerability of a particular community. Livelihoods and economic activities are subject to changes depending on prevailing circumstances within a locality. In this case, it is important that national, regional, and local government authorities, ministries, and its relevant agencies revise and update their drought management strategies so as to ensure resiliency and adaptability to prevailing conditions.

10.0 MONITORING, EVALUATION, AND REPORTING

Monitoring, evaluation and reporting (MER) are essential tool to ensure the National Drought Plan is effectively implemented to delivers timely and evidence-based actions. MER strengthens the integration of drought preparedness and response into national development frameworks and ensures that interventions meaningfully contribute to sectoral, national and regional development objectives. This is guided by the National Monitoring and Evaluation Guidelines (2024) and the National Evaluation Manual (2024).

10.1 Monitoring

The monitoring process will adopt a comprehensive mechanisms/system to tracks early warning indicators includes rainfall patterns, water availability, crop conditions and socio-economic trends by integrating data from multiple sectors and utilizing digital platforms to enhance earlier country's ability to detect drought risks and guide/provide preparedness measures, as outlined in **Annex 2**.

10.2 Evaluation

Evaluation provides a structured approach to determine the drought interventions effectiveness as planned in achieving the intended outcomes and its contribution to long-term resilience. Mid-term and end-term evaluations will assess efficiency, sustainability and impacts using tools such as baseline assessments, reviews, outcome analysis, remote sensing, household surveys and cost-benefit assessments. the integrated MER framework will support learning, enhance accountability and guide necessary adjustments to advance the country toward a climate-resilient and low-carbon economy. Further, assessing the effectiveness of the proposed interventions across the entire drought management cycle, includes the use of financial and technological support, will provide credible evidence on the impact of invested resources and secure additional financial support through the established MER system, as outlined in **Annex 3** and **Annex 4**.

10.3 Reporting

Reporting ensures that monitoring and evaluation of findings are communicated clearly and consistently to decision makers, stakeholders and communities. Reporting of drought status either monthly, quarterly or annually will promote transparency and strengthen coordination. A structured reporting flow from community and district levels to regional and national level with accessible communication channels such as digital dashboards and community engagements, enables timely dissemination of drought information and support rapid action. The reporting requirements include submissions to relevant ministries and the UNCCD, to ensure the country meets both national and international obligations while enhancing the country's overall drought risk management system, as outlined in **Annex 5**.

ANNEXES

ANNEX 1: DROUGHT MITIGATION AND PREPAREDNESS ACTION PLAN

| Sector | Challenges | Proposed Actions | Primary Responsible Organisations | Other contributor Organisations |
|-----------------|---|--|--|---|
| 1. Water | Uncoordinated planning, exploitation and development of water resources. | 1.1 Institutionalize multi-sectoral and integrated water resource management approaches that promote rational utilization and conservation based on community needs and priorities and the protection of the ecosystems. | MoW, Ministry of Env; TMA; TANDREC; water users; Regional, districts, and Municipal water management authorities, Basin Water Boards; ZAWA, MoWEMZ | MoEM; NGOs/Community Based Organizations (CBOs); Research and academic institutions/centres; EWURA; NEMC; TANESCO; Donor Partners Group; MNRT, UNCCD, WMO; UNEP; UNFCCC; WWF; IUCN; Media outlets |
| | Ineffective implementation and enforcement of water laws and policies and strategies. | 1.2 Capacity building and strengthening national and local awareness and implementation mechanism. | | |
| | Conflicts among water users especially farmers and pastoralists | 1.3 IWRM approaches be encouraged through awareness and campaigns | | |
| | | 1.4 Controlling surface and groundwater abstraction from upper and lower aquifers to be within the sustainable yield limits. | | |
| | Pollution of surface and groundwater leading to poor water quality | 1.5 Awareness creation and law enforcement on proper water use | | |
| | Insufficient water storage infrastructures. | 1.6 Construction of water storage infrastructures | | |
| | | 1.7 Promotion of water transfers from low-value agricultural uses to higher-value urban uses during drought periods. | | |

| Sector | Challenges | Proposed Actions | Primary Responsible Organisations | Other contributor Organisations |
|---|--|--|---|--|
| | Insufficient hydro-meteorological data | 1.8 Capacity building and advancement of technology | | |
| | Insufficient water harvesting technology. | 1.9 Promotion of rainwater harvesting technologies including building micro- and macro-dams for storing water. | | |
| | Decline of water levels in lakes, rivers and underground water sources | 1.10 Development of artificial recharge system and promotion of rain water harvesting technology | | |
| 2. Agriculture (Crops, Livestock, Fisheries) | Skewed production systems against women due to lack of capital | 2.1 Eliminate gender- based barriers and hardships that limit access to production capital to women | Ministry of Agriculture, Ministry of Water, Ministry of Livestock & Fisheries; Ministry of Finance and Planning, Ministry of Lands, PO-RALG, TMA, MBEFZ | NGOs/CBOs; TMA, Research Institutes/Centres; Local Banks, Insurance Firms, FAO; UNCCD; Donor Partner Group; FEWS-Net, National Bureau of Statistics (NBS), Media outlets |
| | Inherent low soil fertility. | 2.2 Adopt improved agricultural systems: - Increase access to drought resistant crops and varieties | | |
| | Insufficient soil moisture for crop production | 2.3 Adopt better soil management practices including Climate Smart technologies | | |
| | Low soil moisture holding capacity of the soil. | 2.4 Raising farmer awareness to implement soil moisture conservation measures. | | |
| | | 2.5 Encouraging communities to use organic manure to improve soil structure. | | |

| Sector | Challenges | Proposed Actions | Primary Responsible Organisations | Other contributor Organisations |
|--------|---|---|-----------------------------------|---------------------------------|
| | Withering of crops leading to poor crops yields | 2.6 Encourage farmers to use water saving technologies e.g. drip irrigation in their production systems in order to reduce pressure on surface & groundwater. | | |
| | Poor crop production techniques | 2.7 Provision of credit facilities and inputs to farmers at a reasonable cost to increase their production capacity as well as adopt water saving and efficient technologies in order to minimize losses. | | |
| | Overstocking/overgrazing leading to land degradation. | 2.8 Improvement of agricultural extension services and Promote access to credit facilities for establishment of pasture farms and improvement of rangelands | | |
| | Declining/ shortage of fodder yield leading to a shortage of feed and inappropriate grazing approaches. | | | |
| | Rangeland conflicts from shifting pastoralists seeking for pastures and water | 2.9 Development and implementation of Land use plans | | |
| | Encroachment of wetlands by farmers and pastoralist | 2.10 Provision of alternative sources of water and pastures while enforcing the laws protecting the wetlands | | |
| | Insufficient suitable grazing area. | 2.11 Promoting the establishment of fodder banks for pastoralists. | | |

| Sector | Challenges | Proposed Actions | Primary Responsible Organisations | Other contributor Organisations |
|---------------------------------|---|---|--|--|
| | Lack of qualitative pasture and dwindling drinking water for livestock. | 2.12 Diversifying livelihoods while considering gender to adopt off-farm activities which can cushion the communities or families against impacts of droughts | | |
| | Increased pest and diseases including cases of zoonosis | 2.13 Improvement of agricultural extension services | | |
| | Dwindling Fish farming production significantly affected as a result of declining water resources | 2.14 Encourage climate smart fish farming practices and protection of water sources | | |
| | Incapacitated extension services. | 2.15 Allocation of funds for extension services and promotion of intersectoral capacity building and knowledge exchange/transfer. | | |
| 3. Forestry and Wildlife | Insufficient water points and grazing land that affect wild animals | 3.1 Provision of water storage structures e.g. check-dams, ponds for the wild animals in protected areas and improvement of wildlife rangelands. | Wildlife Management Authority (TAWA); Tanzania National Parks Authority (TANAPA); Tanzania Forest Services Agency (TFS); Tanzania Wildlife Research Institute (TAWIRI); Ministry of Water; Ministry of | Academic/Research Institutes and Centres; NGOs and CBOs, Media outlets |
| | Increased cases of Human - wildlife conflicts. | 3.2 Promote protection of wildlife corridors through awareness raising, law enforcement and establishment of wild animals' deterrent crops (e.g. Chilli) and insects (bees) in farmlands. | | |

| Sector | Challenges | Proposed Actions | Primary Responsible Organisations | Other contributor Organisations |
|------------------|---|--|---|---|
| | Poaching is common during droughts as the big games often roam beyond their normal habitat in search of pasture and water points. | 3.3 Enforce laws to prevent poaching activities. | Land Housing and Human Settlement (MoLHHS); Ministry of Natural Resources and Tourism (MNRT), MoAINLZ | |
| | Increase in frequency and intensity of wild fires in forests | 3.4 Development and implementation of integrated fire management plan. | | |
| | Increase in uncontrolled exploitation of forest resources | 3.5 Enforcement of laws, preparation and implementation of Land use plans and forest management plans. | | |
| | Extinction of rare tree species | 3.6 Establishment of in situ and ex-situ conservation areas for rare tree species, awareness creation and law enforcement. | | |
| | Increase in forest and land degradation and deforestation | 3.7 Use of landscape restoration techniques such as Sustainable Forest Management (SFM) techniques, such as agroforestry assisted natural regeneration and afforestation | | |
| 4. Health | Malnutrition due to shortage of food and poor diets | 4.1 Instituting public awareness programs about importance of proper diet and diversification of food crops | MoHCDGEC; Gender Experts; Women Groups; Ministry of Finance and Planning (MoFP); Ministry of | NGOs/CBOs; Academic and Research institutes or Centres; Tanzania Legal Human Rights |

| Sector | Challenges | Proposed Actions | Primary Responsible Organisations | Other contributor Organisations |
|------------------|---|--|-----------------------------------|---|
| | | 4.2 Institute feeding programmes for ongoing school children to maintain a balanced diet. | | |
| | Dehydration of the body associated with drought conditions resulting in health hazards like thirst, dizziness, kidney and liver problems. | 4.3 Develop health education programs to the communities | | |
| | Poor hygiene and sanitation leading to outbreak of water-borne diseases | 4.4 Establish a feeding and hygiene programme for vulnerable groups in affected communities | | |
| | Compromised water security associated with pollution and contamination of water resources | 4.5 Improving public health sector communication systems to reach mass | | |
| | | 4.6 Reinforce programmes to build and maintain wastewater and solid waste management facilities and enforce relevant laws. | | |
| 5. Land | Less than 50% of the land in Tanzania is planned | 5.1 Develop the Land use plans and enforce them | MoL, NLUPC, PO-RALG, VPO, MoLSZ | NGOs, CBOs, MNRT, Development Partners, Media outlets |
| | Ineffective enforcement of land use plan | | | |
| | Land degradation | 5.2 Conduct restoration activities on the degraded land | | |
| 6. Energy | Low production of HEP due to declined water level | 6.1 Construction of dams (upper, middle and lower stream) to facilitate the storage of water for HEP | MoE, MNRT, VPO-DoE, MoWEMZ | Development Partners, NGOs, CBOs, Media outlets |

| Sector | Challenges | Proposed Actions | Primary Responsible Organisations | Other contributor Organisations |
|---------------------------------------|--|--|---|--|
| | | 6.2 Promotion of alternative sources of Power (e.g. Solar, geothermal, Wind) | | |
| 7. Transport and Communication | Low water level restricts inland waterways navigation. | 7.1 Restoration of riparian areas and dredging of sediments from the riverbeds | MoW, MNRT, MoWTI, MoLHSD, MoCTZ | Development Partners, NGOs, CBOs, Media outlets |
| | Insufficient and limited coverage of near real time weather forecast information to different stakeholders | 7.2 Dissemination of early warning information employing tools and modalities applicable and suitable to stakeholder at all levels | | |
| | High emission of GHGs from vehicles | 7.3 Promotion of low carbon transport e.g. Railways, electricity mobility. | | |
| 8. Tourism | Loss of wild animals due to drought and shortage of pastures | 8.1 Dredging of sediments in dams and ponds within the parks. | TAWA, TANAPA, TFS, TAWIRI, Ministry of Water, MNRT, MoAINLZ | Academic/Research Institutes and Centres; NGOs and CBOs, Media outlets |
| | | 8.2 Promotion of catchment conservation activities on the upstream communities | | |
| | Decline of revenue from tourism resulting from migration of wild animals in search for pasture and water | 8.3 Diversification of tourism packages including eco-tourism, Api-tourism, Antiquities and cultural tourism) | | |
| | Reduced attractiveness and the value of tourism sites caused by environmental changes (e.g. Decline of the ice cap on Mt. Kilimanjaro) | | | |

ANNEX 2: MONITORING LOGICAL FRAMEWORK

| S/N | Goal | Specific Objectives | Activities | Indicator | Target | Start Date | End Date | Input (Financial) | Implementation Status | Expected Outcome | Actual Output | Responsible |
|-----|------|---------------------|--|---|-----------------------|--------------|-----------------------|-------------------|-----------------------|--|---------------|-----------------------|
| 1. | | | To enhance communication and awareness promotion through mass medias and other transmitting ways on drought prevention and combatation (Radios, phone calls, posters, Television, leaflets, brochures, meetings, dances and drama, Storytelling, school clubs, helpline, social marketing, and advertising: and newspapers | Number of TV and Radios programmes aired; Number of posters printed and disseminated; and Number of drought schools club established; | 100; 100; &200; | Jan,20 26 | Decem ber, 2027 | 100,000,000 | | Awarenes s among the stakeholde rs involving in the plan | | MCIT VPO Medias |

| S/N | Goal | Specific Objectives | Activities | Indicator | Target | Start Date | End Date | Input (Financial) | Implementation Status | Expected Outcome | Actual Output | Responsible |
|-----|------|---------------------|--|--|--------|------------|-----------|-------------------|-----------------------|------------------|---------------|-------------|
| 2. | | | To conduct capacity building and awareness creation among stakeholders (NGO's, Government Institutions, Individuals) | Number of sessions conducted | 40 | Jan, 2026 | Dec, 2027 | 500,000,000 | | | | |
| 3. | | | To establish National Drought Management Centre at Local Government Authority (LGAs) | Number of LGAs established NDMA | 185 | Jan, 2026 | Dec, 2027 | 370,000,000 | | | | |
| 4. | | | To conduct baseline survey to assess the areas affected by droughts | Number of surveys conducted in all semi-arid regions | 6 | Jan, 2026 | Jan, 2027 | 420,000,000 | | | | |

| S/N | Goal | Specific Objectives | Activities | Indicator | Target | Start Date | End Date | Input (Financial) | Implementation Status | Expected Outcome | Actual Output | Responsible |
|-----|------|---------------------|---|--|-----------------------------------|------------|-----------|-------------------|-----------------------|------------------|---------------|-------------|
| 5. | | | To promote ecosystem and land management through establishment of planting trees, soil conservation, wetlands protection, and water sheds management | 1. Number of trees planted; 2.soil productivity rate | 500,000 trees planted in each LGS | Jan, 2026 | Dec, 2027 | 450,000,000 | | | | |
| 6. | | | To introduce strategic framework of cooperation between (NDMP and MoA) through promoting climate smart agriculture (CSA) practices and sustainable land use plan. | Availability of MoU between NDMP and MoA; Number of CSA introduced and monitored. | 1 MoU& 120 CSA introduced | Jan, 2026 | Dec, 2027 | 20,000,000 | | | | |

ANNEX 3: EVALUATION LOGICAL FRAMEWORK

| Project Description | | Indicator | Means of verification | Assumption/Risk |
|---------------------|--|--|---|--|
| Goal | To enhance Tanzania resilience to drought through pro-active risk reduction, preparedness, Response and recovery strategies | 1. Strengthen institutional coordination and policy framework for drought Management | 1. Availability of institutions coordination for policy framework for drought management 2. MoU of government in construction and employ policy makers | 1. Shortage of funds |
| Purpose | Increased afforestation | 1. Increased hectares of trees planted 2. Increased vegetation cover 3. Compactible soil | 1. 1,000,000 trees planted 2. Availability of tall grasses 3. productive soil for agriculture | |
| Output | 1. NDMA established and functional 2. Early warning system operational 3. Community resilience programs implanted 4. Stakeholder coordination mechanisms in place | 1. Number of staff trained 2. Number of bulletins issued 3. Number of communities reached 4. Number of coordination meetings held | 1. Training records 2. Bulletins 3. Project reports 4. Meeting minutes | 1. Adequate technical capacity 2. Community participation sustained |
| Activities | 1. Draft and enact drought policy 2. Train stakeholders 3. Develop and disseminate early warnings 4. Implement community-based resilience projects | 1. Number of policy enacted 2. Number of trainings conducted 3. Number of alerts disseminated 4. Number of projects implemented | 1. Policy documents 2. Training reports 3. Communication logs 4. Field monitoring reports | 1. Timely funding disbursement; 2. Access to vulnerable areas |

ANNEX 4: EVALUATION CHECKLIST

| S/N | Type of Evaluations | Description of Evaluation | Evaluation Study Questions | Methodology to be used | Time frame | Responsible |
|-----|------------------------------------|--|---|---|------------------------------------|-------------|
| 1. | Midterm/ terminal Evaluation | The evaluation will seek to bring into perspective the outcome and impact of implementation of the Plan after end of its desired implementation period | <ul style="list-style-type: none"> • To what extent has the plan achieved its objectives? • What are the success factors during the implementation of the Plan • What were the challenges occurred during the implementation of the plan? • Are the objective and targets full-filled as desired? • What are the lesson learnt and way forward for future improvement? | Undertake field visit and desk review on objectives and targets and conduct mini survey to capture stakeholders' opinion regarding the implementation of the plan | End of each Planned period of TNDP | |

ANNEX 5: MONITORING AND EVALUATION REPORTING PLAN

| S/N | Goal | Specific Objectives | Activities | Indicator | Target | Start Date | End Date | Approved Budget | Amount received | Expenditure | Implementation status | Remarks |
|-----|------|---------------------|------------|-----------|--------|------------|----------|-----------------|-----------------|-------------|-----------------------|---------|
| 1. | | | | | | | | | | | | |
| 2. | | | | | | | | | | | | |
| 3. | | | | | | | | | | | | |
| 4. | | | | | | | | | | | | |
| 5. | | | | | | | | | | | | |

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