Report on Forests, Rangelands and Climate Change Adaptation in Tanzania

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1. Country Overview

Tanzania is located in Eastern Africa, between Latitude 1^0 and 12^0 South and Longitude 29^0 and 41^0 East. It is bordered by Kenya and Uganda to the North; Rwanda, Burundi and Democratic Republic of Congo to the West; Zambia and Malawi to the South West; Mozambique to the South; and Indian Ocean to the East. It is constituted by Tanzania Mainland and Zanzibar with a total area of 945,087 sq. km comprised of land area of 883,749 sq. km (881,289 sq. km mainland and 2,460 sq. km Zanzibar Islands), plus 59,050 sq. km inland water bodies. Tanzania mainland encompasses major island of Mafia (518 km2) and Zanzibar consists of Unguja (1,666 km2) and Pemba (795 km^2). The available land for cultivation is 40 million hectares and cultivated land is about 5.2 square kilometers. Forests and woodland occupy 50 percent of the total area and 25 percent is wildlife reserves and national parks.

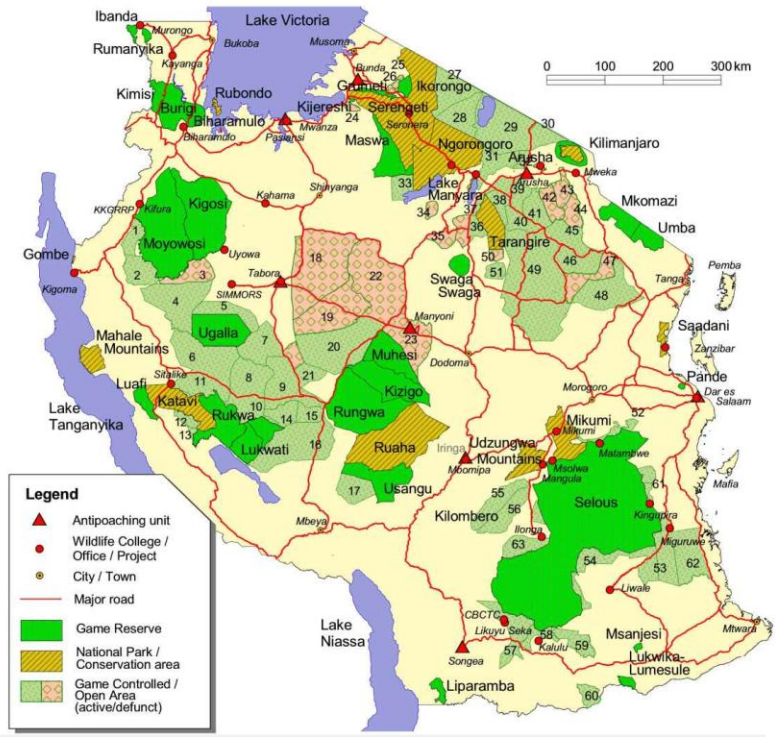

Figure 1. Map of some protected areas in Tanzania: 2012

The country has a total of 35.3 million hectares of forests out of which 16 million hectares comprise of reserve forests, 2 million hectares are forests in national parks and the rest, 17.3 million hectares (49% of all forestland), are unprotected forests in general land. This is one of the highest forest cover in the Eastern and Southern Africa. The forests contribution to the national GDP is estimated to be between 2.3% and 10% of the country's total GDP. However, this contribution is underestimated because of unrecorded consumption of wood fuels, bee products, catchment and environmental values and other forest products. The forest sector acts as a carbon sink, absorbing all emissions produced at national level and more, making Tanzania a net sink of GHGs. Figure 1 is a map of Tanzania showing some protected areas.

About 80% of Tanzania's population live in rural areas and are engaged mostly in subsistence agriculture, whose harvests are highly unreliable due to low production technologies, financial capacity, too much dependence on rainfall and climate change low per capita consumption of commercial energy in form of petroleum and electricity forces majority of the rural and urban communities to depend on natural resources such as forest resources to meet their basic needs such as firewood, food, water and income. Biomass energy accounts for 90% of total energy consumption (Figure 2).

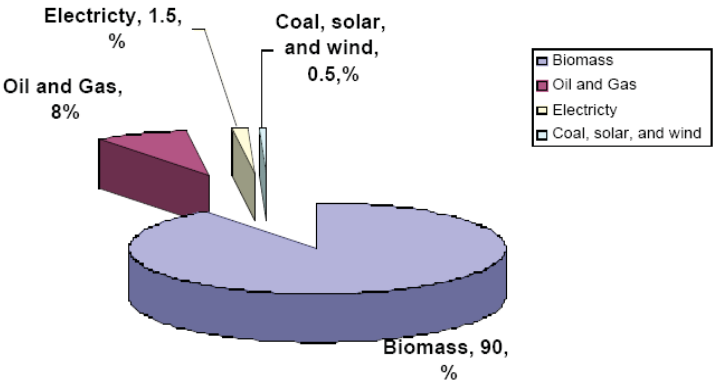

Figure 2. Energy consumption by sources in Tanzania

Tanzania is estimated to have about 18.5 million cattle, 13.1 million goats, 3.6 million sheep, 1.2 million pigs and 30 million local chickens. Approximately 95% of ruminant livestock in the country are kept under traditional production systems (*Nomadism or semi-nomadism, Extensive Agro-pastoralism, and Intensive Agro-pastoralism*) depending mostly on pastures and crop residues as the main feed resources. In this system, limited inputs such as feed additives, supplementary feeds are offered. This system produces about 93% of the milk and 99% of the meat consumed in the country.

2. Impacts, Risks and Vulnerabilities of Climate Change in Tanzania

2.1. Vulnerability

Tanzania is experiencing the impacts of extreme weather events, such as drought and flood that have had significant impact to both the people and the economy. Severe droughts are increasingly being felt in many parts of the country with negative consequences on, among others, food production and water scarcity. Droughts have seriously affected most vulnerable sectors including agriculture, forestry, fisheries, energy, health, water, industry, business/trade, tourism and services. The livelihoods of about 80% of Tanzanians depend on the agriculture, forestry and fisheries resources. Small-scale farmers are more vulnerable as they are highly dependent upon rain fed production. In addition to the effects of prolonged dry spells or droughts on crops and livestock, periods of increased rainfall (with associated increase in pests and diseases) will negatively affect agricultural output. High rainfall intensity also influences soil degradation. Since agricultural development is strongly dependent on environmental resources such as land, forest, air, water and other resources, sustainable utilization of these resources is vital for the growth and sustainability of the sector. However, as noted earlier, agriculture is vulnerable to the effects of climate change associated with global warming. The increased vulnerability of this sector is therefore the biggest challenge for sustained economic development and improved livelihood in the rural communities.

The major portion of Tanzania's electricity supply comes from hydro-generation. Rainfall variability has affected power generation and supply, changing the energy mix from over 60% hydro power generation ten years ago to less than 50% hydro power generation to date. Tanzania's industries are mainly agro-based, dealing mainly with processing of agricultural and wood products, and manufacturing of agrochemicals. These products are vulnerable to climate change. Therefore, the manufacturing industries aligned to the agricultural sector will be affected by the climate change-impacted agricultural economy.

Infrastructure is also highly vulnerable to climate change impacts, e.g. through damage caused by flooding. Such disruptions may act as disincentives to investment, and sustainable economic growth and poverty reduction. Similarly, various service sectors are vulnerable to the impacts of climate change and may require rapid response to be able to avert the needed resiliencies.

2.2. Impacts

Climate change projection indicates that the frequency and severity of extreme and recurring droughts with devastating effects to agricultural, water and energy sectors. Currently more than 70% of all natural disasters in Tanzania are hydro-meteorological, and are linked to droughts and floods. For instance, the droughts of 2003, 2005 and 2009 severely affected agriculture, energy and business sectors in Tanzania. The environmental and ecological impacts of these droughts were alarming. Agriculture in the affected areas was crippled, a lot of livestock and wildlife perished due to starvation and lack of water. Following these droughts, Tanzania suffered serious energy crisis which had severe social and economic implications. The floods of 2009, for instance, were particularly devastating on humans, property and infrastructure. Some of these impacts are further elaborated as follows.

(a) Agriculture and Food Security

Agricultural development is strongly dependent on environmental resources, such as land, forest, air, water and other resources. Thus sustainable utilization of these resources is vital for the growth and sustainability of the sector. However, agriculture is vulnerable to the effects of climate change associated with global warming. Changing climate has resulted in a general decline in agricultural productivity, including changes in agro-diversity. The prevalence of crop pest and diseases is also reported to have increased, posing more challenge to agriculture.

There have been considerable changes in the types of crops grown in agro-ecological zones with declining production trends. For instance, there has been declining trends in productivity of maize and sorghum that led to introduction of drought tolerant crops such as cassava in Muheza and Vanilla in Muleba districts. Crop pests have increased over the past few decades, and that the pests have become more prevalent with time. As a result, emerging diseases such as batobato, banana xanthomonas wilt, panama, elihuka, coffee wilt, headsmuts, fusarium wilt, maize streak, cassava mosaic, cassava purple stripes, cassava root rot, and rust particularly in green grams have become more prevalent. Furthermore, increase in temperatures has led to increased incidences of some of noxious weeds particularly for cereal crops (for example, striga spp); insect pests (for example, *Prostephanus truncatus,* and *Bemisia tabacci*); and vermins such as the mole rats

Productivity of most crops seems to have declined due to changing climate, particularly due to the increasing unreliability of rainfall. However, the production of some crops seems to have improved with the changing climate. For example, the productivity of mangoes and oil palm in the western plateau of Tanzania has increased considerably during the last 20 years, than in earlier years.

(b) Fresh Water Resources

Increasing rainfall variability and prolonged droughts cause serious pressure in the country's available water resources. Severe and recurrent droughts in the past few years triggered a decrease in water flows in rivers, hence shrinkage of receiving lakes, declines of water levels in satellite lakes and hydropower dams. Furthermore, some of the perennial rivers have changed to seasonal rivers and some wetlands have dried up. Thus, as water is a finite resource is under pressure because of increasing climate change and variability, degradation due to pollution, over-abstraction, and encroachment of water catchments for various land uses (e.g. agriculture, urbanisation and industrial development). This scarcity and vulnerability has negative impacts on important watershed and recharge areas, as well as wetlands. Figure 3 shows extent of the drop of water level in Lake Victoria

Figure 3. Bismark rocks in Lake Victoria showing the drop in water level

Many ecosystems are overwhelmed by an unprecedented combination of climate change related events, and land-use change, pollution, siltation, damming and over-exploitation of water resources. Socially, the impacts of climate change on water resources are felt by the whole society regardless of gender. However, where water sources are depleted or quality compromised, women and children are the most affected. On the other hand, in some areas like Kilombero and Same, floods, landslides and associated waterborne diseases are on the increase and women and children are mostly impacted.

Wetlands are facing increasing challenges of climate change, particularly frequent droughts. With increasing evapo-transpiration due to increased temperature and changed rainfall regime, wetland

water characteristics will change with catastrophic consequences for the biodiversity within, for example, increased pH levels in Lake Natron is affecting the breeding sites of flamingos.

(c) Human Health

In Tanzania there are already reported incidences of epidemic malaria especially in highland areas that were traditionally free from mosquitoes and malaria such as highland areas of Tanga, Kilimanjaro, Iringa, Kagera and Mbeya, among others, where it was not prevalent before.. Malaria has been common in high temperature and humid lowland areas especially during and after rainy seasons. Studies undertaken in the Lake Victoria basin indicate that incidences of other diseases such as cholera have increased as a result of climate change. In dry areas of the country, prolonged dry spells have caused increased outbreaks of respiratory diseases and eye infections. Incidences of food-borne and water borne diseases such as dysentery, diarrhoea, cholera and typhoid fever are also on the increase due to extreme weather events which affect water quality.

(d) Coastal and Marine Environment

Some of the impacts of climate change in the coastal and marine environment are associated with sea level rise which is responsible for destruction of coral reefs, coastal erosion, submergence of small islands (such as small islands of Maziwe in Pangani and Fungu la Nyani in Rufiji), destruction of coastal infrastructures for example, some beach hotels in northern Dar es Salaam, Pangani wall) and human settlement, intrusion of sea water into freshwater wells (e.g. Bagamoyo, Pangani, Rufiji and Zanzibar), and degradation of mangroves. Thus sea level rise can be among the most challenging climate change issues since it threatens the destruction of key coastal infrastructure and costal livelihoods. Figure 4 shows the submerged Maziwe island and the collapsing sea defense wall at Pangani township.

Figure 4. Submerged Maziwe Island, Pangani, Tanga (left) and Collapsing sea defense wall at Pangani Township (right)

(e) Energy

As a result of increasing climate variability, over the last years, the country has experienced increasing incidents of recurrent and prolonged droughts with severe implications on hydro power generation. Power rationing and black outs have become a common phenomena. This has affected individuals, household and industrial income generating activities. Consequently, additional resources which are committed for other development programmes are sometimes being reallocated for thermal electricity generation. This undermines national efforts to attain the MDGs and place poverty reduction efforts at jeopardy. On the other hand, insufficient electricity generation result in increased utilization of forest resources for energy

(f) Forestry

Climate change impacts on forest ecosystems and biodiversity have been evidenced in many parts of the country and they are expected to vary depending on vegetation species. The common impacts to all forests types include loss of biodiversity; disappearance of wildlife habitats, increased risk of bush fires, limited availability of forest products (timber and non timber products) and ecosystem shift (for example, forest to woodlands, or woodlands to grasslands). The NAPA, 2007 forecasts change to drier forests and ecosystems as a result of climate change. Species that are expected to be more vulnerable are those with limited geographical range and heat intolerant; low germination rates; low survival rate of seedlings; and limited seed dispersal/migration capabilities. However, knowledge on the magnitude of effects on individual species is still limited.

(g) Wildlife Biodiversity

Water shortage for the large mammals especially in the years with low rainfall is one of the main challenges facing the wildlife in Tanzania. The places that naturally used to hold water during the dry season no longer hold water long into the dry season. For instance, water dependent animals especially hippopotamus and crocodiles are often found crowded in small and few remaining water ponds impairing their physiological functions and many times becoming easy target to poachers and predators. Human-wildlife conflicts have become a common phenomenon to crop raiding while wild animals roam around in search for pastures and water. The animals commonly involved in these conflicts are hippopotamus, elephants and buffaloes. Serious lack of surface water in dry seasons of 2003/2004 to 2005/2006 led to considerable hippopotamus and buffalo mortalities. Contagious diseases such as anthrax have been reported in areas where animals concentrate in small water points, for instance, in Ruaha National park, which are also shared with domestic animals. Figure 5 shows some hippopotamus congested in a small water pool in one of the rivers in Katavi region.

Figure 5. Hippopotamus congested in a small water pool due to water shortage in the Katavi river

Tourism

Climate affects a wide range of the environmental resources that are key attractions for tourism. The disappearance of snow on top of Mount Kilimanjaro is one of the threats to tourism sector in the country. Mountain Kilimanjaro has is reported to have lost 80% of its ice cover between 1912 and 2005. Climate also has an important influence on environmental conditions that can deter tourists, infectious disease; wildfires; insect or waterborne pests; destruction of costal investments and infrastructures (for example, hotels and recreation facilities), and beaches; destruction of cultural, historical, archaeological and heritage sites; as well as coral reef bleaching will continue to impact negatively the tourism sector by changing the scenic view of the natural environment. For example the 2006 El Niño rains, left many park roads impassable for a long period of time, and resulted in reduced tourist visits and loss of revenue. In places like Ruaha National Park ecosystem, droughts have had significant impacts on wildlife and hence tourism.

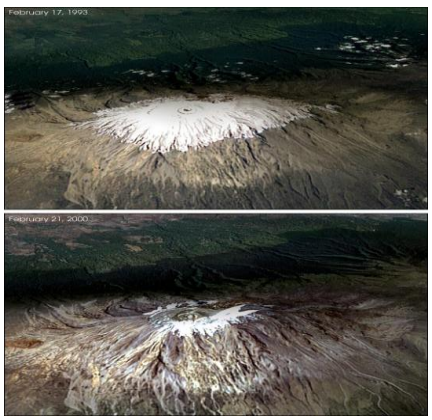

Figure 5. Lost glacier over Mount Kilimanjaro

(h) Livestock

Most of the livestock are concentrated in the semi-arid areas (including, Arusha, Dodoma, parts of Iringa, Kilimanjaro, Manyara, Shinyanga, Mwanza, Singida, Mara, Tabora and parts of Rukwa) which are more suitable for livestock than any other form of agriculture. These areas are characterized by relatively low mean annual rainfall with stronger spatial and temporal variability, and therefore not very reliable for production of food and cash crops. Concentration of ruminant livestock in these areas is also attributed to low prevalence of tsetse flies and less competition for land for arable agriculture. However, the sector is affected by various climate change impacts, drought being the most serious. There have been severe and recurrent droughts, particularly in the northern parts of the country, reducing water and pastures availability for livestock. For instance, the drought which occurred in 1996 in 14 regions affected about 3.9 million people, while the one which occurred between 2009 and 2010 killed a total of 316,437 cattle, 236,359 goats and 92,640 sheep in Arusha region alone (Figure 6). Shortage of water and pasture has often resulted into resource use conflicts between crop cultivators and livestock keepers, particularly in the catchment areas and crater basins.

Figure 6. Livestock remains in Longido district which died due to severe drought in 2009 – 2010

Climate change has also been associated to the increasing incidences of vector-borne diseases of livestock, such as trypanosomiasis, East Coast Fever, and Rift Valley Fever, and hence increases in livestock mortalities. In recent years, the country has experienced increasing incidences of recurrent and prolonged droughts with severe implications in the livelihood activities of the communities particularly those dependent on livestock.

(i) Infrastructure and Human Settlements

Increased rainfall due to climate change has had serious impacts to transport, communications and buildings infrastructures in Tanzania. For instance, in December 2009 and January 2010, unusual heavy rainfall associated with El Niño event saw widespread flooding in Morogoro (Kilosa) and Dodoma (Mpwapwa and Kongwa) Regions which led to severe damage on road, bridges, water dams, railway, electricity poles, drainage networks, water supply, and human settlements. In April 2011 also in Morogoro (Kilombero) region heavy rains caused flood which destroyed bridges, several roads and several human settlements. In December 2012 Dar es Salaam city was hit by serious floods which killed more than 40 people, loss of property and destruction of various infrastructures (Figure 7).

Figure 7. Effects of floods in Dar es Salaam city, December 2011

3. National Priority actions for addressing climate change

Various mechanisms have been put in place and implemented in the country to address challenges of climate change in forestry and rangeland management in Tanzania. Some of priority climate change areas developed to address both mitigation and adaptation policies, legislations, programmes, strategies and plans are summarised below.

S/N	**National initiative/Study**	**Study Year**	**Financing Agency**	**Remarks**
1	Inventory of GHG emissions	1993 - 1994	UNEP	The main GHG studied were CO_2, CH_4 and N_2O
2	Technological options for GHG Mitigation	1994 - 1995	The German Technical Cooperation (GTZ) Agency	The study involved the macroeconomic analysis, energy pricing and mitigation cost analysis and a multiple criteria assessment
3	Assessment of Vulnerability and Adaptation to Climate Change.	1994 - 1996	United States Country Studies Programme	The main sectors studied were: agriculture (crop production and livestock), water, coastal resources and forestry
4	Development of Climate Change National Action Plan	1996 - 1998	United State Country Studies Programme	Identification of the complimentary actions between climate change and sectoral policies
5	Adoption of National Environment Policy	1997	Government of Tanzania	Provides a policy framework for environmental issues relating those sectors to climate change
6	Enabling Activities Towards preparation of the Initial National Communication to the UNFCCC	1997 - 1999	GEF/UNEP	The project updated the previous works of climate change studies, through capacity building
7	National Forest Policy	1998	Government of Tanzania	The National Forest Policy focuses on ensured ecosystem stability through conservation of forest biodiversity, water catchments, and soil fertility
8	Initial Communication to the UNFCCC	2002	Government of Tanzania	The report suggests a number of ways in which the sustainable management of forest resources in Tanzania can be achieved and Identifies mitigation options to greenhouse gasses, including Commercial/industrial forest plantation; extension and replanting of other industrial forest plantations; small holder or village tree growing for multiple purposes; and Natural/catchment forest protection.
9	Revised National Energy Policy	2003	Government of Tanzania	Policy promotes environmentally sound technologies
10	National Adaptation Program of Action (NAPA)	2004 - 2006	GEF/UNEP	The project identified Urgent and Immediate Adaptation options to combat climate change impacts, Preparation of National Adaptation Program of Action (NAPA). NAPA identifies several priority areas for adaptation in various sectors, which are ranked as (1) agriculture and food security (including livestock); (2) water; (3) energy; (4) forestry; (5) health; (6) wildlife; (7) tourism; (8) industry; (9) coastal and marine resources; (10) human settlements; and (11) wetlands.
11	Enactment of the Environment Management Act – CAP 191	2004	Government of Tanzania	Section 75 of EMA describes how climate change issues can be addressed in Tanzania.
12	Assessment of Technology Needs Assessment (TNA)	2004 - 2005	GEF/UNEP /GOT	The project identified environmentally friendly technology to adapt and mitigate climate change impacts in Tanzania

13	Preparation of the National Clean Development Mechanism – CDM investor's Guide	2004	Government of Tanzania	enabled the approval process for CDM projects in Tanzania
14	Strategy for Urgent Actions on Land Degradation and Water Catchments	2006	Government of Tanzania	Aims at addressing environmental degradation issues, particularly those related to land and water catchments. It initiated a Presidential Award Competition for the Conservation of Water Sources; and Planting Trees and ensuring their survival.
15	Preparation of National Capacity Needs Self Assessment and Action Plan	2007	Government of Tanzania/UNDP - GEF	Enabled the preparation of capacity building needs for MEAs implementation in Tanzania
16	National CDM Handbook	2009	Government of Tanzania	Further elaborated the approval procedure for CDM in Tanzania
17	Preparation of National REDD Framework for Reducing Emissions from Deforestation and Forest degradation	2009	NORAD	The main goal of the National REDD+ Strategy is: to facilitate effective and coordinated implementation of REDD+ related policies, processes and activities so as to contribute to climate change agenda and overall sustainable development; and enable establish mechanisms required for Tanzania to benefit from a post-2012 internationally approved system for forest carbon trading, based on demonstrated emission reductions from deforestation and forest degradation
18	Climate Change, Impacts, Adaptation and Mitigation in Tanzania (CCIAM)	2009	NORAD	Research programme initiated to support the REDD+ implementation capacity in the country. By the end of the programme, a comprehensive research and methodology tool kit for climate change adaptation and mitigation will have been put in place to enable Tanzania implement the post-2012 climate mitigation and adaptation regimes successfully.
19	National Strategy for Reduced Emissions from Deforestation and Forest Degradation (REDD+)	2011	Government of Tanzania	The Strategy aims to facilitate effective and coordinated implementation of REDD+ related policies, processes and activities so as to contribute to climate change agenda and overall sustainable development. It is expected to guide the implementation and coordination of mechanisms required for Tanzania to benefit from a post-2012 internationally approved system for forest carbon trading, based on demonstrated emission reductions from deforestation and forest degradation.
20	Climate change Impacts Assessment-Tanzania	2009	Government of Tanzania/DANIDA	The overall objective was to reveal and document both the key locally based impacts of climate change and their cultural, socio-economic and environmental implications to the local communities and to the country as a whole, and collect and consolidate pictorial and textural materials that could facilitate comparability of the past and present physical environment so as to reveal the magnitude of change where possible
21	Tanzania economics of climate change	2010	DFID/SEI	The objective was to evaluate the costs and implications of climate change to Tanzania and explore carbon opportunities in mitigation activities
22	National Strategy for Growth and Reduction of Poverty (I & II)	2005 & 2010	Government of Tanzania	The Strategies recognize that poverty is largely a rural phenomenon and that the rural poor depend solely or to a greater extent on natural resources. They set broad targets of reducing the proportion of the population below the poverty line from 48% to 24%, reduce the proportion of the rural poor by 7.5% and reduce the proportion of the poor by 3.5%. To reach these targets among other activities proposed these

				strategies have effectively mainstreamed environmental issues in their formulation and implementation. Among the activities include promoting the use of rainwater harvesting to support irrigation schemes in arid and semiarid areas, sustained effort in re-afforestation, enforcement of water quality laws, regulations and standards in water sources, empowering local authorities and communities to protect water sources.
23	The National Water Sector Development Strategy		Government of Tanzania	It aims to support re-alignment of other water related key sectoral policies of energy, irrigation, industry, mining, and environment. In the implementation of comprehensive and prioritised water conservation and environmental protection measures the strategy is guided by the Urgent Actions on land degradation and water catchments, and the protection of marine, lakes, rivers and dams environment.
24	National Climate Change Strategy (NCCS)  Vice President of the United Republic of Tanzania (right) officially launching the NCCS	2012	Government of Tanzania/DANIDA	The goal of the Strategy is to enable Tanzania to effectively adapt to climate change and participate in global efforts to mitigate climate change with a view to achieving sustainable development in line with the Five Years National Development plan; the Tanzania Development Vision 2025, as well as national sectoral policies.
25	Other climate related studies	Various	Research and institutions of higher learning	Several studies have been undertaken under support Government and various organizations.

4. Key gaps, constraints and challenges in addressing Climate change

a) Inadequate financial capacity to:-
- Assist the communities to engage in alternative income generating activities to avoid too much dependence on the natural resources for their livelihoods.
- Increase the capacity of Tanzanians to mitigate impacts and adapt to climate change.
- Map the country and prepare appropriate land use plans in order to avoid land use conflicts among various users.

b) Inadequate technologies for appropriate mitigation and adaptation measures

c) Inadequate human capacity (knowledge, awareness) to assist in mitigation and adaptation technologies.

d) Long and tedious process for accessing the GEF funds; and unequal distribution of the GEF funds among the eligible members.

e) Long, complicated and expensive process for qualifying for CDM projects.

5. Assistance required for climate change actions

(a) Financial resources

(i) For mapping/surveying and preparation of land use plans in order to avoid land use conflicts among various users.
(ii) For developing appropriate livestock infrastructure in the pastoral areas in order to avoid migrations of livestock into protected, agricultural and water catchment areas so as to avoid conflicts between pastoralists, farmers, conservators and other land users.
(iii) For improving and strengthening weather forecasting and early warning systems particularly as it relates to disaster management in floods, drought, heat waves, hurricanes, and other climate change related catastrophes**.**

(b) Technology development and transfer

(i) For accessing, developing, transfer and diffusion of environmentally sound technologies and corresponding know-how.
(ii) For strengthening national, scientific and technological capacities to develop own innovative solutions, scientific research and new, environmentally sound technologies.

(c) Human capacity

(i) To assist in training adequate experts on climate change mitigation and adaptation technologies as well as raising awareness of the communities on how to mitigate and adapt to climate change.
(ii) To Support the establishment and strengthening of national and regional centres of excellence as important nodes for national institutional capacities, for building research capacities and sharing knowledge and experience on forest and rangelands issues.
(iii) To provide climate services that support institutional capacities, training research and systematic observation actions that will allow the country to build a critical mass of endogenous capacity to deal with climate change challenges in forest and rangelands sector in general.
(iv) To enhance collaboration with other stakeholders to improve adaptation measures to current and future climate change.

(d) CDM projects

To streamline and simplify the procedures and process to qualify for CDM projects

6. Recent Climate change activities related to forests and rangelands

The following is a list of few climate change projects/activities that have been implemented or are planned for implementation in forestry and rangeland management.

S/N	Programme/Project	Year	Financing Agency	Key objectives
1	Developing Core Capacity to Address Adaptation to Climate Change in the coast of Dar es Salaam city.	**2012**	Adaptation Fund (AF)	The objective of the project is to reduce vulnerability of ecosystems, infrastructure and economy in Tanzania as well as to rehabilitate the sea protection wall along the Ocean road drainage systems of Dar es Salaam city.
2	Addressing Core Capacity on Adaptation to Climate change in Productive Coastal zones of Pangani, Bagamoyo, Rufiji and Zanzibar.	**2012**	Least Developed Countries Fund (LDCF)	The project involves among other activities the rehabilitation of Pangani sea protection wall and Bwawani in Unguja; protection of mangroves in Rufiji; and relocation of fresh water wells in Bagamoyo and Pemba

3	Mainstreaming Environment and Climate Change Adaptation in the implementation of National Policies and development Plans.	**2011**	GEF/UNDP	It is expected that the key MDAs and LGAs will integrate climate change adaptation and mitigation in their strategies and plans. Also, the relevant MDAs, LGAs and Non-State Actors are expected to improve enforcement of environment laws and regulations for the protection of ecosystems, biodiversity and the sustainable management of natural resources.
4	Enhancing Climate Change Adaptation and Mitigation Capacities of Vulnerable Communities to Eco-villages of different Ecosystems of Uluguru Mountains.	**2010**	European Union through Global Climate Change Alliance (EU-GCCA)	The project aims to improve the resilience to climate change impacts of the communities in highland areas of Morogoro region through:- environmental conservation activities; land use planning; participatory forest management; sustainable agroculture and livestock keeping; water utilization management; and environmental education in schools.
5	Resilient Landscapes for Resilient Communities in Pemba Island.	**2010**	(EU-GCCA)	The project aims to support transformative and community-driven climate change adaptation and mitigation in some villages in the rural areas of Pemba Island. It is envisioned that by assisting these villages to become exemplary eco-villages, the project will simultaneously improve the resilience of a number of Tanzania's most vulnerable communities by establishing models of community-based climate change adaptation and mitigation replicable in villages throughout the region.
6	Empowering Vulnerable Communities to Adapt and Mitigate the Impacts of Climate Change in Central Tanzania.	**2010**	(EU-GCCA)	The project aims to:- identify, test, evaluate and share a comprehensive range of innovative joined-up adaptation technologies and approaches; to support the village communities to implement a solid framework of land use plans and natural resource management principles and practices; to empower women to act at the forefront of the transformation, with increased authority and reduced workload; and to increase household food security and incomes, and improve livelihoods.
7	Supporting Integrated and Comprehensive Approaches to Climate Change Adaptation in Africa: Africa Adaptation Programme – AAP.	**2010**	Government of Japan through UNDP	The project aims to enhancing the adaptive capacity of vulnerable countries, promoting early adaptation action and laying the foundation for long-term investment to increase resilience to climate change to communities in selected areas in Tanzania.
8	Implementation of the National Forest Resources Monitoring and Assessment (NAFORMA)	**2009 - 2013**	Government of Finland	The project aims at assisting the country to map all of its forest resources. This information will assist the country to assess its forest resources including the size of the carbon stock stored within its forests. This will also feed into better policy making to ensure Tanzania's most valuable forests are either conserved or utilized in a sustainable way. This would help mitigate climate change but would also help the country in other ways such as managing its water resources and sustaining biodiversity and rural livelihoods.
9	Climate Change, Impacts, Adaptation and Mitigation in Tanzania (CCIAM) programme.	**2009**	Government of Norway	This programme addresses research and capacity enhancement in climate change adaptation and mitigation for increased resilience of the country to climate change. It also aims to support forest carbon and REDD+ initiatives in Tanzania.
10	Technology Needs Assessment (TNA) study.	**2005**	Government of Tanzania	The assessment identified environmentally friendly technology to mitigate and adapt climate change impacts in Tanzania.

7. Funding Opportunities

The Government of Tanzania has been implementing activities or projects related to climate change in forest and rangelands with multilateral or bi-lateral partnership, including, but not limited to:- United Nations Environment Programme (UNEP); The German Technical Cooperation (GTZ) Agency; United States Agency for International Development (USAID); United Nations Development Programme (UNDP); Canadian International Development Agency (CIDA); Norwegian Agency for International Development (NORAD); Danish International Development Agency (DANIDA); Department for International Development – UK (DFID); and Finnish International Development Agency (FINNIDA).

8. Recommendations and conclusions

While it is difficult to accurately predict the consequences of climate change, enough understanding is available on the kind of risks posed. Severe impacts such as: melting of glaciers; floods; frequent and prolonged droughts; reduced water supply; decline in crop yields; increase of vector-borne diseases such as malaria; rising sea levels leading to displacement of people; degradation of important natural habitats; and disruption of both terrestrial and marine ecosystems, are now vivid.

Unfortunately, although poor countries like Tanzania have contributed the least in the problem, the adverse impacts are more pronounced in such countries due to their least adaptive capacity and weak early warning systems. The key challenges to address climate change in Tanzania include:- inadequate financial resources (both national and international commitments and aid); inadequate technologies for mitigation and adaptation; inadequate human capacity; long and tedious process for accessing the GEF funds; and long, complicated and expensive process for developing CDM projects. Therefore, in order to effectively implement programmes and projects related to climate change Annex 1 countries are obliged to fulfill their ODA commitments for the least developed countries; and procedures for accessing GEF funds for Environmental Management should be streamlined and simplified. Also, free access to and the development, transfer and diffusion of environmentally sound technologies and corresponding know-how; human capacity on climate change mitigation and adaption should be enhanced. Lastly, the procedures and process to qualify for CDM projects should be streamlined and simplified.

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