



THE UNITED REPUBLIC OF TANZANIA



NATIONAL AUDIT OFFICE

**STUDY ON THE STATUS OF ENVIROMENT WITH A FOCUS ON
LAND DEGRADATION, FOREST DEGRADATION AND
DEFORESTATION**



**A REPORT OF THE CONTROLLER AND AUDITOR GENERAL OF
TANZANIA**

March 2018

THE UNITED REPUBLIC OF TANZANIA



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PREFACE

Section 28 of the Public Audit Act No. 11 of 2008, authorizes the Controller and Auditor General to carryout Performance Audit (Value -for-Money Audit) , Environmental Audit for the purposes of establishing the economy, efficiency and effectiveness of any public expenditure or use of public resources in the Ministerial Departments and Agencies (MDAs), Local Government Authorities (LGAs) and Public Authorities and other Bodies which involves enquiring, examining, investigating and reporting, as deemed necessary under the circumstances.

I have the honour to submit the Survey Report on the status of environmental degradation with the focus on land degradation, forest degradation , and deforestation in Tanzania to His Excellency the President of the United Republic of Tanzania, Dr. John Pombe Magufuli and through him to the Parliament of the United Republic of Tanzania.

The report contains conclusion and recommendations that focus mainly on status of land degradation, forest degradation, and deforestation in Tanzania .

The management of Vice President's Office, and President's Office Regional Administration and Local Government were given the opportunity to scrutinize the factual contents of the report and come up with comments on it.

I wish to acknowledge that the discussions with the Ministry of Natural Resources and Tourism entities have been very useful and constructive in achieving the objectives of the study.

In completion of the assignment, the office subjected the report to the critical reviews of the following experts namely Dr. Felician Kilahama former Director of Forestry and Beekeeping Division, Ministry of Natural Resources and Tourism, and Prof. Richard Kangalawe from Institute of Resources Assessment of University of Dar es Salaam who came up with useful inputs in improving this report.

This report has been prepared by Ms Yuster D. Salala (Team Leader), Adam Mniko and Ms Asimuna Kipingu (Team Members) under the supervision of the Team Supervisor Michael Malabeja. The whole team was under supervision of Assistant Auditor General -Specialized Audit, Eng. James Pilly and the Deputy Auditor General -Performance and Specialized Audit, Ms . Wendy W. Massoy.

I would like to thank my staff for their valuable inputs in the preparation of this report. My thanks should also be extended to the stakeholders involved for their cooperation and their fruitful comments on the draft report.



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March, 2018

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ABBREVIATION

LGAs	-	Local Government Authorities
MDAs	-	Ministries Departments and Agencies
MNRT	-	Ministry of Natural Resources and Tourism
PO-RALG	-	President's Office Regional Administration and Local Government
TFS	-	Tanzania Forestry Services
VPO	-	Vice President's Office

EXECUTIVE SUMMARY

The economic and human development of Tanzania depends on state of the country's natural resources. Although, Tanzania is richly endowed with natural resources, these resources are under threat from competing users, unsustainable management, climate change and pollution.

The current state of Tanzania environment is a matter of concern because the rate of environmental degradation is considered high. Main environmental issues facing Tanzania are related to land degradation, deforestation, forest degradation, water and air pollution, noise pollution, deterioration of aquatic systems, climate change and natural disasters.

The objective of the study was to unveil the state of environment with a view to establish current status of land degradation, forest degradation and deforestation in the country, identify contribution of different drivers and pressures and recommend appropriate responses. Information on state of environment was collected from all responsible parties amongst MDAs and LGAs.

The study employed document review, questionnaire interviews, and physical observations as methods for data collection. Assessment of the status of land degradation, forest degradation and deforestation in Tanzania was guided by the Drivers- Pressure-State-Impact-Response (DPSIR) analytical framework to provide a better understanding of the current state of the country's environment

Results showed that, the average amount of forest lost in 48 LGAs covered in this study amount into 236,711.2 hectares per year. Out of 48 LGAs, 68.8 per cent reported that there was an increased rate of deforestation in their areas in the past three years. The rate of deforestation in the country was influenced by different drivers and pressures such as Energy demand, Poverty, Population Growth, Unsustainable Farming, Economic Growth, Political and social instability and bio-fuel crop farming. The highest leading drivers were energy demand, poverty and population growth which affects at 16.8 per cent, 16.4 per cent and 15.1 per cent respectively.

Findings also revealed that about 53 per cent of the LGAs showed that the level of land degradation was medium while only 9 per cent showed that land was extremely degraded. Medium degradation implies that degradation was apparent but rehabilitation was still possible with considerable efforts. The leading factors for land degradation include Inadequate Land-Use Management, Unsustainable Farming Practice at 14.8per cent, and 14.5per cent respectively.

Effects of land degradation among others include soil erosion, loss of soil nutrients, salinization, siltation and soil deformation.

This study concludes that there is increased forests degradation and deforestation and there is high risk of increasing rate of land degradation in the country. Despite the fact the Government through LGAs and TFS made several initiatives to control and improve land and forest use, still there was an increased rate of forest degradation and deforestation due to malpractices.

Based on the study findings this study recommends that the Vice President's Office-Environment should:

1. Coordinate sectorial ministries to come up with sustainable and practical strategies to reduce improper use of land and forest.
2. Design a strategy in collaboration with Ministry of Education and PO-RALG to provide awareness of environmental education in schools to develop an environmentally friendly society among the young generation.
3. Harmonize and support initiatives to conserve environment and facilitate provision of demarcation of the forest reserves which have been encroached.

Ministry of Natural Resource and Tourism should

1. Install physical and visible demarcation on the forest reserves areas which are under the jurisdiction of TFS.
2. Enhance enforcement of the existing rules and regulations and ensure that environmental destructive activities are severely punished through the established procedures.

President's Office Regional Administration and Local Government should

1. Design ways to prohibit development activities in forest reserves and put in place practical procedures to follow for forest harvest.
2. Establish land use plans that clearly defines boundaries and use of each specified land for agriculture, settlements, grazing and other use depending on the nature of a particular LGA.
3. Raise awareness on forest management, rights, laws and opportunities among forest dependent communities and strengthen capacity within local governments to ensure tangible economic and social benefits.

CHAPTER ONE

INTRODUCTION

1.1 Background

The Government of Tanzania aspires to have a healthy and sustainably managed environment for the benefit of the present and future generations. This vision can be achieved when environmental management issues are well strengthened and mainstreamed into development actions.

The economic and human development of Tanzania depends on state of the country's natural resources. This is in line with the theme of the Government in the second National Five-Year Development Plan 2016/17 - 2020/21, that advocates Nurturing Industrialisation for Economic Transformation and Human Development. Having focus on industrialisation means taking advantage of the abundant and diverse natural resources present in Tanzania.

Although, Tanzania is richly endowed with natural capital, these resources are under threat from competing uses, unsustainable management, climate change and pollution. Therefore, industrialisation will only be achieved through, among others, ensuring environmental sustainability.

Lack of suitable framework to guide and coordinate environmental management will remain a challenge to achieve an industrial economy. This is because livelihood of people and raw materials for industrialisation will largely depend on natural resources. This calls for an intentional and strategic arrangement that will ensure sustainable use of the country's natural resources.

This will only be attained by striking a balance between natural resource utilisation and conservation. This can partly be achieved when the Government Ministries Departments and Agencies and Local Government Authorities fully adopt and practice a sustainable management approach of the natural capital.

1.2 Motivation for study

The current state of Tanzania environment is a matter of concern. The rate of environmental degradation is considered high and affects our environmental resources such as forests, water, freshwater and marine

resources, wetlands, land, wildlife, natural gas, minerals, and renewable energy sources.

Environmental issues facing Tanzania are related to: land degradation, deforestation and forest degradation, loss of biodiversity, environmental pollution, water pollution, air pollution, noise pollution, deterioration of aquatic systems, water accessibility and quality degradation, climate change, natural disasters, emerging issues such as Genetically Modified Organisms, E-waste management, Biofuels, Invasive Alien Species (IAS), etc.).

These problems pose significant impacts to environmental sustainability of our country. Because of this, the Controller and Auditor General Decided to carry out a study on the State of Environment with a view to establish status of the environment in the country, improve understanding of the causes and effects of environmental challenges, and recommend appropriate responses. This study is limited to land degradation, deforestation and forest degradation. The problems related to land degradation; deforestation and forest degradation are as follows:

1.2.1 Land Degradation

Land, one of most prized natural assets in Tanzania, is under increasing pressure stemming from competition for access, changing consumption patterns and the drive for greater economic growth. This results into degradation, loss of access, inequity and encroachment on fragile and protected ecosystems.

A substantial part of Tanzania is experiencing different forms of land degradation including deforestation, loss of vegetation cover, soil erosion, soil pollution, and loss of biodiversity. It is estimated that about 61% of land in Tanzania is degraded. The problem is more eminent in semi-arid areas including Dodoma, Shinyanga, Manyara, Singida, Simiyu, Geita and Kilimanjaro Regions (Kirui & Mirzabaev, 2014)¹. The total annual economic value of land lost due to degradation is estimated at USD 10.2 billion (VPO, 2014)². The extent of land degradation and its respective costs are increasing hence suggesting the need to have more intensive effort to address the problem.

¹ Kirui, O. K., & Mirzabaev, A. (2014). *Economics of land degradation in Eastern Africa*. ZEF Working Paper Series, No. 128

² *Status of Land Degradation in Tanzania*. Retrieved from Vice President's Office -Dar es Salaam.

1.2.2 Deforestation and Loss of Wildlife Habitats and Biodiversity

Tanzania Mainland has 48.1 million hectares (ha) of forests and woodlands, representing about 55 per cent of the total land area. This area provide habitat for wildlife, unique natural ecosystems and biological diversity and water catchments³. Deforestation and forest degradation affect a total of 469,420 ha each year⁴. The main driver is the rapidly growing population which is largely dependent on wood fuel to meet the daily energy needs.

1.3 Objective of the study

The objective of the study was to unveil the state of environment with a view to establish current status of land degradation, forest degradation and deforestation in the country, identify contribution of different drivers and pressures and recommend appropriate responses.

1.4 Scope of the study

The study focused on the state of environment in relation to land degradation and deforestation. Information on state of environment was collected from all responsible parties amongst MDAs and LGAs. In addition, the study gathered information on the Government interventions in curbing the environmental challenges encountered.

PO-RALG provided contacts information of officials responsible for environmental management in LGAs. Information on environmental status was requested from all 185 LGAs in the country. The Study enquired additional information from the Vice President's Office specifically, from Division of Environment, key sector Ministries⁵ with a view to supplement or corroborate the information obtained from the LGAs. The following is the brief presentation of the roles of key players involved in this study

i) The Vice President's Office-Environment

The VPO provided the team with updated 'state of the environment' reports and National Environmental Action Plan and other related documents.

³ URT (2014). *Second State of the Environment Report*. Vice President's Office

⁴ Estimate by National Carbon Monitoring Centre in 2018

⁵ Ministry of Water, Works, Natural Resources and Tourism, Agriculture, Trade, Investment and Industries.

ii) Regional Secretariats

Regional Secretariats (RSs) were responsible for coordination of all matters related to environmental management in their respective regions. RSs provided the status on how they coordinated environmental issues in their regions.

iii) Local Government Authorities

Local Government Authorities (LGAs) provided status of all environmental issues in their respective areas of jurisdiction. LGAs through forest and environmental officers provided information on how they integrate environmental issues in their development plans and programmes; promoting protection and conservation of natural resources; and raising awareness of environmental management in their geographical jurisdiction.

iv) Tanzania Forest Services (TFS)

TFS provided information related to forest status and conservation strategies on their areas of jurisdiction.

1.5 Methods of data collection and analysis

The study employed the following methods of data collection; document review, Questionnaire and surveys, interviews, and physical observations as explained below.

Document Review

To find theoretical parameters of drivers, pressure, State, impact and response on deforestation, forest degradation and land degradation various documents were reviewed. Most of reviewed document were from different sectors, such as Vice Presidents Office, President's Office Region Administration and Local Government and the Ministry of Natural Resources and Tourism especially departments responsible for Forestry. Likewise, documents related to other thematic policies area such as, Environmental Quality, Climate Change, Biodiversity, Human Settlements and Infrastructure Development were reviewed.

The list of documents reviewed together with the purpose of reviewing each document has been shown in **Appendix C**.

Questionnaire

Parameters contained in the Drivers, Pressure, State, Impact and Response (DPSIR) framework were converted into questions. The questions aimed to find the extent of Driver, Pressure, Impacts, State and Responses. On each parameter respondents were supposed to rate the extent of these parameters in their areas, e.g. the respondent could rate on the scale of one to four (low, medium, High and extreme). The rank was 0-25% - Low, 25-50%-Medium, 50 -75% - High and 75-100% Extreme (Appendix D and E present the questionnaire used for land degradation, forest degradation and deforestation). Questionnaires were sent to all 185 LGAs. Timely responses on land degradation were obtained from 43 LGAs whereas responses on forest degradation and deforestation were obtained from 46 TFS districts.

Interviews

Interviews were conducted with Tanzania Forest Managers and selected LGAs (District, Municipal and City Councils) Officials responsible for Environmental Management. The Officials from the said offices were interviewed in order to confirm or clarify information from the documents reviewed. Also, interviews were carried out to get the views and opinions of actors in regard to state of environment in the country. The list of Officials interviewed is shown in **Appendix H**.

Physical Observations

Field visits were conducted in selected areas with extreme environmental degradation cases. Areas visited are as follows: Same-Kilimanjaro, Serengeti dc -Mara, Singida DC in Singida, Magu DC and Ilemela DC in Mwanza, Kyela DC in Mbeya, Nzega DC in Tabora, Ludewa DC in Njombe, Mvomero-Morogoro, Mbinga DC in Ruvuma and Liwale DC in Lindi. In these areas, team visited and verified the extent of problems identified by different stakeholders and responses from questionnaires.

1.6 Assessment Criteria

Assessment of the status of land degradation, forest degradation and deforestation in Tanzania was guided by the Drivers-Pressure-State-Impact-Response (DPSIR) analytical framework to provide a better understanding of the current state of the country's environment. The Framework describes the interaction between the society and the

environment in which key environmental issues were analysed as well as identification of interventions for informed decision making.

The framework serves as a tool to analyse the cause-effect relationship and the interaction between the society and the environment. It, analyses the drivers of environmental change, pressure exacerbating the change, state of the affected environment, impacts caused by changes on the environment and responses to address such changes.

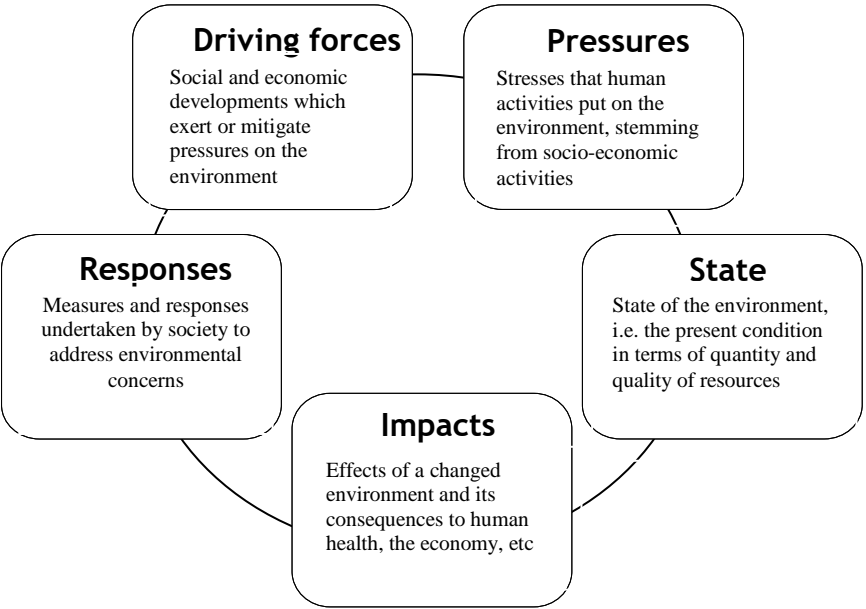


Figure 1: The DPSIR Model-Schematic view

1.7 Data Validation Process

PO-RALG, MNRT and VPO-Environment which are directly concerned with this report, were given opportunity to go through the draft report and commented on the figures and information being presented. They also, confirmed on the accuracy of the figures used and information being presented in this study report. Furthermore, information was crosschecked and discussed with experts on the management of environment (forest and land) to ensure validation of the information obtained.

1.8 Structure of the Report

The remaining part of this report is presented as follows:

Chapter Two presents policies, legal and institutional framework governing environment.

Chapter Three presents the status of forest degradation and deforestation and different initiatives towards forest degradation and deforestation.

Chapter Five is about status of land and different initiatives towards land degradation.

Chapter Six presents conclusion of the survey on land degradation, forest degradation and deforestation

Chapter Seven presents recommendations to address the challenges highlighted in this report.

CHAPTER TWO

POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK

2.1 Introduction

The study on the status of environmental degradation involved the analysis of different policies and legal frameworks that are relevant to land degradation, forest degradation and deforestation. This chapter presents policies, legislations and institutional framework governing environmental management in Tanzania.

2.2 Policies

The National Environmental Policy (NEP) 1997

The National Environmental Policy, 1997 provides an overall framework on the environmental management in the country. The overall objectives of the Policy, among others, are to conserve, protect and ensure sustainability and equitable use of country's natural resources. The Policy further emphasizes the need to conserve and enhance the natural resources including the biological diversity of the unique ecosystems of Tanzania. The policy identifies major environmental concerns in the country which call for urgent response. The identified concerns are:

- i. Land degradation;
- ii. Deforestation;
- iii. Loss of wildlife habitats and biodiversity;
- iv. Lack of accessible, good quality water;
- v. Deterioration of aquatic systems; and
- vi. Environmental pollution.

2.3 Sector policies

Analysis of the policies indicates that, there are several sectoral policies that support environmental management in Tanzania. Such policies are developed, not only to address challenges in respective sectors, but also to include provisions to address environmental matters in relevant sectors. The identified sector policies relevant to the study are as follows:

The National Forest Policy of 1998

The overall goal of this Policy is to enhance the contribution of the forest sector to the sustainable development of the country and the conservation and management of natural resources for the benefit of present and future generations. Likewise, the policy emphasises on biodiversity conservation; describes the importance of forest ecosystems for maintaining biodiversity and the threats to biodiversity. One of the main objectives in the policy focuses on ensured ecosystem stability through conservation of forest biodiversity, water catchments, and soil fertility.

The National Land Policy of 1995

The policy governs land tenure, land use management, and administration. It aims at promoting and ensuring a secure land tenure system and to encourage the optimal use of land resources without compromising the ecological balance. Among other things, the Policy advocates the protection of land resources from degradation, for sustainable development. The policy addresses several environmental issues such as land use planning, which take into consideration the land capability, ensures proper management of land resources, promotes resource sharing and multiple land use techniques in areas of conflicting land use, and involvement of community in resource management, land use and conflict resolution. The national land policy recognises the need for protecting environmentally sensitive areas.

2.4 Legislations

There are several legal and regulatory instruments relevant to environmental management in Tanzania. Some of them include the following;

The Environmental Management Act 2004 (EMA)

The EMA was enacted by the Parliament in 2004 and came into force in 2005. Before enactment of this law, environmental issues in Tanzania were governed by sectorial legislations. Among other things EMA 2004 establishes an administrative and institutional arrangement that is designated to facilitate administration of environmental matters across the country, from the local to national level. The Act provides a legal and institutional framework for the sustainable management of the environment.

Similarly, the Act outlines principles of environmental management, environmental impact and risk assessment, prevention and control of pollution, waste management, environmental quality standards, public participation in environmental decision making and planning; environmental compliance and enforcement; implementation of international instruments on environment; and implementation of the National Environmental Policy (NEP).

The Act also directs each local authority to prepare local environmental action plan identifying environmental problems prevalent in its area of jurisdiction. Among other things the Act mandates the Minister responsible for environment, the authority to declare any part of the land as environmental sensitive area and place the responsibility to manage those areas under the supervision of National Environmental Management Council (NEMC).

2.5 Other Sectorial Laws

The Forest Act of 2002

The Act provides for management of forests and requires carrying out of Environmental Impact Assessment (EIA) for certain development projects. The Act obliges establishment of forest management plans for all types of forests to ensure sustainable management in the long-term. The Act provides for designation of Community Forest Reserves, Mangrove Forest Reserves and encourages community based management. Harvesting and export of mangrove is permitted under license issued by the Division of Forestry and Beekeeping.

The Plant Protection Act No. 13 of 1997

The Act provides for prevention of the introduction and spread of harmful organisms, to ensure sustainable plant and environmental protection, to control the importation and use of plant protection substances, to regulate export and imports of plants and plant products.

The Land Act No. 4 of 1999 and the Village Land Act No. 5 of 1999

The fundamental principle of the Land Act and the Village Land Act is to ensure that land is used productively and that, any such use complies with the principles of sustainable development. Among others, the Land Act prohibits any development activities in environmentally sensitive areas such as wetlands and swamps and 60m

from the shoreline and riverbanks. The Village Land Act as well empowers the Village Government to have legal control on village land and its uses. This also includes prohibiting or minimising land problems like bush fires as well as land use related conflicts between farmers and livestock keepers/pastoralists.

2.6 Roles and Responsibilities of Key Actors

The Vice President's Office (VPO)- Environment

The responsibilities of environment issues are vested under the Vice President's Office- Environment. VPO through the Division of Environment implements NEP through relevant Ministries and Specialised committees. Mandates flow from the VP's Office to the LGAs. The VP's Office mainly assists Ministries, public bodies and private persons engaged in activities, which are likely to have a significant impact on the Environment. Hence, the Ministry has mainly coordinating and regulatory roles rather than an implementing role.

The National Environment Management Council (NEMC)

The National Environment Management Council (NEMC) was initially established in 1983 in terms of the National Environment Management Council Act No 19 of 1983. Its composition, powers and functions have been rearticulated in Part III (d) of the Environmental Management Act of 2004. NEMC is a corporate body with all the legal powers of such. Its objectives are to undertake the enforcement, compliance, review and monitoring of Environmental Impact Assessments (EIA), including facilitation of public participation processes in environmental decision-making.

NEMC is under the Vice President's Office, where its main role is to provide advice on all matters pertaining to environmental conservation and management. NEMC is the leading technical advisory, coordinating and regulatory agency responsible for the protection of the environmental and sustainable use of natural resources in Tanzania.

President's Office Regional Administration and Local Government (PO-RALG)

President 's Office Regional Administration and Local Government(PO-RALG) is responsible for coordinating the implementation of all governing Policies, Acts and Regulations regarding environmental

conservation at the Local Government Authorities; and Monitor the performance of all LGAs.

Local Government Authorities (LGAs)

Local Government Authorities (LGAs) are responsible to ensure that all activities along its administrative areas such as forest harvesting and land use practices are well managed.

Sector Ministries

These are responsible to ensure that all activities in their sectors are carried out while ensuring environmental sustainability. **Figure 2** presents the institution arrangement for environmental management under EMA.

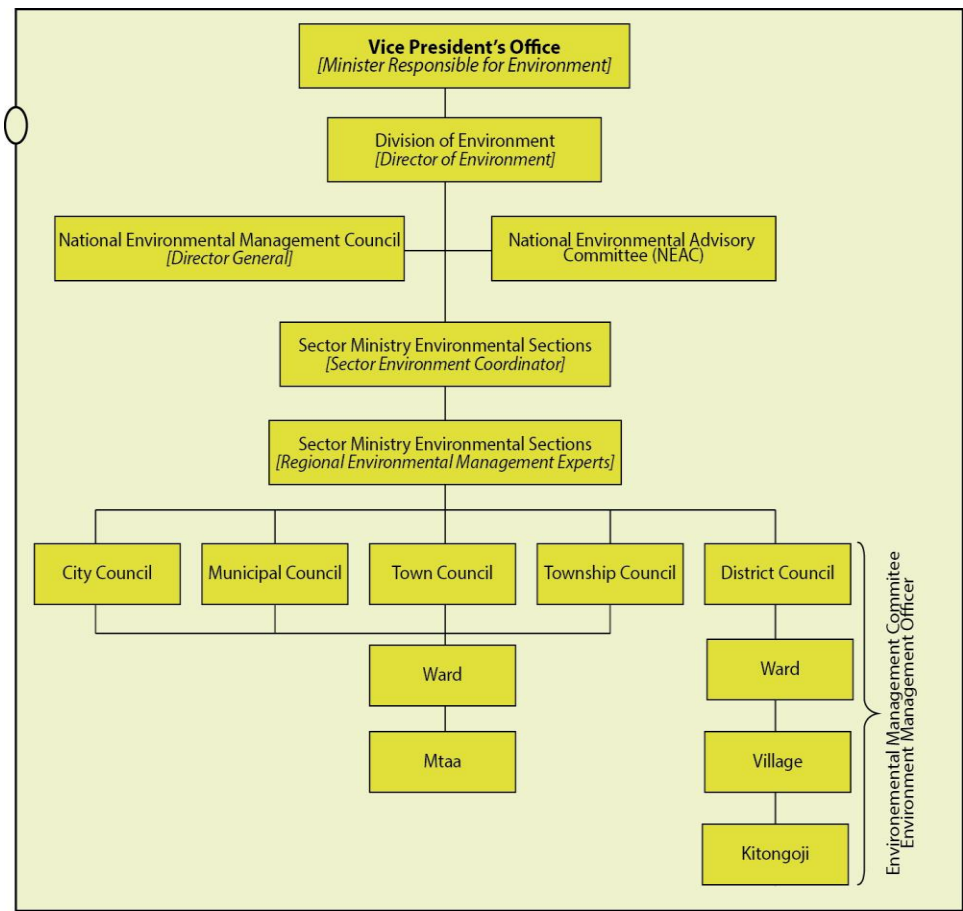


Figure 2: Institutional Arrangement

2.7 International Commitments in Environment

Environment being a global agenda, Tanzania cooperates with other nations in managing the global environment. In this regard, the United Republic of Tanzania is a party to various international treaties aimed at the protection of the environment. The treaties are divided between those having a universal application and those limited to the Africa Region. Some of the treaties and conventions on environmental issues that Tanzania is a part are presented hereunder;

- i. The African convention on the conservation of nature and Natural Resources, Algiers.
- ii. The convention on International Trade and Endangered species of Wild Fauna and Flora (CITES), Washington, 1973.
- iii. The Montreal Protocol on substances that deplete the Ozone layer, Montreal, 1987.
- iv. Convention on Biological Diversity, 1992.
- v. The United Nations Framework convention on climate change, 1992.
- vi. Convention to combat Desertification, particular Africa, Paris, 1994.
- vii. The Kyoto Protocol

International convention on natural resources and environment had an impact in the enactment and approach adopted in national legislation on similar matters in Tanzania. The Environmental Management Act, 2004, for example empowers the Minister responsible for environment to initiate and prepare legislative proposals for implementation of international or regional agreements concerning the management of the environment.

That includes identification of appropriate measures necessary for the implementation of agreements, which Tanzania is a party. The responsibility of creating mechanism for working closely with international and regional communities in ensuring a peaceful, healthier and better global environment is again vested in the Minister responsible for environment.

CHAPTER THREE

FOREST DEGRADATION AND DEFORESTATION

3.1 Background

This chapter presents key findings of the survey inform of drivers, pressure, state, impact and responses related to forest degradation and deforestation. Deforestation refers to the removal of a forest or stand of trees where the land is thereafter converted to non-forest use, for example, conversion of forest land to farms, ranches and settlements. Forest degradation is the long-term reduction of the overall supply of benefits from forest, which includes wood, biodiversity and other products or services.

3.2 Level of deforestation

Results of survey have shown that, the average rate of forest lost in 48 LGAs covered in this study amount into 236,711.2 hectares per year. According to the report of Tanzania National Carbon Monitoring Centre 2018 annual rate of forest lost is 469,420 ha. This is an increase from the value estimated in the state of environment report of 2014 which was 372,000 hectares per year. The rate of deforestation in the country is influenced by different drivers and pressures. Out of 48 LGAs 68.8 per cent reported that, there is an increased rate of deforestation in their areas in the past three years (For details refer to Appendix G).

3.3 Drivers of Forest Degradation and Deforestation

Analysis was done on responses from 48 LGAs to determine the extent to which different drivers contributed to deforestation. Based on the analysis of responses, several drivers have significantly contributed to various degrees of deforestation in the sampled regions. The highest contributor to deforestation is energy demand followed by Poverty, while the lowest contributor to deforestation being issues related to bio-fuel farming.

Table 1: Contribution of different driver to forest degradation and deforestation

Driver	Percentage of contribution
Energy demand	16.8
Poverty	16.4
Population Growth	15.1
Unsustainable Farming	14.1
Economic Growth	13.8
Other	8.8
Political and social	8.1
Biofuel	6.9
Total	100

Source: Survey Questionnaire, February 2018

Based on **Table 1**, energy demand combined with poverty, population growth, and unsustainable farming contributed to more than half of forest degradation. The proceeding sections provide explanations for each driver in all districts.

3.3.1Energy demand (charcoal, firewood)

Findings revealed that majority of people could not afford other sources of energy such as electricity and gas due to poverty. This is an indication that, the future demands for charcoal and firewood was going to increase in both rural and urban areas. This would certainly increase the rate of forest degradation and deforestation.

According to the study findings, majority of LGAs indicated that deforestation and forest degradation was highly driven by Energy Demand, while few (12 percent) indicated that there was low contribution of energy demand to deforestation

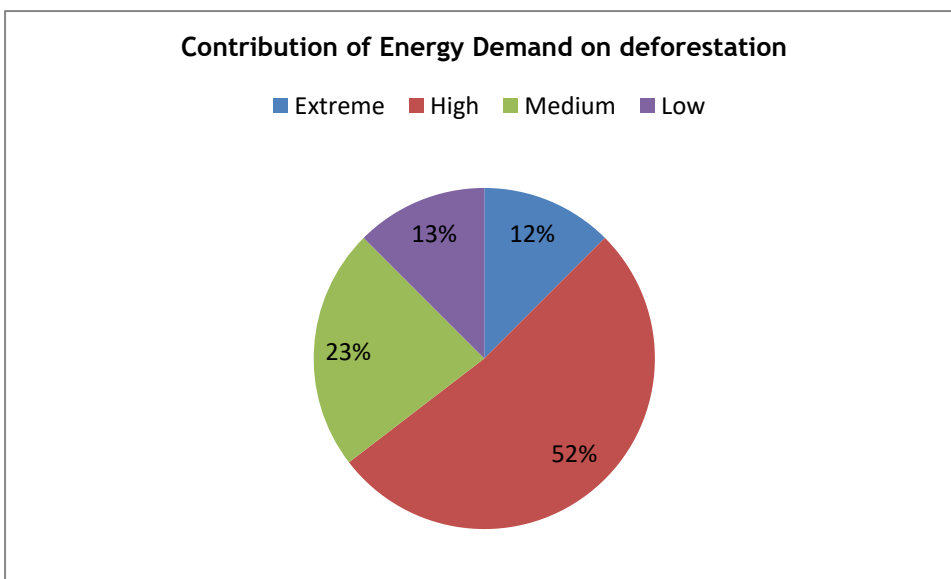


Figure 3: Contribution of Energy Demand to Deforestation
Source: Survey Data

LGAs experienced forest degradation and deforestation caused by unsustainable farming practises including uncontrolled burning of forest and forest clearance and incidences of shifting cultivation. The forests were cleared to pave way for new farms.

During the site visit which was conducted in Nzega forty bags of charcoal were caught in less than three hours during patrol which was conducted by TFS officers in refer to Photo1.

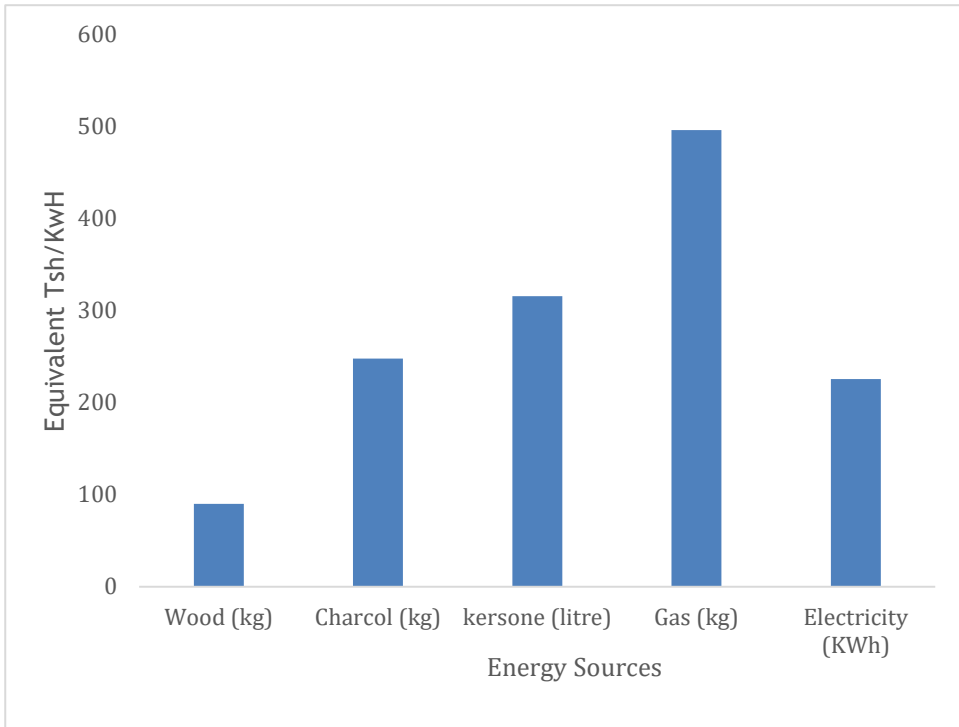


Figure 4: Price of different energy sources

Figure 4 indicates various prices of energy sources. It indicates that wood has the lowest price while gas has the higher price. People with low incomes tend to prefer more the use of wood and charcoal as source of energy. And, this has increased more pressure on the forest.

Photo 1: Bags of charcoal caught during patrol in Nzega



Photo 1: shows bags of charcoal which were caught only on one day of patrol in less than three hours.

3.3.2 Poverty

According to the interviewed forest officers in the LGAs and TFS, livelihoods of most people in both urban and rural areas depend on forest and other natural resources. Majority of people especially in rural areas are poor and therefore their economic activities such as grazing, charcoal production and firewood collection and agricultural activities are directly connected to degradation of forest and deforestation.

Findings also revealed that deforestation and forest degradation was highly driven by Poverty (**Figure 5**).

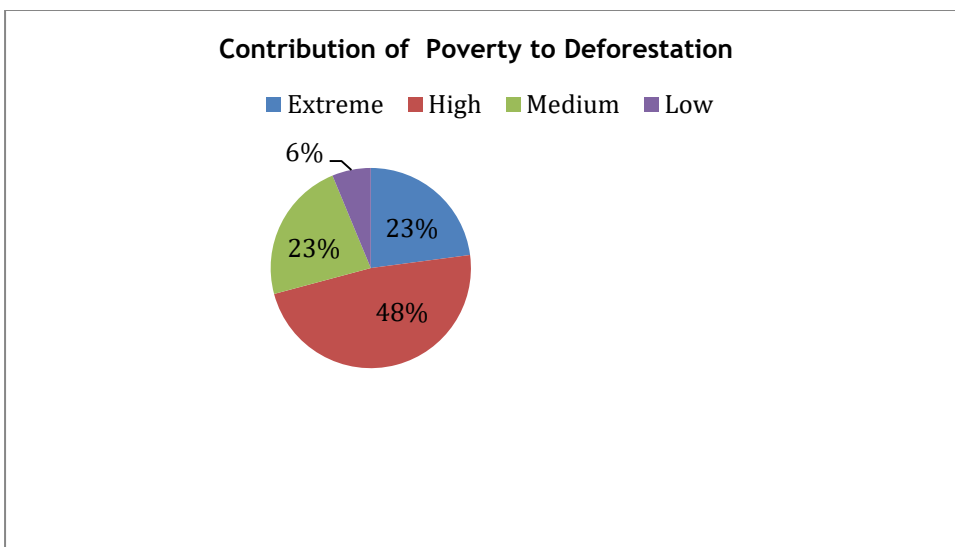


Figure 5 Contribution of Poverty on Deforestation

Source: Survey Data

Figure 5 indicates that 23 per cent of LGAs regarded poverty as an extreme contributor to forest degradation in their areas. Some of these LGAs include Ludewa, Itilima, Biharamulo, Kilindi and Mpwapwa. In addition, 48 per cent ranked the contribution of poverty as high, 29 per cent reported it as medium, whereas 6 per cent of LGAs reported poverty contribution to deforestation to be low, as reported by Malinyi, Igunga, and Kibondo District councils.

3.3.3 Population growth

Regarding population growth, responses vary among the LGAs. About 12 per cent of LGAs indicated that population growth drives deforestation at extreme levels. A considerable proportion (52 per cent) of LGAs considered the impact of population growth on deforestation to be high⁶. Other LGAs (23 per cent) including, among others, Itilima and Mbulu ranked medium⁷. The remaining 13 per cent of LGAs such as Urambo and Kilwa indicated that population growth has low influence on the problem.

Absence of effective and implementable village land use plans coupled with ineffective forest management mechanisms leads to establishment of human settlements in forest and woodlands plus

⁶ Between 50 to 75%

⁷ Between 25 to 50%

rampant tree cutting. Population increase is an influencing factor. The impact of population growth may particularly be significant especially where the population depends on natural resources, particularly agriculture. The impact may be more felt if the concerned population is also practicing unsustainable farming.

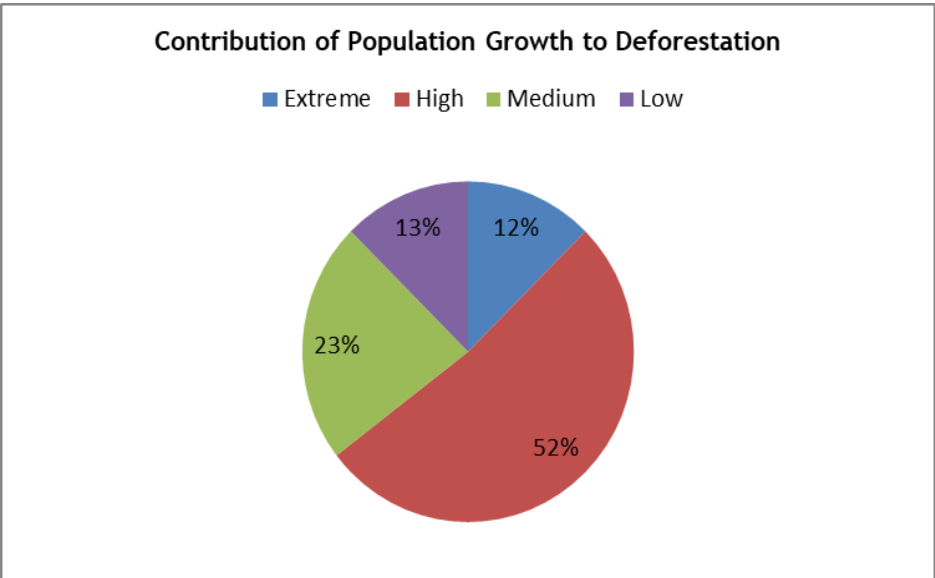


Figure 6 Contribution of Population Growth to Deforestation
Source: Survey Data

Given the facts in **figure 6**, it is inevitable that population will continue to grow. If upfront plan is not made, population increase will lead to more pressure on the use of forest resources and result into more problems of forest degradation and deforestation. In addition, if measures are not properly taken, with population increase there is high risk of people to encroach the reserved forest land.

3.3.4 Unsustainable farming practices

According to survey 17 per cent and 31 per cent of LGAs reported unsustainable farming practices to have high and extreme rates of contribution to deforestation and forest degradation respectively. Examples of these LGAs includes such as Serengeti, Kilwa and Ludewa. Also, 35 per cent of LGAs reported that, an unsustainable farming practice has medium contribution to the problem related to deforestation and forest degradation in their area. Only 17 per cent of LGA such as Ilala and Misenyi reported unsustainable farming practises

to have low contribution on the level of deforestation and forest degradation.

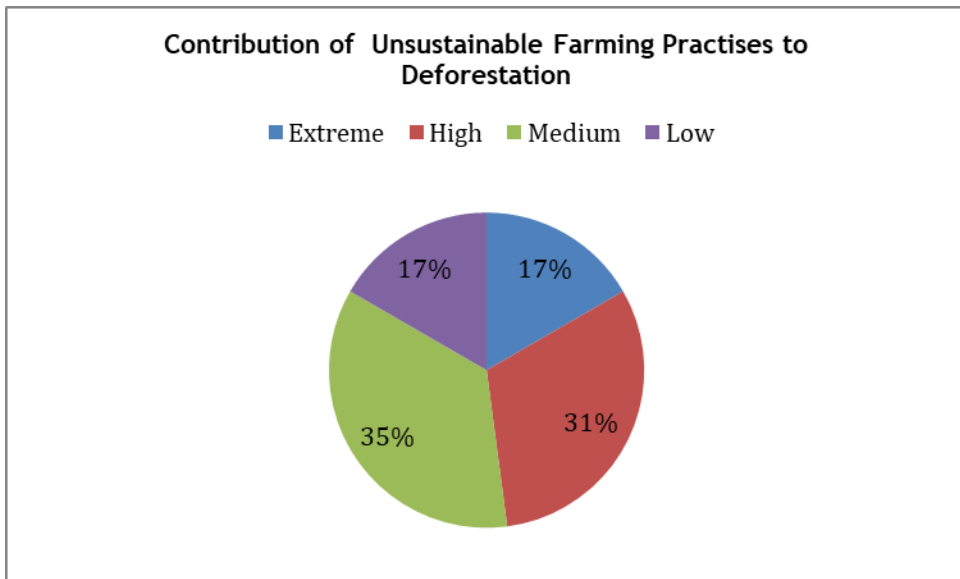


Figure 7 Unsustainable Farming Practises to Deforestation

Source: Survey Data

Based on the survey, LGAs faced with unsustainable farming practises are experiencing uncontrolled burning of forest and forest clearance and incidences of shifting cultivation. These were some of contributing factors of forest degradation and deforestation.

3.3.5 Economic Growth (construction, agricultural, timber harvesting and industrialisation)

Economic activities such as construction, agriculture, timber harvesting and industrialisation have been key drivers to deforestation and forest degradation. In the survey conducted, 15 per cent of LGAs showed that, economic growth lowly contributed to deforestation and forest degradation while 42per cent of LGAs reported a medium scale. The remaining LGAs showed that, economic growth has extremely and highly influence on the problem. In LGAs such as Nkasi and Ilala contribute to12 per cent and 31 percent respectively.

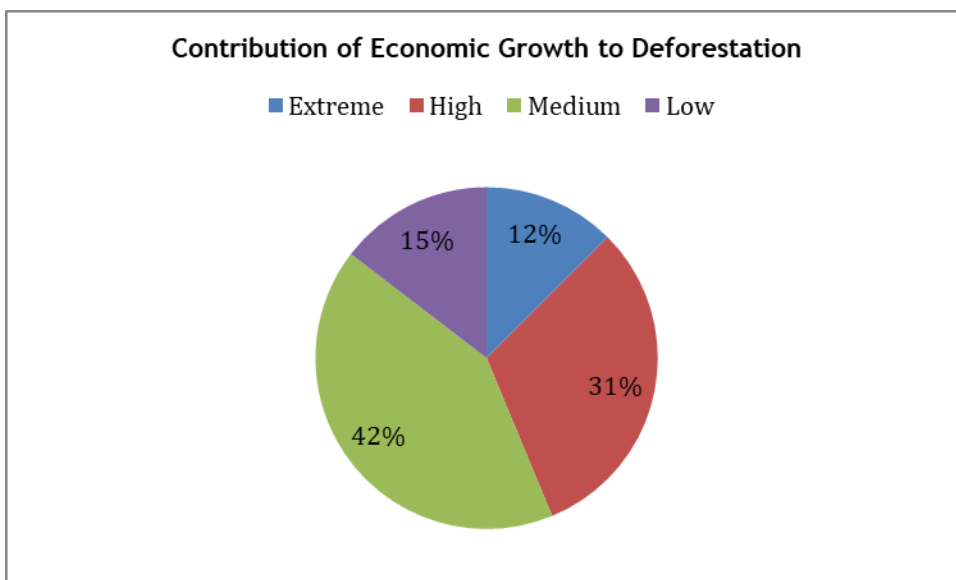


Figure 8 Contribution of Economic Growth to Deforestation

Source: Survey Data

Considering the vision of the Government to nurture for industrialisation in the next five years, the demand for wood products is expected to increase; these will be used as important resources to feed into the production chain. Should there be no appropriate control, it is expected that economic growth will lead to acute forest degradation and deforestation.

Photo 2: Cleared part of the forest for agriculture



Photo 2: Part of a forest at Kichonda village, in Liwale District which was cleared for agriculture purposes. (Photo was taken by auditors on February 2017)

3.3.6 Political and social instability

About 75 per cent of LGAs, including, Mtwara and Ulanga reported that Political and social instability has low⁸ contribution towards deforestation in their areas while extreme, high and medium contribution of political and social instability were reported by 13, 8, 4 percent of LGAs respectively. The LGA ranked extreme political and social instability were Kibondo.

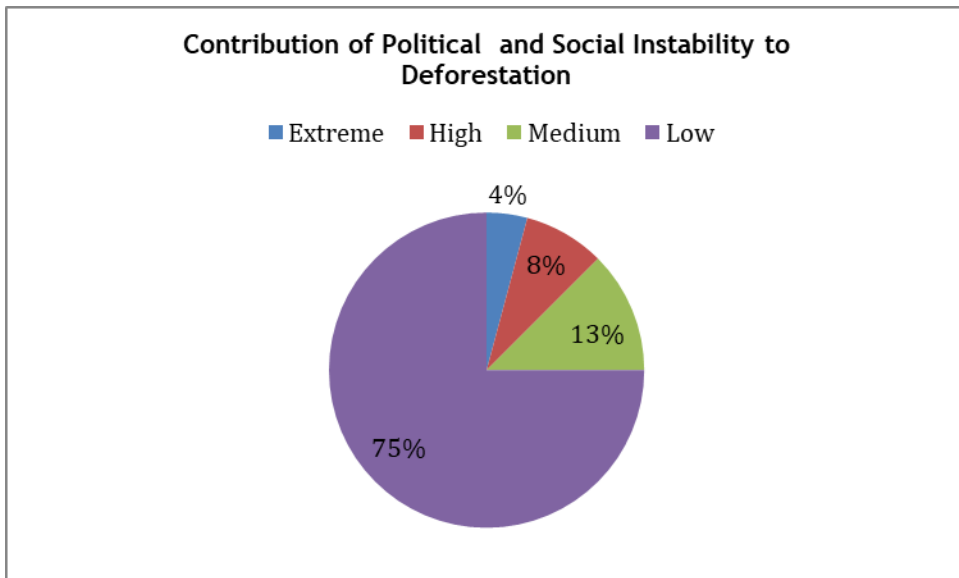


Figure 9 Contribution of Political and Social Instability to Deforestation

Source: Survey Data

The study has shown that most parts of the country which were affected with the problem linked it to political and social unrest were those which were bordering with countries reported with political instability resulting in the influx of refugees who clear forest for construction camps, fuel wood and agriculture. Examples of the districts are Kakonko and Kibondo both in Kigoma region.

3.3.7 Bio-fuel crop farming

Most of the LGAs (86 per cent) responded to questionnaires during the survey reported that Bio-fuel crop farming had low contribution to forest degradation and deforestation, for instance in Lushoto, Madaba

⁸Between 0-25%

and Kibiti. Ten per cent of LGAs ranked biofuel crop farming as a medium driver to deforestation. The remaining 4per cent of LGAs indicated that Biofuel crop farming has contributed to forest degradation and deforestation to different rates, including that two per cent of LGAs such as Nkasi rates biofuel contributing to extremely and high.

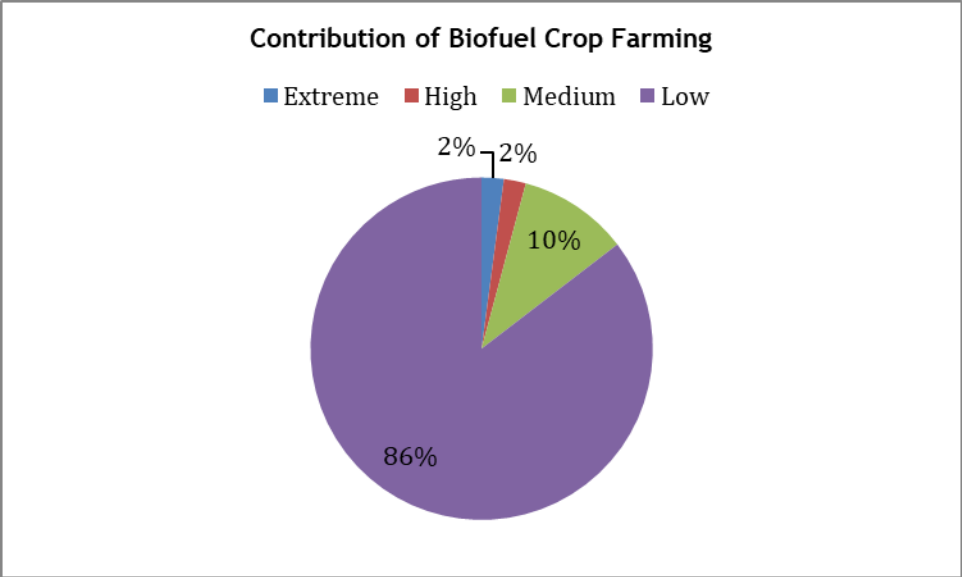


Figure 10: Contribution of Biofuel Crop Farming to Deforestation
Source: Survey Data

Analysis of the findings presented in section 3.3.7 suggests that biofuel investment has been increasing in demand especially for jatropha, sugar-cane, oil palm and maize. To be able to plant these biofuel, will require removal of natural forest and intern will increase the erosive power of the land.

3.4 Pressure on Forest Degradation

The study found that there were different activities that added more pressure on forest degradation and deforestation and as presented in Table 2.

Table 2: Percentage of contribution of different pressure to deforestation

Pressure	Percentage of contribution to deforestation
Bush Fires	18.9
Overgrazing	17.7
Climate Change	17.6
Enforcement	16.9
Land Tenure	16.6
Others	12.3
Total	100

Source: Filed data, 2018

Table 2 shows, that most important pressure leading to deforestation in Tanzania was bushfires followed by overgrazing, climate change and lack of enforcement, while land tenure was rated lower compared to other factors.

3.4.3 Bushfires as a cause of forest degradation and deforestation

Wildfires are a common problem in many parts of the country. All LGAs covered in this survey indicated presence of bushfire incidences in their areas. About 13 per cent of LGAs such as Ludewa and Kilwa rated this problem as extreme, 29 per cent as high, while the remaining 35 per cent and 23 per cent rated this problem as medium and low respectively (Figure 11). LGAs such as Meatu and Chunya ranked low presence of bushfires.

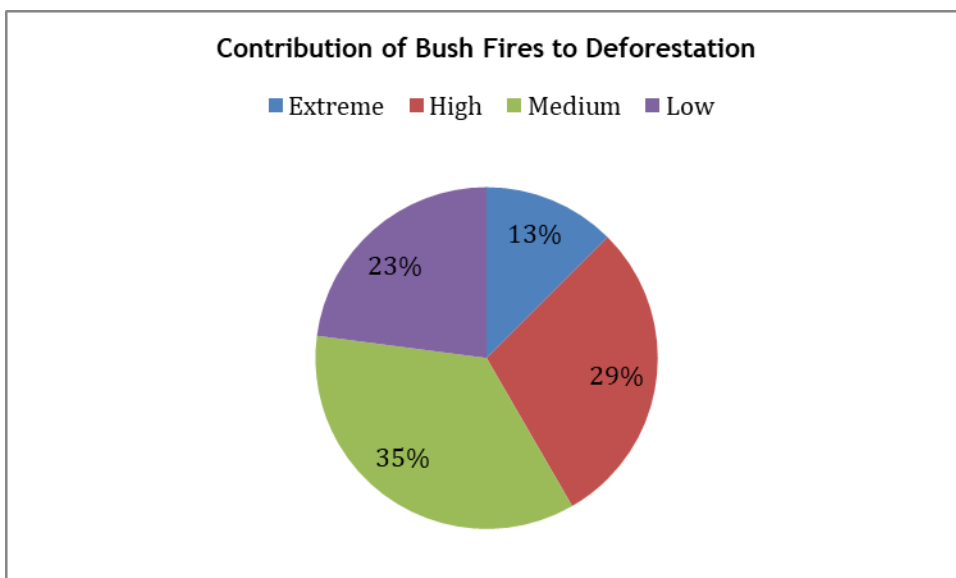


Figure 11 Contribution of bush and wild fires on deforestation and forest degradation

Source: Survey Data

In addition to wild fires, other causes of fire incidences are connected to the clearing of the farmland, and other uncontrolled human activities such as hunting, honey hunting, to eradicate tsetse flies and ticks, or to induce growth of fresh grass in rangelands.

3.4.2 Overgrazing and nomadic pastoral practices:

The results of survey showed that all LGAs declared that overgrazing has been contributing to deforestation and forest degradation in their areas with the following levels; 11per cent of the LGAs indicated that overgrazing has been contributing to deforestation and forest degradation in their areas at extreme level31per cent of LGA at high level,23 percent of LGA at medium level and 35per cent of LGA such as Karatu and Kilwa rated it at low level.

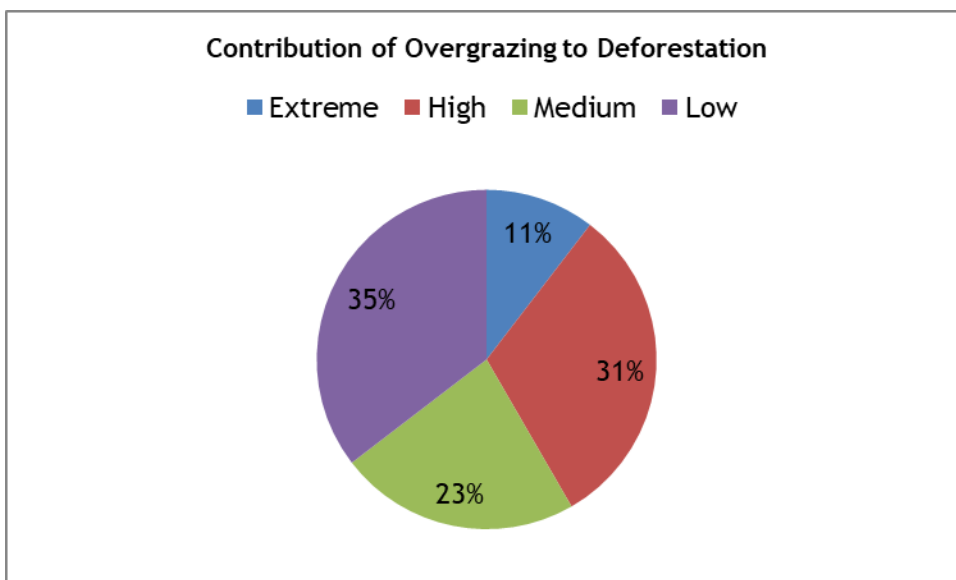


Figure 12: Contribution of Overgrazing to Deforestation

Source: Survey Data

The variations presented in **figure 12**, is due to the fact that, in most LGAs there was no specified grazing areas. Grazing was left to be done on the no-reserved land; this land was left as an open access to everyone. In turn this land is subjected to high pressure of grazing and other pastoral practices.

Although no LGA had an established carrying capacity, but given the experienced impacts related to number of castles and other animals, some LGAs had a lot of animals more than the carrying capacity of the LGA.

3.4. Climate change

Climate change impacts in terms of drought and floods can result into degradation of forest resources. Drought affects trees directly by slowing or arresting growth, and causing injury or death. It also affects them indirectly, by increasing their susceptibility to wildfire, insect pests and disease. While floods, flooding may cause direct damage to trees by changing soil conditions, interrupting normal gas exchange between trees and their environment, sedimentation, and physical damage.

Several LGAs reported to have been impacted by climate change at different scales. About 4 per cent of the LGAs reported extreme level

of forests degradation being associated with climate change, for instance, in Mpwapwa district, whereas 36 per cent of the LGAs reported high impacts, as represented by Ukerewe District. About 29 per cent of LGAs reported to have had inadequate experience regarding the impacts of climate change on forest degradation. The remaining 31 per cent of LGAs, such as Chunya and Kibondo, claimed to have experienced minimum levels of forest degradation related to climate change impacts.

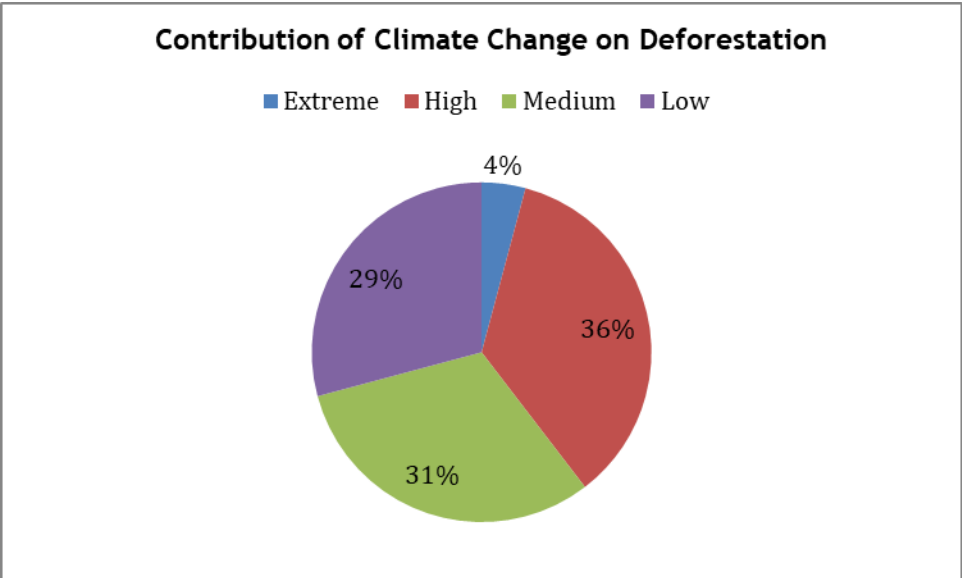


Figure 13: Contribution of Climate Change on Deforestation
Source: Survey Data

Regardless of various responses shown by LGAs on the pressure of climate contribution to forest degradation, the impacts of climate change affect also the pastoralists and farmers who then moved into putting more pressure on forest Land.

3.4.1 Inadequate enforcement and compliance to relevant laws and regulations

Pressure on the use of natural resources needs appropriate legal instruments such as laws, regulations, and policies for protection. The study conducted showed that the impact level of forest degradation and deforestation varied from medium to extreme because of inadequate enforcement and compliance to relevant laws and regulations as shown in the figure below.

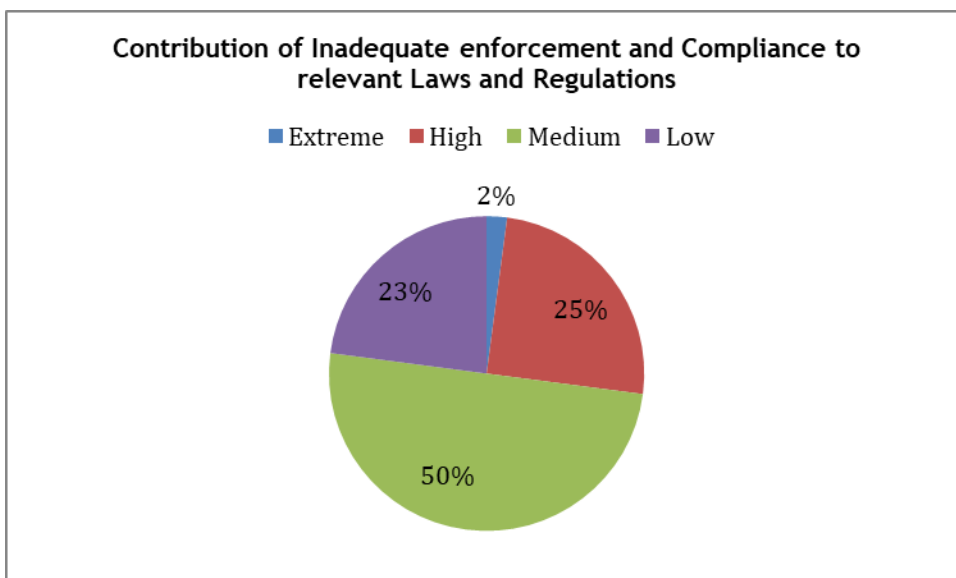


Figure 14 Contribution of Inadequate Enforcement and Compliance to relevant Laws and Regulations.

Source: Survey Data

Figure 14 shows that, inadequate enforcement of laws and regulation was a source of increased deforestation in their areas. About 2 per cent of LGAs such as Mpwapwa showed that contribution of inadequate enforcement to this problem is extremely leading to deforestation pressure, while other 25 per cent of LGAs rated it as a high problem.

About 50 per cent of the LGAs showed that issues related to inadequate enforcement had medium contribution to deforestation in their areas. The remaining 23 per cent of LGAs, including Temeke, Songwe and Momba, among others, showed that inadequate enforcement and compliance to relevant laws and regulations contributed very low to deforestation.

3.4.4 Land tenure

The survey results showed that 2 per cent of the LGAs such as Serengeti ranked land tenure high, 35 per cent ranked extreme as a pressure of forest degradation and deforestation (**Figure 15**). About 25 per cent ranked it as medium, while 38 per cent of LGAs, such as Makete and Songwe, ranked low the problem related to land tenure. LGAs are responsible in managing non-reserved land which is on their areas of jurisdiction. In this type of land, forests are often left as an

open access resource to anyone, because of lack of farm ownership or user right.

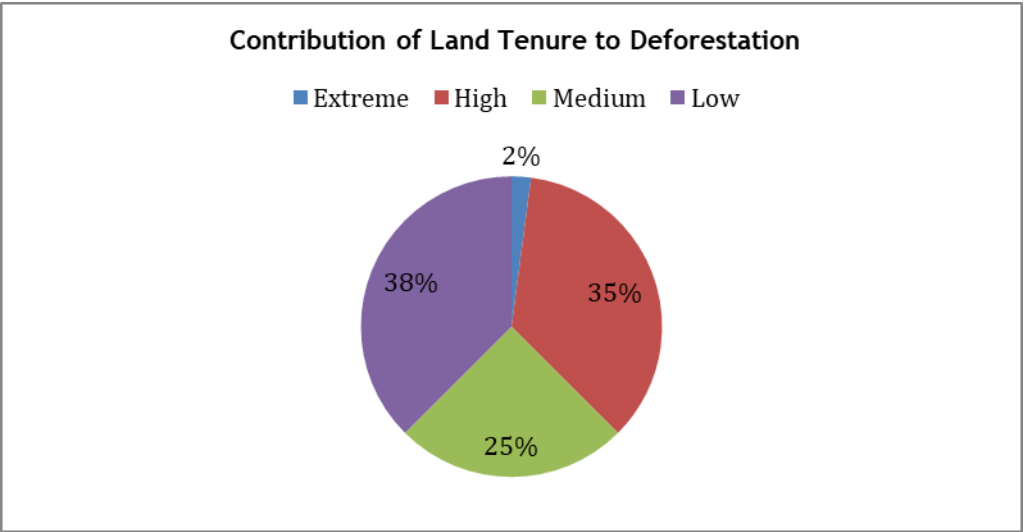


Figure 15 *Contribution of land tenure on deforestation*
Source: Survey Data

3.5 State of Environment

Results showed that between 2014 and 2017, the estimated annual amount of lost forest was 710133 ha in the selected LGAs. The amount of forest loss has been increasing every year as indicated in **figure 16**.

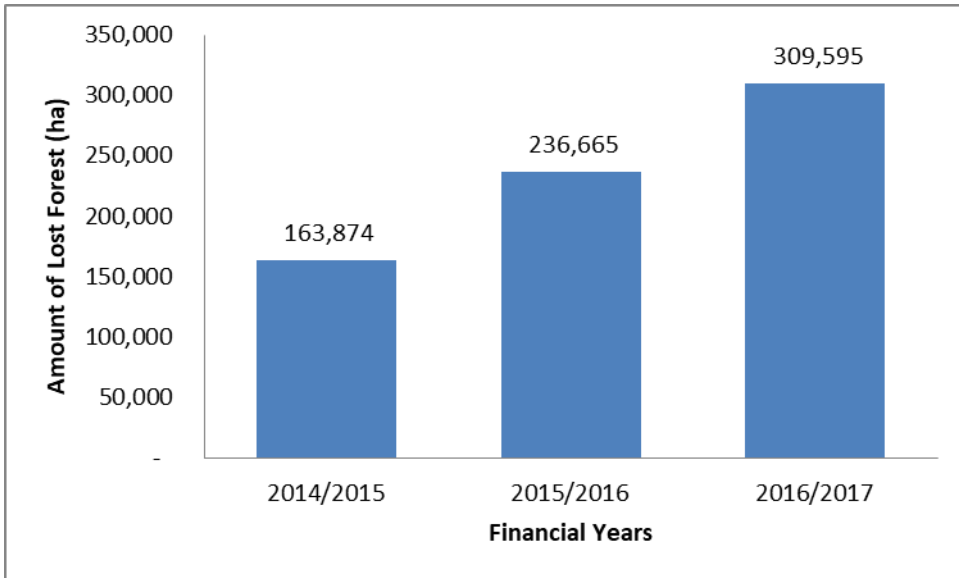


Figure 16 State of deforestation and forest degradation in five LGAs
Source: Survey Data

Photo 3Part of Vumari forest in Same Kilimanjaro



Photo 3: Part of Vumari forest in Same Kilimanjaro affected by deforestation

3.6 Impacts of forest degradation and deforestation

Results showed that several impacts noted in the LGAs which were associated with forest degradation and deforestation (Table 3). LGAs reported impacts related to loss of biodiversity, loss of habitat, loss of amenity and soil erosion. Excessive cutting of trees also, impaired the beauty of some places because of greenish land cover was removed.

Table 3: Impact of deforestation

Impacts of forest degradation and deforestation	Percentage of contribution to the total impacts
Loss of biodiversity	11.8
Economic Loss	10.4
Soil erosion and siltation of watercourses	10.4
Loss of habitat	10.0
Drought/floods	9.7
Loss of amenity	9.0
Desertification	8.8
Wildlife -Human conflicts	8.2
Non-indigenous species	8.2
Acidification	6.9
Eutrophication	6.6
TOTAL	100

Source: Survey Data

Table 3 presents the impacts of deforestation, the notable impacts are those related to Loss of biodiversity, Economic Loss and Soil erosion and siltation of watercourses, while Acidification and eutrophication showing low impact in association with forest degradation.

3.6.1 Loss of biodiversity

Loss of biodiversity was reported to be extreme in 4 per cent of LGAs, particularly in Mpwapwa and Serengeti, and high in 46 per cent of all LGAs. In addition, 40 per cent of LGAs reported medium level while 10 per cent reported low level of this impact. Loss of biodiversity is manifested due to logging of valuable timbers such as Mninga (*Pterocarpus angolensis*), Mvule (*Milicia excelsa* (*Chlorophora excelsa*)), and Mpingo (*Dalbergia melanoxylon*) and several others.

3.6.2 Economic Loss

LGAs indicated to have experience acute economic impacts due to forest degradation and deforestation. Only 2 per cent of LGAs reported extreme economic problems while 50 percent rated medium. About, 29 percent reported high, and only 19 percent reported low. Deforestation affected water sources and water sheds and as a result LGAs noted reduction of water flows which could further affects other key economic activities such as power generation and agriculture.

Interview conducted with District Forest Managers in the visited LGAs revealed that traditional methods of making charcoal are inefficient as they use more trees while little charcoal is produced. In addition, most of the people who cut trees for charcoal do not have permits hence they do not pay the needed fees.

3.6.3 Soil Erosion and Siltation of Watercourses

Results showed that, 9 per cent of LGAs reported that they experienced extreme soil erosion and siltation of water sources; with excessive soil erosion the receiving water bodies receive nutrient causing eutrophication. Further, about 29 per cent indicated High problem while 31 reported to experience medium and 31 counted the problem as low. For instance, the study found that, Mgori River in Singida region faced effects of siltation. In addition to increase an erosive power, LGAs also manifested the increased flood and drought, because of the increased bare land, the speed of flooded water has been increased as well as its related consequences.

3.6.4 Loss of habitats

A considerable proportion (58 per cent) of LGAs such as Kibondo, Monduli and Malinyi claimed to have high rate of loss of habitat in their districts, which is the greatest threat to some wildlife species. Habitats continue to disappear as trees are increasingly being harvested for human consumption and cleared to make way for agriculture, housing and roads. Examples of notable impacts include the increased conflict of human and wildlife in which wild animals such as elephants encroach the farms destroy crops, because their habitats have been destroyed.

3.7 Response towards impacts

Majority of LGAs (96 per cent) reported to have established mechanisms for preventing and combating forest degradation and deforestation. There are different initiatives undertaken in the districts to respond to the effects of deforestation, some of which are presented hereunder.

3.7.1 Tree planting campaign

Majority of LGAs (96 per cent) indicated to have tree planting campaigns except for two LGAs, Mpwapwa and Bagamoyo. In few visited LGAs, like Magu and Nzega TFS officers in collaboration with LGAs have established their tree nurseries and distribute them to public offices like schools, hospitals, churches and other public offices to plant them and provide them with best watering techniques to help grow.

Photo 4 Images of tree Nurseries in Magu



Photo 4: Tree nurseries preparing tree seedlings as part of the tree planting campaigns in Magu district

3.7.2 Awareness programmes/sensitization

Most of the LGAs (96 per cent) of have established awareness programmes against forest degradation and deforestation to minimize bad practices that degrade environment except for the two LGAs which are Mpwapwa and Bagamoyo. This could be due to lack of financial resources and human resource. Despite the awareness programme there is still numerous cases of encroachment in forest reserves. Examples of serious encroachment are in Kagongho forest reserve in Nzega, Ziba forest reserve in Igunga, Mng'hola Forest in Singida.

3.7.3 Participatory forest management

Almost all the sampled LGA reported to have participatory forest management arrangements except Malinyi district. From the visited LGAs strong cooperation were observed in different LGAs between officials and Local communities. Examples of strong working PFM were in Same District council, particularly in Marwa village where the communities have established measures to control forest use; and in several cases LGA officials and villagers conduct patrols and enforcement strategies.

CHAPTER FOUR

LAND DEGRADATION

4.1 Introduction

Land degradation is any undesirable destruction to the land in which the value of biophysical environment is affected by a combination of human-induced processes acting upon the land. This chapter presents key driver, pressure, state, impact and responses related to Land degradation.

4.2 Status of land degradation

The survey showed that about 54 per cent of the LGAs showed that the level of land degradation was medium, while only 9 per cent showed that land was extremely degraded while the remaining 37 per cent showing low impact as shown in Figure 17. Medium degradation implies that degradation is apparent but rehabilitation is still possible with considerable efforts.

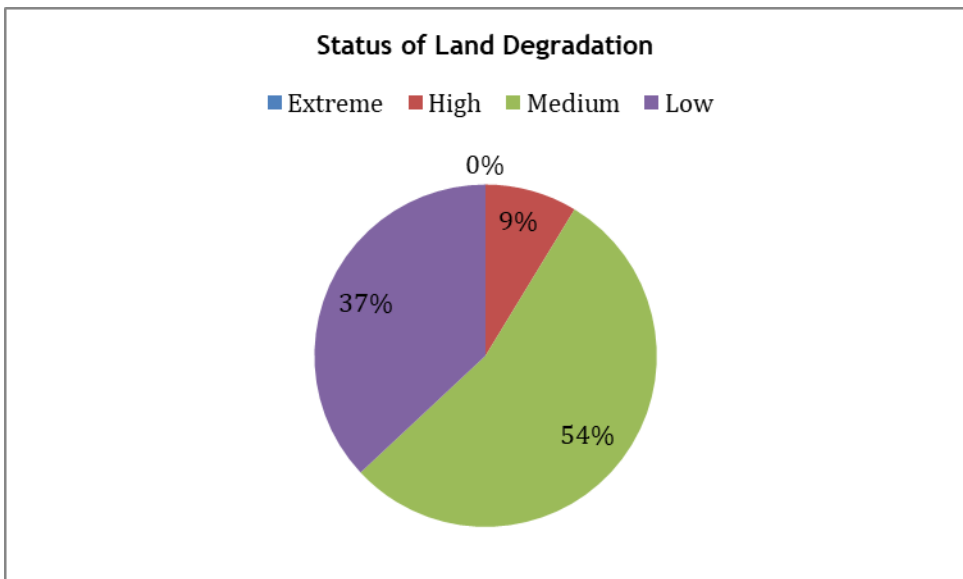


Figure 17 Status of land degradation

Source: Survey Data

4.3 Driver

The study found that drivers for land degradation were mainly associated with human actions and decisions on natural environment. These actions created changes on the natural systems. Likewise, the study found that there were inadequate land-use management, unsustainable farming practice, and rapid increase of population, climate change and poverty in the selected LGAs. Table 7 presents the responses on the contribution of different drivers in land degradation, as reported by the LGAs.

Table 4: Contribution of Different Drivers in Land Degradation

Drivers	Percentage of contribution of drivers in land degradation
Inadequate Land-Use Management	14.8
Unsustainable Farming Practice	14.5
Deforestation and Forest Degradation	14.4
Climate change	14.0
Inadequate Livestock Infrastructure	12.8
Population increase	11.7
Poverty and Cultural Believe Beliefs	11.4
Political Instability (influx of r Refugee)	6.4
TOTAL	100

Source: Survey Data

4.3.1 Inadequate Land -use Management

According to **Table 4**, LGAs ranked inadequate Land-use management as the highest driver to land degradation in their area.

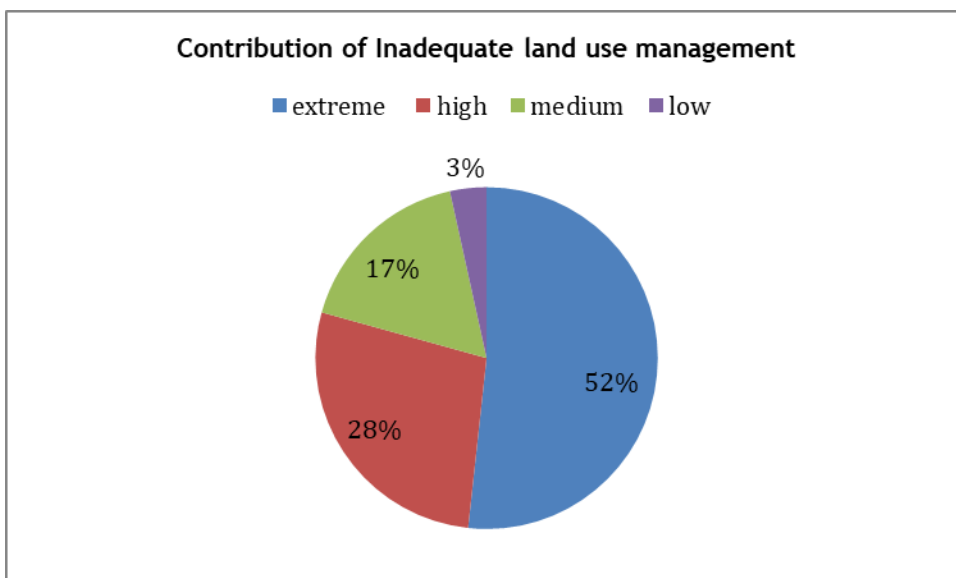


Figure 18: Contribution of Inadequate Land use management to Land Degradation

Source: Survey Data

About half of the LGAs (52 per cent) ranked inadequate land-use management as the highest driver to land degradation in their area. This was particularly raised as a concern in LGAs such as Chato, Moshi, Songwe and Musoma. About 28 percent of LGAs ranked this problem as high while 17 per cent ranked medium. The remaining 3 percent of LGAs ranked low, especially in Rungwe.

Inadequate land-use management, as a driver has several indicators noted in the LGAs. For example, uncontrolled economic activities and lack of appropriate technology, uncontrolled mining activities which, among other things, leave waste heaps of soil, rocks, and abandoned pits. All these contribute to degradation of the physical environment.

Photo 5: Unrehabilitated land after completion of mining activities



Photo 5: Part of the Land which was left with no rehabilitation after mining activities at Mkako village in Mbinga district. (Photo was taken by auditors on February 2018)

In addition, the study found that inadequate land use management was more supported by existing land tenure system present in the country. Most of the land in rural areas was not assigned property right to people by the Government, therefore, remained as an open access land. Being an open access, it allowed uncontrolled cultivation and grazing. Lack of ownership of land hindered people to engage in conservation practice.

4.3.2 Unsustainable farming

Several LGAs (38 per cent), for example Chato and Meru, indicated that land degradation in their areas is extremely driven by unsustainable farming, whereas 48 per cent of LGAs ranked it as high (Figure 19). The remaining 10 per cent and 4 per cent of LGAs ranked medium and low respectively. Among the LGAs that ranked low was Rungwe district.

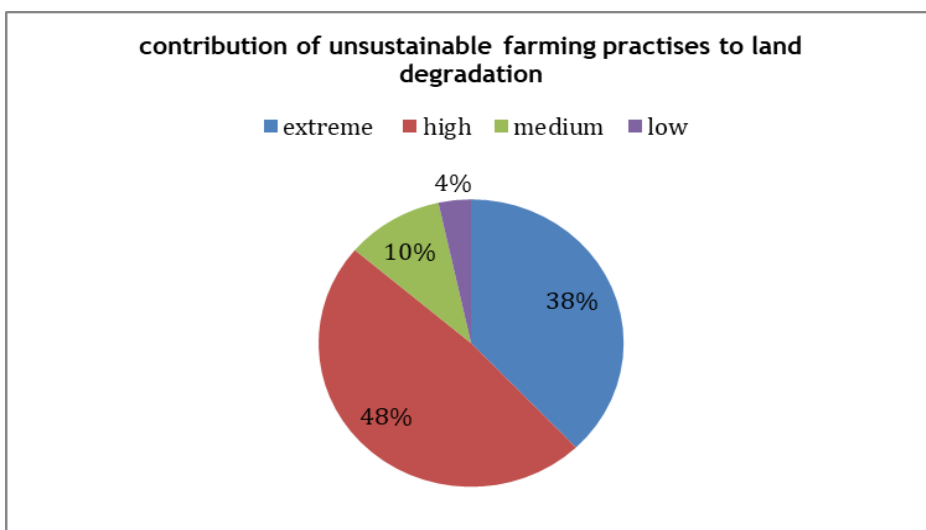


Figure 19 Contribution of farming practises to land degradation

Source: Survey Data

The study found that unsustainable farming as a driver of land degradation is visible in many parts of the country. Practices such as over cultivation and shifting cultivation are experienced in many parts of the LGAs covered in this survey. For instance, along Uruguru mountains in Morogoro farmers tend slash grass and burn to kill grass and pest.

4.3.3 Deforestation and Forest Degradation

In this survey 42 per cent of LGAs such as Kasulu and Babati ranked deforestation and forest degradation to be the driver that lead to land degradation at extreme level, while 41 per cent LGAs ranked this problem as high (Figure 20), meaning it is the second most important cause of land degradation. About 10 per cent of LGA has ranked deforestation and forest degradation as medium level, while 7 per cent ranked it as low, as shown by Meru and Rungwe.

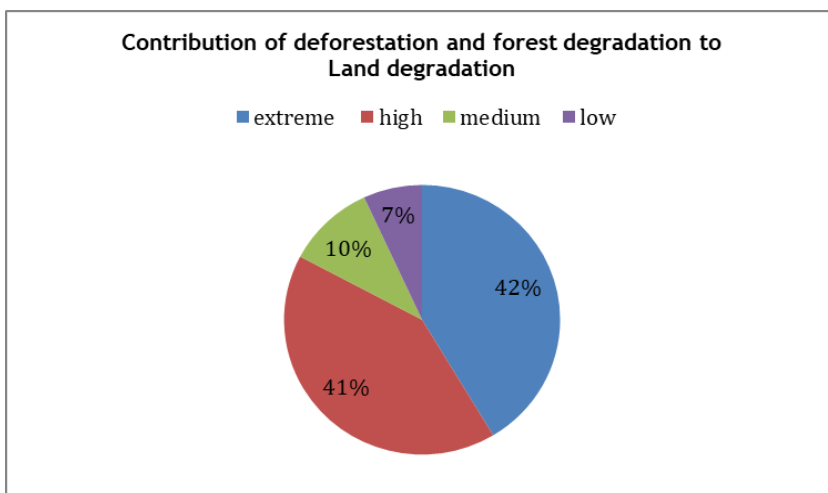


Figure 20: Contribution of forest degradation and deforestation to land degradation

Source: Survey Data

It has been urged for instance that while the biofuel investment has been increasing in demand, especially for Jatropha, sugar-cane, oil palm and maize, such investments have involved removal of natural forests, which in turn will increase the erosive power of the land, leading to land degradation.

4.3.4 Climate change as a driver to land degradation

Climate change was reported by LGAs to have a significant contribution to land degradation. About 35 per cent of LGAs (Figure 21) such as Misungwi, Mwapwa and Ileje stated that land degradation in their areas is extremely driven by climate change. Another 48 per cent of LGAs ranked climate change at the high level, while 10 percent ranked climate change as the medium driver land degradation. The remaining LGAs (7 per cent) ranked climate change as the lowest driver of land degradation, for instance in Serengeti and Kasulu districts.

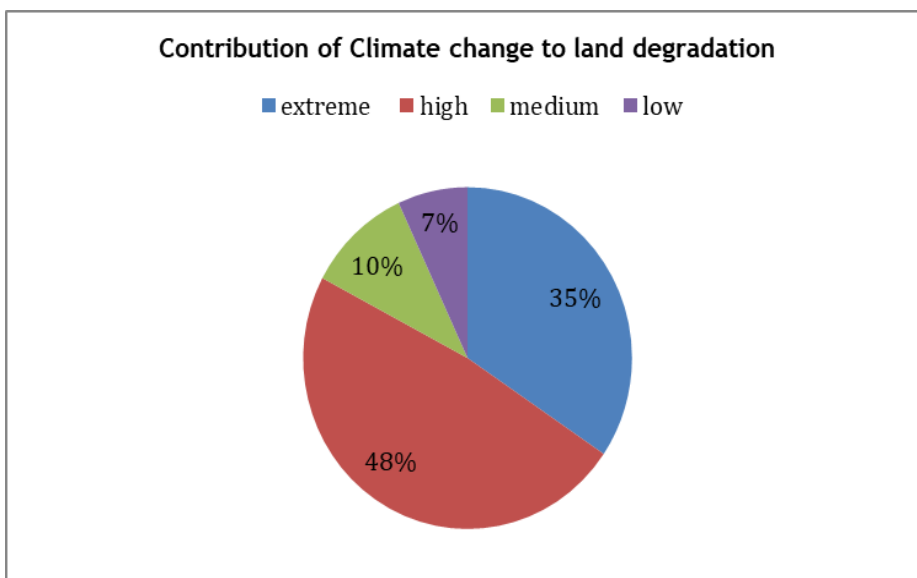


Figure 21: Contribution of Climate Change to Land Degradation

Source: Survey Data

Analysis of the results presented in section 4.3.4 indicates that several parts of the country have experienced different climatic events such as change of rainfall pattern and extreme drought. Rainfall is one of the important factors linked to land degradation and desertification, for instance because the amount and intensity of rainfall determines the degree of resultant soil erosion especially where the land is not well protected.

Generally, those areas which receive extreme rainfall are associated with severe soil erosion. Soil erosion is one of the aspects of land degradation which is caused by human activities. This involves removal of the top part of the soil which is very rich in plant nutrients.

4.3.5 Inadequate Livestock Infrastructure

Inadequate livestock infrastructure is another experienced cause of land degradation in various parts of the country. In the present survey 31 percent of LGAs stated that land degradation was extremely driven by inadequate livestock infrastructure, particularly in Busega, Misungwi and Meru. Another 24 per cent of LGAs ranked this factor as the highest driver, while 41per cent of LGAs ranked it as a medium driver of land degradation. Only 4 per cent of the LGAs such as Masasi ranked this factor as the lowest driver. The latter could be attributed to the fact that most of the southern parts of the country are not

traditionally pastoralists; hence until recently there has been a limited number of livestock.

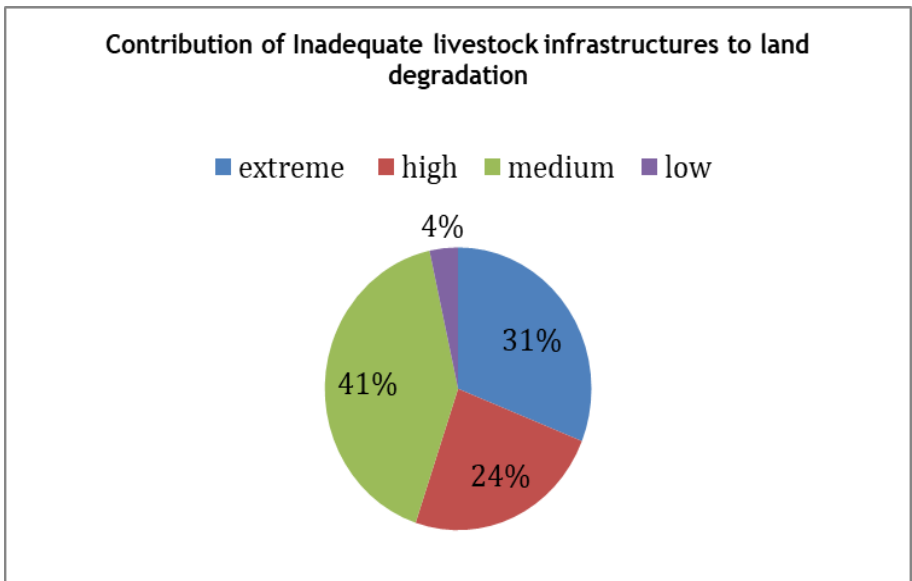


Figure 22: Contribution of farming practises to land degradation
Source: Survey Data

In pastoral communities farmers tend to have large herds of cattle and other types of livestock as an insurance against problems and uncertainties without considering the carrying capacity of land. This increases the likelihood of permanent damage to the land. Although it is currently difficult to conclude whether there is an overgrazing or not because none of the LGA has established any grazing standards and carrying capacities of their land, the effect of overgrazing has been noted in most of the LGAs with large numbers of animals. In these areas, there is high risk of occurrence of incidences of conflict between the crop farmers and pastoralists.

In terms of infrastructure for livestock, most of LGAs have one or more of the following, specified grazing zones, crush pens, charcoal dams (Malambo), dip tanks, slaughter facilities, farmer training centres, cattle feeder roads. However, the presence of livestock infrastructures has varied considerably among the LGAs.

4.3.6 Population and economic growth

Population is inevitably increasing in Tanzania, similarly to other part of the world. This increase had been an important driver to land

degradation. Population increase is directly causing an increase of the resource to meet the demands. Since the yields of natural systems do not resonate to the increased rate, the resources tend to decline with time. About 35 per cent of LGAs, including, among others, Chato and Masasi indicated that land degradation in their areas has been extremely driven by population growth (Figure 23). Ten per cent of LGAs ranked population and economic growth at high level, 34 percent of LGAs ranked at medium level, while 21 per cent of LGAs ranked these factors as low level. Examples for the latter experience come from Misungwi and Ileje district.

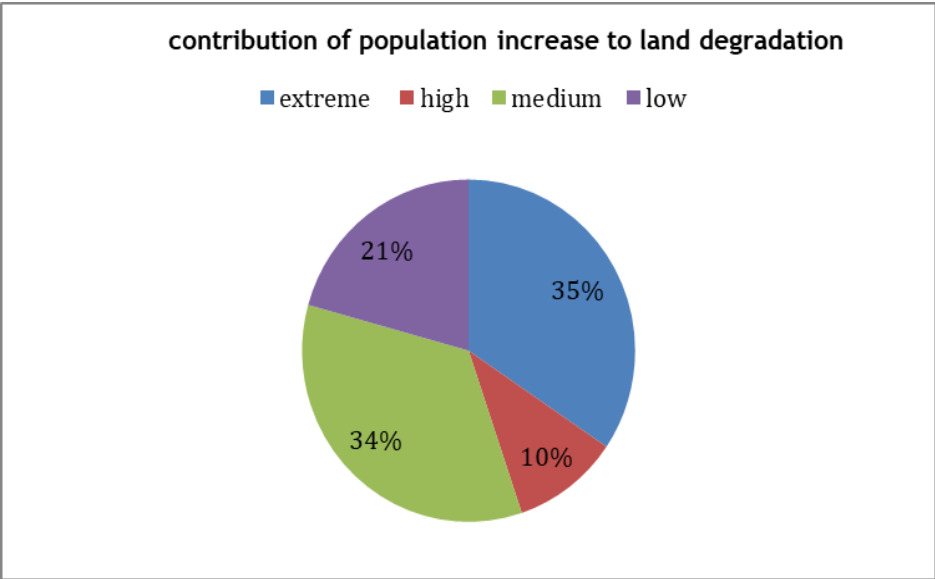


Figure 23 Contribution of population growth to land degradation
Source: Survey Data

In many LGAs population increase has reduced the amount of land for pasture, and as a result, some pastoralists with their livestock to many other parts of the country. Even the farming areas have increased to the extent that natural vegetation has been replaced farms.

Population growth goes hand to hand with economic growth. Growth of economic activities has resulted in increasing demand for resources e.g. food and energy these intensifies the pressure on the land. The increased economic activities have increased the conversion of the land to suit various other uses. Most LGAs have reported degradation of important wetland ecosystems. This is the results of economic activities that are not consistent with environmental conservation.

4.3.7 Poverty and Cultural Beliefs

Poverty and cultural belief plays an important role toward land degradation. To some extent, its land degradation which leads to poverty due to under productivity of the land, on other hand over exploitation of natural resources found in their surroundings by poor people in order to meet their basic needs. Because of poverty and dependence on natural resource most of farmers do subsistence farming.

In the survey conducted, 21 per cent of LGAs including Moshi, Sumbawanga and Korogwe ranked poverty and cultural beliefs as extremely important cause of land degradation (Figure 24). Thirty four per cent (34 per cent) of LGAs ranked poverty and cultural beliefs as high, while 21 per cent ranked them to have medium contribution. The remaining and 24 per cent of LGAs such as Pangani, Ngorongoro and Ludewa ranked these drivers to have low contribution.

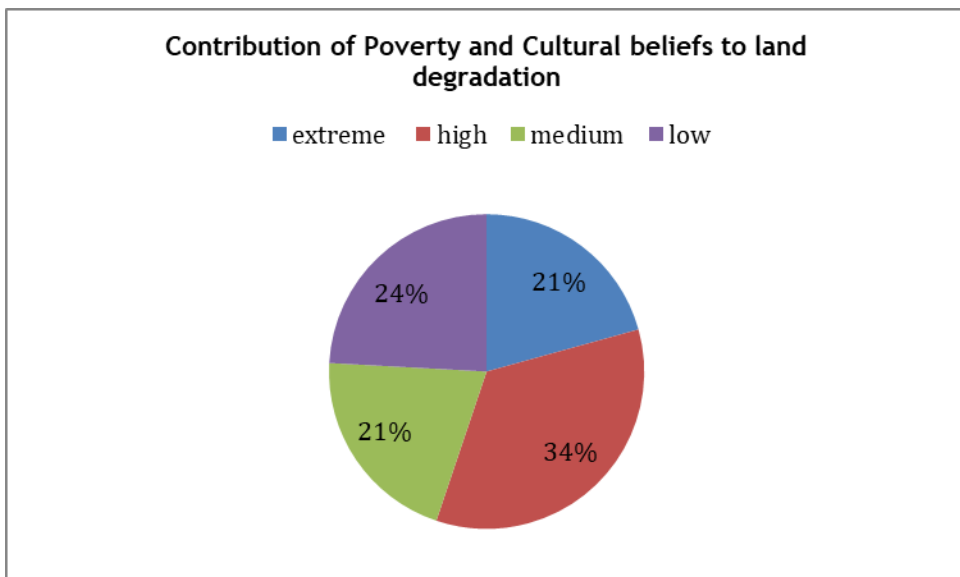


Figure 24: Contribution of poverty and cultural belief to land degradation

Source: Survey Data

Figure 24 testifies that poverty and cultural beliefs play an important role towards land degradation. Since poor people had limited access to fertilizers, good seed, and technologies, they tend to focus on small scale production of crops with low productivity and as a result cause deforestation as they cultivate on virgin land.

Apart from poverty issue, the study found that land degradation was also supported by culture of a society. The team found that in many pastoralist communities, keeping large herds was a prestige regardless of exceeding the carrying capacity of the land. In this society everyone was free to move everywhere in search for water and grass.

Other common culture in some part of the community was the farming along river valleys, during dry seasons. This practice was one of major sources of soil erosion along river valleys since land was left exposed during dry season by farmers. In some areas community tend to burn forest as ritual every year.

4.3.8 Political Instability (Refugees)

Figure 25 shows the contribution of political instability to land degradation. About 7 percent of LGAs stated that land degradation is extremely driven by political instability, for example, as mentioned by Kasulu and Kibondo LGAs. A few LGAs (7 percent) ranked it as the highest, while 7 percent ranked it as medium. The remaining 79 per cent of LGAs stated that land degradation is lowly driven by political instability, as indicated by LGAs such as Moshi, Serengeti and Misungwi

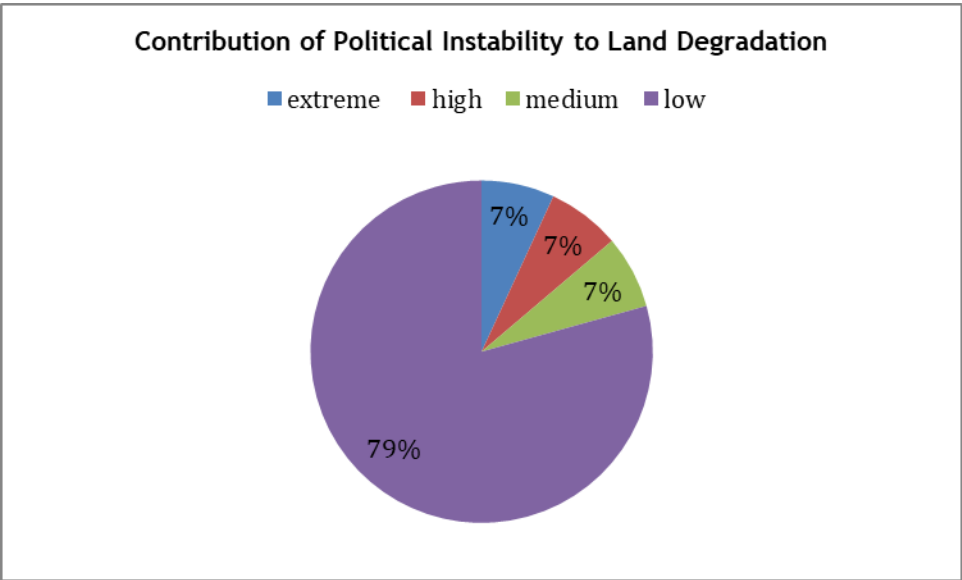


Figure 25: Contribution of Political Instability to Land Degradation
Source: Survey Data

4.4 Pressure

Pressure on land degradation is attributed to inadequate land use planning, unsustainable farming, overgrazing, inadequate livestock infrastructures, severe draught, rapid urbanization and mining activities. Contribution of each aspect is shown in the **Table 8** below:

Table 5: Contribution of various pressures to land degradation

Pressure	Percentage contribution of various pressure to land degradation
Inadequate Land Use Plan	17.3
Unsustainable Farming practices	16.4
Inadequate Livestock Infrastructure	13.9
Overgrazing	13.9
Severe draughts	13.1
Rapid Urbanization	12.9
Mining Activities	12.5
Total	100

Source: Survey Data

Results presented in Table 5 portray the overall response of forty-seven LGAs on the extent to which various pressures on land have led to land degradation. For the whole country, inadequate land use management has been the leading pressure that leads to land degradation followed by unsustainable farming and inadequate livestock infrastructure. In this survey, mining activities were ranked low out of all pressures causing environmental degradation. The next section explains each of the pressures in details.

4.4.1 Overgrazing and nomadic pastoral practices

In this survey, 19 per cent of LGAs such as Shinyanga and Simanjiro rated overgrazing as an extreme factor to land degradation (Figure 26). About 33 per cent of LGAs rated overgrazing problem as high in their areas, while 35 per cent rated it medium. The remaining 13 per cent of LGAs reported overgrazing to have lower contribution to degradation in their areas, a concern particularly raised in Kyerwa and Ludewa. It can be assumed that such areas do not have large numbers of livestock, hence overgrazing is not often experienced as compared to other areas.

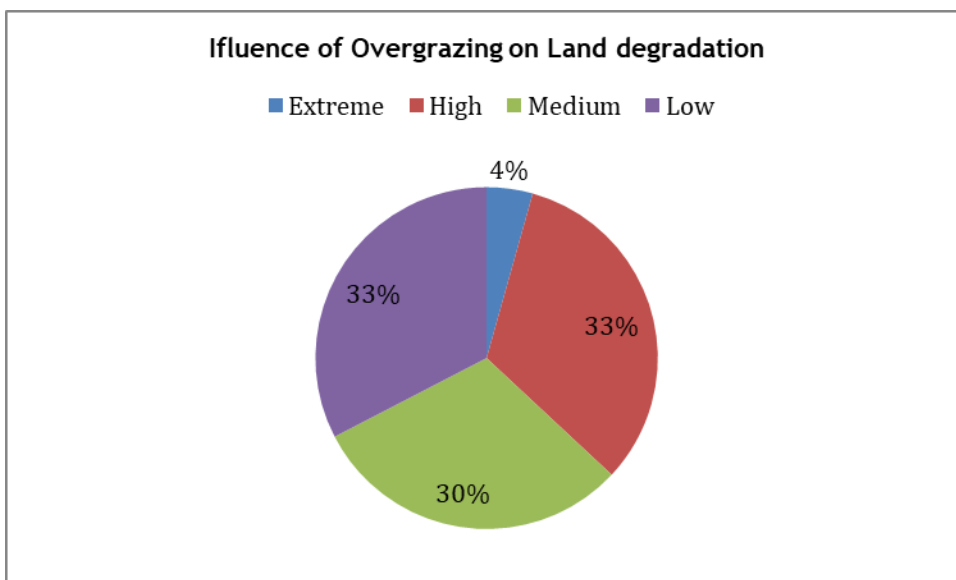


Figure 26: Influence of Overgrazing on land degradation

Source: Survey Data

Generally, in most LGA there are no specified grazing areas. Overgrazing is more practised in non-reserved land. Non-reserved land is left as an open access to everyone. Because of that, this land is subjected to high pressure of grazing and other pastoral practices. Cases of land degradation due to overgrazing have been reported to be severe in regions where by pastoralism is the main economic activity, for example in Mara, Shinyanga region.

In addition to overgrazing, several LGAs added that inadequate livestock infrastructure was among the pressures facing their areas and contribute to land degradation. Infrastructure such as crush pans, charco dams (Malambo), dip tanks, slaughter facilities, cattle feeder roads are lacking in most LGAs. Because of this livestock keepers tend to migrate from one place to another searching for such facilities and for good pastures for their animals, which in turn, leads to encroachment of various parts of the landscape, including wetland, swamps and river basin that are important ecosystems.

4.4.2 Unsustainable farming practices

In this study 9 per cent of LGAs rated unsustainable farming practises as an extreme factor to land degradation (Figure 27), for instance in Mbinga and Babati. Other 39 per cent of the LGA ranked high, and 41 per cent considered unsustainable farming to have a medium

contribution to land degradation. The remaining 11 per cent of the LGAs indicated to have low pressure on land degradation caused by unsustainable farming practices, as was mentioned in Mafia and Bagamoyo.

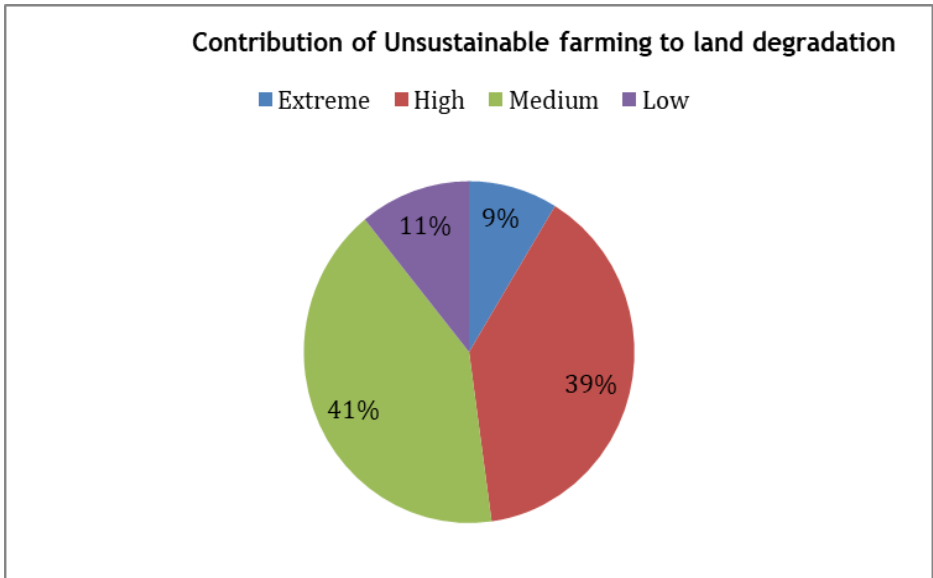


Figure 27 Influence of unsustainable farming practises on land degradation

Source: Survey Data

As it can be noted in **Figure 27**, unsustainable farming practices may lead to land degradation. In theory, farming practices which is done along the river valleys during the dry season, excessive use of agrochemicals and monoculture and farming on steep slopes of mountains all have contributions to land degradation.

Unsustainable farming is a common problem mostly in Kasulu, Bahi, Babati, Same, Musoma, Kondo and Biharamulo. Such unsustainable farming practices expose the land to soil erosion and siltation in downstream areas. In addition, the traditional way of irrigation for which water is left to flow freely by gravity along the farm, also increase the soil erosion especially in large annual crop farms e.g. rice farms and maize. Also, inappropriate use of agrochemicals by some small-scale farmers contributes to soil pollution, thus leading to land degradation.

Another factor related to unsustainable farming is deforestation. Deforestation results from uncontrolled cutting of wood, mainly of

wood fuel for cooking, sale, and drying fish, tobacco curing, burning bricks and for building poles. Other factors contributing to deforestation include cutting tree branches to provide fodder to livestock and to make fences for the herds, clearing forestland for cultivation and/or to expand grazing areas. Cases of this nature have been predominantly reported from Magu district in Mwanza and Busega in Simiyu.

In addition, many areas are characterized by the presence of wildfires. This is more associated with farmers who use it to clean their farms.

4.4.3 Inadequate Land Use plan

Inadequate and/or absence of land-use plans are one of the factors contributing to land degradation. From the survey 19 percent of LGAs stated that land degradation is extremely pressured by inadequate land use plan (Figure 28). This was a strong concern particularly in Songwe and Malinyi. Larger proportions, 33 and 35 per cent of LGAs ranked it high and medium respectively. The remaining 13 percent of LGAs stated that land degradation is pressured by inadequate land use plan only to low extent, as reported by Ngara and Sumbawanga district

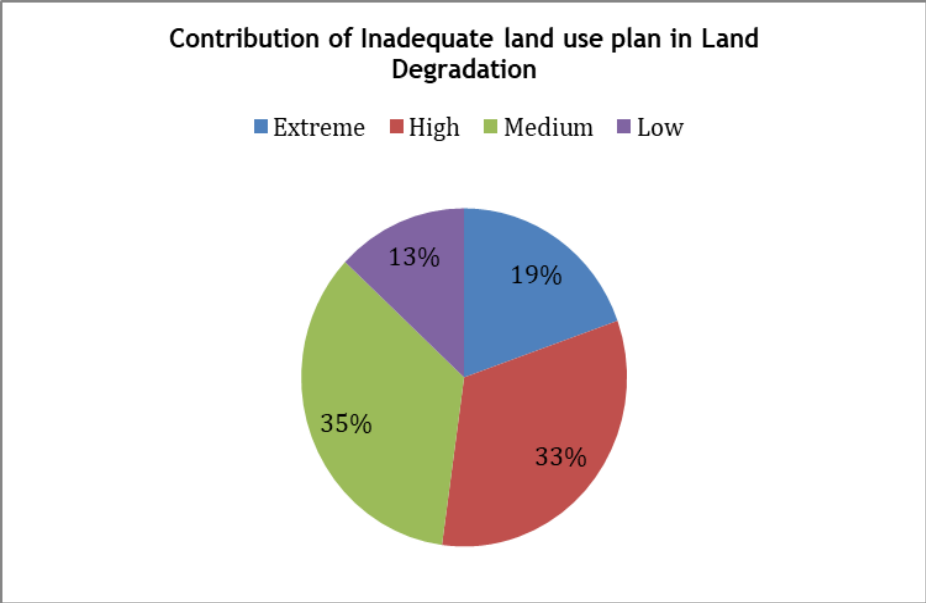


Figure 28 Inadequate Land Use Plan

Source: Survey data

Land use plan, is an important sustainability tool for land. Since most of LGAs do not either have the land use plan or does not follow the established land use plan, the land is not divided according to the various uses. For example, there is no LGA that specified the established carrying capacity for grazing in their areas, as a result overgrazing is manifested in many parts of the councils. Lack of known land use plans also welcomes the emergence of unplanned settlements, which may lead to land degradation.

4.4.4 Rapid Urbanization

Apart from lack of land use plan, rapid urbanisation creates more demand on resources used for building, energy and food. Increased demand for food creates more pressure on the arable land. This demand for arable land, leads to the clearance of more vegetation to open up new farms. Figure 29 presents the perceived contribution of rapid urbanisation to land degradation.

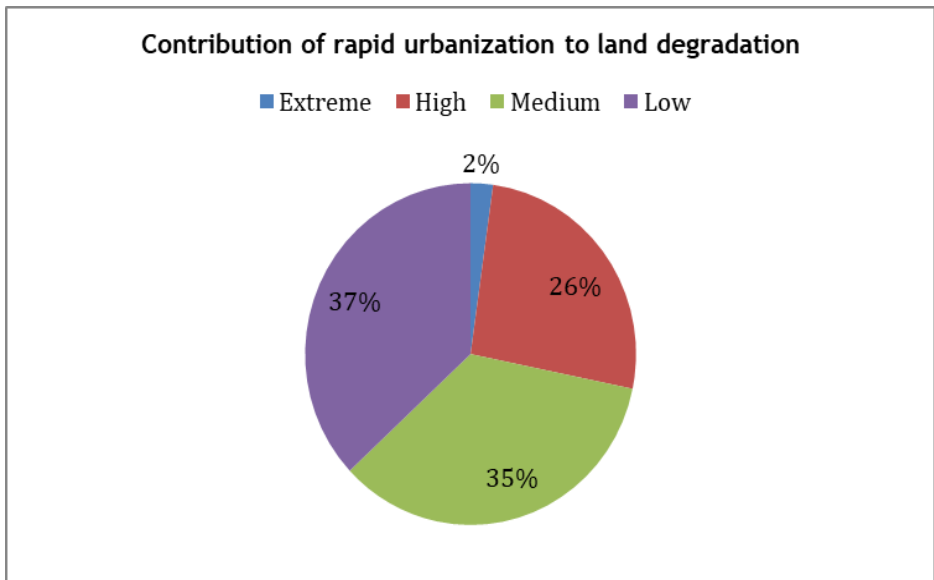


Figure 29 Contribution of rapid urbanization to land degradation
Source: Survey data

Findings from the survey being reported here have indicated that only 2 per cent of the LGAs were concerned of rapid urbanisation to have extreme contribution to land degradation (Figure 29). This was mainly mentioned for Arusha City Council. The rest, have shown contribution of rapid urbanisation to various levels of land degradation. About 35 percent of LGAs rated medium, while 26 percent rated high, and 37

per cents of LGAs rated rapid urbanization as a low pressure toward land degradation in their areas, for instance in Bahi and Kibiti districts.

4.4.5 Mining Activities

Mining activities are known to add more pressure on land and contribute to large extent into causing land degradation. Figure 30 shows the perceived contribution of mining activities to land degradation. However, it can be seen from Figure 30 that only 6 percent of LGAs rated mining as extreme pressure for land degradation in their areas, for example in Misungwi and Mbinga district. The remaining 20 per cent of LGAs rated this as high, while 28 per cent rated it as medium pressure.46 per cent of LGAs such as Msalala and Karagwe rated mining activities as the lowest pressure on land degradation. Photo 7 displays the impact of small-scale mining activities on land degradation, as demonstrated by the badlands created.

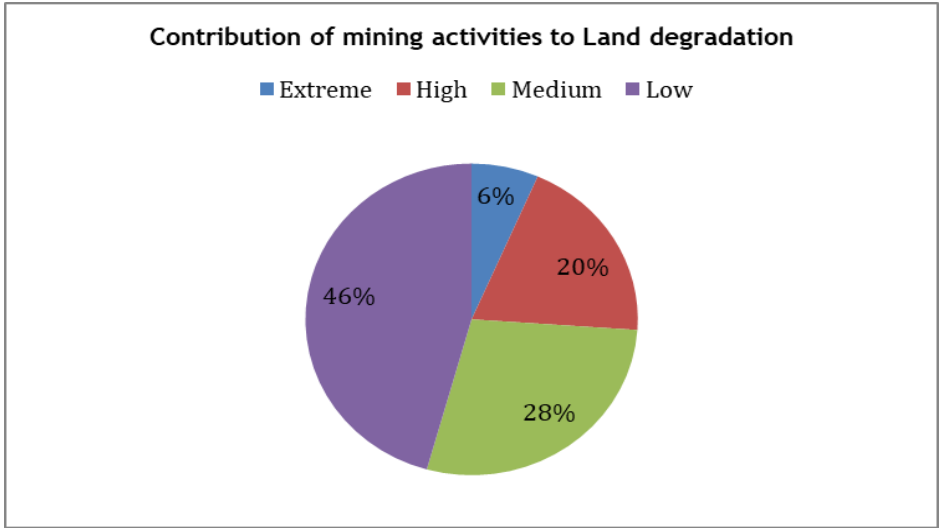


Figure 30: Contribution of mining activities to land degradation
Source: Survey data

Photo 6 Mining activities at Serengeti district



Photo 6: Mining activities at Matare in Mugumu, Serengeti district which add pressure on land degradation. Mining activities are for aggregates which are used in construction (Photo was taken by auditors on February 2018).

4.4.6 Extreme climatic events

Because of changing climate, there are many associated climatic events such as drought. Figure 31 shows that 4 per cent of LGAs experienced land degradation caused by extreme draught, such as in Misungwi and Ngorongoro districts. About 24 per cent of the LGAs ranked to have a high scale while 35 per cent of LGAs ranked it at medium scale. Others LGAs (37 per cent) stated that land degradation has been pressured by drought at a low scale, for instance in Nsimbo district and Mwanza city. Because of these problems pastoralist and crop farmers have been moving out in search of new places for farming.

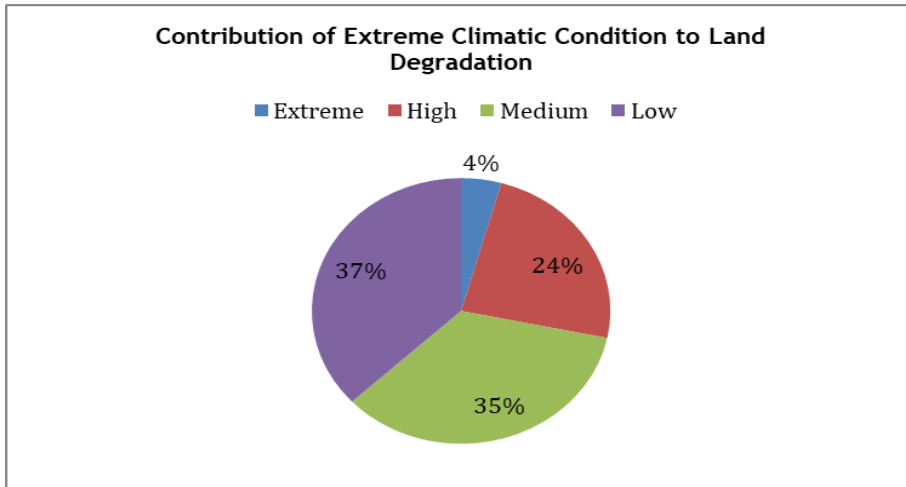


Figure 31 Contribution of extreme climatic condition

Source: Survey data

4.5 State of land degradation

Land degradation can be seen in different aspects as follows:

4.5.1 Soil Erosion

Soil erosion is the state of environment noted in many LGAs covered in this study. This condition results from various pressure and drivers discussed in the previous sections. The prominent factors being overgrazing, unsustainable farming practices, deforestation and clearance of vegetative cover. **Figure 32** presents the perceived state of soil erosion in the LGAs covered during this survey.

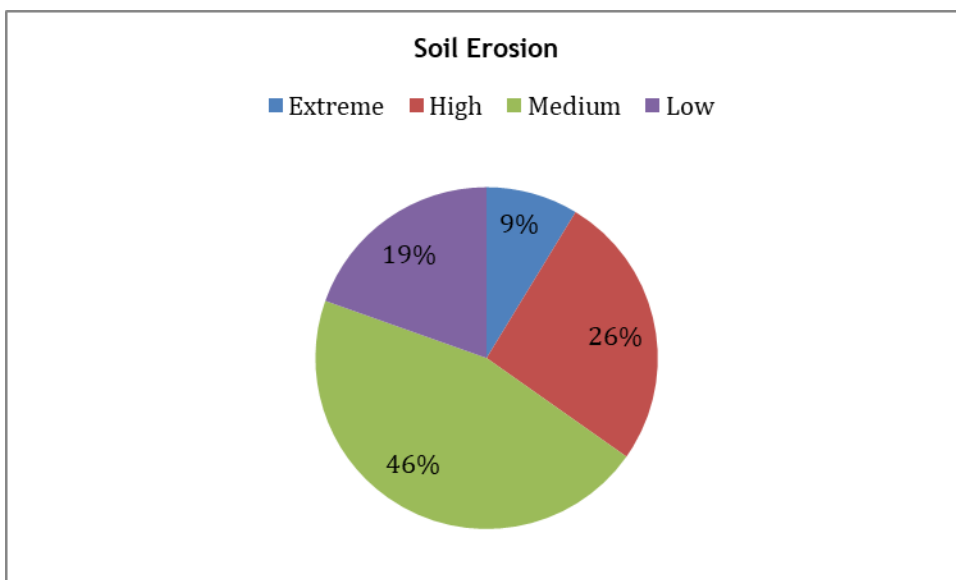


Figure 32 Soil erosion

Source: survey Data

It can be seen from the Figure 32 that about 35 per cent of the respondent LGAs rated soil erosion as extreme to high. Others (46 per cent) of LGAs reported medium soil erosion. The remaining 19 per cent of LGAs reported low level of soil erosion. However, the problem of soil erosion has been and continues to be serious especially in the areas where deforestation, shifting cultivation and bushfires are a common phenomenon. Among the most affected areas in the country include Kibondo, Biharamulo and Kongwa. Photo 7 presents an example of siltation along Dumila River in Morogoro resulting from soil erosion in the river catchments.

Photo 7: Soil erosion



Photo 7: A pile of sand at Dumila River in Morogoro region resulting from soil erosion in the up-hills.

4.5.2 Loss of soil nutrient

According to this survey, decline of soil fertility in the country is more prominent along the foot and slopes of mountains and hills, for example, in Morogoro, Same, Mbinga, Masasi and Mpanda. Decrease in crop production is one of the indicators of soil fertility. The decline of nutrients in the soil is causing farmers to use more amount of fertilizer as a supplement.

In this survey, 9 per cent of LGAs reported extreme level of loss of soil nutrients, 28 per cent of the LGAs reported high level, while 48 per cent of LGAs reported medium level. The remaining 15 per cent of LGAs reported low level of loss of soil nutrients. Most of the nutrients are lost due to soil erosion are mostly carried away by water or leached during the rainy season.

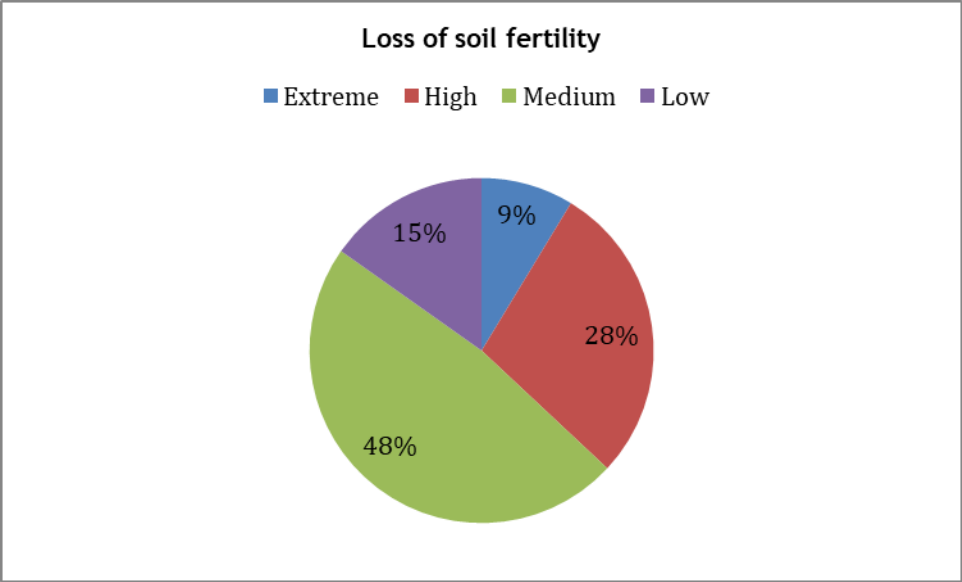


Figure 33 Loss of soil nutrients
Source: Survey Data

4.5.3 Salinisation

This occurs when the salt concentration is increased. The source of increased salt is due to poor management of irrigation water or insufficient attention to drainage. In the present study 9 per cent of LGAs claimed to have experienced high level of salinisation, while 32 per cent reported medium level of salinisation (Figure 34). A larger

number of LGAs (59 per cent) reported low level of salinisation. LGAs have shown to experience soil salinisation.

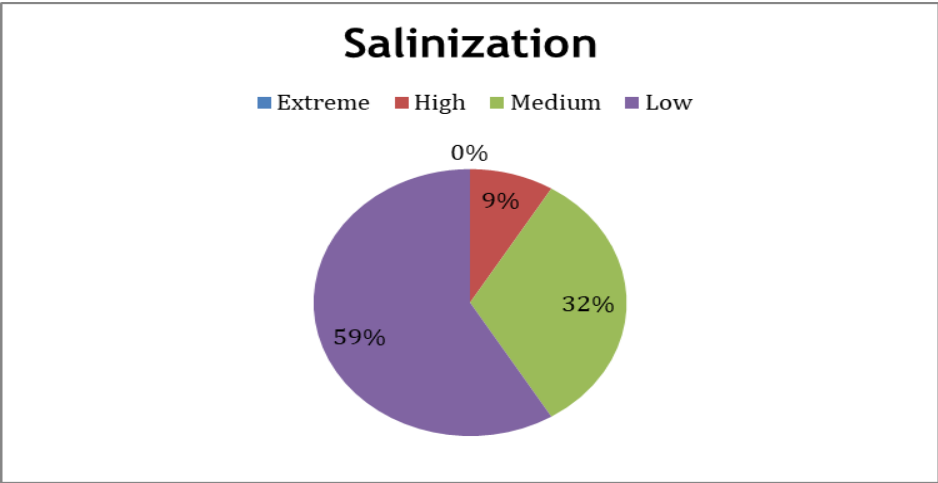


Figure 34 Salinization

Source: Survey Data

4.5.4 Soil pollution

Soil pollution is prominent in all LGAs covered in this study. Soil pollution is a result of fertilizers, pesticides and other agrochemicals. In those LGAs with mining activities, soil is polluted more because of chemical used in mining processes. Soil pollution is also due to inadequate waste management (solid waste and liquid waste). About eleven percent of all the sampled LGAs have rated high soil pollution in their areas, 35 percent have rated medium and 54 per cent of LGAs have rated low (**Figure 35**).

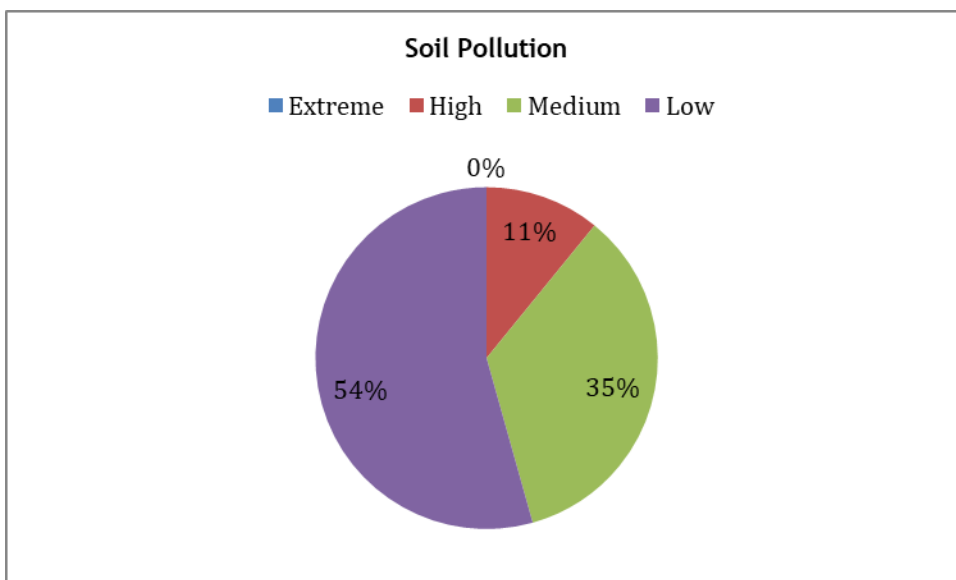


Figure 35 Soil pollution

Source: Survey data

Soil pollution was prominent in all LGAs covered in this study. Soil pollution was a result of fertilizers, pesticides and other agrochemicals. In those LGAs with mining activities, soil was polluted more because of chemical used in mining processes. Soil pollution was also due to inadequate waste management (solid waste and liquid waste).

4.5.5 Terrain deformation

About 5 per cent of LGAs reported extreme condition of terrain deformation, 4 percent of LGAs reported high condition of terrain deformation, while 50 per cent of LGAs reported medium terrain conditions (**Figure 36**). The other 41 percent of LGAs reported low condition of terrain deformation.

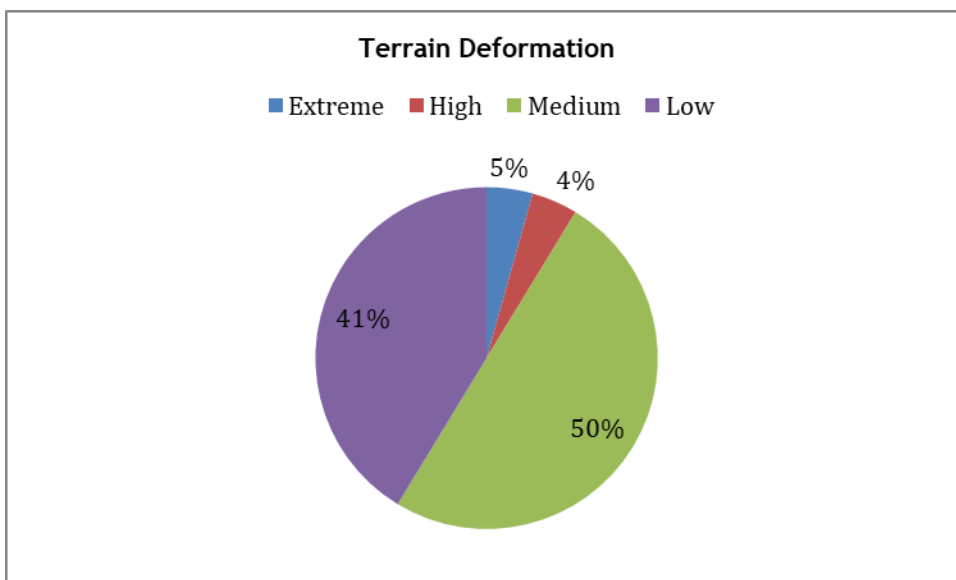


Figure 36 Terrain deformation

Source: Survey data

4.5.6 Siltation

Siltation is a process whereby sediments/silt is suspended in water and deposited at low-lying areas. Among other consequences, the water becomes dirty and the water depth is reduced due to the accumulation of sediment at the bottom of the river. In most cases, sediments are generated from eroded soil from pastureland and/or cultivated lands. The sediment also carries nutrients into water sources causing eutrophication.

About 4 percent of LGAs consulted during this study rated extreme condition of siltation in their areas, whereas 28 per cent rated siltation state to be high (Figure37), for instance, around Mgori dam in Singida, where the problem was reported to feature in most of the areas. About 33 per cent of LGAs in this region rated siltation problem as medium, while 35 per cent of LGAs rated it as low.

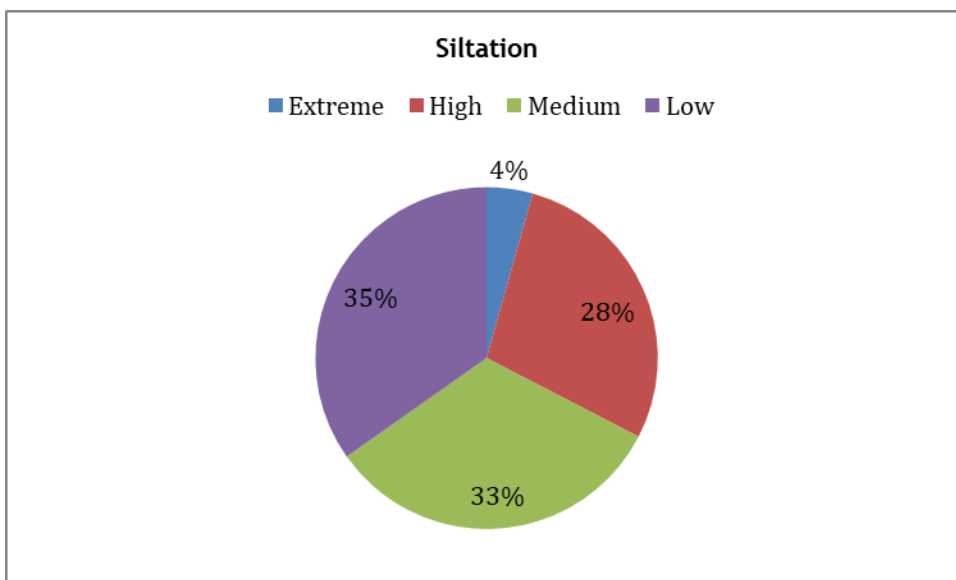


Figure 37 Siltation

Source: Survey data

The problem of siltation in most cases is causing drying up of the water sources, the eroded sediment is depositing in these water sources, especially when farming is undertaken upstream. The increased clearance of vegetation in many parts of Morogoro region, for instance, contributes to increased silt load in downstream parts of rivers.

4.5.7 Loss of land cover and vegetation

State of extreme loss of vegetation was noted in 7 per cent of the LGAs that were involved in this study, while high loss of vegetation was noted in 30 per cent of LGAs (Figure 38). Medium scale loss of land cover and vegetation was noted in 48 percent of LGAs and low level was reported by 15 per cent of LGAs. Loss of vegetation and land cover has a direct connection with the land degradation, in most cases being due to depletion of soil nutrients.

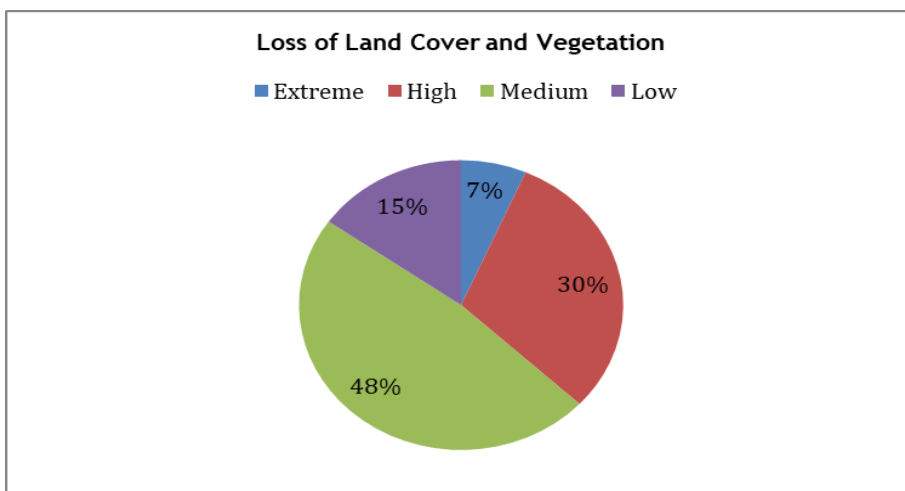


Figure 38 Loss of land cover

Source: Survey data

As can be seen in Figure 38, the extent of loss of land cover varies among the LGAs. Natural vegetation in these LGAs is destroyed by various human activities as indicated in previous sections (e.g. section on drivers and pressure), with crop farming and grazing being the leading cause of vegetation clearance.

4.6 Impact of land degradation

Several impacts related to land degradation featured in LGAs covered in this study. These impacts are both nature, the physical loss of land or quality and impacts related to social, cultural and economic aspects (Table 6). Impacts such as decline or loss of agricultural productivity, water pollution, food insecurity, desertification, migrations and land-use conflicts, and Loss of biodiversity are presented hereunder based on the responses received from the questionnaire responses. From Table 6, loss of biodiversity, water pollution and decline of agricultural productivity appeared to be the major impacts in the country, while desertification and migration being among the low ranked impacts.

Table 6:Percentage of impacts of land degradation

Effects	Percentage
Loss of Biodiversity	20.4
Decline of agricultural productivity	17.5
Water Pollution	17.3
Food Insecurity	16.0
Desertification	14.4
Migration and Land Conflict	14.4
Total	100

From the above **Table 6**, Loss of biodiversity water pollution and Decline of agriculture productivity are the main featured impacts in the country, while desertification and migration being the low ranked impact.

4.6.1 Loss of biodiversity

Loss of biodiversity was ranked extreme by 20 per cent of LGAs and high by 28 per cent of LGAs, while 30 per cent rated it as medium, and 22 per cent rated low (**Figure 39**). As presented in the previous sections, loss of biodiversity reported to have occurred in these LGAs is mostly due to overgrazing and uncontrolled farming. With these activities, more biomass is lost, and more soil is eroded. The case examples for extreme loss of biodiversity were reported for Gairo, Nsimbo, Shinyanga and Mwanza.

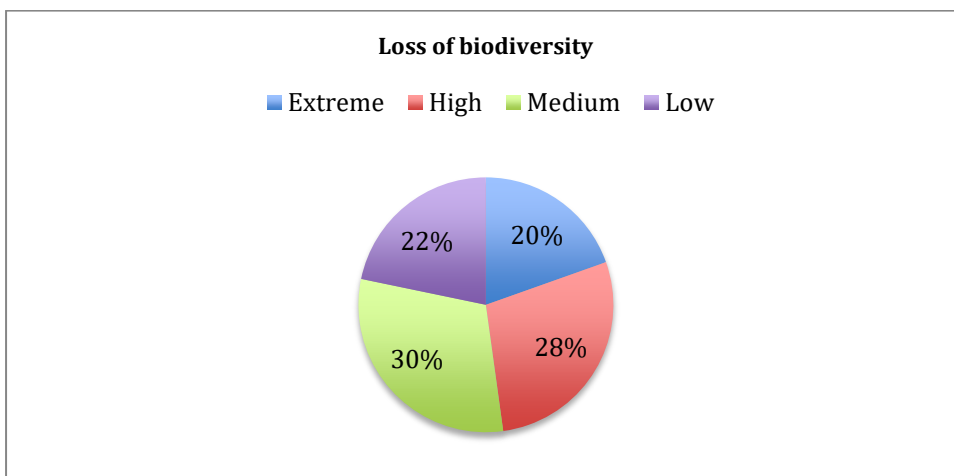


Figure 39 Loss of biodiversity

Source: Survey data

4.6.2 Decline or loss of agricultural productivity

Because of land degradation, important soil nutrient has been depleted which in turn reduced the land productivity. Due to this problem, farmers and pastoralists tend to move from the most affected areas to virgin land; this in turn creates the problems shift. Example Farmers in Uruguru mountains practices shifting cultivation due to decline of agricultural productivity. *Figure 40* Indicates LGAs in response to this problem

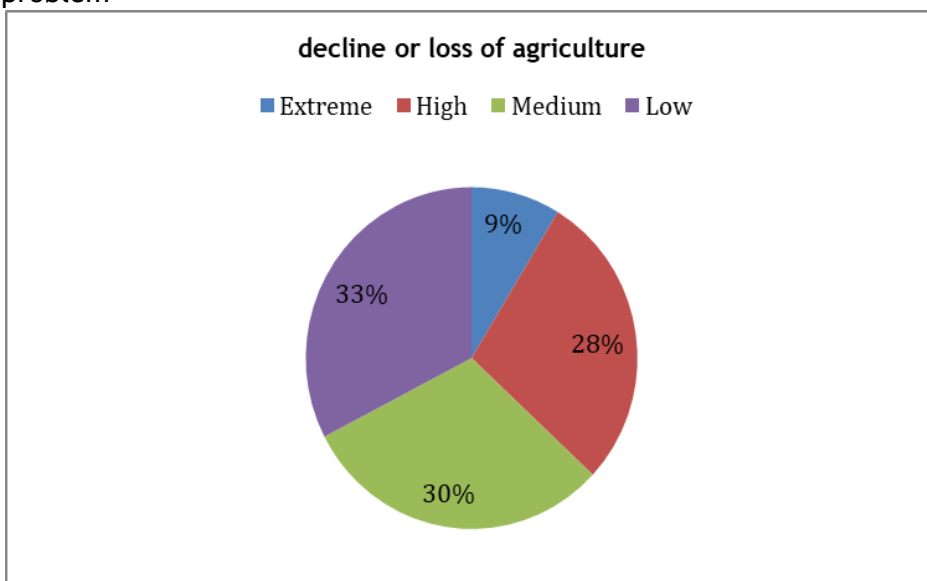


Figure 40 Decline or loss of agricultural productivity

Source: Survey data

As can be reflected from figure 40, about 33 per cent rated agricultural productivity as low, 30 per cent of LGAs rated this problem as medium, while 28 per cent and 9 per cent of LGAs rated this problem as high and extreme respectively. These areas have experienced decline in crop production partly could be because of declined soil fertility.

4.6.3 Water Pollution

Water pollution in the covered LGAs was caused by many factors which were directly connected to land degradation particular the soil erosion. In this survey, about 7 per cent percent of all LGAs have rated extremely high-water pollution in their areas. 30 per cent of the LGAs have shown to rank high the problem of loss of water pollution. About,

30 per cent rated this problem as medium while 33 percent ranked as low (**Figure 41**).

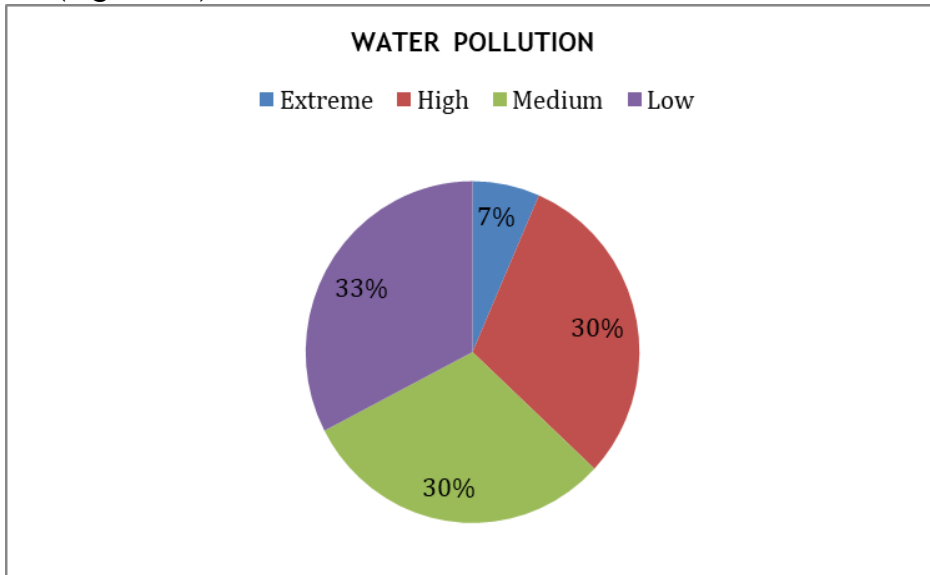


Figure 41 Water pollution

Source: Survey Data

Soil erosion generates nutrients load and sediment into water source. The study found that in Singida region, the sediment carrying nutrients from cultivated farms and pastures tend to flow into Mgori dam. This dam was a source of water and water for castles in villages of Sughana and Manhole villages around the dam. The effect of increased nutrient in the water created more pollution and siltation on the dam.

4.6.4 Desertification

The result of the survey showed that problems related to desertification are not so severe in the country. Only 2 per cent of LGA such as Shinyanga DC ranked extreme condition on desertification, whereas 17 per cent ranked high and 35 percent ranked medium. Other LGAs (46 per cent) indicated low condition of desertification (**Figure 42**).

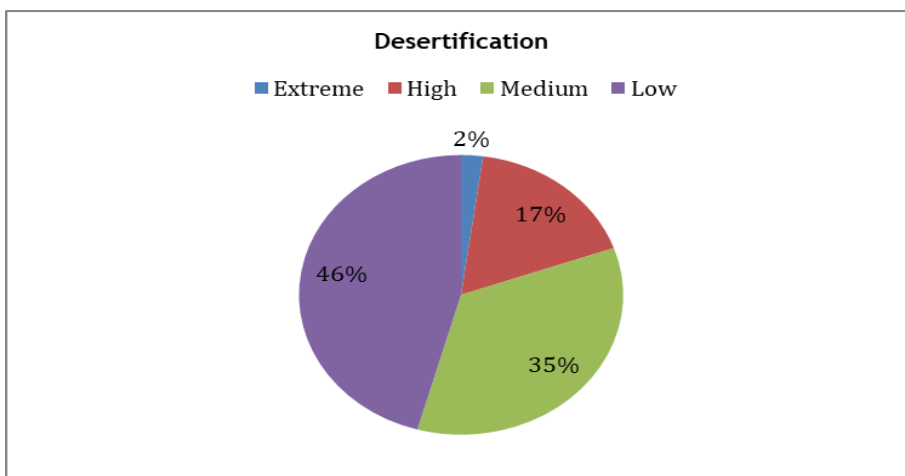


Figure 42: Desertification

Source: Survey Data

4.6.5 Migration and Land Conflicts

From the survey, Migration and Land Conflicts problem is extreme in about 2 per cent of the LGAs, high in 15 per cent of the LGAs, medium in 39 per cent of the LGAs and low in 44 per cent of the LGAs (Figure 43). The problem is more prominent when the livestock keepers move to other areas to search for water and fodders. This move caused conflicts among farmers and livestock keepers in Morogoro region. This problem was more prominent in LGAs of Kilosa and Kilombero.

Due to impacts associated with land degradation such as polluted water, soil erosion, and loss of productive land, among others, farmers, pastoralists and other people in the community tend to migrate from one place to another seeking for the better land for agriculture and other livelihood activities. Such concern was raised to be higher in Gairo, Biharamulo, Mbinga and Serengeti.

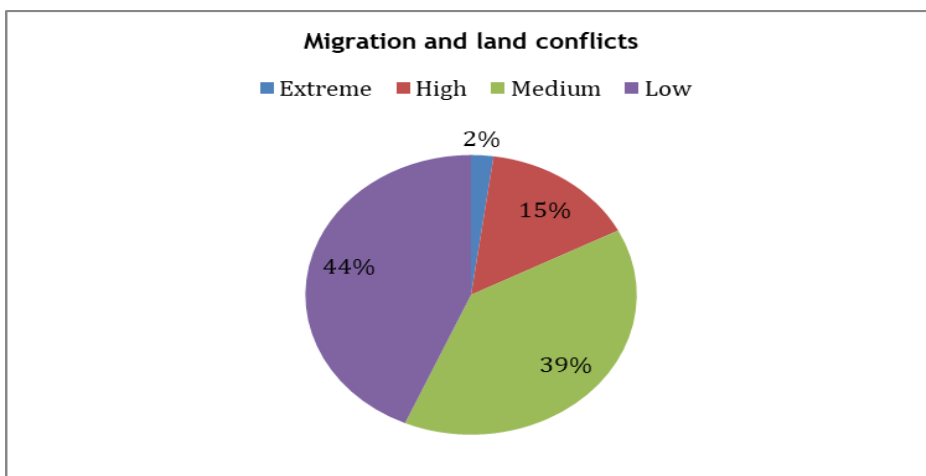


Figure 43 Migration and land conflicts

Source: Survey Data

4.6.6 Food insecurity

From the survey, 2 per cent of LGAs ranked food insecurity at extreme level and 26 per cent ranked it as high. About 37 per cent of LGAs ranked food insecurity as medium problem while 35 per cent ranked it low. LGAs that indicated high concerns on food insecurity include Same, Masasi, Simanjiro and Kongwa district.

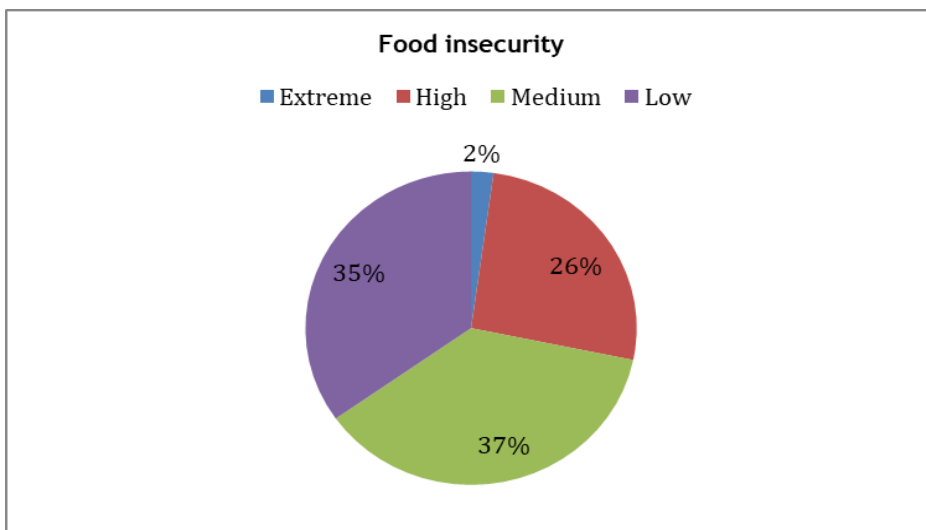


Figure 44 Food insecurity

Source: Survey Data

4.7 Factors Affecting Effective Control of Land Degradation in LGAs

Based on the survey conducted in this study on the factors which affect LGAs effort to control land degradation, the combined result for the LGA responded to the survey is presented in Table 10.

It can be noted from **Table 7** that, non-compliance to various regulations and by laws and shortage of funds were rated by most of LGAs to be the leading factors hindering the effort towards controlling land Degradation in their areas. The ranking of these factors is provided in Figure 45.

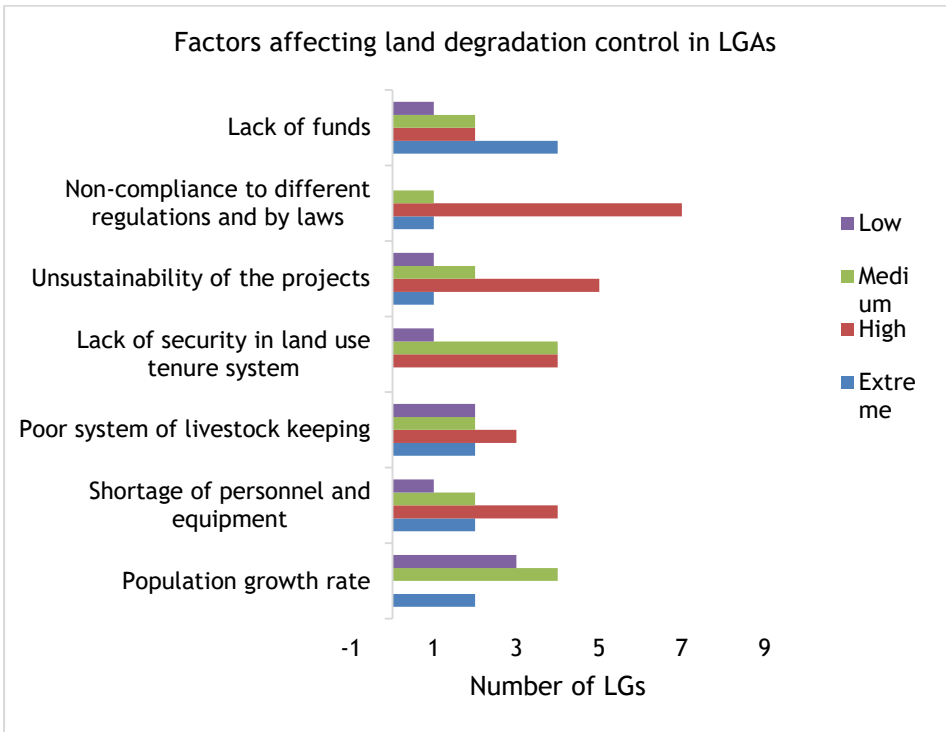
Table 7 Factors affecting LGAs efforts to control land degradation

Factors	Percentage
Non-compliance to different regulations and by laws	16.15
Lack of funds	15.63
Shortage of HR and Equipment	15.05
Unsustainability of the projects	14.64
Lack of security in land use tenure system	13.52
Population growth rate	12.77
Poor system of livestock keeping	12.24
Total	100

Source: Survey conducted

From **Table 7**, Non-compliance to different regulations and by laws and Lack of funds was rated by most of LGAs to be the leading factors hindering the effort towards controlling land Degradation in their areas.

Figure 45 Factors affecting efforts of land degradation control



Source: Survey Data

Most of the Social-economic activities in Tanzania of are based on land. Therefore, a wise and proper use of land resources is required to influence whatever is done in that piece of land. Several initiatives have been taken in the LGAs covered in this study

4.7 Initiatives for combating land degradation in Different LGAs

Initiatives to combat land degradation were almost the same in most of LGAs with exception of initiatives that were very specific to a cause of degradation like increase of seawater in Dar es Salaam and Mtwara. In these areas, initiatives included construction of walls along the ocean to prevent further destruction of roadsand nearby land. Other Initiatives reported by the in LGAs are as follows:

1. Provision of environmental education in every village and streets, campaigning for modern livestock keeping and proper use of land
2. Tree planting campaigns,

3. Training on the conservation agriculture and Increasing community awareness,
4. Prohibit constructions along water currents, water catchment
5. Conducting public awareness on importance for combating deforestation, use of sustainable farming practices (conservation agriculture or climate smart farming systems.

CHAPTER FIVE

CONCLUSION

5.1 General Conclusion

This study concludes that there is an increased forest degradation and deforestation and there is high risk of increasing rate of land degradation in the country. Despite the fact the Government through LGAs and TFS made several initiatives to control and improve land and forest use, still there was an increased rate of forest degradation and deforestation due to malpractices like unsustainable farming practices, charcoal making and quest for timber.

LGAs still experience several challenges in dealing with these problems. The effect of land degradation presented in this report pose an indication of unsustainable land use management. Because of this, it is expected that there will be no balance between socio-economic advancement and environment conservation. Since majority of Tanzania's depend on land resources for their livelihood, it is expected that the problems of land degradation and its associated impacts will continue increasing with time if strong and sustainable actions are not taken.

Government commitment is required to control the drivers, pressure, state and impacts as indicated in this report. Strong will and national commitments is required to control, among others, encroachment of forest reserves, overgrazing, uncontrolled land clearance and unsustainable farming practices.

5.2 Specific Conclusions

The following are specific conclusions of the survey.

5.2.1 Risk of Increasing Rate of Land Degradation

From the survey conducted it can be concluded that most parts of the land of the surveyed LGAs is not extremely affected by land degradation. The aspect of land degradation to many parts is still at early stages except to the few places which are extremely degraded such as Mwanza, Shinyanga, Mara, Singida and Dodoma where initiatives are needed to rescue all the land which has signs for extensive land degradation.

5.2.2 Increased Rate of Forest Degradation and Deforestation

The survey has shown that the rate of deforestation and forest degradation is increasing and awareness on conserving the forests is, in many communities, still low. Driver of forest degradation and deforestation are not well managed such that they increase the rate of deforestation and forest degradation. Enforcement of forest conservation is needed and may be enhanced by improving the working conditions for under for forest officers.

To adequately address the problems of land degradation and deforestation, intensive coordination is required among the MDA, LGAs and other stakeholders. Land degradation and deforestation are multifaceted problems that requires integrative approach, including integrating the local communities, and the existing institutional arrangement that deal with this problem.

CHAPTER SIX

RECOMMENDATIONS

6.1 Introduction

This chapter presents recommendations on what should be done to reduce the level of environmental degradation. It basically focuses on land degradation, forest degradation and deforestation. The recommendations have grouped into categories with respect to the key actors, namely VPO, MNRT and PO-RALG. It is anticipated that if these recommendations are adequately implemented by responsible parties the level of environment degradation will be reduced.

6.2 Recommendation on forest degradation and deforestation

Vice President's Office should:

1. Coordinate sectoral ministries to come up with sustainable and practical strategies to reduce improper use of land and forest.
2. Design a strategy in collaboration with Ministry of Education, science and Technology and PO-RALG to provide awareness through environmental education in schools and in the community, so as to develop an environmentally friendly society among young generation.
3. Harmonise and support various initiatives to conserve environment and facilitate demarcation of the forest reserves which have been encroached.

Ministry of Natural Resource and Tourism should:

1. Install physical and visible demarcation on the forest reserves which are under the jurisdiction of TFS.
2. Establish supportive supervision programmes to local communities in each district to enhance forest conservation initiatives.

3. Enforce the existing rules and regulations that govern forest and land management and ensure that environmentally destructive activities are discouraged and punished through the established procedures.

President's Office Regional Administration and Local Government should:

1. Design ways to prohibit development activities in forest reserves and put in place practical procedures to follow for harvesting forest resources.
2. Establish and enforce effective land-use plans that clearly define boundaries and use of each specified land use category, such as agriculture, settlements, grazing and other use depending on the nature of a particular LGA.
3. Increase level of awareness to all communities in the country on sustainable of forest and alternative energy sources.
4. Create a long-term and sustainable programme for monitoring forest management and use of forest resources.

6.3 Recommendation on land degradation

Vice Presidents Office should:

1. Coordinate sectoral ministries to come up with sustainable and practical strategies to reduce improper use of land.
2. Coordinate the responsible units to take immediate measure on the extremely affected areas.
3. Develop policy to control overgrazing and nomadic pastoral practices, and ensure that each LGA establishes grazing areas.
4. Enforce compliance to relevant laws and regulations.
5. Ensure that control such as conducting EIA is enforced to all projects linked to economic growth (construction, agriculture, timber harvesting and industrialisation).
6. Establish appropriate mechanism to control energy demand by providing an alternative and affordable energy.

PO-RALG, MNRT/TFS should:

1. Ensure that the LGAs and sector ministries enhance sustainable farming practises in areas prone to environmental degradation. More efforts must be put in place to reduce incidences of uncontrolled burning of forests, forest clearance and shifting cultivation.
2. Develop strategies to raise awareness on forest management rights, laws and opportunities among forest dependent communities and strengthen capacity within LGAs to ensure tangible economic returns.
3. Establish land-use plans that clearly define boundaries and use of each specified land-use category, such as agriculture, settlements, grazing and other use depending on the nature of a particular LGA.
4. Encourage and expand tree planting efforts.

REFERENCES

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Dar es salaam, Tanzania
- 3) URT (2003). National Forest Policy, Dar esSalaam, Government Printers
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- 5) URT (2014). State of environment report, DaresSalaam, Government Printers.

APPENDICES

Appendix A: Visited Districts

DISTRICT	SPECIFIC AREA	ASPECT SEEN
Liwale-Lindi	Kichonda Village	Deforestation and forest degradation
	Kimambi Village	Land degradation-overgrazing
Mbinga-Ruvuma	Kigonsera water source	Land degradation-soil erosion
	Mkako Village-Dodoma	Land degradation- mining
Ludewa-Njombe	Kingole village, Lihagule Village	Deforestation
	Lifua Village	Land degradation-soil erosion
Kyela-Mbeya	Kasumulu Forest Reserve	Deforestation
	Itope area	Land degradation
Mvomero-Morogoro	Dumila	Land degradation -soil erosion
Same-Kilimanjaro	Same mjini	Land degradation
	Marwa village	Deforestation
	Vumari forest reserve	Deforestation
Serengeti-Mara	Matare	Land degradation-mining
	REMUNG'ORORI	Land degradation-overgrazing
Magu, Ilemela-Mwanza	Magu	Deforestation and Forest degradation
	meko, nyasaka, kiseke	Land degradation-soil erosion
Nzega-Tabora	Kagonho forest, Idudumo village	Deforestation and Forest Degradation
Singida DC - Singida	Mgori	Land degradation -siltation
	Mng'hola Forest	Deforestation and Forest Degradation

Source: Auditors' analysis

Appendix B: Parameters used in data collection

Tables B1 and B2 summarize identified parameters of the study. These parameters were subjected to a pilot test in one region. The draft framework was subjected into test for six LGAs in Morogoro Region. The result of the pilot study was used to modify the framework.

Table B1: Identified Parameters related to forest degradation and deforestation

Driver	Pressure	Impacts	State	Response
1. Poverty 2. Population Growth 3. Economic Growth 4. Energy demand 5. Political and social factors 6. Biofuel 7. Unsustainable 8. Farming	<ul style="list-style-type: none"> • Climate Change • Bush Fires • Land Tenure • Enforcement • Overgrazing 	<ul style="list-style-type: none"> • Loss of biodiversity • Economic Loss • Soil erosion and siltation of watercourses • Loss of habitat • Drought/floods • Loss of amenity • Desertification • Wildlife - Human conflicts • Non-indigenous species • Acidification • Eutrophication 	<ul style="list-style-type: none"> • Amount of land or volume of forest lost because of forest degradation and deforestation 	<ul style="list-style-type: none"> • Tree planting campaign • Awareness program/sensitization • Participatory forest management

Table B2: Identified parameters related to land degradation

Driver	Pressure	State	Impacts	Response
1.Climate change 2.Political Instability (Refugees) 3. Inadequate Land-Use Management 4.Unsustainable Farming Practice 5.Poverty and Cultural Believe 6.Inadequate Livestock Infrastructure 7.Deforestation and Forest Degradation 8.Population increase	<ul style="list-style-type: none"> •Inadequate Livestock Infrastructure •Overgrazing •Inadequate Land Use Plan •Rapid Urbanization •Unsustainable Farming] •Severe draughts •Mining Activities 	<ul style="list-style-type: none"> • Loss of soil fertility/nutrients • Salinisation • Silting of dams, Rivers, Lakes and other water bodies • Soil pollution /acidification • Loss of land cover and vegetation • Terrain deformation • Soil erosion 	<ul style="list-style-type: none"> • Decline or loss of agricultural productivity • Water pollution • Food insecurity • Desertification • Migrations and land conflicts • Loss of biodiversity 	Monitoring of land degradation

Appendix C: List of Documents Reviewed

S/N	Type of Document	Information Required
1	State of Environment Report 2012-2016	General status of environment in the country
2	National Environmental Policy	To get main environmental framework that are used for decision making on matters related to land degradation
3.	National Forestry Policy	Obtaining key focus and priority of the country in forest as related to land conservation.
4.	The National Biodiversity Framework for Tanzania.	Guidelines to show anticipated outcomes in the environmental conservation at large
5.	Districts and Regional environmental reports	Get overall state of environment in the regional and district levels

Information obtained from these documents helped the team to identify theoretical Drivers, Pressure, State, Impact and Responses.

Appendix D: Environmental Survey Questionnaires

QUESTIONNAIRE ON LAND DEGRADATION

1. What is the percentage of land degraded in your area?
(Tick appropriately)

S/N	Degradation level	Description	Remarks
1	Low	Some indications of degradation, but the process is still in an initial phase	
2	Moderate	Degradation is apparent, but its control and full rehabilitation of the land is still possible with considerable efforts	
3	Strong	Strong- evident signs of degradation. Changes in land properties are significant and very difficult to restore within reasonable time limits	
4	Extreme	Degradation beyond restoration	

2. Rate the contribution of the following drivers to land degradation in your area (using number one as the highest driver and number 12 as the lowest driver)

- 1) Climate Change, ()
- 2) Poverty, ()
- 3) Political Instability, ()
- 4) Insecure Land Tenure System, ()
- 5) Unsustainable Farming Practice ()
- 6) Cultural Believes. ()
- 7) Inadequate Livestock Infrastructure, ()
- 8) Deforestation ()
- 9) Forest Degradation, ()
- 10) Uncontrolled Wildfires, ()
- 11) Population increase ()
- 12) Inadequate Land-Use Plans. ()

3. What is the population of livestock in your LGA?

b) What livestock infrastructures are available in your LGA? (tick the appropriate)

1. Specified Grazing Zones ()
2. Cattle Feeder Roads ()

3. Dip Tanks()
4. Crush Pens()
5. Slaughter Facilities()
6. Farmer Training Centers()
7. Charco dams (malambo)
8. Others()

c) What is the estimated amount of grazing land (in hectares) in your LGA?

4. What is the contribution of the following pressure on land degradation in your LGA?

S/N	Pressure	Low (0-25%)	Medium (25%-50%)	High (50%-75%)	Extreme (75%-100%)
1	Inadequate Livestock Infrastructure				
2	Overgrazing				
3	Inadequate Land Use Plan				
4	Rapid Urbanization				
5	Unsustainable Farming				
6	Severe draughts				
7	Mining Activities				

5. To what extent has the occurrence of the following climate extreme events contributed to land degradation in your LGA?

	Low (0-25%)	Medium (25%-50%)	High (50%-75%)	Extreme (75%-100%)
Droughts				
Heavy rain				
Associated floods				

State

6. What is the state of land degradation in the last five years

State of land degradation	Low (0-25%)	Medium (25%-50%)	High (50%-75%)	Extreme (75%-100%)
Loss of land cover				
Terrain deformation				
Soil erosion				
Loss soil				

fertility/nutrients				
Salinization				
Loss of vegetation				
Silting of dams, Rivers, Lakes and other water bodies				
Soil pollution /acidification				

7. What are the impacts of land degradation in your LGA?

S/N	Impacts	Low (0-25%)	Medium (25%-50%)	High (50%-75%)	Extreme (75%-100%)
1	Decline or loss of agricultural productivity				
2	Water pollution				
	Food insecurity				
3	Desertification				
4	Migrations and land conflicts				
5	Loss of biodiversity				

8. How do you monitor land degradation in your area?

1. Physical observation/ Patrol()
2. Use of local village leaders()
3. GIS and Remote sensing()

9. What strategic measure or actions have been taken to control land degradation in your area? (Tick the appropriate)

- a) Conservation Agricultural ()
- b) In-situ compost cultivation and pattern farming ()
- c) Vegetative gully healing ()
- d) Ripping and cover crops ()
- e) Integrated plant nutrition technique/Strategies ()
- f) Rain water harvesting ()

10. Does your LGA has specific land use action plan
If yes, please mention them

11. Do you have projects /programs for sustainable land use management in your LGA

a)Yes()

b) No ()

11b) if yes, Mention the existing projects /programs

12. What government initiatives are present in your LGA for combating land degradation?

13. To what extent the following factors affect your effort to control land degradation?

	Factors that hinder efforts to control land degradation in your area.	Low (0-25%)	Medium (25%-50%)	High (50%-75%)	Extreme (75%-100%)
	Population growth rate				
	Shortage of personnel and equipment				
	Poor system of livestock keeping				
	Lack of security in land use tenure system				
	Unsustainability of the projects				
	Non-compliance to different regulations and by laws				
	Lack of funds				

Appendix E: Environmental Survey Questionnaires

QUESTIONNAIRE ON DEFORESTATION AND FOREST DEGRADATION

- What is the status of deforestation in your LGA for the last three years?
 - Increased ()
 - Decreased()
- What is the amount of Hectares of forests lost due to deforestation in the last three years.....
- To what extent does the following contribute to deforestation? (Tick the appropriate)

	Low (0-25%)	Medium (25%-50%)	High (50%-75%)	Extreme (75%-100%)
Poverty				
Population growth				
Economic Growth(construction, agricultural ,timber harvesting and industrialization)				
Energy demand(charcoal, firewood)				
Political and social instability in neighboring countries				
Biofuel crop farming				
Unsustainable farming practices				
Others, mention				

- To what extent does the following pressure contribute to deforestation?

pressures	Low (0-25%)	Medium (25%-50%)	High (50%-75%)	Extreme (75%-100%)
Climate change				
Cultural believes/bushfires				
Land tenure				
Inadequate enforcement and compliance to relevant laws and regulations				

Overgrazing and nomadic pastoral practices				
Others, mention				

5. How many incidences of wildfire have occurred in your LGA annually (for the Past two years)?

STATE

6. Trends of various land cover in Tanzania

Category	2014	2015	2016	2017
Forest				
Other wooded land				
Other land				

7. What is the amount of forest lost due to the following aspects in your LGA for the past 2 years?

Aspect	Estimated amount of lost forest(Hectares)
Charcoal and firewood	
New settlements	
Timber harvesting	
Infrastructure development projects such as roads	
Unsustainable Farming Practice	
Bush fires.	
Biofuel crop farming	
forest encroachment	
Refugee migration	
Wildfire	

8. Evaluate the impacts of deforestation in your LGA

	IMPACTS	Low (0-25%)	Medium (25%-50%)	High (50%-75%)	Extreme (75%-100%)
1	Loss of biodiversity				
2	Economic Loss				
3	Desertification				
4	Drought/floods				
5	Loss of habitat				
6	salinization				
7	Loss of amenity				
8	Coastal erosion				
9	Non-indigenous species				

10	Acidification				
11	Eutrophication				

RESPONSE

9. Are there mechanisms for preventing and combating deforestation in your LGA?

(a) Yes()

(b) No()

10. What initiatives are available in your LGA to control deforestation

(tick the appropriate on the left)

	MECHANISMS	
1	National tree planting campaign	
2	Preparation and implementation of policies, plans, strategies and programs	
3	Strengthening of institutional setup	
4	Promotional of alternative energy sources and energy efficient technology	
5	Promotional of traditional management practices	
6	Different awards on conservation of water sources, tree planting and management.	
7	Forest information management	

11. Total number of trees planted since 2014

Year	Trees planted	Trees survived	% of trees survived
2014/2015			
2015/2016			
2016/2017			

12. How do you monitor and control deforestation and forest degradation?

a) Physical observation/ Patrol()

b) Use of local village leaders()

c) GIS and remote sensing()

13. How many patrols did you plan to conduct for the past 12 months?

14. How many patrols have you conducted for the past 12 months?

15. Do you involve local communities in the controls of deforestation?

a) Yes ()

b) No ()

16. Number of forest harvesting permits issued in your LGA

Year	2015	2016	2017
Number of permits			

issued			
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17. Number of forest harvested (hectares)in your LGA

Year	2015	2016	2017
Number of hectares harvested			

18. What were the challenges in implementing the initiatives for controlling deforestation in your LGA?

Factors that hinder efforts to control deforestation in your area.	Low (0-25%)	Medium (25%-50%)	High (50%-75%)	Extreme (75%-100%)
Fund				
Shortage of personnel and equipment				
Lack of Awareness by the local communities				
Conflict of the local communities with the government due to unclear boundaries				
Unsustainability of the projects				
Non-compliance to different regulations and by laws				
Others mention				

19. What are the strategies set by your LGA for alternative energy sources?

- a. Use of natural gas()
- b. Use of electricity()
- c. Use charcoal kilns and charcoal stoves()
- d. Use of biogas()

Appendix F: State of Land Degradation

SN	Name of LGAs	Loss of land cover and vegetation	Terrain deformation	Soil erosion	Loss of soil fertility/nutrients	Salinization	Silting of dams, Rivers, Lakes	Soil pollution Acidification
1	Arusha CC	Extreme	High	Extreme	High	Low	Low	Low
2	Babati DC	Medium	Low	Medium	Medium	Low	High	Low
3	Babati TC	Medium	Medium	High	High	Medium	High	Medium
4	Bagamoyo DC	Medium	Low	Low	Medium	Low	Medium	Low
5	Bahi DC	High	Medium	High	Medium	Medium	High	Medium
6	Biharamulo DC	High	Low	Low	Low	Low	Medium	Low
7	Chemba DC	Low	Low	Low	Low	Low	Low	Low
8	Dodoma MC	Medium	Medium	Medium	Medium	High	High	Low
9	Gairo DC	High	Medium	High	High	Medium	Low	Medium
10	Karagwe DC	High	Low	Medium	Low	Low	Medium	Low
11	Kasulu TC	High	Medium	High	High	Medium	High	High
12	Kibiti DC	Medium	Medium	Medium	Medium	High	High	Medium
13	Kibondo DC	Medium	Extreme	High	Low	High	Low	High
14	Kondoa DC	Medium	Medium	High	Medium	Low	Low	Low
15	Kongwa DC	High	High	Extreme	High	Medium	High	Medium
16	Korogwe TC	Low	Medium	Medium	Medium	Medium	Medium	Low
17	Kyerwa DC	High	Medium	High	High	Medium	Low	High
18	Ludewa DC	Low	Low	Low	Medium	Low	Low	Low
19	Mafia DC	Low	Low	Low	Low	Low	Low	Low
20	Malinyi DC	Medium	Low	Low	Low	Low	High	Low
21	Masasi DC	High	Medium	Medium	Extreme	Medium	Medium	Medium
22	Mbinga DC	High	Medium	Medium	Extreme	Medium	Extreme	High

SN	Name of LGAs	Loss of land cover and vegetation	Terrain deformation	Soil erosion	Loss of soil fertility/ nutrients	Salinization	Silting of dams, Rivers, Lakes	Soil pollution Acidification
23	Misungwi DC	High	Medium	Medium	High	Low	High	Medium
24	Moshi MC	Medium	Low	Medium	Medium	Low	Medium	Low
25	Mpanda MC	Medium	Medium	High	Extreme	Medium	Extreme	Low
26	Mpwapwa DC	High	Medium	High	Medium	Medium	High	Medium
27	Msalala DC	Low	Low	Medium	Medium	Low	Low	Low
28	Muheza DC	Medium	Low	Medium	Medium	Low	Medium	Medium
29	Musoma MC	Low	Medium	Medium	High	Low	Low	Low
30	Mwanza CC	Medium	Medium	Medium	Medium	Low	High	Medium
31	Nanyumbu DC	Medium	Low	Low	Medium	Medium	Low	Low
32	Ngara DC	Medium	Medium	Medium	Medium	Low	Medium	Medium
33	Ngorongoro DC	Medium	Low	Medium	Medium	Low	Medium	Low
34	Nsimbo DC	Low	Medium	Medium	Low	Low	Low	Low
35	Pangani DC	Medium	Low	Medium	Medium	High	Medium	Medium
36	Same DC	High	Extreme	Extreme	Extreme	Low	High	Low
37	Serengeti DC	Medium	Low	Medium	Medium	Low	Medium	Low
38	Shinyanga DC	High	Low	High	High	Low	Low	High
39	Simanjiro DC	Extreme	Medium	Extreme	High	Low	High	Medium
40	Songwe DC	Extreme	Medium	High	Medium	Medium	Medium	Medium
41	Sumbawanga DC	Medium	Low	Medium	Medium	Low	Medium	Low
42	Tandahimba	Medium	Low	Low	Medium	Low	Low	Low
43	Urambo DC	Medium	Medium	Low	High	Low	Low	Low

Appendix G: State of Forest Degradation and Deforestation in the Districts

SN	Name district	Trend
1	Meatu	decreased
2	Mbeya	decreased
3	Kyela	decreased
4	Ileje	decreased
5	Temeke/kigamboni	decreased
6	Iringa	decreased
7	Itilima	decreased
8	Lushoto	decreased
9	Biharamulo	decreased
10	Mufindi	decreased
11	Njombe	decreased
12	Karatu	decreased
13	Serengeti	decreased
14	Rondo Nature Forest Reserve	decreased
15	Urambo	decreased
16	Ludewa	increased
17	Momba	increased
18	Sumbawanga	increased
19	Simanjiro	increased
20	Songwe	increased
21	Kibondo	increased
22	Chunya	increased
23	Makete	increased
24	Kongwa	increased
25	Kakonko	increased
26	Manyoni	increased
27	Mvomero	increased
28	Mtwara	increased
29	Muleba	increased
30	Kibiti	increased
31	Bunda dc	increased
32	Mbulu	increased
33	Kilindi	increased

34	Monduli	increased
35	Ulanga	increased
36	Ilala municipal	increased
37	Missenyi	increased
38	Madaba	increased
39	Kilwa	increased
40	Malinyi	increased
41	Mpwapwa	increased
42	Bagamoyo	increased
43	Ukerewe	increased
44	Mvomero	increased
45	Magu	increased
46	Nkasi	increased

Appendix H: List of Interviewed Officials

No	District	Interviewed officials
1	Liwale,Lindi	District Forest Officer
2	Mbinga,Ruvuma	District Land Officer District Forest Officer
3	Ludewa,Njombe	District Land Officer
4	Ilemela,Mwanza	Land Officer District Forest Officer
5	Magu ,Mwanza	District Forest Manager District Forest Officer
6	Serengeti,Mara	District Forest Manager Land Officer District Forest Officer
7	Nzega,Tabora	District Forest Manager
8	Same ,Kilimanjaro	District Forest Officer
9	Mng'ori,Singida	Land Officer District Forest Officer
10	Kyela ,Mbeya	District Land Officer District Forest Officer