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VICE PRESIDENT'S OFFICE

BASELINE STUDY OF ECOSYSTEM BASED ADAPTATION FOR RURAL RESILIENCE IN TANZANIA

**Submitted by the Center for Climate Change Studies,
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EXECUTIVE SUMMARY

Climate change has become one of the significant global challenges that affect various socio-economic and natural systems. This has been influencing changes in attitude and policies to adapt, particularly, in developing countries like Tanzania, which are regarded as highly vulnerable. While climate change is a global issue, adverse impacts of climate change are already being experienced in many parts of Tanzania, and in almost all socio-economic activities. Tanzania is one of the countries that have laid enabling environment to support adaptation and mitigation, through mainstreaming climate change into national and sector policies, programs and budgets, livelihoods support, and ecosystem based adaptation. The Ecosystem-based Adaptation for Rural Resilience in Tanzania project is one among various initiatives by the government and other stakeholders geared towards supporting adaptation at local level while taking into account the available ecosystems and how they can be used to enhance capacity in the context of adaptation interventions. The general objective of the project is to enhance resilience to climate change in rural communities of Tanzania by strengthening ecosystem resilience and diversifying livelihoods. This contributes to the overarching goal of reducing the vulnerability of rural populations. The baseline assessment was undertaken with the aim of updating indicators and targets, as well as collecting baseline data for these updated indicators. The assessment was performed in a participatory manner, involving a team of consultants, project management team in the Vice President's Office - Division of Environment (VPO-DoE), and key stakeholders that were engaged to validate key deliverables. All field studies applied the participatory process for data collection in order to achieve reliability and validity of the results. The Results Framework was updated, where indicators and targets were updated based on SMART criteria. Additionally, the baseline for each indicator and target were updated, where notable changes were observed since the project document was developed. The most notable changes were made to Output 1.2, where there was a mismatch between activities and the target, and Output 2.3, where the indicator and target for this output were amended to make them specific and measurable. The Results Framework was updated taking into account findings from the baseline study. It was also noted that the baseline study did not establish any kind of VIA study to be conducted recently, thus, no Vulnerability Index (VI) exists in the study districts. However, sources of vulnerability were established during the baseline study, which are such as erratic rainfall patterns, frequent droughts, poverty, deforestation and forest degradation through shifting cultivation and unplanned settlements, overstocking and overgrazing, and inadequate alternative environmental friendly energy sources. The analysis of the various policies, legislation and institutional arrangements indicate that natural resources sector laws are diverse, and there are direct bearing on sustainable forest management. It was found that the legislative framework for sustainable forest management is found in segmented legislative and policy provisions that seek to regulate environmental and natural resources conservation and management in general. These provisions are found in the various sector policies and in both principal and subsidiary legislation regulating resources such as land, forests and the general environment. The analysis also identifies the potential areas of conflict in the legislation governing natural resources and environment which have implications for sustainable forest management. The conflicting provisions of the Forest Act, Village Land Act and the Local Government (District Authorities) Act have been highlighted. The most important data gap established by this study is Vulnerability Index. A comprehensive Vulnerability and Impact Assessment (VIA) is required before the implementation of the project, taking into account the vulnerability conditions described in the updated Output 2.2. Moreover, climate change vulnerability of communities was found to be characterized by household parameters of all the three dimensions of vulnerability such as exposure, sensitivity and adaptive capability, hence, the VIA study should be undertaken in that context. The approaches and strategies for monitoring and evaluation of project indicators in the Revised Framework are presented in section 6.0. The sections outline the sampling design and data collection and management protocol to track the progress of updated project indicators and targets. The regular measurement of outputs enables the Project Management team and the M & E to monitor progress towards achieving these outputs and outcomes. The measurement of progress of the project implementation need to be inclusive of all key stakeholders, including local communities.

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LIST OF ABBREVIATIONS

AKMS	Adaptation Knowledge Management Systems
BHO	Best Harvest Organisation
CCMA	Climate change mitigation and adaptation
CRESD	Creativity for Rural Development and Sustainable Development
CRiSTAL	Community-based Risk Screening Tool – Adaptation and Livelihoods
CSA	Climate smart agriculture
CVCA	Climate Vulnerability and Capacity Analysis (CVCA)
DEMO	District Environmental Management Officer
DTs	District Technicians
EbA	Ecosystem based Adaptation
FGDs	Focus Group Discussions
M&E	Monitoring and Evaluation
PMU	Project Management Unit
NSGRP	National Strategy for Growth and Reduction of Poverty
PROVIA	Programme of Research on Climate Change Vulnerability, Impacts and Adaptation
REDD	Reducing emissions from deforestation and forest degradation
SPSS	Statistical Product and Service Solution
TNRF	Tanzania Natural Resources Forum
ToTs	Trainer of Trainers
UPAF	Urban and peri-urban agriculture and forestry
VIA	Vulnerability Impact Assessment
VI	Vulnerability Index
VICOBA	Village Community Bank
VPO - DoE	Vice President's Office -Division of Environment
WDC	Ward Development Committee
ZSGRP	Zanzibar Strategy for Growth and Reduction of Poverty

1.0 INTRODUCTION

1.1 BACKGROUND AND CONTEXT

Ecosystem-based approaches for climate change adaptation are promoted at international, national, and local levels by both scholars and practitioners (Wamsler et al. 2016). Ecosystem-based approaches for adaptation (EbA) integrate the use of biodiversity and ecosystem services into an overall strategy for helping people adapt to climate change (Munroe et al. 2012). Biodiversity is the foundation and mainstay of agriculture, forests, and fisheries. Biological resources provide the raw materials for livelihoods, agriculture, medicines, trade, tourism, and industry. Forests, grasslands, freshwater, and marine and other natural ecosystems provide a range of services, often not recognized in national economic accounts but vital to human welfare: regulating water flows and water quality, flood control, pollination, decontamination, carbon sequestration, soil conservation, and nutrient and hydrological cycling (World Bank, 2009). Ecosystem-based Adaptation approaches have proved to provide flexible, cost effective and broadly applicable alternatives for reducing the impacts of climate change and as such are a critical tool at adaptation planners disposal for tackling the threats that climate change poses to people's lives and livelihoods across the globe (Munang et al. 2013). While recognizing importance of ecosystems in climate change adaptation, these ecosystems are under increasing pressure from unsustainable use including outright conversion (Ángela Andrade Pérez 2010; Karrasch, Klenke, and Woltjer 2014; Nainggolan et al. 2012). Likewise, these ecosystems are reported to have been significantly impacted by climate change (Hannah 2010). Natural and climate induced disasters can trigger sudden transformations and move ecosystems to different states where the provision of ecosystem services is altered. These changes in ecosystem services affect local communities' well-being and challenge users' adaptation capacities (Marín, Gelcich, and Castilla 2014).

Ecosystem-based adaptation can reduce social vulnerability to climate hazards and can be more sustainable in the long term than hard technical solutions to adaptation. Thus, it can provide a strong argument for the conservation of natural ecosystems (Pasquini and Cowling 2015). However, people have differentiated abilities to benefit from ecosystem services which may constrain the poorest. It is also worth noting that there are different categories of ecosystem services in their contribution to wellbeing, provisioning services and cash being comparatively easy to control (Fisher et al. 2014). It is vital that ecosystem-based approaches to mitigation and adaptation are reconsidered as a third essential pillar in national strategies to address climate change. This is based on the grounds that such ecosystem-based strategies can offer cost-effective, proven and sustainable solutions contributing to, and complementing, other national and regional adaptation strategies (World Bank, 2009).

Climate, biodiversity, and human well-being are inextricably linked (Karrasch, Klenke, and Woltjer 2014; Battarbee et al. 2007). Ecosystems provide important services that can help people adapt to climate variability and change (Pramova et al. 2012). Many of the people most vulnerable to climate change are those who depend most on biodiversity. The continuing, accelerating loss of biodiversity could compromise people's well-being (Battarbee et al. 2007). Thus, ecosystem management approaches are needed to provide solutions for meeting both ecological and human needs, while reducing anthropogenic warming and climate-related impacts on society. For instance, conserving and restoring naturally-functioning ecosystems, which is often one of the goals of ecosystem management can significantly contribute to buffering ecological responses to climate extremes such as droughts. In this regard, it is imperative to reframe climate change issues based on the ecosystem approach. The ecosystem-based approaches can enable flexible and effective responses to the uncertainties associated with climate change (Mori et al. 2013). Thus, resilient ecosystems are vital to human well-being and are increasingly recognized as critical to supporting communities' efforts to adapt to climate change (Chong 2014). However, it is equally important to understand the uptake and implementation of ecosystem-based approaches as a means of understanding how to improve the integration of such approaches in climate change adaptation and mitigation strategies (Naumann,

Gerardo, and Berry 2011). There are challenges faced in adapting to climate change in the developing world due to often weak institutions and governance systems struggle to deal with mounting pressures from population growth, inadequate infrastructure, and diminishing or already depleted natural resources (Tobey et al. 2010).

Forests also play a role in how the broader society adapts to climate change because forests provide diverse ecosystem services that contribute to human well-being and reduce social vulnerability (Locatelli et al. 2010). Ecosystem-based adaptation (EBA) with forests and trees is one of the examples provided. Based on extensive literature review, five cases are highlighted in which forests and trees can support adaptation: (1) forests and trees providing goods to local communities facing climatic threats; (2) trees in agricultural fields regulating water, soil, and microclimate for more resilient production; (3) forested watersheds regulating water and protecting soils for reduced climate impacts; (4) forests protecting coastal areas from climate-related threats; and (5) urban forests and trees regulating temperature and water for resilient cities. The literature provides evidence that EBA with forests and trees can reduce social vulnerability to climate hazards (Pramova et al. 2012). However, forest ecosystems are also undergoing changes due to climate change. Climate change has been inducing range shifts for many species as they follow their suitable climate space and further shifts are projected (Vos et al. 2008).

Coastal ecosystems play a critical role in reducing the vulnerability of coastal communities to rising seas and coastal hazards, through their multiple roles in wave attenuation, sediment capture, vertical accretion, erosion reduction and the mitigation of storm surge and debris movement (Spalding et al. 2013). Coastal ecosystems generate diverse services, such as protection, production of food, climate regulation and recreation across the globe. These services are vital for extremely vulnerable coastal areas for enhancing present and future adaptation capacity under changing climate (Ahammad, Nandy, and Husnain 2013). For example, mangroves provide vital climate change mitigation and adaptation (CCMA) ecosystem services (ES) (Duncan et al. 2016). However, coastal ecosystems have largely declined, threatening the principal source of protein, building materials, tourism-based revenue, and the first line of defense against storm swells and sea level rise (SLR) for small tropical islands (Hernández-Delgado 2015; Duncan et al. 2016). Some studies demonstrate that sea level rise is one of the major long-term impacts, and the most affected ecosystems in the tropics would be mangroves (Sierra-Correa and Cantera Kintz 2015). Irrespective of future climate change, coastal hazards already impact countless communities and the appropriate use of ecosystem-based adaptation strategies offers a valuable and effective tool for present-day management (Spalding et al. 2013). Maintaining and enhancing coastal systems will also support the continued provision of other coastal services, including the provision of food and maintenance. The vulnerability of tourism-dependent communities, coastal tourism facilities, and beaches to climate change demands the use of measures that can urgently minimize vulnerability and in the long term achieve sustainable development. Thus severity of coastal damage, the importance of tourism to sustainable development, and the country's adaptive capacity play a key part in the selection and implementation of climate change adaptation measures. Keywords: (M. Mycoo 2014). Ecosystem-based adaptation provides an opportunity to reduce the vulnerability of these communities through an improved management of marine and coastal ecosystems so that they continue providing important ecosystem services on which so many depend (M. A. Mycoo and Gobin 2013; Hale et al. 2009). The conservation, restoration and use of vegetated coastal habitats in eco-engineering solutions for coastal protection provide a promising strategy, delivering significant capacity for climate change mitigation and adaptation. (Duarte et al. 2013).

Small Island Developing States (SIDS) are also reported to be highly dependent on natural resources for livelihoods. However, these SIDS are vulnerable to climate change impacts including sea level rise, invasive species, and ocean acidification, changes in rainfall patterns, increased temperatures, and changing hazard regimes including hurricanes, floods and drought. Therefore, focus on ecosystems and their interaction with people is essential for climate change adaptation (Mercer et al. 2012).

Ecosystem - based adaptation is also important in the agricultural sector, particularly, in developing countries. For example, urban and peri-urban agriculture and forestry (UPAF) in cities of developing regions, particularly in Africa, has demonstrated scalable adaptation and mitigation potential. The key emerging areas of adaptation and mitigation include enhanced food security, productive greening, ecosystem services and innovative policy for urban resilience and transformation (Lwasa et al. 2014). Likewise, agri-tourism is considered to be a climate change adaptation strategy capable of supplementing agricultural incomes and sustaining rural livelihoods. Agri-tourism is presented as a short-term strategy to increase household's revenues, reduce risks associated with agricultural production, and decrease the depletion of natural resources (Valdivia and Barbieri 2014). However, despite the growing interest in Ecosystem-based Adaptation, there has been little discussion of how this approach could be used to help smallholder farmers adapt to climate change, while ensuring the continued provision of ecosystem services on which farming depends (Vignola et al. 2015). Furthermore, local planning practices that support these approaches are scattered, and measures are neither systematically implemented nor comprehensively reviewed. These practices must also help smallholder farmers to increase their food security, increase or diversify their sources of income generation, take advantage of local or traditional knowledge, be based on local inputs, and have low implementation and labor costs (Vignola et al. 2015). There is also a need for inventories of assets at the landscape level that can inform adaptive management of agro-biodiversity-based interventions (Jackson et al. 2012). Much as there is a need for ecosystem based adaptation options to improve community resilience to climate change impacts, there is a need for adaptations options to support ecosystems, as they are impacted by both community activities and climate change (Figure 1.1). Therefore, the baseline study recommends indicators for monitoring both EbA and ecosystem changes.

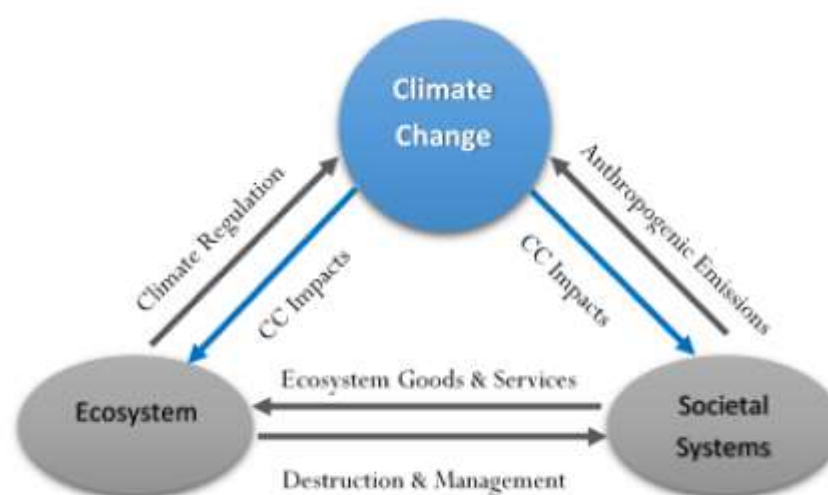


Figure 1.1 Interaction between climate change, society and ecosystem (Source: Sharma et al., 2013)

1.2 ROLE OF ECOSYSTEM BASED ADAPTATION IN TANZANIA

Climate change has become one of the significant global challenges that affect various socio-economic and natural systems. This has been influencing changes in attitude and policies to adapt, particularly, in developing countries like Tanzania, which are regarded as

highly vulnerable. While climate change is a global issue, adverse impacts of climate change are already being experienced in many parts of Tanzania, and in almost all socio-economic activities. The current situation and projections suggest that impacts of climate change will continue to be felt in almost all socio-economic systems and many facets of people’s lives and ecosystems across the country.

Changes in temperature and seasonal shifts in rainfall patterns, especially late rainfall onset and early rainfall cessation, seasonal floods and increase in dry spells have been observed in various parts of the country. As a result, low adaptive capacity and high dependence on climate sensitive sectors such as agriculture, energy, livestock, health, water, fisheries, forestry, wildlife and infrastructure place many developing countries, including Tanzania into high vulnerability index. The high level of vulnerability is also attributed by non-climate stress factors such as unsustainable use and hence degradation of natural resources.

Even though non-climate stress factors have high contribution to vulnerability in many parts of the country, climate change impacts such as recurrent drought and floods have direct significant negative impacts on communities’ livelihoods and natural resources, including availability of and access to ecosystems goods and services. Frequent droughts over the years have resulted into massive crop failure and livestock loss in many parts of the country, especially in the semi-arid areas. For example, between year 2009 and 2010, drought was estimated to have killed a total of 316, 437 cattle, 236,359 goats and 92, 640 sheep in Arusha and Manyara Regions alone. The value of loss of agriculture GDP from the impacts of climate change over the coming 50 years is estimated at US\$ 27 billion (Tanzanian Shillings 43,200 trillion), which is an annual average of about US\$ 540 million (Tanzania Shillings 864,000 billion)¹.

Efforts to combating effects of climate change have been put forward by many countries, through inter alia, policy changes and capacity building to address direct and indirect impacts of climate change. Tanzania is one of the countries that have laid enabling environment to support adaptation and mitigation, through mainstreaming climate change into national and sector policies, programs and budgets, livelihoods support, and ecosystem based adaptation. The Ecosystem-based Adaptation for Rural Resilience in Tanzania project is one among various initiatives by the government and other stakeholders geared towards supporting adaptation at local level, which take into account the available ecosystems and how they can be used to enhance capacity in the context of adaptation interventions.

The general objective of the project is to enhance resilience to climate change in rural communities of Tanzania by strengthening ecosystem resilience and diversifying livelihoods. This contributes to the overarching goal of reducing the vulnerability of rural populations. This objective will be achieved by implementing activities within three main components as described in Table 1.1.

Table 1.1: EBARR Project Components, Outcomes and Outputs

Components/Outcomes/Outputs	Activities
Component 1. Capacity to adapt to climate change through EbA approaches.	
Outcome 1. Improved stakeholders capacity to adapt to climate change through EbA approaches and undertake resilience building responses	
Output 1.1. A GIS-based adaptation knowledge management system (AKMS) that supports planning	1.1.1 Design and develop the basic structure of the knowledge management system utilizing available open source tools
	1.1.2 Form a cross-sectoral multi-stakeholder group to support the management and maintenance of the knowledge system and its use for adaptation planning
	1.1.3 Verify the data produced by the stakeholders and identify capacity gaps and opportunities for collaboration on all levels
	1.1.4 Identify currently available data in GIS format and additional data needs for planning appropriate climate change responses

¹ United Republic of Tanzania –URT (2014). State of the Environment Report, Vice President’s Office , URT

	1.1.5 Provide annual recommendations on gaps and needs for adaptation planning and programming based on findings from the knowledge system
Output 1.2. Training and guidance provided to a cadre of knowledgeable resource persons on ecosystem-based adaptation	1.2.1 Develop ToT training material on ecosystem based adaptation approach
	1.2.2 ToT training for VPO staff, National climate change steering committee and working groups members, climate change and disaster management focal points in relevant ministries
Component 2. EbA for rural resilience	
Outcome 2. Increased resilience in project sites through demonstration of EBA practices and improved livelihoods	
Output 2.1. Local authorities, committees and user groups trained on communities' adaptation to climate change using EbA.	2.1.1 Training (ToT) on climate change vulnerability assessment (including disaster risk) and EbA/adaptation planning for local authorities, committees and user groups
Output 2.2. Locally-specific climate change vulnerability, risks and adaptation options are identified by local stakeholders.	2.2.1 Undertake participatory Climate Change Vulnerability and Impact Assessments in project sites using guidelines for VIA under PROVIA and identify recommended adaptation actions
	2.2.2 Develop a diagnostic and indicators of climate-change affected ecosystem services, based on recognized methodologies for measuring ecosystem services such as the UNEP-WCMC Toolkit
	2.2.3 Establish a map of drought, flood, pest and diseases risk zones (baseline and climate change scenario) in selected sites and incorporate results to knowledge management system
	2.2.4 Assess the physical and socio-economic impacts of climate change on selected project sites and incorporate results to Output 1.2.
Output 2.3. Ecosystem services are rehabilitated through the implementation of EbA practices (ecosystem rehabilitation, sustainable management and conservation of natural resources)	2.3.1 Develop new, resilient and seasonality based, land use and ecosystems management plans with communities
	2.3.2 Establish, through consultations with local communities, exclosure and no-take zones to support the natural regeneration of degraded areas
	2.3.3 Undertake rangeland rehabilitation on 6,000 ha
	2.3.4 Undertake watershed rehabilitation and reforestation, using local species on 3,000 ha
	2.3.5 Undertake riverbank rehabilitation in areas
Output 2.4. Income is increased and maintained across seasons, through sustainable and resilient livelihoods	2.4.1 Implement climate smart agricultural practices, including conservation-based irrigation, water harvesting, crop rotation, etc.
	2.4.2 Improve resilience of current livelihoods and introduce alternative, income-generating, climate resilient livelihood activities for vulnerable groups, particularly women (livestock value chain, beekeeping)
	2.4.3 Introduce and promote efficient cooking stoves and efficient charcoal production technologies to reduce pressures on forest resources
	2.4.4 Training and support to LGAs, extension services and key producer groups on resilient livelihoods
Component 3: Knowledge management on climate change adaptation and up-scaling	
Outcome 3: Strengthened information base on EbA supports an upscaling strategy	
Output 3.1. Project lessons, knowledge on Climate change adaptation and resilient livelihoods using ecosystems captured, stored and widely disseminated	3.1.1 Document best practices, applicable technologies, success stories to inform policies and adaptation planning, linked to the knowledge management system in Outcome 1
	3.1.2 Develop and disseminate practical and applied training and communication material for different target audiences (policy decision makers, planning, agricultural advisory services at local level) using print, radio and social media
	3.1.3 Undertake participatory monitoring of ecosystem services, project indicators and livelihoods
	3.1.4 Develop a sustainability and upscaling strategy using lessons learned through project implementation.

1.3 TERMS OF REFERENCE FOR CONSULTANTS

The assignment for baseline assessment and development of indicators and targets was performed in a participatory manner, involving a team of consultants, project management team in the Vice President's Office - Division of Environment (VPO-DoE), and key stakeholders that were engaged to validate key deliverables. All field studies applied the participatory process for data collection in order to achieve reliability and validity of the results. Specifically, the key tasks for the Consultant were to:

- i. Assess the project results framework and propose any specific revisions to project activities, outputs and outcomes, risks and assumptions
- ii. Assess and describe status of each of the indicators, validate and/or use of SMART criteria to revise or further develop the indicators and targets for each of the revised outcomes and output according to the adaptation results the project is aiming to generate. This task also included review of project documents, national/sectoral strategies, plans and policy documents related to climate change adaptation, land degradation ecosystem based adaptation or sector specific (water, agriculture, livestock, forestry) relevant to the determination of project indicators baseline (National Climate Change Strategy (2012), Zanzibar Adaptation Programme of Action (ZAPA), National REDD Strategy (2013), First and Second National Communications to UNFCCC (2003; 2014), National Adaptation Programme of Action (NAPA) (2007), National Environmental Action Plan, the National Strategy for Poverty Reduction and Economic Growth, the Agriculture Sector Development Strategy (2001) and the Water Sector Development Strategy (2006) and National Water Policy (2002).
- iii. In close cooperation with the district technicians, collect baseline data, that are gender-disaggregated, for the project indicators established
- iv. Identify data gaps and agree in consultation with the UN Environment, the Sector Ministries and the Vice President's Office on a methodology to fill in the data gaps
- v. Develop a sampling design and a data collection and management protocol. The data sampling protocol should provide a detailed description of the methodology used to obtain values for each indicator so that monitoring of each indicator can be independently replicated by external reviewers during Mid Term Reviews and Terminal Evaluation

1.4 THE MAIN OUTPUTS OF THE BASELINE ASSESSMENT ARE

- i. Inception report with detailed methodology, tools, work plan, and reviewed project results framework and indicators.
- ii. First draft report with description of baseline methodology, and baseline data that are gender-disaggregated for the project indicators, against which the project performance and impact will be measured. The consultant carried out baseline surveys in each of the five districts (Simanjiro, Mpwapwa, Mvomero, Kishapu and Kaskazini-A, Unguja). The report also provide updated version of the results framework and recommended strategies for monitoring project indicators during project implementation and relevant datasets.
- iii. Final report incorporating all comments from stakeholders.

2.0 METHODOLOGY

2.1 SAMPLING AND DATA COLLECTION METHODS

The assignment applied mixed participatory approaches (obtaining both qualitative and quantitative data) in site selection, data collection (field surveys, stakeholders' engagement) and data analysis. The survey involved sampling of respondents for collection of information relevant for setting baseline and validation of project indicators and targets. The questionnaire was used to collect information from sample households/respondents. Checklists with open-ended questions guided interviews with key informants and Focus Group Discussions (FGD). The study was conducted in one ward/shehia per district. The selection of the study wards/shehia was done by the District Technician in collaboration with district council and the study team. The team managed to visit one ward per project district, and two villages per ward (for Tanzania mainland) and one village/three Shehia (Zanzibar) as a sample representative of all villages in a ward (Table 2.1). At least, 30 respondents were interviewed per ward (Table 1.2). The number of households/units for questionnaire surveys, focus group discussions and key informants interviewees varied per hamlet/shehia/village/ward/district municipal depending on the existing number of population in a given sample site. Whilst, 6-12 people were purposively selected per village for focus group discussions (i.e. gender was considered).

Table 0.1: Wards and village studied in districts

District	Ward	Village	No. of Households
Mvomero	Melela	Melela	43
		Magali	37
Mpwapwa	Ng'hambi	Ng'hambi	38
		Kazania	35
Simanjiro	Orkesumet	Narosoito	35
		Jitegemee	33
Kishapu	Kiloleli	Kiloleli	30
		Muguda	30
Kaskazini A	Kijini	Kijini	0
		Matemwe	77
Total			358

2.2. DATA SOURCES

Both primary and secondary data were collected. Secondary data were sourced from a detailed desk review of key documents, e.g. the programme documents, project reports, national/sectoral policies, strategies plans and programmes and other relevant literature that were accessed online and collected from physical libraries. Primary data were sourced from household questionnaire survey, key informant interviews, roundtable meetings, expert meetings and/or focus group discussions where possible with key project team members, district staff, district project technicians, ward and village officers and leaders as well as communities across the sample sites.

2.3 SUMMARY OF DATA COLLECTION METHODS

The methodology of this study was based on participatory approaches (combination of both qualitative and quantitative) of data collection and analysis. Table 2.2 below summaries key methodologies for each task performed under this assignment.

Table 0.2: Summary of key methodological approaches

	Activity/Task	Approach
1.	Assess the project results framework and propose any specific revisions to project activities, outputs and outcomes (if deemed necessary)	<p>Documentary review, including the project documents and project inception report. All project activities, outputs and outcomes will be assessed and necessary revisions made by experts.</p> <p>Roundtable discussion with project management team/Key Informant Interviews to validate the revisions made in the project activities, outputs and outcomes</p> <p>Review of relevant policies, strategies, plans and other relevant agreements, so as to align project activities, outputs and outcomes with the national documents</p>
2.	Description of indicators status and/or use of SMART criteria to revise indicators, targets, outputs and outcomes relative to adaptation results of the project.	<p>Review of project document, including project log-frame/Result based framework, budget and detailed work plan. Project indicators, targets, outputs and outcomes relative to adaptation results of the project will be examined and a short description made to ensure they are SMART.</p> <p>Documentary review of national and sectoral policies, strategies, plans and programmes will be made to align the project indicators, targets, outputs and outcomes with national documents.</p> <p>Roundtable discussions/technical review meetings with the project management team and selected key informants will be organized to validate the revised project indicators, targets, outputs and outcomes, as well as the short descriptions</p>
3.	Field surveys for baseline data collection	<p>Household questionnaire survey,</p> <p>Focus group discussions with mixed gender groups,</p> <p>A separate Focus group discussion with women only,</p> <p>Key informant interviews</p> <p>Expert meetings or roundtable discussions</p> <p>District Documentary reviews (e.g. District profiles)</p>
4.	Identification of gaps and methodology for gaps filling and development of complete baseline information	<p>Documentary reviews and stakeholder analysis to uncover existing data sets from various sources. For example, spatial datasets which will be gathered from various sources including institutions which undertook earlier initiatives in the study areas etc.</p> <p>Roundtable discussions with project management/technical team to discuss the existing gaps and methods to fill them</p>
5.	Development of a sampling design, data collection and management protocol	<p>Documentary reviews to uncover a sampling design, data collection and management protocol for filling data gaps</p> <p>Roundtable discussions with project management/technical team to discuss the proposed sampling design, data collection and management protocol for filling data gaps</p>

2.4 QUALITY CONTROL AND DATA ANALYSIS

Quality control was ensured through close supervision of trained enumerators, and data cleaning. Great care was exercised to ensure proper translation of questionnaires used in soliciting data from the individual respondents. Prior to their use, the data collection tools were piloted, reviewed and aligned to the Statistical Product and Service Solution (SPSS) data sheet, which was used to analyse primary data. Survey methods were triangulated in order to ascertain reliability of the data.

2.5 ASSESSMENT OF LAND USE AND LAND COVER

This was conducted to set a baseline (current status) of land use/cover in the study districts before project implementation. It will also facilitate monitoring and evaluation of the restoration changes achieved. Likewise, it will help to track changes at the end of the project. This assessment helps to collect baseline information for restoration under output 2.3. To reflect land use/cover changes and produce maps in the five districts of the study area, the following Landsat TM (1996) and Landsat TM8 (2016) images scenes have been used:

- i. Kishapu District (Scene 170/062, 170/063 and 169/063).
- ii. Simanjiro District (Scene 167/062, 167/063, 168/062 and 168/063)
- iii. Mpwapa District (168/064, 168/065 and 167/065)
- iv. Mvomero District (167/064 and 167/065)
- v. Kaskazini Unguja District in Zanzibar (167/064 and 167/065)

Dates for images

1. Kishapu District:

Landsat Tm scenes of 1996/1995 (170/062 of 10-07-1995, 170/063 of 08-10-1995 and 169/063 of 01-10-1995), Landsat Tm 8 scenes of 2016 (170/062 of 24-06-2016, 170/063 of 28-05-2016 and 169/063 of 04-07-2016)

2. Simanjiro District:

Landsat Tm scenes of 1996/1995 (167/062 of 31-01-1996, 167/063 of 27-10-1995, 168/062 of 02-07-1996 and 168/063 of 01-07-1996), Landsat Tm 8 scenes of 2016 (167/062 of 21-06-2016, 167/063 of 28-06-2016, 168/062 of 28-09-2016 and 168/063 of 28-09-2016)

3. Mpwapa District:

Landsat Tm scenes of 1996/1995 (168/064 of 27-09-1995, 168/065 of 14-08-1996 and 167/065 of 15-07-1996), Landsat Tm 8 scenes of 2016 (168/064 of 21-06-2016, 168/065 of 29-06-2016 and 167/065 of 12-09-2016)

4. Mvomero District:

Landsat Tm scenes of 1996/1995 (167/065 of 15-07-1996, 167/064 of 02-07-1996), Landsat Tm 8 scenes of 2016 (167/065 of 12-09-2016, 167/064 of 01-07-2016)

5. Kaskazini A District :

Landsat Tm scenes of 1996/1995 (166/064 of 05-06-1996, 166/065 of 06-09-1996), Landsat Tm 8 scenes of 2016 (167/065 of 02-06-2016, 167/064 of 20-04-2016)

It was expected to use images for 1996 but in some areas the available images without cloudy cover was from 1995.

Image interpretation

Though computerized classification of satellite data is time saving, it is not reliable where image signatures are not consistent. We therefore opted for semi-automatic (On screen visual) interpretation given the heterogeneous nature of the study area. Expert knowledge of the study area was important in identifying different land use/cover types when doing on screen digitization. Image interpretation was done by first creating colour composites from the combination of bands 4 (red), 5 (green) and 3 (blue) that clearly distinguished features or vegetation types for on screen digitization. All digitized data sets went through the following processes:

- i. Creation of raw digitized coverage
- ii. Cleaning of the coverage (identifying errors)
- iii. Editing of the coverage (correcting errors)
- iv. Transformation of the coverage to UTM projection
- v. Checking for sliver polygons and editing-out
- vi. Coding of polygons
- vii. Clipping of the coverage (to allow-edge-matching to adjacent image scenes)
- viii. Edge match editing
- ix. Production of color plot and checking
- x. Generation of the final coverage and copying

The final coverage was then used to prepare the land use/cover change maps of the study districts. Analysis of data to produce the change detection matrix was done using a GIS software (ArcGIS) and MS Excel. The maps (Figures 2.1, 2.2, 2.3, 2.4 and 2.5) are presented below to show, first the change in land cover/use that has happened over the past two decades, and the current status (baseline condition), from which, implementation interventions will be measured. These are ecosystem indicators, which are further detailed under Output 2.3 (Chapter 3)

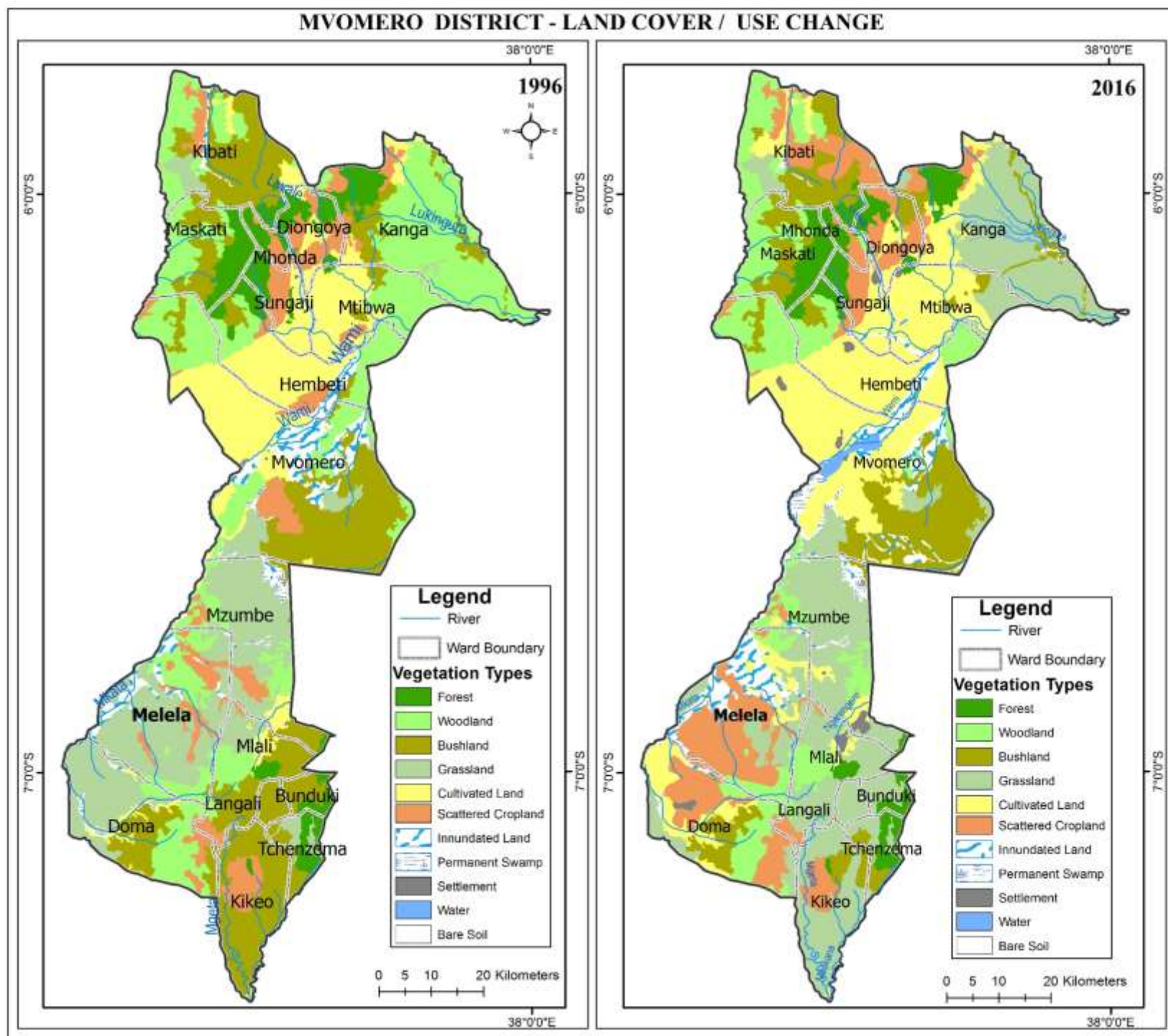


Figure 2.1 Mvomero District land Cover/Use Change

MPWAPWA DISTRICT - LAND COVER / USE CHANGE

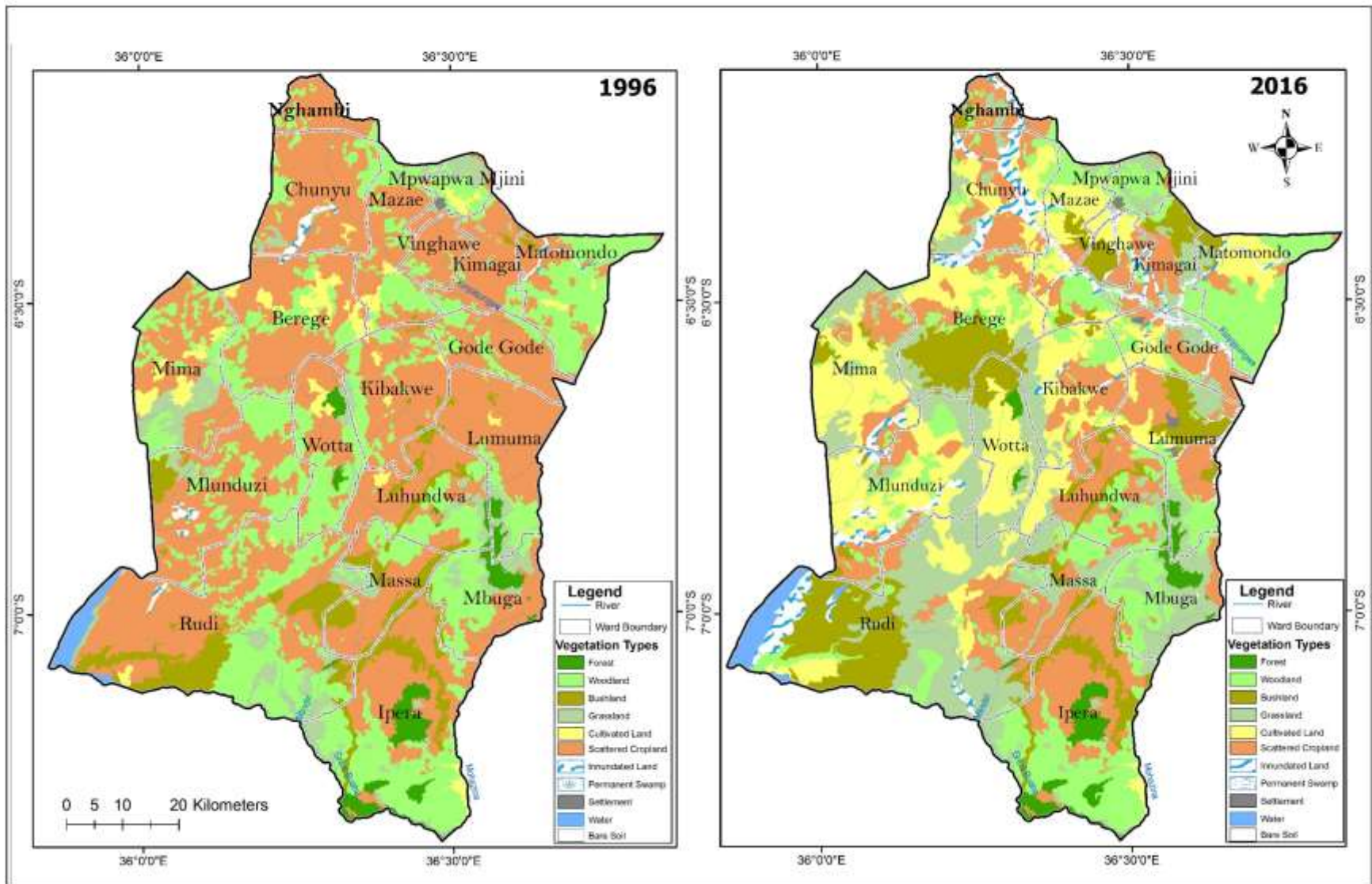


Figure 2.2 Mpwapwa District land Cover/Use Change

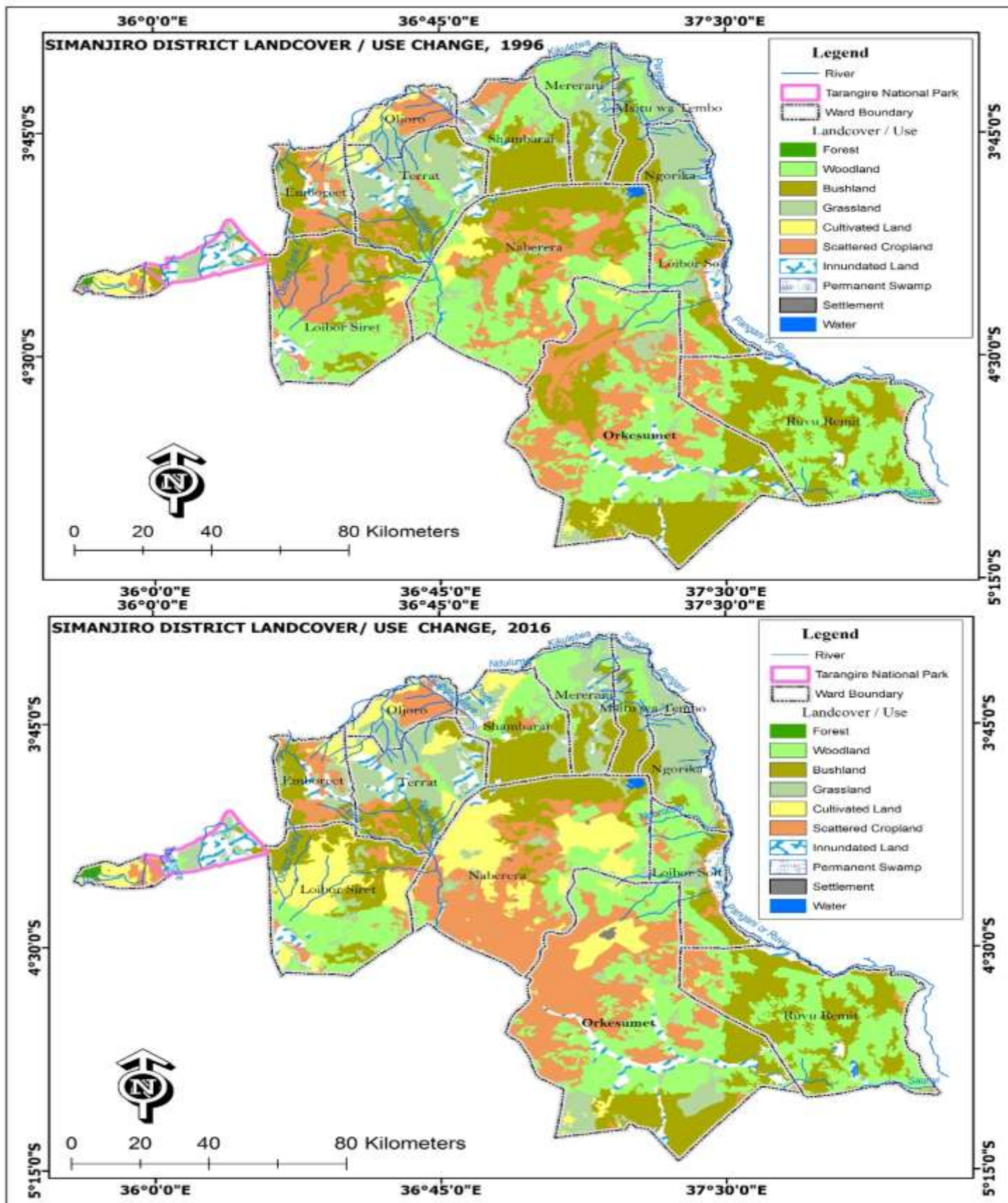


Figure 2.3 Simanjiro District land Cover/Use Change

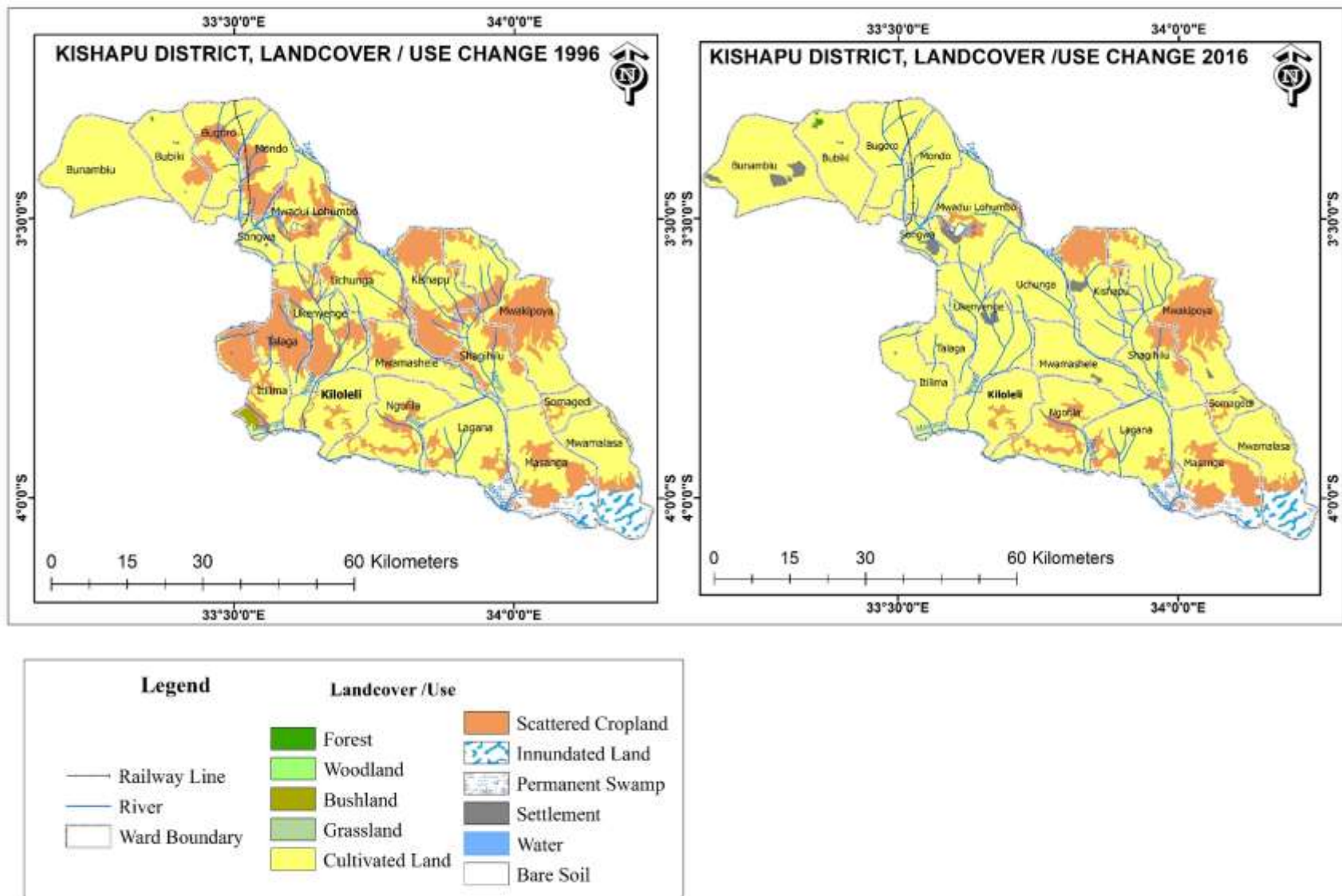


Figure 2.4 Kishapu District land Cover/Use Change

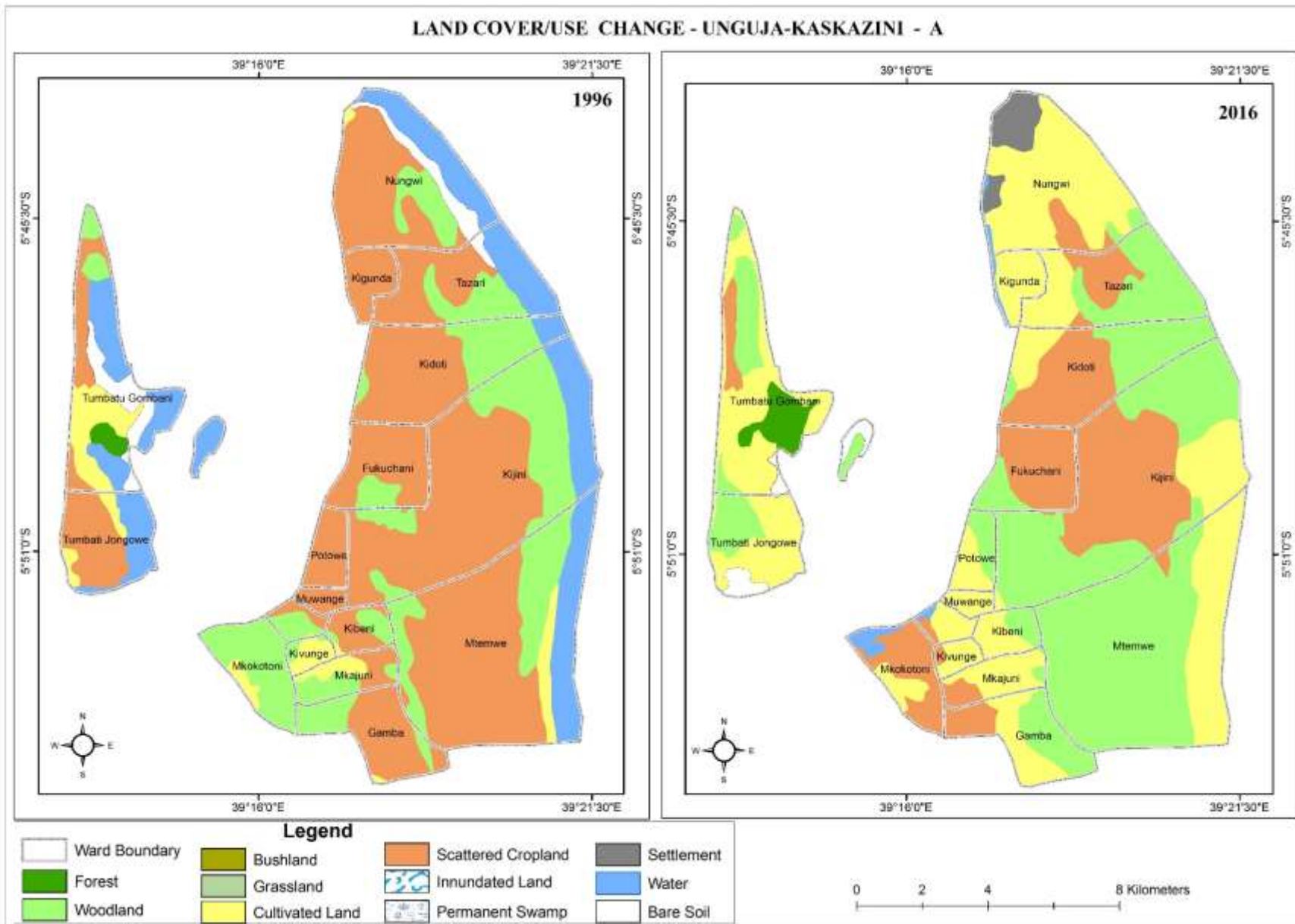


Figure 2.5 Kaskazini A District land Cover/Use Change

3.0 ASSESSMENT OF PROJECT INDICATORS AND TARGETS

The assessment of indicators and targets was carried out as indicated in Table 3.1 below. Results are described from an assessment of the original indicators and targets (Appendix 3 of the project document) against SMART criteria. Revised indicators and targets are recommended where required and informed by information from the baseline study. A valuable indicator is: i) relevant for capturing changes resulting from project implementation; and ii) practical and cost-effective in terms of data collection and management. The suitability of the original project indicators was determined by evaluating them against a set of criteria that were developed using the SMART criteria². SMART stands for:

Table 0.1 Summary of criteria definitions for assessment of indicators and targets

'SMART' criteria	Supportive questions:
Specific to the objective	Is it clear exactly what is being measured? Does the indicator capture the essence of the desired result? Does it capture differences across areas and categories of people? Is the indicator specific enough to measure progress towards the result?
Measurable either quantitatively or qualitatively	Are changes objectively verifiable? Will the indicator show desirable change? Is it a reliable and clear measure of results? Is it sensitive to changes in policies and programmes? Do stakeholders agree on exactly what to measure?
Attainable (in terms of realistic, practical and simple)	What changes are anticipated as a result of the assistance? Are the result(s) realistic? For this, a credible link between outputs, contributions of partnerships and outcome is indispensable Is information available at a reasonable cost and effort? Will it be easy to collect and analyze?
Relevant to the information needs of decision-makers	Does the indicator capture the essence of the desired result? Is it relevant to the intended outputs and outcome? Is the indicator plausibly associated with the scope of activity? Will the information be useful for decision-making, accountability, and learning?
Time-bound so that users know when to expect the objective or target to be achieved	Is it a consistent measure over time?

Source: GEF, 2012.

Assessment of Indicators and Targets

The preliminary assessment of the project indicators and targets were carried during the inception phase and included in the inception report. In this report, more revisions to the preliminary assessment using baseline information are made, thus, necessary amendments are made to strengthen the assessment and make concrete recommendations on project indicators and targets. Findings from the baseline assessment are added under each original indicator and target, and hence used to understand the baseline status for each indicator and target.

- Project objective: Increasing resilience to climate change in rural communities of Tanzania by strengthening ecosystem resilience and diversifying livelihoods.
- Component 1: Capacity to adapt to climate change through EbA approaches.

²GEF [Global Environment Facility] (2012). "Operational Guidelines on Ecosystem-Based Approaches to Adaptation" GEF/LDCF/SCCF Council Meeting, November 2012. Washington, D.C.Pp. 5.

Original Outcome 1: Improved stakeholders' capacity to adapt to climate change through EbA approaches and undertake resilience building responses

Indicator	Baseline	Target	Means of Verification	Assumptions/risks
Number of AKMS users who report strengthened capacity to plan for adaptation	0	90% of AKMS users are reporting strengthened capacity to plan for adaptation by end of project	AKMS surveys, reports	R: The individuals trained or institutions are not empowered enough to influence the project implementation. A: Stakeholders are interested in improving adaptation planning through learning and using the AKMS.

Types of users at different levels are not clearly disaggregated by the indicator and target. The indicator and target need to clearly specify the users (e.g. Technicians, farmers, livestock keepers, etc.) at different levels of operation (e.g. regional, district, ward or village levels), where EbA approaches are being adopted or implemented. Assigned officers, including district technicians will be relevant for both populating data in the AKMS and users of information for adaptation planning and decision making. Likewise, farmers and livestock keepers (i.e. small-, medium- and large-scale) and institutions (NGOs and private sector) will be the source of data for the AKMS platform (i.e. EbA practices and other lessons learnt), and those who have access to the platform would be considered as end users (e.g. by adopting EbA practices). However, populating information on the Adaptation Knowledge Management Systems (AKMS) on voluntary scheme might affect achievement of the target. Therefore, there is a need to assign a specific officer to validate (including disaggregation) the information before populating to the platform and for these functions to be included in officers' work plans and the district's performance targets.

Baseline results indicate that respondents at ward and village levels in all five districts are not exposed to any kind of GIS-based knowledge management system. Stakeholders at village and ward levels will be the source of data for populating in the AKMS, and also users of the output from the system. Likewise, FGDs at NGOs and district levels show that there is no any kind of a knowledge management system that exists, apart from occasional trainings related to climate change to some officials. This baseline study concludes a fresh start of establishing and training users on AKMS in all districts. Hence, the baseline for indicators and targets for the outcome is not amended, except the statements are qualified to include users at different levels. Furthermore, in all districts, there is no clear coordination of climate change related matters in the councils, this also includes coordination of implementation of climate change related interventions in the district councils. Through the FGDs, it was recommended to institutionalize a standing committee and/or designate the District Environmental Management Department (under the District Environmental Management Officer (DEMO)) to coordinate climate change related issues in the council.

✓ Updated Outcome 1: Improved stakeholders' (AKMS users) capacity to adapt to climate change through EbA approaches and undertake resilience building responses across scales

Indicator	Baseline	Target	Means of Verification	Assumptions/risks
Number and type of AKMS users who report strengthened capacity to plan and implement EbA practices at district and village levels	0 AKMS users at district and village levels	90% of AKMS users are reporting strengthened capacity to plan for adaptation by end of project	AKMS surveys, reports	R: The individuals trained or institutions are not empowered enough to influence the project implementation. A: Stakeholders are interested in improving adaptation planning through learning and using the AKMS.

 **Original Output 1.1: A GIS-based adaptation knowledge management system (AKMS) that supports planning**

Indicator	Baseline	Target	Means of Verification	Assumptions/risks
Existence of a fully operational GIS-based adaptation knowledge management system (AKMS)	0	The AKMS is fully operational and used by multi-stakeholder partners by end of project	Project website, reports, consultations	R: Limited continuous stakeholder engagement in populating and updating the AKMS (governments, donors, NGOs, CSOs, private sector) A: The AKMS is a web-based adaptation tool providing immediate benefits for stakeholders planning climate change adaptation activities and baseline data on EbA

The target does not measure effectiveness (frequency, quantity of information, number of users). The target should support achievement of the component and outcome that aim at achieving 90% of the users by end of the project. Thus, the target is amended to be measurable and specific.

 **Updated Output 1.1: A GIS-based adaptation knowledge management system (AKMS) that supports planning**

Indicator	Baseline	Target	Means of Verification	Assumptions/risks
Existence of a fully operational GIS-based adaptation knowledge management system (AKMS)	0 GIS-based AKMS	The AKMS is fully operational and daily used by the majority of the multi-stakeholder partners by end of project (i.e. the system will count number of users visiting per day)	Project website, reports, consultations	R: Limited continuous stakeholder engagement in populating and updating the AKMS (governments, donors, NGOs, CSOs, private sector) A: The AKMS is a web-based adaptation tool providing immediate benefits for stakeholders planning climate change adaptation activities and baseline data on EbA

 **Original Output 1.2: Training and guidance provided to a cadre of knowledgeable resource persons on ecosystem-based adaptation**

Indicator	Baseline	Target	Means of Verification	Assumptions/risks
# of people trained	0	At least 100 people per district, among which half are women, by end of project	training reports, surveys	R: Individual capacity may not be sufficient to lift any remaining institutional barriers to the broader dissemination of EbA A: The government continues to support, through VPO leadership, EbA as a viable adaptation approach.

There is a mismatch between activities and the target. Activity 1.2.2, states that there will be ToT training for VPO staff, National climate change steering committee and working groups members, climate change and disaster management focal points in relevant ministries. Thus the target for ToTs trained at national level is not reflected by the original target

✓ **Updated Output 1.2: Training and guidance on EbA practices provided to local communities and a cadre of knowledgeable resource persons on ecosystem-based adaptation at national and sub-national levels**

Indicator	Baseline	Target	Means of Verification	Assumptions/risks
Number of people trained on EbA at national and sub-national levels	0 Knowledge of existing AKMS users at various levels in most districts Existing ToTs developed by MWEDO on VICOBA in Simanjiro district	At least 100 people trained on AKMS and EbA practices at national level, among which half are women, by end of project	Training reports, surveys	R: Individual capacity may not be sufficient to lift any remaining institutional barriers to the broader dissemination of EbA A: The government continues to support, through VPO leadership, EbA as a viable adaptation approach.

• **Component 2:EbA for rural resilience**

 **Original Outcome 2:Increased resilience in project sites through demonstration of EBA practices and improved livelihoods**

Indicator	Baseline	Target	Means of Verification	Assumptions/risks
Vulnerability Index as measured by Vulnerability and Impacts Assessments (VIAs) ³	NA	a 45% reduction in vulnerability of beneficiaries in project sites, among which 40% are female-headed households, by end of project	VIAs will be conducted during year 1 of project, and monitored annually through participatory M&E	R: perception-based vulnerability indexes may be insufficient in revealing changes in resilience. A: A similar methodology can be used and repeated at various milestones during the project.

Vulnerability index need to be disaggregated based on male and female headed households depending on the actual statistics of female and male headed households in each project site. The target should also consider gender in broader sense, considering other vulnerable groups such as orphans, disabled, and elders. Thus, the target is amended accordingly. The baseline study did not establish an existence of an established Vulnerability Index from a previous VIA in the study districts. The baseline study, however, recommend a gendered vulnerability and impacts assessment during the year 1 of the project, thus establishing a gender disaggregated vulnerability Index.

³The VIA would use the PRO-VIA methodologies, or any other methodology successfully used by the Tanzanian government in other adaptation projects, for comparability of results.

✓ **Updated Outcome 2: Increased resilience in project district sites through demonstration of EBA practices and improved livelihoods of targeted vulnerable groups**

Indicator	Baseline	Target	Means of Verification	Assumptions/risks
Vulnerability Index as measured by Vulnerability and Impacts Assessments (VIAs) ⁴	0 Gender and district disaggregated vulnerability and impacts assessments (Gender disaggregated Vulnerability Index)	a 45% reduction in vulnerability of beneficiaries in project sites, among which 40% are female headed households and other vulnerable groups, by end of project	VIAs conducted during year 1 of project, and monitored at project mid-term (mid-term review) and end (terminal evaluation) through participatory M&E, reports. The VIA will develop vulnerability scorecard that will be monitored at mid-term and terminal stages of the project.	R: perception-based vulnerability indexes may be insufficient in revealing changes in resilience. A: A similar methodology can be used and repeated at various milestones during the project.

 **Original Output 2.1: Local authorities, committees and user groups trained on adapting communities to climate change using EbA.**

Indicator	Baseline	Target	Means of Verification	Assumptions/risks
Number of people trained in EbA to adapt to climate change	0	At least 60 people per district trained on EbA among which half are women, by end of project	Project reports; List of participants to training (by gender) Training reports, training manuals	R: Local authorities, committees and user groups are not engaged in EbA approaches. A: Local authorities, committees and user groups will learn adaptation through EbA approaches and improve their practices and livelihood strategies.

The Unit of measurement for adaptation options need to be streamlined at household level as indicated in the output target. Therefore, the target should specify that women to be trained are from female headed households. Thus, the target is amended accordingly.

Baseline information indicates that, a number of trainings have been conducted by the district councils, NGOs and other development partners to some officials in most of the districts visited. In Simanjiro district for example, agricultural department had conducted a number of trainings on best agricultural practices that can help smallholder farmers to address climate change related challenges. CARE Tanzania had also conducted training twice (women, village chairpersons, and influential people) in Kitai, Yondokesi, Korongo, and Majengo on climate change. Tanzania Natural Resources Forum (TNRF) is another partner that has worked with Simanjiro district to build capacity on climate change including officers in the agriculture, environment and disaster management units. Environmental management and climate change mitigation and adaptation are integrated in all projects activities, such as Forest/Biodiversity and water conservation and tree planting, Energy serving stoves, and promotion of CSA/EbA practices (minimum tillage, cover crops, crop rotation and terraces, Beekeeping, fish farming and forest conservation. These interventions are relevant for climate change and have adequate capacity to mainstream climate change adaptation in their plans. Restoration of Melela river banks is one of the

⁴The VIA would use the PRO-VIA methodologies, or any other methodology successfully used by the Tanzanian government in other adaptation projects, for comparability of results.

interventions supported by Creativity for Rural Development and Sustainable Development (CRESD) in Mvomero district. Some officers in the councils have received either long or short-term trainings related to climate change. None of them have received training on integrating climate change adaptation/mitigation into their development plans. Therefore, apart from qualifying the levels on the indicator and target, there is no further amendment to these attributes, as trainings provided touches generally on EbA practices.

The baseline study indicates evidence of ecosystem based adaptation practices in the study districts. Majority of respondents in Mvomero district reported to practice five EbA options, which are mulching, crop residues, crop diversification/intercropping, irrigation systems (both using motorized pumps and gravity flow), terracing and contour bands and use of drought resistant crop varieties. Mpwapwa district's respondents reported to mostly engage in six EbA options, namely mulching, crop residues, crop diversification/intercropping, irrigation systems, restoration of river banks and de-silting of rivers. In Simanjiro district, five EbA practices were reported to have been in use which are mulching, crop residues, crop diversification/intercropping, integrated crop-livestock management and use of drought resistant crop varieties were also reported. Likewise, in Kishapu district, four Eba practices were reported: mulching, crop residues, crop diversification/intercropping and irrigation systems. Lastly, in Kaskazini A district, mostly one Eba option, which is mulching, followed by crop residues, crop diversification/intercropping (Table below).

EbA practices performed by households

District	EbA practices																	
	Mulching	Use of crop residues	Crop diversification/intercropping(Includes	Integrated crop-livestock management	Avoided deforestation	Reforestation/Afforestation	Agroforestry	Rainwater harvesting	Irrigation systems(gravity flow)	Restoration of river banks	Terracing and contour bands	Zero grazing	De-silting of rivers	Use of energy saving technologies	Alternative income generation	Drought resistant crop varieties	Tree pollarding	WMA
Mvomero	72.5	90	63.8	8	0	8.8	8.8	1.3	62.5	11.3	73.8	0	36.3	30	2.3	81.3	0	0
Mpwapwa	65.4	84.6	55.8	13.5	0	9.6	10.7	3.8	69.2	53.8	28.8	0	61.5	0	1.2	2	0	0
Simanjiro	75.7	81	60.2	67.9	0	10.8	2.8	0	0	10.8	2.8	0	0	35.1	0	72.2	0	0
Kishapu	90	86.7	76.7	10	0	13.3	3.3	0	60	20	0	0	0	30	39.2		0	0
Kaskazini A	72.7	36.4	31.2	18.2	5.2	20.8	10.4	1.3	1.3	0	0	0	0	0	23	1.3	0	0

✓ Updated Output 2.1: Local authorities, committees and user groups trained on adapting communities to climate change using EbA.

Indicator	Baseline	Target	Means of Verification	Assumptions/risks
Number of people trained in EbA to adapt to climate change	Some people in the study districts have knowledge on EbA practices . They only require training to improve their capacity	At least 60 people per district trained on EbA among which half are from female headed households, by end of project	Project reports; List of participants to training (by gender) Training reports, training manuals	R: Local authorities, committees and user groups are not engaged in EbA approaches. A: Local authorities, committees and user groups will learn adaptation through EbA approaches and improve their practices and livelihood strategies.

🗺️ Original Output 2.2: Locally-specific climate change vulnerability, risks and adaptation options are identified by local stakeholders.

Indicator	Baseline	Target	Means of Verification	Assumptions/risks
Number of Vulnerability and Impacts Assessment (VIAs) conducted	0	1 VIA conducted per district, that identifies adaptation options	Activity reports, VIAs, maps	R: Communities do not feel engaged in conducting VIAs A: The benefits of VIAs are explained to communities and seen as a useful tool to identify adaptation options.

The spatial map proposed in Activity 2.2.3 (Establish a map of drought, flood, pest and diseases risk zones (baseline and climate change scenario) in selected sites and incorporate results to knowledge management system), might not be relevant at village level. If considered relevant at village level, then temporal patterns (historical) of occurrence could be relevant. Activity 2.2.4 (Assess the physical and socio-economic impacts of climate change on selected project sites and incorporate results to Output 1.2), should consider impacts to both communities and ecosystems. The indicator and target for this output were not amended, because they are measurable and specific. The baseline study did not establish any kind of VIA study to be conducted recently in the study districts. However, sources of vulnerability were established during the study. Some findings are presented here, but more details are found in the baseline study, which is an attachment to this report.

Climate trends and patterns and Institutional capacity

Discussions with respondents across the study area revealed that climate has changed and many of the key sectors are experiencing effects of the changing climate. For instance, in Simanjiro district, discussions during expert meeting revealed that there is significant change of rainfall (unreliable onset and cessation, reduced rainfall amount, decrease of rain days in a season, rainfall is increasingly becoming erratic, and an increase of temperature is now evident). These have induced a number of effects to communities' livelihoods and natural resources management, including recurrent drought, extended dry spells, shortened growing season, shifting rainfall seasons as well as emergence of human diseases such as malaria.

Intensity and severity of livestock and crop pests and diseases are also becoming common in the study areas. These affect various primary sectors for food and income for local communities such as agriculture and livestock keeping. Change of vegetation cover is also attributed to increasing drought and inadequate rainfall distribution which pressurize communities to cope through unsustainable practices. As challenges related to climate change are increasingly becoming evident, there is no specific department for addressing climate change issues, but issues related to climate change are managed through environmental department and disaster management unit. However, disaster management unit has no budget allocation, and in most cases, climate change issues are partially mainstreamed into the planning and decision making processes.

Therefore, in Simanjiro, the disaster management committee needs revival and facilitation to make it effective. TNRF is one of the organisations in the District that has been active to provide capacity building on climate change issues to district officers. TNRF has also supported capacity building to district officers on mainstreaming climate issues in development plans. Some of the issues that district officers have been trained and integrated in the development plans and have engaged communities include, rotational harvesting of livestock, carrying capacity issues in livestock keeping, water catchment conservation (including 60 meters from the river bank, enforcement of by-laws), rain water harvesting - especially in schools and dispensary, sustainable land management, land use planning and provision of support to community conservation banks (COBA).

Discussions with key stakeholders in Mvomero district indicated that there is a decreasing trend in rainfall patterns, and thus affecting crop production and livestock keeping. Changes observed include, prolonged dry spells, crop failures, decreased amount of rainfall, poor distribution of rainfall and disappearance of short rains (Vuli). It was also reported that temperature has slightly increased in the district. Changes in rainfall trends and patterns were linked to increase in frequency and severity of drought events, which have been affecting crop production and livestock keeping. The respondents indicated that there was a severe drought in 2017, where many cattle died, which led to the drop of cattle price (up to TZS 10,000) and most water sources dried up. It was further revealed that changes in climate conditions also affect natural resources, including critical ecosystems. There are evidences of major decrease in vegetation cover, emanating from human activities especially, in Malali and Mgeta, which are semi-arid areas.

Decrease in vegetation cover also affects soil cover and fertility, especially in the uplands. Land cover changes also affect river flow, and perennial rivers are slightly becoming seasonal. Driving factors include charcoal making, and shifting cultivation. As a result, the district is undertaking various activities to counteract the effects. These include conservation of natural forests (e.g. 16 village forests). There is an increase in irrigation agriculture upstream, with notable illegal abstractions. In terms of institutional capacity in climate

change issues, there is no clear coordination of climate change related matters in the council. Impliedly, it is in the department of environment and management, under DEMO.

Interviews with communities in Zanzibar indicated that climate has changed, with changes in temperature and rainfall being observed to have changed significantly. Communities reported that there has been increase in temperature, with effects on livelihoods and sectors being evident. They indicated that in the past farmers used to harvest tree times but now only once a year. Major observed changes in rainfall included decrease in rainfall amount and erratic patterns. Communities reported that they now experience only one rainy season within very short period of time followed by long period of droughts. Major changes in frequency and severity of drought episodes have been experienced with effects on livelihoods and sectors, such as crop production and livestock keeping. Changes in rainfall had negative effects on natural resources, through unsustainable livelihood practices, charcoal making during bad crop harvest years. Major changes observed include decrease in vegetation cover. As a result, some trees such as *Psidium cuminii*, *Sorendeiya usambarensis* and *Virtex* spp have disappeared in Matemwe Kijini village. Deforestation and forest degradation have also resulted into the decrease of soil cover/ fertility.

Changes in climate condition was also reported in Kishapu district, where discussions with respondents at district, ward and village level indicated that rainfall and temperature trends have changed significantly. According to the interviews, change in climate have increased the frequency of droughts in the study area. While rainfall was reported to be decreasing, temperature was reported to be increasing and thus affecting crop production and livestock keeping, especially through inadequate water and pasture availability. They indicated that major timelines of drought incidences in the district are 1983/84, 1992, 1999, 2003; while floods largely due to change of rainfall intensity, diminished tree cover and location of most villages in lowland landscape, were experienced in 1997/98, 2006 and 2018.

Major climate induced pests and diseases for crops include army worms, morrow cricket, stalk borrow, and ants. Climate related challenges are propagated by inadequate pasture, inadequate water, inadequate cattle dips and charco dams, and inadequate of planned cattle routes. As a result, the district is collaborating with various stakeholders to counteract impacts of the changing climate. Such interventions include establishment of disaster management committees as guided by the Disaster Management Act, 2015 (e.g. Muguda village), training on climate change issues to WDC (Ward Development Committee). Respondents identified tree planting (possibility of achieving 500 hectares in five years), supporting alternative energy sources e.g. biogas, and promotion of tree crops with diversity of benefits such as cashew nuts, and sisal can be important for both conservation and livelihood improvement.

Moreover, discussions with respondents in Mpwapa District indicated that climate change has changed and impacts are revealed through recurrent drought, floods, strong winds and changes in the patterns and trends of rainfall and temperature. Field survey findings indicated that there have been significant changes of rainfall and temperature across the study area. Discussions with respondents in Mpwapa indicated that temperature has slightly increased and changes in rainfall (especially, prolonged dry spells, decreased amount of rainfall, and poor distribution of rainfall) are increasingly becoming evident.

These changes have triggered frequency and severity of drought events experienced with notable effects on farming and livestock keeping sectors. Indirectly, these changes also affect natural resources endowment in the district. Major changes observed in natural resources include decrease in vegetation cover, where more shrubs and decreased grassland are observed, slight decrease in land cover and fertility, especially in the uplands, decrease in river flow (rivers are increasingly becoming seasonal) due to changes in rainfall and effects of deforestation and forest degradation. In terms of institutional capacity on climate change matters, there is no clear coordination of Climate change related matters in the council. Impliedly, it is in the department of environment and management, under DEMO.

Some officers in the council have received either long or short-term training on climate change. None of them have received training on integrating climate change adaptation/mitigation into plans. Support of perennial tree crops with diversity of benefits to communities, such as avocado, and cashew were recommended in Mpwapa and support of improved livestock breeds were also given high priority among key stakeholders as an initiative that requires immediate support.

Summary of climate conditions and response measures in the study sites.

Perceive normal climate condition	Perceived change	Perceived causes of changes	Perceived impacts	Coping strategies
Reliable onset and cessation of rainfall (September – November for short rains and January – June for long rains)	Unreliable onset and cessation of rainfall.	Natural changes of weather	Recurrent drought, shortage of water, effect on planting calendar and harvesting seasons Drying of crops	Government provides small grants for entrepreneurship activities. Simanjiro District had provided 230,000,000 to support small business groups Adopting drought resistant crops such as sunflower
Even distribution of rainfall within the season	Erratic rainfall trends within the season	Natural changes of weather	Wilting of crops due to extended dry spells and erratic rainfall	Gardening – producing tomato and vegetable Food aid from high potential areas such as Hedaru Forming entrepreneurship groups such as Hope environmental group which is centred on environmental conservation and gardening activities, conservation of natural forests and environmental awareness
Stable temperature, with distinct cold and warm months	Very low temperature during 1990s, extended dry season (June – September) from 2000s with high temperature. Significant temperature increase from 2007	Deforestation and forest degradation and natural changes of weather	Drying of water sources such as Marucha and manonga rivers in Muguda village (Kishapu), and andNjoro - engasimeti in Simanjiro district. Drying of pasturelands Unplanned migration in search of water and pasture lands	Tree planting Livelihoods diversification through entrepreneurial skills. The government supports entrepreneurial activities through small grants schemes.

Locally - based vulnerability to climate change, risks and adaptation options

Climate change as a concept and process is linked to both human activities and natural processes. The concept is also perceived differently among communities and technocratic. Discussions with respondents in the study area indicated that climate change is largely driven by human activities especially degradation of natural resources, including deforestation and pollution from industrial activities. Field survey findings indicated that climate change is induced by

- i. Deforestation and forest degradation through shifting cultivation and unplanned settlements
- ii. Overstocking and overgrazing
- iii. Environmental pollution especially through rapid urbanization and industrial processes
- iv. Inadequate awareness
- v. Inadequate alternative environmental friendly energy sources

Communities' vulnerability to climate change impacts and risks

This study found that communities' vulnerability is largely driven by changes in rainfall and temperature patterns. Major changes observed, include erratic patterns of rainfall, and recurrent droughts and floods. These changes affect crop production (cropping calendar, pests and diseases, weeds, phenology and yield) and livestock keeping (pests and diseases, pasture, invasive species, and water as well as productivity) which forms major livelihood options in the study area. Impacts emanating from the changes in rainfall and temperature are largely aggravated by non-climate stress factors such as poverty, degradation of natural resources, and dependence on climate sensitive sectors.

Vulnerability of Ecosystems to climate change impacts and risks

This study found that vulnerability of ecosystems to climate change is largely driven by changes in rainfall and temperature patterns, which affect communities' livelihoods. Direct drivers of ecosystem vulnerability to climate change effects are recurrent drought and increase in temperature. These changes create favourable environment for occurrence of pests and diseases, and growth of invasive species. Indirectly, effects of climate change induce pressure of adjacent communities to respond to the stress factors (e.g. erratic patterns of rainfall, occurrence of recurrent drought and floods) affecting their livelihoods, whereas some response measures devised by communities have effects on adjacent natural resources. Some of the effects include deforestation and forest degradation, deterioration of biodiversity resources, deterioration of water resources and degradation of land resources.

Impacts of the changing climate on household assets

Human capital

Human capital is one of the important aspects of livelihoods assets. It encompasses key spheres of human health, education, productivity, and nutrition. This study revealed that there has been emergence of human diseases such as malaria partly due to the increase of temperature. Emergence of pests and diseases (such as army worms) that affect crop production and livestock keeping affect household food security. Additionally, death of livestock and decline of poor crop yield affect household food security and productivity. Migration disrupts social networks within the community, and affects education for youth and increases burden to women to take care of their families. Migration of people and livestock also induce spread of communicable livestock and human diseases. Study districts have been experiencing both temporary/seasonal and permanent human migration (rural –rural and rural – urban), especially, during bad crop harvest years.

Natural capital

Natural capital, which is considered to be one of the central assets for livelihoods and natural resources management; encompass major natural resources land, water, forests, wildlife, biodiversity and environmental services. Discussions with experts in Simanjiro district indicated that there are many parts of the district which have fertile land for crop production (e.g. maize and beans), and borders major conserved wildlife resources such as Tarangire National Park. However, they indicated that there are no wildlife management areas, forest plantations and national forest reserves in the District. Other effects of climate change reported by stakeholders include drying up of water wells such as Njoro - engasimeti in Simanjiro district. Drying of water sources coupled with shrinking pasture land increase pressure to available water and pasture sources resulting into natural resource use conflicts and degradation of the available resources. Disappearance of wildlife and fruit tree species in some sites in Simanjiro is also considered to be some of the evidences related to natural resources degradation, especially forest resources. Some of the tree species that have disappeared in Simanjiro district include Lama, Ngaisijo, Ngailale, Ngururu, Ondungu, and Miskerere. Emergence of invasive species is also becoming major challenge across the project districts, and effects on natural capital and livelihoods are increasingly becoming evidenced. It was reported that invasive species affect crop production and livestock keeping, including pasture availability; accelerate impacts of the changing climate and increases migration of people and livestock. Invasive species such as Ipomea spp - Olelemet in pastureland areas were reported in Simanjiro district. Likewise, Magugu (similar to sorghum - affect crop production), mihale trees (affect water catchments), kidua (affect maize, sorghum and cotton production) and chungu, which grows quickly when there is decrease of rainfall, were reported in Kishapu district. In Mvomero district, major invasive species included Bracken fern (Mgeta area), Lantana camara (Turiani area) and water hyacinth in wetlands and Malambo. Observed invasive plant species in Mpwapwa district were spp include, Mexican Poppy, Datura Stramonium and Lantana Camara. In Matemwe/Kijini, there have been minor increase in the

occurrence of invasive plant species which grow well in less fertile soils. Kisaanye spp is one of the invasive species observed in Matemwe Juga Kuu village. These weeds were seriously affecting the crops.

As a result, the district in collaboration with major stakeholders has initiated a number of interventions to plant trees. The district is also collaborating with stakeholders, including communities to remove invasive species, and has developed seed bank of tree species (high valued - pasture, fruit, etc). Natural resources degradation in Mpwapwa (e.g. gullies) are highly induced by human activities such as deforestation and forest degradation in the upland and accelerated by the effects of recurrent drought and floods. Discussions with key stakeholders also revealed that deforestation and forest degradation in Mpwapwa is highly influenced by governance challenges such as lack of political will at lower levels, including conflicting interests and motives of policy and decision makers.

Social capital

Migration of some community members, especially youth and men in search of water and pasture for livestock has reduces social network and increases vulnerability to elders and women who remain and take care of their families.

- ✓ **Updated Output 2.2: Locally-specific climate change vulnerability, risks and adaptation options are identified by local stakeholders.**

Indicator	Baseline	Target	Means of Verification	Assumptions/risks
Number of Vulnerability and Impacts Assessment (VIAs) conducted	0 VIA studies	1 VIA conducted per district, that identifies adaptation options	Activity reports, VIAs, maps	R: Communities do not feel engaged in conducting VIAs A: The benefits of VIAs are explained to communities and seen as a useful tool to identify adaptation options.

- ✚ **Original Output 2.3: Ecosystem services are rehabilitated through the implementation of EbA practices (ecosystem rehabilitation, sustainable management and conservation of natural resources)**

Indicator	Baseline	Target	Means of Verification	Assumptions/risks
Number of hectares of forest and rangeland rehabilitated and under sustainable and climate resilient management	0	Up to 3000 ha of forest (up to 500 ha per district), 6000 ha of rangeland (up to 1000 ha per district) rehabilitated and under sustainable and climate resilient management, by end of project, as specified in the LUMPs	Project reports, land use plans, surveys, field observations	R: Communities are not willing and able to participate in ecosystem restoration and activities improving livelihoods A: Local authorities and communities are engaged in EbA thanks to training and successful information sharing through the AKMS

The indicator and target for this output were amended to make them specific and measurable. The baseline study established findings through communities' perceptions and quantification of land use and cover in the study districts (see details in the attached in Annex I: baseline survey report). Most respondents in four districts (Mvomero, Mpwapwa, Simanjiro and Kishapu) reported that natural resources adjacent to their villages are moderately degraded, followed by those who had a perception that they are severely degraded. Contrary, majority in Kaskazini A reported that natural resources are severely degraded, followed by those who perceived that they were moderately degraded (Table below).

Condition of natural resources adjacent to the village

District	Condition (%) as reported by respondents		
	Intact or not degraded	Moderately degraded	Severely degraded
Mvomero	22.5	41.3	36.3
Mpwapwa	19.6	54.9	25.5
Simanjiro	21.6	45.9	32.4
Kishapu	16.7	46.7	36.7
Kaskazini A	0	23.3	76.3

A summary of land cover types is presented in the table below to show the current status (more details are provided in the attached Annex I: baseline survey report). Land cover/use maps presented (Figures 2.1, 2.2, 2.3, 2.4 and 2.5) show that it is unrealistic to reach the original target. Thus, an amendment to the target of rehabilitating the forest and rangeland per district is recommended. Findings show that study districts have land set aside for forest conservation and grasslands, from which this project can build on and reach the recommended target of rehabilitating up to 1100 ha of forest (250 ha per district for Mvomero, Mpwapwa, Simanjiro and Kishapu and 100 for Kaskazini A), and 2100 ha of rangeland (500 ha per district for Mvomero, Mpwapwa, Simanjiro and Kishapu and 100 for Kaskazini A district) under sustainable and climate resilient management, by end of project. It was reported during FGDs that the rehabilitation of forests and rangelands can only be achieved through a combination of natural regeneration and reforestation (including sustainable management, for forests), and natural pasture regeneration through both traditional sustainable management (e.g. Ngitili in Kishapu) and improved pasture seeding where applicable. The VIA study should identify areas for forest and rangeland rehabilitation, and also come up with the plan for the same. It was further established that none of the study villages had village land use maps (LUMPs), however, this study prepared land cover maps as baseline condition (Figures 2.1, 2.2, 2.3, 2.4 and 2.5 and Table below).

Land cover/use change in the project districts, 1996 - 2016

Landcover Types	1996		2016		Relative Change 1996_2016	
	Area (Ha)	Area %	Area (Ha)	Area %	Area (Ha)	Area %
Forest	1411.00	0.07	2712.00	0.13	1301	0.0645
Woodland	602845.00	29.90	496212.00	24.61	-106633	-5.2880
Bushland	541285.00	26.84	455366.00	22.58	-85919	-4.2608
Grassland	278143.00	13.79	283223.00	14.05	5080	0.2519
Cultivated Land	77546.00	3.85	238322.00	11.82	160776	7.9730
Scattered Cropland	388278.00	19.26	408621.00	20.26	20343	1.0088
Inundated Land	105963.00	5.25	107917.00	5.35	1954	0.0969
Permanent swamp	15145.00	0.75	14993.00	0.74	-152	-0.0075
Settlement	209.00	0.01	3524.00	0.17	3315	0.1644
Water	5678.00	0.28	5613.00	0.28	-65	-0.0032
Total Area	2016503.00		2016503.00			

Mvomero District, Land Cover/ Use Change Detection, 1996_2016						
Landcover Type	1996		2016		Relative Change 1996_2016	
	Area (Ha)	Area %	Area (Ha)	Area %	Area (Ha)	Area %
Forest	42512.00	6.69	37065.00	5.83	-5447	-0.8571
Woodland	159410.00	25.08	82475.00	12.98	-76935	-12.1059
Bushland	155038.00	24.40	84240.00	13.26	-70798	-11.1403
Grassland	102173.00	16.08	166560.00	26.21	64387	10.1315
Cultivated Land	90343.00	14.22	138972.00	21.87	48629	7.6519
Scattered Cropland	54478.00	8.57	79245.00	12.47	24767	3.8972
Innundated Land	27329.00	4.30	30349.00	4.78	3020	0.4752
Permanent Swamp	3978.00	0.63	7964.00	1.25	3986	0.6272
Settlement	116.00	0.02	4043.00	0.64	3927	0.6179
Water	137.00	0.02	4601.00	0.72	4464	0.7024
Total Area	635514.00		635514.00			
Mpwapwa District, Land Cover/ Use Change Detection 1996_2016						
Land Cover Types	1996		2016		Relative Change 1996_2016	
	Area (Ha)	Area %	Area (Ha)	Area %	Area (Ha)	Area %
Forest	17128.00	2.31	16704.00	2.25	-424	-0.0572
Woodland	218398.00	29.45	138223.00	18.64	-80175	-10.8122
Bushland	45873.00	6.19	95060.00	12.82	49187	6.6332
Grassland	41599.00	5.61	141141.00	19.03	99542	13.4240
Cultivated Land	20519.00	2.77	145164.00	19.58	124645	16.8093
Scattered Cropland	386894.00	52.18	156644.00	21.12	-230250	-31.0510
Innundated Land	4729.00	0.64	30633.00	4.13	25904	3.4934
Permanent Swamp	66.00	0.01	8704.00	1.17	8638	1.1649
Settlement	421.00	0.06	1326.00	0.18	905	0.1220
Water	5895.00	0.79	7923.00	1.07	2028	0.2735
Total Area	741522.00		741522.00			
Kishapu District, Land Cover/ Use, Change Detection 1996_2016						
Land Cover Types	1996		2016		Relative Change 1996_2016	
	Area (Ha)	Area %	Area (Ha)	Area %	Area (Ha)	Area %
Forest	50.00	0.01	314.00	0.07	264	0.0617
Woodland	265.00	0.06	189.00	0.04	-76	-0.0178
Bushland	1104.00	0.26	122.00	0.03	-982	-0.2297
Cultivated Land	291624.00	68.21	356167.00	83.30	64543	15.0957
Scattered Cropland	113546.00	26.56	46592.00	10.90	-66954	-15.6596
Innundated Land	11371.00	2.66	9979.00	2.33	-1392	-0.3256
Permanent swamp	7650.00	1.79	7593.00	1.78	-57	-0.0133
Settlement	472.00	0.11	5677.00	1.33	5205	1.2174

Water	792.00	0.19	737.00	0.17	-55	-0.0129
Total Area	426874.00		427370.00			
Unguja Kaskazini A District Landover/ Use Change Detection 1996_ 2016						
	1996		2016		Relative Change 1996_2016	
Landcover Types	Area (ha)	Area %	Area (ha)	Area %	Area (Ha)	Area %
Forest	74.00	0.44	244.00	1.46	170	1.0183
Woodland	3773.00	22.60	6328.00	37.90	2555	15.3040
Cultivated Land	863.00	5.17	5835.00	34.95	4972	29.7814
Scattered Cropland	8951.00	53.61	3856.00	23.10	-5095	-30.5181
Water	2578.00	15.44	257.00	1.54	-2321	-13.9024
Bare Soil	456.00	2.73	175.00	1.05	-281	-1.6831
Total	16695.00	100.00	16695.00	100.00		

✓ **Updated Output 2.3: Ecosystem services are rehabilitated through the implementation of EbA practices (i.e. natural regeneration, reforestation, pasture seeding and sustainable management)**

Indicator	Baseline	Target	Means of Verification	Assumptions/risks																														
Number of hectares of forest and rangeland rehabilitated (through natural regeneration, reforestation and pasture seeding) and under sustainable and climate resilient management	<p>Established land cover maps per district (see the attached Annex I: baseline survey report)</p> <table border="1"> <thead> <tr> <th>Land cover types</th> <th>Mvomero (Year 2016) ha</th> <th>Mpwapwa (Year 2016) ha</th> <th>Simanjiro (Year 2016) ha</th> <th>Kishapu (Year 2016) ha</th> <th>Kaskazini A (Year 2016) ha</th> </tr> </thead> <tbody> <tr> <td>Forest</td> <td>37065.00</td> <td>16704.00</td> <td>2712.00</td> <td>314.00</td> <td>244.00</td> </tr> <tr> <td>Woodland</td> <td>82475.00</td> <td>138223.00</td> <td>496212.00</td> <td>189.00</td> <td>6328.00</td> </tr> <tr> <td>Bushland</td> <td>84240.00</td> <td>95060.00</td> <td>455366.00</td> <td>122.00</td> <td>5835.00</td> </tr> <tr> <td>Grassland</td> <td>166560.00</td> <td>141141.00</td> <td>283223.00</td> <td>-</td> <td>244.00</td> </tr> </tbody> </table>	Land cover types	Mvomero (Year 2016) ha	Mpwapwa (Year 2016) ha	Simanjiro (Year 2016) ha	Kishapu (Year 2016) ha	Kaskazini A (Year 2016) ha	Forest	37065.00	16704.00	2712.00	314.00	244.00	Woodland	82475.00	138223.00	496212.00	189.00	6328.00	Bushland	84240.00	95060.00	455366.00	122.00	5835.00	Grassland	166560.00	141141.00	283223.00	-	244.00	<p>Up to 1100 ha of forest (up to 250 ha per district Mvomero, Mpwapwa, Simanjiro and Kishapu and 100 for Kaskazini A), Up to 2100 ha of rangeland (up to 500 ha per district 500 ha for Mvomero, Mpwapwa, Simanjiro and Kishapu and 100 for Kaskazini A district) rehabilitated (through natural regeneration, reforestation and pasture seeding) and under sustainable and climate resilient management, by end of project, as specified in the LUMPs</p>	<p>Land cover maps, project reports, land use plans, surveys, field observations</p>	<p>R: Communities are not willing and able to participate in ecosystem restoration and activities improving livelihoods A: Local authorities and communities are engaged in EbA thanks to training and successful information sharing through the AKMS</p>
Land cover types	Mvomero (Year 2016) ha	Mpwapwa (Year 2016) ha	Simanjiro (Year 2016) ha	Kishapu (Year 2016) ha	Kaskazini A (Year 2016) ha																													
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Grassland	166560.00	141141.00	283223.00	-	244.00																													

 **Original Output2.4: Income is increased and maintained across seasons, through sustainable and resilient livelihoods**

Indicator	Baseline	Target	Means of Verification	Assumptions/risks
Number of people reporting a sustained increased income from alternative IGAs introduced by the project, among which a percentage are female-headed households	0	Targeted communities are reporting a 15% increase in all season income, starting on year 1 of the project and maintained on the 4 following years, for smallholder farmers/HH, among which 40% are femaleheaded households, by end of project	Annual reports on production numbers for each value chain, per district; Project reports; Producer surveys	R: Targeted communities are too risk-averse to try adopting alternative activities. A: Communities are willing and able to adopt climate smart agricultural practices and activities improving livelihoods

Reporting of sustained increased income can only be achieved starting from year 2 of the project, based on the investments from year 1. Project beneficiaries will form units for measuring the level of achievement of project targets. Thus the target is amended to reflect this reality. The baseline study established both primary sources of food and income, and alternative income generating activities (more details are found in the attached baseline report).

Primary source of food and income of households

The primary source of food was crop production, which was reported by the most respondents (more than 80%) in all districts (Table below). Likewise, the primary source of income was crop production (crop sales), as reported by majority in Mvomero, Mpwapwa, Simanjiro and Kaskazini A. Contrary, Kishapu district report Livestock keeping (livestock sales) as the primary source of income (Table below).

Source of food

District	Primary source of food				Primary source of income			
	Crop production	Livestock keeping	Employing	Business	Crop production	Livestock keeping	Employing	Business
Mvomero	100	0	0	0	88.8	0	0	11.2
Mpwapwa	100	0	0	0	100	0	0	0
Simanjiro	94.6	2.7	0	2.7	86.5	2.7	0	10.8
Kishapu	100	0	0	0	43.3	56.6	0	0
Kaskazini A	84.2	3.9	1.3	10.5	69.7	7.9	2.6	19.7

Alternative Income Generating Activities (IGAs)

Respondents in respective districts reported various alternative income generating activities (IGAs) undertaken. These include, vegetable farming and selling, and beekeeping in Mvomero, Mpwapwa, Simanjiro and Kaskazini A. All districts reported to engage in other IGAs, including food vending, VICOBA, labour selling, weaving of mats/baskets, carpentry, handicrafts, and fishing (Table below).

Alternative income generating activities

District	Alternative Income Generating Activities(IGAs)						
	Beekkeeping	Vegetable farming	Tourism	Selling of NTPs	Mining	Others	Not applicable
Mvomero	3.8	42.5	0	0	0	36.3	17.5
Mpwapwa	7.7	19.2	0	0	0	40.4	32.7
Simanjiro	2.7	32.4	0	0	0	27	37.8
Kishapu	0	0	0	0	0	20	80
Kaskazini A	0	9.1	0	0	1.3	70.1	15.6

- ✓ **Updated Output 2.4: Income from primary sources and IGAs is increased from year 2 and maintained across seasons, through sustainable and resilient livelihoods**

Indicator	Baseline	Target	Means of Verification	Assumptions/risks
Number of people reporting a sustained increased income from alternative IGAs introduced by the project, among which a percentage are female-headed households	An average of TZS 500,000/= household income per year. Also a number of primary and secondary sources of income, including IGAs	Targeted households are reporting a 15% increase in all season income, starting from year 2 of the project and maintained on the 4th following years, for smallholder farmers/HH, among which 40% are female headed	Annual reports on production numbers for each value chain, per district and ward/village; Project reports; Producer surveys	R: Targeted communities are too risk-averse to try adopting alternative activities. A: Communities are willing and able to adopt climate smart agricultural practices and activities improving livelihoods

- **Component 3: Knowledge management on climate change adaptation and up-scaling.**

Original Outcome 3: Strengthened information base on EbA supports and up-scaling strategy

Indicator	Baseline	Target	Means of Verification	Assumptions/risks
Availability of an exit and up-scaling plan at the end of the project	0	One documented and agreed exit/up-scaling strategy is approved at the end of the project	Project reports, Information products	R: Stakeholders do not agree on the lessons learned and up-scaling plan. A: Information base on EbA is disseminated and benefits targeted audiences leading to action.

The exit strategy is a comprehensive document that includes plan for smooth transition, and identifies stakeholders and institution that will handle responsibilities of maintaining and up-scaling key project achievements and best practices. Therefore, the indicator is amended to focus on producing an exit strategy, which includes an up-scaling plan. The baseline study established that some of key stakeholders are conversant and exposed to an exit strategy, thus came up with recommendations for sustainability strategy options:

Recommended options for Exit Strategy

Stakeholders (NGOs and district officials) reported that inadequate engagement of key stakeholders and partners in the process of project implementation, disregard of stakeholders' suggestions in the course of project implementation. Top-down approaches for project implementation are some of the challenges that may affect smooth implementation and achievement of project targets, hence sustainability of interventions. Therefore, stakeholders recommended that:

- i. Livelihoods support should be given high priority, with both short-term and long-term benefits to communities being planned and implemented in an inclusive and collaborative manner.
- ii. Existing ToTs developed by MWEDO on VICOBA have adequate experience and ground touches that can support trainings during the project phase and beyond project period
- iii. Farmer field facilitators developed by Best Harvest Organization (BHO) have adequate field experience that can be utilized by the EBARR project to ensure smooth project implementation and sustainability of project interventions beyond project period
- iv. Mainstreaming key results in school curricula (e.g. school clubs) is important. Mainstreaming may also include establishment of water user associations.
- v. Adequate engagement of lower levels of government, including village government committees can increase ownership and sustainability of project interventions
- vi. Implementation of the project should be developmental centred rather than project funding based approach.
- vii. Provide incentives to key implementers of the project activities, including performance awards.

✓ **Updated Outcome 3: Strengthened information base on EbA supports an up-scaling strategy**

Indicator	Baseline	Target	Means of Verification	Assumptions/risks
Availability of an exit strategy at the end of the project	Few relevant stakeholders in project districts have relevant knowledge on exit strategy	One documented and agreed exit strategy (including an up-scaling plan) is approved at the end of the project	Project reports, Information products	R: Stakeholders do not agree on the lessons learned and up-scaling plan. A: Information base on EbA is disseminated and benefits targeted audiences leading to action.

🚩 **Original Output 3.1: Project lessons, knowledge on Climate change adaptation and resilient livelihoods using ecosystems captured, stored and widely disseminated**

Indicator	Baseline	Target	Means of Verification	Assumptions/risks
Number of information products distributed by the end of the project	0	At least 15 information products disseminated	Project reports, Information products	R: The majority of stakeholders maintain business-as-usual approach or have improved attitudes but do not take action. A: Information products are developed with and for specific target groups to ensure utilization.

The original output indicator and target are SMART, thus, no amendment was made.

✓ **Updated Output 3.1: Project lessons, knowledge on Climate change adaptation and resilient livelihoods using ecosystems captured, stored and widely disseminated**

Indicator	Baseline	Target	Means of Verification	Assumptions/risks
Number of information products distributed by the end of the project	0 Information products	At least 15 information products disseminated	Project reports, Information products	R: The majority of stakeholders maintain business-as-usual approach or have improved attitudes but do not take action. A: Information products are developed with and for specific target groups to ensure utilization.

4. NATIONAL/SECTORAL STRATEGIES, PLANS AND POLICIES RELEVANT TO SUSTAINABLE ECOSYSTEM MANAGEMENT AND RESILIENCE

4.1 PREAMBLE

This section presents key highlights of the review of selected policies, laws and institutional arrangements that have a comparatively closer bearing on the sustainable management of ecosystems. It provides an overview of the national/sectoral strategies, plans, policies and some relevant legislations as well as institutional arrangement which have key stake to the ecosystems management. The specific focus of the analysis of the selected policies, legislations and institutions focused on the extent to which policies, strategies, legislative provisions and institutional arrangements foster sustainable ecosystems management of which communities are relying for their livelihoods including climate change adaptation.

The review shows that a number of legislations and policies on environmental management have provisions that aim at sustainable ecosystems management including support for community livelihoods. Most of the policies, strategies and programs reviewed emphasize on the attainment of sustainable development. National policies embrace principles of sustainable development, and are in line with international environmental agreements and conventions. The policies are also in harmony with macro strategies which guide development pathways. The macro national strategies include the Tanzania Development Vision 2025 and National Strategy for Growth and Reduction of Poverty (NSGRP). These national strategies intend to alleviate poverty, attain economic development and sustainable natural resources management. Important sectors and ministries that have policies, strategies and programmes with focus of addressing sustainable ecosystems management are agriculture, energy, forestry, lands, energy, and water resources management. These sectors are also important in improving livelihoods of the people, sustainable resources use, ensuring regeneration of resources, and community participation in natural resources management, and enhancing communities' adaptive capacities to climate change impacts. The following sections provide review of strategies, policies and legislations;

4.3 NATIONAL STRATEGIES RELEVANT TO SUSTAINABLE FOREST MANAGEMENT

Most of the sustainable development pathways in Tanzania are guided by macro strategies which entail broad vision and development objectives. Most of the strategies embed principles of sustainable development and objectives that are targeted towards achieving Sustainable Development Goals (SDGs). Some of the key national strategies that are relevant to sustainable ecosystems management include the following:

4.3.1 TANZANIA DEVELOPMENT VISION 2025

Tanzania Development Vision (TDV) 2025 foresees development strategies and interventions at national level. It provides national framework for the attainment of sustainable development. It also gives framework for sustainable natural resources management as essential component for attaining sustainable natural resources management.

4.3.2 THE NATIONAL STRATEGY FOR ECONOMIC GROWTH AND REDUCTION OF POVERTY/THE ZANZIBAR STRATEGY FOR GROWTH AND REDUCTION OF POVERTY (ZSGRP).

National Strategy for Economic Growth and Reduction of Poverty (NSGRP) is one of the macro and cross-cutting national strategies focusing on poverty reduction. It merges poverty alleviation strategies within the aspirations of Tanzania's Development Vision (Vision 2025). It is also committed to Sustainable Development Goals (SDGs), as internationally agreed targets for reducing poverty and ensuring environmental sustainability. Also the ZSGRP focuses on ensuring the attainment of sustainable growth that will reduce both

the income and non-income poverty to the majority in Zanzibar. The strategy is also in line with the international goals, commitments, and targets, including the SDGs

These strategies synergize issues related to sustainable ecosystems management through its strategies of improving quality of life and social well-being and recognition that poor people rely heavily on natural resources (land, forests and water) for their livelihoods. Furthermore, the strategy looks into sustainable use of the country's natural resources and avoiding harmful effects on the environment and on people's livelihoods. It also advocates for people-centred development. Similarly the ZSGRP realized that Zanzibar relies a great deal on wood products for cooking and other natural resources for livelihood which accelerate the high rate of resources degradation. For example, the State of the Environment Report 2004/05 (RGoZ), estimated that about 500 hectares of coral rag forest is cleared each year for fuel-wood and pressure on mangroves for building poles is increasing. The proportion of people using solid fuels that include wood and charcoal is 96percent; the proportion is higher in the rural areas (98percent) compared with urban areas (93percent).

Furthermore, the strategy looks into sustainable use of the country's natural resources and avoiding harmful effects on the environment and on people's livelihoods. It also advocates for people-centred development. The ZSGRP promoting sustainable human development through the judicious use of resources, insisting that the exploitation of natural resources will be made in such a way that it does not affect needs of future generations. The strategy will ensure all negative effects on environment are avoided.

4.3.3 THE RURAL DEVELOPMENT STRATEGY (2002)

The Rural Development Strategy of 2002 is a lead guideline for cross-sectoral rural development projects/programmes that seek to reduce poverty in rural areas. This is important for addressing sustainable ecosystems management since most rural dwellers depend primarily on natural resources for their livelihoods. The strategy stipulates the need to address land degradation problems in rural areas and undertaking Environmental Impact Assessments (EIAs) for rural development projects and/or programmes.

The Strategy also embraces issues relevant for sustainable ecosystems management its emphasis on the promotion of social forestry and agro-forestry for small scale and medium wood based industries, fuel wood saving techniques and alternative energy sources to deter encroachment of forests.

4.4 SECTORAL POLICIES RELEVANT TO SUSTAINABLE ECOSYSTEMS MANAGEMENT

Policies, sectoral programmes and plans, and strategies in Tanzania provide opportunities for promotion of sustainable ecosystems management. Most of the sectoral policies, programmes and plans, and strategies address sustainable ecosystems management encompassed through their fundamental consideration of principles for sustainable development. Their linkages to sustainable ecosystems management is also linked to the fact that most of the policies in Tanzania were developed after the Brundtland report (1987) and the Rio conference 1992 organized by the United Nations Commission on Environment and Development (UNCED). The Rio conference also built on the global environmental concerns which were raised through the Stockholm conference of 1970s.

As the response to the international move on environmental management, Tanzania enacted the National Environment Management Act No. 19 of 1983 as the key policy instrument to promote an integrated national framework for sustainable maintenance, protection and exploitation of the environment and natural resources. The National Environment Management Council (NEMC) was established along this Act and in response to the national need for such an institution to oversee environmental management issues and also implement the resolutions of the Stockholm conference (1972), which called upon all nations to establish and strengthen national environmental councils to advise governments and the international community on environmental issues. The National Environmental Action Plan (NEAP) of 1994 was also key step towards incorporating environmental concerns into national planning and development.

The NEAP identified six priority environmental concerns, namely land degradation; lack of accessible, good quality water for both urban and rural inhabitants; pollution; loss of wildlife habitats; deterioration of marine and freshwater systems; and deforestation (Agrawala et al., 2003). Subsequently, National environment policy (1997) was developed in order to address environmental problems identified through NEAP and providing a framework for mainstreaming environmental considerations into the decision-making processes in Tanzania. The subsequent discussions are focused on how the sectoral Policies, Acts and its institutional arrangements complements address issues related to Sustainable Ecosystems Management.

4.4.1 ENVIRONMENTAL POLICY (1997)

The National Environment Policy of 1997 addresses policy objectives relevant to sustainable ecosystems management. It is built on the principles and objectives of attaining sustainable development. The policy states that Tanzania's forest and woodland heritage are being reduced yearly through clearance for agriculture and fuel wood, among other causes. It identifies six major environmental problems that require urgent action. Among these, three are of direct relevance to sustainable ecosystems management. These are land degradation, loss of wildlife habitats and deforestation. Some of the strategies the policy sets out to address the problems include minimizing wood fuel consumption through the development of alternatives, wood fuel energy efficiency, the promotion of sustainable renewable energy resources, and energy conservation.

The policy also calls for the development of a sustainable regime of soil conservation and forest protection by considering the interface between desertification, deforestation and climate change, among other factors. The Policy pertinently articulates the relationship between poverty and environmental degradation, and by inference poverty and production and consumption of forest products which have a bearing on ecosystems degradation as well as setting strategies for sustainable ecosystems management. The policy recognizes that satisfaction of basic needs is an environmental concern of relevance to environmental policy. Investment in development is vital for environmental protection because the environment is the first victim of acute poverty, urban overcrowding, overgrazing, shrinkage of arable land and desertification.

The policy emphasizes on the multi-sectoral approach in planning and management of environmental related issues which are relevant to sustainable ecosystems management. The National Environmental Policy also emphasizes the need to conserve biological diversity of unique ecosystems. This emphasis has positive implication to the implementation of strategies for sustainable ecosystems management.

For the case of Zanzibar, the new Zanzibar Environmental Policy (ZEP) of 2013, established national climate change committees and working groups to prepare the Islands for a national response framework to the impacts and vulnerabilities of climate change on the isles ecosystems and the resulting socio-economic vulnerabilities to the population. ZEP clearly stated that the climate change adaptation and mitigation remains a major national priority as mentioned in Zanzibar Strategy for Growth and Reduction of Poverty (ZSGRP). It is imperative to engage in the national efforts to rescue the fragile island forest and coastal ecosystems from the impacts of global warming and climate changes

In the adaptation and mitigation of climate change the new environmental policy (ZEP) is really integrating and supporting the related sectorial policies including forest, agriculture, fisheries, energy etc., by focusing on: i. Ensuring the maintenance of basic ecological processes upon which all productivity and regeneration, on land and in the sea, depend. ii. Promoting the sustainable and rational use of renewable and non-renewable natural resources. iii. Preserving the terrestrial and marine biological diversity, cultural richness and natural beauty of Zanzibar's lands. iv. Ensuring that the quality of life of the people of Zanzibar, present and future, is not harmed by

destruction, degradation or pollution of their environment and natural resources utilization. v. Strengthening both institutional mechanisms for protecting the environment and the capabilities of the institution involved in the environmental management.

4.4.2 THE NATIONAL LAND POLICY (1995)

The National Land Policy takes into consideration of the principle of sustainable development including sustainable management of land, which hosts forest resources. The policy acknowledges that growth in the already large livestock population has raised the demand for grazing land (including that now under cultivation) and has also created serious soil erosion problems in some areas like Nzega, Dodoma and Kondoa districts, Shinyanga and Mwanza regions where the effects of overgrazing on the ecosystems are most visible.

The policy also asserts that the increased movement of large herds of livestock from traditional livestock keeping areas to low livestock population areas such as Mbeya, Iringa, Morogoro, Rukwa and Ruvuma regions is creating land use conflicts in the receiving areas. The policy further acknowledge that free movement of pastoralists with their cattle bring about land ownership and land use conflicts with settled communities. The policy also recognises that unregulated movement of livestock causes land degradation in areas through which they pass.

As a result, the policy sets objective on protecting land resources from degradation for sustainable development. The policy also intends to ensure security of tenure for pastoralism in pastoral land areas through various measures including gazetting to protect grazing land from encroachment. Other policy objectives towards ensuring sustainability of pastoral activities include restoration of pasture lands (when not in conflicts with national interests), prohibit shifting agriculture and nomadism, regulate cattle movements through coordinated planning and the provision of stock routes and other mechanisms as well as providing education to pastoralists. In addition, the Land Policy seeks to establish, support and guarantee a secure land tenure system, which will facilitate the sustainable use of resources found on land, including forest resources. The Policy reflects some aspects of sustainable ecosystems management by addressing issues relating to Environmental Impact Assessment (EIA). The policy objective (e.g. Objective 2.8) is also set on the protection of land resources from degradation.

Furthermore, the Policy also seeks to ensure that sensitive areas, such as forests, river basins, areas of biodiversity and national parks are not allocated to individuals to conduct development activities. Its directives on undertaking EIA to any development projects also reduces chances for deforestation and ecosystems degradation as well as contributing to sustainable ecosystems management. Undertaking EIAs will also ensure that these sensitive ecosystems are not affected by developments.

4.4.3 THE FOREST POLICY (1998)

The National Forest Policy (1998) is one of the key policies relevant for sustainable forest management. The policy sets objectives for the management of forest land, forest based industry and products including eco-tourism, ecosystem conservation and management including watershed and wildlife resources. Other key areas of the policy that may contribute to the sustainability of forest resources is the forest research which is expected to generate information for informed policy and decision making. Apart from consideration of principles of sustainable development, the national forest policy calls for the need to take into account directives of the National Environmental Policy (1997) in the management of forests and the consideration of environmental tools in their management.

Strategies for enhancing Sustainable Forest Management (SFM) are reflected in the Policy through its conservation goal to ensure ecosystem stability through conservation of forest biodiversity, water catchments, and soil fertility. Areas with high biodiversity values are also given top priority, and the policy envisages establishment of new forest reserves for conservation in areas of high biodiversity

value. The policy also fosters biodiversity conservation and management through development of management plans for all protected forests.

The policy also embeds beekeeping as major forest related environmental friendly and income generating activities in order to improve livelihoods of communities in line with the Tanzania overall development goals. Beekeeping is also recognized as an environmental friendly activity that can reduce wildfires and encroachment through agriculture and settlement. The Policy has is a great departure from the traditional forestry approach of fence and fines or command-and-control by setting strategies for involving communities and other stakeholders through joint management of forest resources. The Policy fosters Participatory Forest Management (PFM) strategies with the objective of managing forest resources through Joint Forest Management (JFM) and Community Based Forest Management (CBFM).

Under Joint Forest Management (JFM), the Policy emphasizes on the collaboration between the government and other stakeholders including local communities to jointly manage and set strategies for sustainable utilization of forest resources. Similarly, the Policy sets objective on the need to establish approaches for implementing activities fostering Community Based Forest Management (CBFM). The Policy provides provisions for encouraging communities to set up forest reserves from the general lands for economic and conservation activities. Whilst these two forest management regimes provide an excellent opportunity for ownership and sustainable management of land based resources, including forestry, it also complements policy direction towards sustainable forest management.

The policy outlines that CBFM and JFM is built upon the national policy to enable local participation in forest management, reducing damages from wildfires and illicit felling, grazing and encroachments; and the real need to bring control and management to more practical local levels (Maraseni et al.,2005; Bukhi, 2010). However, various studies have characterized high level of deforestation and forest degradation in forests under JFM and CBFM.

Bukhi (2010) also mentioned that delegation of powers and enhancement of effective participation of adjacent communities under JFM regime has also been reported to be difficult. Zahabu (2008) and Maanga (2012) also mentioned that implementation of JFM and CBFM has been constrained by human activities such as expansion of agriculture, illegal logging and infrastructure. Brockinton (2007) also mentioned that the regimes, especially CBFM have been associated with various uncertainties including poor management which is characterized by high level of corruption and accountability and weak local government officials at the village level. The Policy further emphasizes on the need for cross-sectoral coordination among government departments whose activities relate to forest resources and the enforcement and application of environmental tools (EIAs) in the conservation and management of forests. The Policystates that EIA in developments in forest areas should be undertaken in accordance with the directives of the Environmental Policy, Environmental Management Act (2004) and other strategies which set objectives to undertake development in forest related resources. This is a positive aspect sine it encourages cross sector synergies which are in line with sustainable development and sustainable forest management.

The Policy also identifies some challenges associated with the attainment of sustainable forest management. Some of the challenges identified in the policy in achieving a sustainable forest management include wild fires that occur annually, unclear boundaries, lack

of including economic and environmental values of forests in product pricing and royalties and uncontrolled settlement in forest plantations⁵.

The strategies that the Policy sets out to address the identified challenges include involving all stakeholders (including local communities) in management systems, demarcation of forest reserves, devising mechanisms to ensure equitable sharing of benefits and leasing out forest reserves to private investors. The identified challenges and strategies to address them have implications for sustainable forest management. The policy also emphasizes on the need to improve coordination mechanism between the natural resources and conservation sectors⁶.

The Zanzibar National Forest Policy (ZNFP) sets forth the interest of the government and the people of Zanzibar in the conservation and development of forest resources. The general goal of the policy derived from the principles of sustainability and welfare of the people shall be as follows; “Protect, conserve and develop forest resources (including wildlife and land that support forests) for the social, economic and environmental benefits of present and future generation of the people of Zanzibar”.

As an effort to conserve sustainably manage the Zanzibar Forest systems, the ZNFP number 3 of the conservation and Biodiversity Policy promote measures which preserve and enhance sustainable ecosystem management. It is specifically place priority on halting the further disappearance of Zanzibar’s remaining natural forests and wildlife; on preserving mangrove ecosystems and space on enhancing the protective functions of forests in soil conservation and watershed.

Also the ZNFP gives specific provision of community participation on production, income generation and conservation of both National Forests and community forests through the implementation of sustainable Community Forest Management agreements/programmes arrangement (CoFMA), which saves as legal instruments to support community involvement

One among the policy strategy on biodiversity conservation is to assist people in finding alternative income generating activities in areas where conservation measures may restrict the use of forest resources. Also policy requires applying environmental Impact assessment (EIA) procedures to ensure that 1. Any proposed uses within forest conservation areas and 2. Any proposed outside developments or policies shall not have significant detrimental effects on such areas

ZNFP remain silent on the matter of climate change. However, Forest department formed a unit during the implementation of Adaptation project through REDD where by selling of carbon believed to be a viable solution that can produce efficient and equitable mechanisms for channeling benefits to local communities under REDD-COFM arrangements. This will minimize the rate of direct dependence of cutting wood materials from forests while enhancing sustainable forest management in the Island through carbon trading in Zanzibar.

The policy proposed that in the sustainable management of ecosystem in the face of climate change, Zanzibar needs a national policy to enable Payments for Ecosystem Services (PES), especially for watershed ecosystem services. To establish such a PES policy will require that parliamentarians and policymakers become educated about what ecosystem services are, and about compensation mechanisms to conserve them.

⁵ See Chapter 4 of the Policy

⁶ See Paragraph 4.4.4 ad 4.4.5 of the Policy

4.4.4 ENERGY POLICY (2003)

The National Energy Policy is also one of the sectoral policies that have major stake in the attainment of sustainable ecosystems management targets. Even though the policy does not mention forest resources direct, it sets strategies to promote the use of alternative sources of fuel that are not harmful to the environment.

The policy recognizes biomass-based fuels particularly fuel-wood (charcoal and firewood) as the main source of energy to both urban and rural areas. According to the policy, biomass-based fuel accounts for more than 90% of primary energy supply. The policy further recognizes that dissemination of renewable energy technologies have been limited to the promotion of improved stoves, improved charcoal production techniques, solar, biogas and windmills and to a lesser extent photovoltaics.

Zanzibar like many parts of Tanzania has high dependence on fuel-wood as the main source of energy for cooking. The Zanzibar energy sectors set some programs to reduce high dependence on forest resources for energy. This has been supported by policy provision of establishment of Zanzibar Renewable Energies and Energy Efficiency Programme. The overall objective of this program is to contribute to the promotion of socio-economic development based on renewable energy and efficient energy management in Zanzibar so as to reduce rate of forest clearance and dependence.

The policy also acknowledges the low level of utilising indigenous energy sources which could be harnessed to meet the growing energy requirements. According to the policy, the indigenous energy sources include hydropower, coal, natural gas, uranium, solar, wind, and geothermal energy.

The household sector constitutes the largest share of the total energy consumption, mainly through its use of wood-fuel. The essential end-uses of energy are heating (including cooking, brewing, smoking, firing, boiling, and ironing, lighting, and electric appliances. In rural areas, firewood energy is the most used energy sources. Electricity, even in areas where it is readily available, is rarely used for cooking due to financial reasons. Firewood will, even given a radical increase in use of electricity, be an important source of energy for households in the foreseeable future. However, this source has other negative impacts in houses, including, indoors pollution causing both health risks and safety problems to the end-user and is also time-consuming to collect.

Alternative energy with less environmental impacts is one of the strategies that would be envisaged under the sustainable ecosystems management approaches. Correspondingly, the Energy Policy (2003) sets objectives to encourage efficient end-use technologies and good household practices. It is therefore along these policy strategies that make the Ministry of Energy and Minerals (MEM) relevant for the implementation of sustainable ecosystems management approaches.

4.4.5 NATIONAL WATER POLICY (2002)

Tanzania National Water Policy (NAWAPO) of 2002 is the policy overseeing water resources management in collaboration with other ministerial policies and strategies. The policy contributes to the national strategy for addressing threats from land degradation, poverty and promoting social wellbeing. The policy also recognizes that water is a basic natural resource for socio – economic development and fundamental for various social – economic development activities. The policy also promotes Integrated Water Resources Management (IWRM) which aims to enhance least detrimental effect on the natural environment. The policy also urges to promote IWRM which aims to enhance least detrimental effect on the natural environment. Although the NAWAPO focuses mainly on water resources management, it recognizes that forests are crucial for conservation of water catchments and watershed, and thus contributing to the strategies for forest resources management.

4.4.6 NATIONAL IRRIGATION POLICY (2009)

The National Irrigation Policy (2009) focuses on the promotion of proper management of water resources, in collaboration with NAWAPO (2002). The policy sets its focus on ensuring optimal availability of land and water resources for agricultural production and productivity to contribute effectively towards food security and poverty reduction as stipulated in the National Strategy for Reduction of Poverty (NSGRP).

The policy also recognizes that agricultural productivity depends on availability of water resources and proper utilization of arable land, thereby embracing sustainable ecosystems management. Indirectly, the policy also integrates issues related to sustainable ecosystems management due to the fact that improvement of farm productivity through irrigation is vital input in crop production and productivity, and ensuring food security and increased income. As a result, improvement of social wellbeing can be instrumental in reducing pressure of local communities to natural forests.

4.4.7 NATIONAL LIVESTOCK POLICY (2006)

The National Livestock Policy (2006) promotes sustainable ecosystems management building on the TDV 2025 that “By year 2025, there should be a livestock sector, which to a large extent shall be commercially run, modern and sustainable, using improved and highly productive livestock to ensure food security, improved income for the household and the nation while conserving the environment.”

Apart from its foundation on the national macro strategies, the policy also synergizes issues relevant for Sustainable Forest Management (SFM). The policy recognizes that lack of land tenure system has induced frequent changes of livestock grazing areas into crop cultivation, game reserves and the migration of livestock farmers. It acknowledges that increased livestock populations and human activities related to livestock production in some areas of the country have resulted in over exploitation and degradation of natural resources.

Some of the indicators of natural resources degradation are the over grazing, soil erosion, deforestation, destruction of water sources and environmental pollution. Degradation of the natural resources is also attributed to lack of environmental awareness, low priority accorded to allocation of land for livestock use, inadequate expertise and inter-sectoral coordination.

Thus, the policy intends to promote integrated and sustainable use and management of natural resources related to livestock production in order to achieve environmental sustainability. Other policy objectives to address natural resources degradation are to strengthen technical support services on environmental issues, promote proper land use planning for livestock production, and strengthen inter-sectoral coordination on environmental issues.

Generally, the policy is set to ensure that livestock resource is developed and managed sustainably for economic growth and improved human livelihoods. Apart from its emphasis on animal breeding to increase animal population and development of the sector, it also emphasizes on the stimulating development in the livestock industry in order to increase rural and national income, improve food security and environmental conservation.

Zanzibar livestock policy (ZLP) stimulates the development of the sector in order to improve community livelihoods while conserving the environment through application of sustainable production practices. The policy also emphasizes on the use of environment

friendly renewable energy sources such as bio-gas not only to reduce the cost of production in the livestock enterprises but also to increase the income level of livestock producers and standard of living.

4.4.8 NATIONAL AGRICULTURE POLICY (2013)

The National Agriculture Policy of 2013 accords to various macro-policies and complements to the attainment of NSGRP objectives, and Tanzania Development Vision 2025 that envisages raising the general standards of living of Tanzanians to the level of a typical medium-income developing country by 2025; and meeting the Millennium Development Goals and Five-Year Development Plan targets.

The policy also builds on a number of reforms such as KILIMO KWANZA Resolve, Tanzania Food Security Investment Plan, Southern Agriculture Growth Corridor of Tanzania, Feed the Future Programme, Bread Basket Initiative and the National Agricultural and Livestock Policy of 1997. The Policy has also taken into consideration of different policy changes taking place at the global, regional and national levels that have impact on the development of the agricultural sector.

The national agriculture policy envisages developing an efficient, competitive and profitable agricultural industry that contributes to the improvement of the livelihoods of Tanzanians and attainment of broad based economic growth and poverty alleviation. Specifically, it is centred on the improvement of agricultural productivity, processing and value chain mechanisms. Other objectives focus on strengthening inter-sectoral coordination and linkages to increase efficiency and effectiveness; protect and promote integrated and sustainable utilization of agricultural lands; and promote implementation of cross cutting issues in agricultural undertakings.

These objectives are expected to realize government commitment towards green revolution that entails transformation of agriculture from subsistence farming towards commercialization and modernization through crop intensification, diversification, technological advancement and infrastructural development.

Furthermore, the policy places environment as a cross-cutting issues. It stresses that agricultural development is strongly dependent on environmental resources such as land, forest, air, water and other resources. The policy synergizes sustainable ecosystems management issues by underlining that degradation of natural resources reduces agricultural production and crop yield. It also recognizes that intensification of agriculture exerts pressure on natural resources and contributes to natural carbon pool.

The Policy also emphasizes that unsustainable farming methods and systems including deforestation, land clearing and/or bush fires contributes to climate change. Hence, it sets strategies for sustainable utilization of these resources for vital growth and sustainability of the agricultural sector.

Even though the Policy also considers bio-fuels as one of the potential activities likely to provide the much needed energy for use, especially by rural dwellers and agro-industries in Tanzania, it recognizes that production of bio-fuel crops must be regulated since they often requires large swaths of land to be cleared for land to be converted into bio-fuel production. Hence, as stated in the Policy, such conversion if not properly managed may result into habitat destruction of biodiversity and environment at large. In light of this critical concern, actions shall be taken to address trade-offs and opportunities for the development of bio-fuel production in the country. These Policy statements embrace strategies to conserve natural forests, and thereby contributing to sustainable forest management.

Agriculture and tourism are among the key sectors that their policies and regulations provide a framework and legal instrument for management, utilization and conservation of natural resources in Zanzibar. A review of policies and legislation from both sectors indicated that they stressed the need for achieving sustainable development of agriculture and tourism sectors through promotion of integrated and sustainable use and conservation of natural resources for the needs of present and future generations (Agriculture Sector Policy, 1992, Tourism Policy, 2006).

For example, the Zanzibar Tourism Policy (2006) provides guidelines on how to achieve sustainable economic development in Zanzibar for the benefit of future generations. The policy objective relevant to natural resources emphasizes sustainable tourism through rational and sustainable use of coastal resources. This is designed to be achieved by conducting Environmental Impact Assessments (EIA), Strategic Environmental Assessments (SEA) where development is taking place and the development of recreational facilities in protected and adjacent areas and areas along the coasts.

In the case of agriculture, the Zanzibar Agriculture Sector Policy (1992) recognize the importance and the interdependence of agriculture to other natural resources, and that sustainable growth of agricultural production cannot be achieved without maintaining healthy natural resources base. Thus the agriculture policy goal places emphasis on promoting sustainable development of the agricultural sector for economic, social and environmental benefits for its people through advocating integrated and sustainable use of natural resources which ensure an ecologically sustainable environment. The policy also calls transformation of agriculture from subsistence to a modern commercial sector through adoption of environmentally friendly agricultural technologies.

Following the fall in the world market price for cloves in the mid-1980s, a large proportion of Gross Domestic Products (GDP) in Zanzibar and greater share of employment and livelihoods of rapidly growing population are associated with agriculture and tourism. For example, tourism has become the main driver of growth in Zanzibar that contributes 47% of the (GDP) and 80% of the foreign exchange (RGoZ, 2010). On the other hand, agriculture is the second largest employer, creating 37.7% of the total employment (RGoZ, 2009). Agriculture remains crucial for broad-based and pro-poor growth, contributing about 22.2% of the GDP (RGoZ, 2010). Thus Zanzibar national economic growth and a large percentage of Zanzibaris are economically dependent on these two service sectors which exert tremendous pressure on the natural resources and environment (RGoZ, 2014). The sectors are also very vulnerable to climate variability. However the existing legal sectoral instruments have not covered any aspect of the impacts of changing climate dispute their serious impacts on people's livelihoods and production.

4.4.9 NATIONAL WILDLIFE POLICY (2007)

The National Wildlife Policy sets key strategies for the enhancement of wildlife resources management. It is primarily focuses on the conservation of wildlife and the resources that support wildlife, including those found in forests. One of the Policy's stated objectives is to "enhance the conservation of biodiversity by administering wetlands, which occur in forest and have a bearing on sustainable forest management.

The objectives that the Policy sets out in conserving and managing biodiversity also have a great bearing on the conservation and management of the habitat necessary to sustain wildlife, and ultimately sustainable management of forest resources. The objectives seek to achieve, among other things, the preservation of aquatic habitats and their environment and the conservation of water catchments and soil resources.

The Policy sets out two major strategies that have a bearing for sustainable ecosystems management in order to achieve its objectives. The first is to identify, create and upgrade a series of protected area networks and important wetlands in order to safeguard the country's biological diversity. The second strategy is to incorporate important wetlands into the wildlife protected area network. The general implementation framework provided for in the Policy includes the management and development of important wetlands and the promulgation of a supportive legislative framework.

Since wetlands are an important component of sustainable ecosystems management, efforts to implement strategies for sustainable ecosystems management must take on board the directives of this Policy document. Accordingly, the Policy calls for involving local community members and other stakeholders in taking joint responsibility for the sustainable management of wildlife resources, encouraging local communities to establish Wildlife Management Areas (WMAs) in areas of critical wildlife habitat with the view of ensuring that wildlife competes with other forms of land use. All these policy strategies would contribute to the implementation of strategies for sustainable ecosystems management.

4.4.10 NATIONAL BEEKEEPING POLICY (1998)

The main objective of the Beekeeping Policy is to enhance sustainable contribution of the sector for socio-economic development and environmental conservation. It covers both stinging and non-stinging (stingless) honeybees regardless of ownership or administration; it includes feral (wild) and domesticated (kept in hives) colonies and all other bees which are non-parasitic and collect nectar and/or pollen for their food. Paragraph 1.2 of this Policy makes reference to the National Environmental Policy relating to cross sector issues. Recently, beekeeping has been exemplified as one of the major activities contributing to socio-economic development and environmental conservation.

Beekeeping activities also have a bearing on issues of ownership of land and natural resources (including Bee Reserves and Apiaries), access to and the right to use them is of fundamental importance, not only for more balanced and equitable development, but also to the level of care accorded to the environment. The Beekeeping Policy notes that it is only when people can satisfy their needs, have control of the resource base as well as have secure land tenure that long-term objectives of environment protection can be satisfied. In recognizing the important role of local communities in beekeeping and its bearing on sustainable ecosystems management, the Policy provides that communal tenure of village lands which are administered by village councils provide a good legal environment for the development of community-based forest, woodland, and management of bee reserves, apiaries and development of Beekeeping-Agro-Forestry Systems.

Para 2.1.3 of the Policy also has a direct bearing on sustainable ecosystems management. It states that beekeeping is the art and science of keeping honeybees (sometimes referred to as Apiculture and or Meliponiculture) and plays a very useful role in improving biodiversity. It notes that the decrease and disappearance of honeybees may be used as indicators of a degrading environment. This fact would assist those charged with implementing strategies for sustainable ecosystems management in the course of monitoring and evaluating environmental degradation. The Policy further directs that every effort must be made to encourage the development of Beekeeping-Agro-Forestry Systems while encouraging formal arrangement for cross-sectoral cooperation and coordination for sustained management of the sectors.

4.5 REVIEW OF SELECTED PROGRAMS FOR SUSTAINABLE ECOSYSTEM MANAGEMENT AND RESILIENCE

4.5.1 NATIONAL FOREST AND BEEKEEPING PROGRAMME, NFBKP (2001-2011; 2009-2014)

The National Forest and Beekeeping Programme (NFBKP) coincides well with national and international policies, strategies and agreements, including natural resources and biodiversity management. The Programme entails two sub-programmes, the National Forest Programme (NFP) and National Beekeeping Programme (NBP). The National Forest Programme was developed in order to address challenges related to ecosystems management and to increase the sector's contribution to the national economy and more so in poverty reduction. The programme also intended to enhance sustainable ecosystems management (SFM) and improve the design and implementation of forest projects and programmes which were so far being fragmented and uncoordinated.

The National Forest Programme (NFP) embeds issues related to sustainable ecosystems management through its objectives on institutional and human resources development aspects. It intends to promote ecosystems conservation and management by ensuring gender balanced stakeholders participation in the management of natural and plantation forests, giving priority to ecosystems conservation, catchment areas and sustainable utilization of forest resources.

The NFP also intends to promote institutional and human resources development programme by strengthening institutional set up, coordination of forest management, establishing sustainable forest sector funding and improvement in research, extension services and capacity building through strengthening human resources.

Other objectives that foster SFM include those directed towards improvement of legal and regulatory framework issues including the Forest Act, rules, regulations and guidelines to facilitate operations of the private sector and participatory management, and the enhancement of forest industry development by promoting private sector investment, improving productivity and efficiency and to tap the income generation opportunities provided by non-wood forest products.

The second sub-programme of the NFP, the National Beekeeping Programme (NBP) aims to unfold the hidden potential of the beekeeping industry. It synergizes issues related to Sustainable Forest Management (SFM) by its recognition that beekeeping is an economic activity that has the potential for both rural poverty reduction and sustainable management of forest and woodland resources. As forests are very important resources in bee keeping industry, the programme also places a special emphasize on forest conservation which will ultimately result into sustainable ecosystems management.

4.5.2 TANZANIA AGRICULTURAL SECTOR DEVELOPMENT PROGRAMME (2006 - 2025)

The Agricultural Sector Development Programme (ASDP) was developed in 2006 as one of the interventions to implement Agricultural Sector Development Strategy (ASDS). The programme serves as the overall framework for developing agricultural sector and operational process for implementing the Agricultural Development Strategy of 2001.

Specifically, the programme intended to improve farm productivity, profitability and incomes through improved access to and use of relevant agricultural knowledge and technology by farmers; increased district level investment; and improved market development. Other objectives of the strategy focus on enabling farmers to have better access to and use of agricultural knowledge, technologies, marketing systems and infrastructure, all of which contribute to higher productivity, profitability, and farm incomes; and promote private investment based on an improved regulatory and policy environment.

4.5.3 NATIONAL FOREST AND BEEKEEPING PROGRAMME (2006)

This programme under the Ministry of Natural Resources and Tourism encompasses two programmes; the National Forest Programme and National Beekeeping Programme. The National Forest Programme was developed in order to address the challenging responsibilities of the forest sector in the near future and to increase the sector's contribution to the national economy and more so in poverty reduction.

The programme also intended to enhance sustainable ecosystems management (SFM) and improve the design and implementation of forest projects and programmes which were so far being fragmented and uncoordinated. The Forest and Beekeeping Programme (2001-2010) is based on four implementation areas that cover both forest resources management as well as institutional and human resources development aspects. These included;

Forest Resources Conservation and Management programme which aims at promoting gender balanced stakeholders participation in the management of natural and plantation forests, giving priority to ecosystems conservation, catchment areas and sustainable utilization of forest resources.

Institutional and Human Resources Development programme which aims at strengthening institutional set up, coordination of forest management, establishing sustainable forest sector funding and improvement in research, extension services and capacity building through strengthening human resources;

Legal and Regulatory Framework programme which focuses on the development of regulatory issues including the Forest Act, rules, regulations and guidelines to facilitate operations of the private sector and participatory management, and

Forestry Based Industries and Sustainable Livelihoods programme which is intended to enhance forest industry development by promoting private sector investment, improving productivity and efficiency and to tap the income generation opportunities provided by non-wood forest products.

Similarly, the National Beekeeping Programme aims to unfold the hidden potential of the beekeeping industry. It recognizes that beekeeping is an economic activity that has the potential for both rural poverty reduction and sustainable management of forest and woodland resources. As forests are very important resources in bee keeping industry, the programme places a special emphasize on forest conservation which will ultimately result into sustainable land and forest conservation.

4.6 STRATEGIES TO SUSTAINABLE ECOSYSTEM MANAGEMENT AND RESILIENCE

4.6.1 NATIONAL BIODIVERSITY STRATEGY AND ACTION PLAN (NBSAP) 2015 - 2020

The National Biodiversity Strategy and Action Plan (NBSAP) provide the overall framework for the national implementation of the Convention on Biodiversity Diversity (CBD). It focuses on the conservation and sustainable use of biodiversity and the equitable sharing of benefits arising from the utilization of genetic resources.

The NBSAP stresses that policies, strategies and programmes for conservation and use of biological diversity shall be integrated into sectoral/cross-sectoral policies, strategies and programmes to make sure that utilization of natural resources should not jeopardize conservation objective. The Strategy and Action Plan synergizes issues related to sustainable ecosystems management through its objectives to foster sustainable biodiversity conservation.

4.6.2 NATIONAL CLIMATE CHANGE STRATEGY (2013)

The National Climate Change Strategy is one recent policy initiative which envisages enhancement of climate change adaptation, mitigation and cross-cutting interventions in the context of sustainable development. The strategy was developed partly in response to the revealed and projected unprecedented negative impacts of the changing climate on the country's social, economic and physical environment.

The strategy serves to enhance Tanzania's participation in international climate change discussions in matters pertaining to adaptation, mitigation and other cross-cutting environmental and climate change related interventions that will contribute in the efforts to tackle climate change impacts, contribute to sustainable development and natural resources management.

The goal of the strategy is centred on enabling Tanzania to effectively adapt to climate change and participate in global efforts to mitigate climate change with a view to achieving sustainable development in the context of major macro development strategies such as Tanzania Development Vision 2025, Five Years National Development plan, and other national cross sectoral policies.

The strategy complements sustainable ecosystems management by setting objectives on enhance resilience of ecosystems to the challenges posed by climate change enhance participation in climate change mitigation activities that lead to sustainable development and mobilize resources including finance to adequately address climate change.

The strategy addresses that climate change is likely to severely affect economic growth of our country, especially climate sensitive sectors such as agriculture, livestock, forestry, water, tourism, transport, energy and health. The strategy asserts that climate change impacts such recurring drought is likely to devastate agricultural production and other related sectors such as water and energy sectors.

The strategy further recognizes that agricultural development is also strongly dependent on environmental resources, such as land, forest, air, water and other resources. Thus, sustainable utilization of these resources is vital for the growth and sustainability of the sector. Therefore, effective implementation of the strategy is expected to contribute to the implementation of sustainable ecosystems management approaches.

Synergy of the strategy to sustainable ecosystems management is also built through its adaptation interventions. Some of the adaptation measures identified by the Strategy include assessing crop vulnerability and suitability (cropping pattern) for different Agro-Ecological Zones (AEZ); addressing soil and land degradation by promoting improved soil and land management practices/techniques. Promotion of best agronomic practices such as conservation agriculture technologies; promoting integrated nutrients management; and exploring other NAMAs opportunities in agriculture complements issues related to sustainable ecosystems management.

The Zanzibar Climate change Strategy recognizes that Zanzibar as an Island is particularly vulnerable to climate change since most of livelihood activities are reliant on climate sensitive activities such as agriculture, fishing and tourism. The coastal, marine and terrestrial ecosystems that are central to these activities are increasingly threatened by changes in temperature and precipitation patterns as well as sea level rise. Furthermore, the built environment, including residential, productive, water, energy and transport infrastructure, is also vulnerable to climate variability and future climate change. Thus the strategy emphasize that Zanzibar requires additional interventions to adapt to the impacts of climate change, in the full sense of both reducing harm and seizing development opportunities. One among its aim in responding to this is to promote climate-compatible development, favouring ecosystem-based

approaches particularly through development of Lower Carbon Agriculture and Promotion of Sustainable Tourism. The Zanzibar Climate change strategies defined as wide range of agriculture practices that can also lead to productivity gains, enhanced climate resilience and increased soil carbon sequestration. These include agroforestry, conservation agriculture e.g. low tillage, soil and water management and various improved agronomic practices. Under tourism sector, the strategy suggested various opportunities for low carbon measures, particularly in terms of energy efficiency measures and renewable technologies. The promotion of such measures could be part of a broader sustainable tourism agenda that helps safeguard the island's resources, ensuring sustainability of the industry and helps the branding of Zanzibar as green tourism destination.

4.6.3 NATIONAL STRATEGY FOR REDD+ (2013)

The national strategy for Reduced Emissions from Deforestation and Forest Degradation (REDD+) is also a recent national initiative to mitigate climate change impacts, improve forest conservation and sustainability of other natural resources. It focuses on promoting sustainable natural resources conservation and management, sustainable community development, enabling country to participate and benefit from the emerging international REDD+ mechanism, and reducing drivers that accelerate deforestation and forest degradation. The National Strategy for REDD+ is well linked to national policies, strategies, programmes and plans.

Sustainable forest management is also synergized in the strategy. The main aim of the strategy is to establish mechanisms for Tanzania to participate and benefit from forest carbon trading, based on demonstrated emission reductions from deforestation and forest degradation. The goal of the strategy is centred to facilitate effective and coordinated implementation of REDD+ related policies, processes and activities so as to contribute to climate change mitigation/adaptation and overall sustainable development and forest resources management.

The strategy also intends to strengthen mechanisms to address drivers of deforestation and forest degradation in various agro-ecological zones. This Strategy takes cognizance of a number of relevant policies that need to be considered during implementation. Policies relevant to REDD+ interventions in Tanzania Mainland include the Tanzania Development Vision 2025, MKUKUTA (I and II), the National Environment Policy (1997), the Forest Policy (1998), the Land Policy (1995), National Energy Policy (2003) and the National Agricultural and Livestock Policy (1997) (URT, 2013a).

4.6.4 ACTION PLAN FOR IMPLEMENTATION OF THE NATIONAL REDD+ STRATEGY (2013)

Action Plan for National REDD+ Strategy has been developed to guide implementation of activities derived from the objectives of the REDD+ strategy for Tanzania. It identifies various strategic interventions and/or key result areas for REDD+ implementation. Proposed interventions encompasses short-term, medium and long term activities which will enable Tanzania to contribute to the global efforts of reduction of greenhouse gas emissions and help the world become more resilient to climate change impacts.

The Action Plan also outlines that agriculture is one of the main driver of deforestation and forest degradation. It sets various interventions ranging from capacity and infrastructural development, policy review and harmonization, mobilization of financial and human resources for the modernization of agricultural production, improvement of farming systems and land management practices, modernization of agricultural production value chain. Interventions proposed in the action plan are intended to reduce emissions from deforestation and degradation, which in turn will result into sustainable forest management, contribute to climate change mitigation and eventually adaptation options.

4.6.5 NATIONAL WATER SECTOR DEVELOPMENT STRATEGY (2006)

The National Water Sector Development Strategy (NWSDS) of 2006 sets out how the Ministry responsible for Water will implement the National Water Policy to achieve the National Strategy for Economic Growth and Reduction of Poverty (NSGRP), Millennium Development Goals, and Tanzania Development Vision 2025 targets as well as other macro strategies objectives.

The National Water Sector Development Strategy also supports re-alignment of other water related key sectoral policies of energy, irrigation, industry, mining, and environment. It specifies roles of the various actors, through clearly defining roles and responsibilities and hence the removal of duplications and omissions.

Further, the institutional framework underscores separation of service delivery and regulation to ensure fair play among the various actors and sectors. This National Water Sector Development Strategy is, therefore, a blueprint for prioritized timely and appropriate interventions to address the Water Sector challenges in the process of achieving all the sectoral policies objectives and targets narrated in the National macro strategies (URT, 2006).

The strategy also is in line with other macro and sectoral strategies by the recognition that livelihoods of poor people who depend on land, water, forests, fish, livestock, and biodiversity will be enhanced if they secure reliable access to water resources through well-enforced water allocation and pollution control procedures in which they have had a role.

It further emphasizes that on the need to ensure sustainable management of water catchments areas and maintenance of forest cover in critical highland catchments; improved land management and adoption of water conservation technologies, and implementation of national plans to halt desertification and land degradation, and restore degraded lands; and establishing and supporting National and Regional Programmes for integrated water resources development and management.

4.7 LEGISLATIONS RELEVANT TO SUSTAINABLE FOREST MANAGEMENT (SFM)

4.7.1 LAND ACT, 1999

The Land Act vests the ownership of all land in Tanzania in the President, as trustee, on behalf of all the people. It vests in the Minister responsible for Lands the power of allocation and enforcement. The Act specifies that some of the lands that are declared to be reserved are governed by the provisions of various laws including the Forests Act; the National Parks Act; the Ngorongoro Conservation Act; the Wildlife Conservation Act; and the Marine Parks and Reserves Act. Other categories of reserve land contemplated by the provisions of the Land Act include those located within the Water Catchment (land parcel(s) within a natural drainage system from which the water resource of the concerned drainage basin originates).

The Act also recognizes land declared by the Minister responsible for lands under the provisions of the Act to be hazardous land.⁷All these categories of land identified by the Land Act especially the catchment and hazardous areas entail some elements of sustainable forest management.

⁷ Section 6(1) (b) and (d)

Some of the hazardous areas which have to be protected include Mangroves swamps and coral reefs; Wetlands and offshore islands; and Land on slopes with a gradient exceeding any angle which the Minister shall, after taking account of proper scientific advice. The Act recognizes the need to protect hazardous areas by stipulating that development of which is likely to pose a danger to life or lead to the degradation of, or environmental destruction should be avoided. The Act also stipulates that land specified as hazardous and/or fragile should not be developed on account of its fragile nature or of its environmental significance.

4.7.2 VILLAGE LAND ACT, 1999

This law provides for the management and control of village land. The main purpose of this Act was to recognize and secure customary rights in land, the main target being rural community members. The Act places all village lands under the management and control of village governments. The transfer of ownership and control over village land is strictly regulated under the Act in order to protect the interest of local communities from unscrupulous dealers.

The most relevant provision of this piece of legislation that has a bearing on some of the elements for sustainable forest management is provided under section 6, which is a replica of section 6 of the Land Act – dealing with hazardous land. Section 3 (f) of the Act also entails issues related to sustainable forest management. The Act calls for ensuring that land resources used productively and that any such use comply with the principles of sustainable development.

4.7.3 LOCAL GOVERNMENT (DISTRICT AUTHORITIES) ACT, 1982

This legislation basically provides for the duties, functions and special guidelines to Local District Authorities to enable them effectively perform their administrative tasks. In executing their duties, these Authorities have been vested with the powers to make, among other things, by-laws.⁸ Some of the by-laws that may be promulgated under this legislation may have a general bearing on the management of forest resources. They may also provide for the requirement of EIAs, directly or by implication, for certain projects and developments.

For example, section 118 of this Act, which stipulates the general functions and duties vested in the Authorities, provides for some of the powers that may be exercised in fostering sustainable forest management. This can be inferred from the powers to: Take all necessary measures for the prevention of soil erosion and the protection of crops; regulate the use of agricultural land; and establish, preserve, maintain and improve the use of forests and forest produce.

The First Schedule to the Act expounds upon the powers provided for in section 118 and makes reference to activities that would be undertaken in order to promote sustainable forest management and be under the control of the authorities. According to the Act, the Local Authorities may: declare any area of land to be reserved for purposes of natural regeneration; prevent pollution of water and any river, stream or water way or other water supply; and regulate or control the use of swamps or marshland⁹.

The Second Schedule to the Act also has some significance to the control, regulation and wise use of environmental and natural resources. This Schedule provides for functions of Township Authorities. It provides that these Authorities may require any person or

⁸*ibid.*, See sections 111 and 118

⁹*ibid.*, see sections 5, 91 and 95 of the 1st Schedule

body to take measures to conserve natural resources and establish and maintain ponds.¹⁰ The control of natural resources referred here could include forest and related resources which may require conducting EIA and thus fostering sustainable forest management. Village by-laws that are made under the mandate of the Local Government (District) Authorities Act, among other laws, that may have provisions to promote activities that address sustainable forest management. Some of the activities may include those related to the conservation and management of forest resources. These by-laws may seek to ensure that developments in village lands are subjected to the EIA process in order to conserve fragile ecosystems. The EIAs may be undertaken under the supervision of District Authorities, partly because the District Authorities are required to assist villagers in formulating village by-laws.

4.7.4 LOCAL GOVERNMENT (URBAN AUTHORITIES) ACT, 1982

Sustainable ecosystems management is a cross-cutting issue for natural resources management. It is the responsibility of ecosystems adjacent communities and those depending on ecosystems related products to promote sustainable management of ecosystems resources in order to meet the present demands without compromising demands of future generation.

Though much of the ecosystems resources are not located in urban settings, urban areas have significant contribution to deforestation and degradation of ecosystems resources. Demand for wood fuel for urban residents and public institutions, whereas extraction of wood fuel is largely unsustainable, require multi-sectoral approaches in order to conserve ecosystems resources sustainably.

The Local Government (Urban Authorities) Act establishes Urban Authorities and provides for their functions and duties. Like the Local Government (District Authorities) Act, this Act also empowers these Authorities to make by-laws to control and regulate, among other things, natural resources conservation and management activities. In this respect, therefore, the power of Urban Authorities to make by-laws also incorporates the power to manage and control the land and resources by issuing directives on EIA upon development projects and/or activities which have potential impacts on ecosystems resources.

Accordingly, in exercising the power vested in them, the Act specifically provides that Urban Authorities may declare any area to be reserved land and control the use of swamps and marshland.¹¹ Urban Authorities may also regulate and control ecosystems related activities by invoking the provisions requiring the carrying of EIA or SEA.

4.7.5 FOREST ACT (2002)

The Forest Act (2002) is the legislative framework for the National Forest Act (1998). Section 4 of the Act establishes four categories (classification) of forests. These are national forests; local authorities forest reserves, village forest and private forests. National and local authority forest reserves are declared by the Minister. These comprise of local authority forest reserves or forest on general land. These are mainly used for sustainable production of timber or forest produce, the protection of water sheds, conservation of soil and wild plants or for any other purposes as determined by the local authority. National or local authority forest reserves could be managed by the Ministry, an Executive Agency, a local authority or a Village Council. The management of the reserves could also be vested in groups such as companies, cooperatives, private persons or NGOs.

¹⁰*ibid.*, see generally section 139 of the Act and sections 6 and 9 of the 2nd Schedule

¹¹ *ibid.* see section 55 and the Schedule to the Act providing for functions which Urban Authorities may perform.

Village forests through Community Based Forest Management (CBFM) may consist of village land forest reserves (owned and managed by one or more village government) or community forest reserves created out of village forests (and not restricted to government ownership and management). Joint Forest Management (JFM), involving a combination of village government and Central Government or local authority stakeholders as provided for by the Forest Act, is also practiced.

Unreserved forests on general land may also be classified under National forests, Local authority forests or Village forests. Village forests are declared by the village council after approval by the Minister. These consists of village land forest reserves, community forest reserves created out of village land and forests which are not reserved which are on village land and of which the management is vested in the village council.

Private forest could either be forest on village land held by one or more persons under a customary right of occupancy or forest on general or village land which a right of occupancy or lease has been granted to a person or company or NGO to manage. Private forests may also be owned either as forestry dedication covenants (to holders of a right of occupancy) or concessions.

Like other pieces of legislation, the Forest Act also makes direct and implied references to environmental concerns relating to sustainable forest management. Section 18 of the Act requires proposed developments in forest areas to conduct an EIA in accordance with the provision of EMA and Regulations made under it.

EMA's coverage of the conservation of forest resources makes some important cross-referencing to the provisions of the principal legislation governing forests. Section 63 (1) of EMA states clearly that all forests shall be managed in accordance with the provisions of the Forest Act, 2002 and matters relating to environment shall conform with the provisions of this Act. However, EMA re-echoes the importance of section 232 noted above where it reiterates in section 63 (2) that 'where any matter concerning management of environment undertaken according to the provisions of the Forest Act, 2002 is in conflict with this Act, the provision of this Act shall prevail.'

4.7.6 WILDLIFE CONSERVATION ACT (2009)

The Wildlife Conservation Act introduces that it was enacted to make provision for the conservation, management and sustainable utilization of wildlife and wildlife products. The definition of "conservation" provided for in this law covers wildlife, its habitat and ecosystems necessary for their survival in the broad sense. This holistic approach of applying the coverage of this Act contributes significantly to the implementation of strategies for sustainable forest management. Approaches for sustainable forest management are likely to contribute to the implementation of the provisions in the Act and continued survival of wildlife species in the conserved forest land.

The Act also makes provision for cross-cutting issues which have a bearing on sustainable forest management. These include taking on board local communities in Wildlife Management Areas to be established in village lands, recognizing the intrinsic relationship between wildlife and forest resources and the need to cooperate and coordinate in ensuring their sustainable utilization. Section 31 (5) of the Act provides that the activities to be undertaken in the WMAs must be conducted in conformity with the Forest, Beekeeping, Fisheries, Environmental Management Acts, and any other relevant laws for wildlife and forest resources management. However, there are conflicting interests and management arrangements between Wildlife Conservation Act (2009) and Forest Act (2002) especially on the establishment of WMAs in forest reserves.

4.7.7 NATIONAL LAND USE PLANNING COMMISSION ACT (2007)

This Act establishes the National Land Use Planning Commission and provides for its powers and functions. Some of its powers and functions have a bearing on the conservation and wise use of natural resources, including forests. The Commission, for example, is charged with, among other things, the task of overseeing effective protection and enhancement of land quality and encouraging better land use plans. The Act also sets out the fundamental principles of land use, which are aimed at giving effect to the fundamental principles of the National Land Policy. In this respect, strategies for sustainable forest management need to be guided with, among other laws, the provisions of this legislation.

The Commission is also required to recommend measures to ensure that government policies for development and conservation of land take into account its effect on land use. Other land use planning bodies are village councils, district councils, and such other bodies that the Minister responsible for land use planning may designate. These bodies have powers to make land use plans in their respective areas. Of particular relevance to sustainable forest management are the powers of the village councils to make village land use plans. Section 22(1) provides that every village council is the village land use planning authority for its respective village. The village councils are supposed to promulgate village use plans in accordance with the Village Land Act of 1999 and the Guidelines for Participatory Village Land Use Planning. Village Assemblies are the ones that approve village land use plans. This is emphasized by section 24 of the Act where it states:

The provisions of the Local Government District Authorities Act and the Village Land Act relating to land use and environment (sic) planning shall, with necessary modification, be read and construed as if they were provisions of this Act.

The Act therefore incorporates the provisions of the Land Act and Village Land Act and enriches it and upholds the security of tenure under those laws. Even though financing of Land Use Planning has been rising concerns of many stakeholders, the Commission Act upholds the powers of village councils in their administration of village lands, an important ingredient to the success of sustainable forest management at the local level.

4.8 INSTITUTIONAL FRAMEWORK FOR SUSTAINABLE FOREST MANAGEMENT

Institutional framework is very important to enable the success of any initiative. There are several institutions and sectors which integrate issues related to the sustainable forest management. Some of the key institutions and sectors relevant for sustainable forest management include:-

Vice President's Office (VPO), Division of Environment: This office is responsible for coordination of the overall environment management in Tanzania. It is responsible for the development of policy options, and coordination of the broad-based environmental programmes and projects. It is specifically charged with the duties and responsibilities of environmental research, environmental policy making, planning, monitoring, and coordination of both national and international environmental issues.

Other key responsibilities for the VPO include overseeing activities coordinated and implemented by executing agencies such as National Environment Council (NEMC), which is charged with environmental issues including Environmental Impact Assessments (EIA), environmental education and awareness, research and enforcement of environmental laws and regulation).

President's Office: Regional Administration and Local Government (PO-RALG): The Office of the Regional Administrative Secretary (RAS) is responsible for all development planning at regional level. Government personnel representing sectoral Ministries at regional level are coordinated through this ministry. It oversees activities performed by Local Government Authorities.

The Ministry of Agriculture (MA): The mission of the Ministry of Agriculture is to conduct public sector support functions in agricultural research, training, extension, policy formulation, and information services. The Ministry also regulates plant health and quality control of agricultural inputs and products, protection of the environment, and creating market conditions for promoting agricultural growth. Soil Conservation and Land Use Planning (SCLUP) is also incorporated within the Agricultural Land Use Planning Department. This Ministry is a critical institution in promoting Sustainable Forest Management.

Ministry of Livestock and Fisheries Development (MLD): The Ministry of Livestock and Fisheries Development (MFD) is responsible for the Livestock Development Policy, the Livestock Research and Extension Services as well as for Veterinary Services. The potential importance of this sector to sustainable forest management is in all matters relating to rangeland management.

Ministry of Water and Irrigation (MoWI): This ministry coordinates the implementation of the Water Resources Development Policy and manages rural and urban water supplies, sewages systems and related services. As water resources management is very crucial in agriculture development, and activities related to Sustainable Forest Management (SFM), especially on catchment management.

Ministry of Natural Resources and Tourism (MNRT): This ministry deals with forestry, wildlife and tourism. The Forestry Division within this ministry is responsible for managing natural and plantation, forest reserves on public land, including conservation in forests and plantations, and protection of catchment areas. The Ministry embeds Forestry and Beekeeping Division (FBD) and Tanzania Forest Service (TFS) Agency, which oversees forestry planning and management, including implementation of policy strategies and enforcement of forestry legislation. Specifically, TFS is mandated for the management of national forest reserves (natural and plantations), bee reserves and forest and bee resources on general lands. The FBD on the other hand, is responsible for the development of the forest policy, laws and regulations and overseeing their implementation in the sector.

Ministry of Lands and Human Settlements Development: The Ministry of Lands and Human Settlements Development is responsible for allocation, registration, mapping and planning land use. It has a number of agencies dealing with these issues including the National Land Use Planning Committee (NLUPC), with primary responsibility being implementation of new Land Act.

Academic and Research institutions: There are also a number of knowledge-based institutions under the Ministry of Science, Technology and Higher Education that are important in the success of sustainable forest management synergy. Also, there a number of sectoral based research institutions and government agencies that have significant contribution to sustainable ecosystem management and resilience to climate change.

4.9 POLICY, LEGAL AND INSTITUTIONAL ARRANGEMENT GAPS

4.9.1 LAND TENURE

Land tenure systems have implications in the management of forest resources (Njukiet al., 2004) because rights to the trees are entwined with rights to the land on which the trees stand (Warner, 1997; Kajembe, 1994). It is equally important to emphasize here that the ownership of a resource to a large extent influences the way in which the resource is used at present and managed for future use. The basic tenet is that when an individual owns a resource and can expect to own and profit from the resource in the future as well, the individual has an incentive to invest in the resource in the form of protective measures, restrained use and careful management (Talwar &Ghate, 2004).

Secure tenure of forests is an important aspect of sustainable forest management, lack of which is a major reason why some local people do not commit themselves to participatory forest conservation (Waiganjo& Ngugi, 2001) hence deforestation and forest

degradation. The nature of property rights over forests and their economic value have been identified as major causes of deforestation in several developing countries (Ligon&Narain, 1999; Dolisca et al., 2007; De Oliveira, 2008).

The study carried out by Dolisca et al. (2007) in Haiti indicated that land tenure significantly affects farmers' decisions, and farmers who use lands illegally are likely to clear more forests for agriculture. This is probably the case in Tanzania too. Even though the Village Land Act of 1999 establishes and defines village land, however, certain reserved lands such as forests and game controlled areas may be found within village lands. As such there are obvious overlaps between the Land Act and the Village Land Act, which induces conflicts and insecurities over land tenure. The study by Mugabi (2013) also mentioned that despite the legal framework in place, still there are a number of challenges related to land ownership, especially in rural areas. The challenges are largely manifested through the farmers-pastoralists conflicts, tenure disputes, and alienation of peasants. Therefore, there is a need to address these challenges in order to promote sustainable land and forest management (Mugabi, 2013). Some of the measures to improve land titling include authorization of land selling, and enact land ceiling acts for avoiding monopoly and excessive ownership by individuals. Other measures may include land expropriation for the public good, land banking, women entitlement to land ownership, land education to the masses, and eased title procedure policies (ibid).

4.9.2 CONFLICTING LEGISLATIONS

Study by the Ministry of Natural Resources and Tourism (2007) on the analysis of conflicts between Central and Local Government Authorities in implementing the National Forest and Beekeeping Programme in Tanzania using a case study Local Authorities By-Laws narrates that some of the by-laws do not comply with the provisions of principal and subsidiary legislation related to local governments, environment, land and forests.

In some cases, the village environment and forests management committees that are required to be established are not in existence. In other cases, committees put in place by the by-laws are not those that have been contemplated by the principal legislation. In some Districts, authorities are not aware of forest related legislation, including the Forest Act and the Forest Policy.

In terms of conflicting legislations, especially between the Land Act of 1999 and the Village Land Act of 1999 is firstly placed through the definition of general land. While the general land is defined as "all public land which is not a reserve land or village land and includes unoccupied or unused village land," by the Land Act of 1999, section 2 of the Village Land Act defines general land as "all public land which is not reserved land or village land."

This is a major conflict in that the Land Act of 1999 tries to make unused or unoccupied village lands part of the general land, which is not the case under the Village Land Act, 1999. This creates tenure insecurity and needs to be reconciled to ensure that sanctity of village land is preserved.

The other concern relates to the conflicting legislation is centred on the declaration of village land forest reserve and gazetted village land forest reserve, as provided for by section 32 of the Forest Act, 2002 which may cause problems to the village. This is because unlike the general scheme of land ownership under the VLA, the scheme provided for by the Forest Act on how the declared village land forest reserve could be registered and gazetted by the Director seems to interfere with the general powers of the villagers to manage their own land.

For example, under section 13 (1) of the VLA the Village Council is required to recommend to the Village Assembly to set aside a portion of land to be communal village land and for defined purpose. Generally, the Forest Act has no provision that would compel the villagers to form village forest reserves under the Forest Act, 2002 rather than under the VLA, 1999. This reality ought to be borne in mind when contemplating sustainable forest management on village lands.

4.10 CONCLUSION

The analysis of the various policies, legislation and institutional arrangements indicate that natural resources sector laws are diverse, and there are direct bearing on sustainable forest management. It was found that the legislative framework for sustainable forest management is found in segmented legislative and policy provisions that seek to regulate environmental and natural resources conservation and management in general. These provisions are found in the various sector policies and in both principal and subsidiary legislation regulating resources such as land, forests and the general environment. The analysis also identifies the potential areas of conflict in the legislation governing natural resources and environment which have implications for sustainable forest management. The conflicting provisions of the Forest Act, Village Land Act and the Local Government (District Authorities) Act have been highlighted.

5.0 UPDATED RESULTS FRAMEWORK/LOG FRAME

After a detailed assessment of indicators and targets in section 3, which resulted into an amendment to some indicators and targets, the revised RF is presented in this section and it integrates baseline information. The amendments made to indicators and targets; also take into account the review of National/Sectoral Strategies, Plans and Policies relevant to Sustainable Ecosystem Management and Resilience (section 4).

Overall Goal: Building resilience of rural communities						
Project Objective: Increasing resilience to climate change in rural communities of Tanzania by strengthening ecosystem resilience and diversifying livelihoods						
Outcome/Outputs	Indicator	Baseline	Midterm Target	End of project Target	Means of Verification	Risks (R) & Assumptions (A)
Component 1. Capacity to adapt to climate change through EbA approaches.						
Outcome 1. Improved stakeholders' (AKMS users) capacity to adapt to climate change through EbA approaches and undertake resilience building responses across scales	Number and type of AKMS users who report strengthened capacity to plan and implement EbA practices at district and village levels	0 AKMS users at district and village levels	30% of AKMS users are reporting strengthened capacity to plan for adaptation by mid-term	90% of AKMS users are reporting strengthened capacity to plan for adaptation by end of project	AKMS surveys, reports	R: The individuals trained or institutions are not empowered enough to influence the project implementation. A: Stakeholders are interested in improving adaptation planning through learning and using the AKMS.
1.1 A GIS-based adaptation knowledge management system (AKMS) that supports planning	Existence of a fully operational GIS-based adaptation knowledge management system (AKMS)	0 GIS-based AKMS	Structure and organization of the AKMS are in place by mid-term	The AKMS is fully operational and daily used by the majority of the multi-stakeholder partners by end of project (i.e. the system will count number of users visiting per day)	Project website, reports, consultations	R: Limited continuous stakeholder engagement in populating and updating the AKMS (governments, donors, NGOs, CSOs, private sector) A: The AKMS is a web-based adaptation tool providing immediate benefits for stakeholders planning climate

						change adaptation activities and baseline data on EbA
1.1.1 Design and develop the basic structure of the knowledge management system utilizing available open source tools						
1.1.2 Form a cross-sectoral multi-stakeholder group to support the management and maintenance of the knowledge system and its use for adaptation planning						
1.1.3 Verify the data produced by the stakeholders and identify capacity gaps and opportunities for collaboration on all levels						
1.1.4 Identify currently available data in GIS format and additional data needs for planning appropriate climate change responses						
1.2 Training and guidance on EbA practices provided to local communities and a cadre of knowledgeable resource persons on ecosystem-based adaptation at national and sub-national levels	Number of people trained on EbA at national and sub-national levels	0 Knowledge of existing AKMS users at various levels in most districts Existing VICOPA ToTs developed by MWEDO in Simanjiro district	At least 50 people per district, among which half are women, by mid-project	At least 100 people trained on AKMS and EbA practices at national level, among which half are women, by end of project	training reports, surveys	R: Individual capacity may not be sufficient to lift any remaining institutional barriers to the broader dissemination of EbA A: The government continues to support, through VPO leadership, EbA as a viable adaptation approach.
1.2.1 Develop ToT training material on ecosystem based adaptation approach						
1.2.2 ToT training for VPO staff, National climate change steering committee and working groups members, climate change and disaster management focal points in relevant ministries						
Component 2. EbA for rural resilience						
Outcome 2. Increased resilience in project district sites through demonstration of EBA practices and improved livelihoods of	Vulnerability Index as measured by Vulnerability and Impacts Assessments (VIAs)	0 Gender and district disaggregated vulnerability and impacts assessments (Gender disaggregated Vulnerability Index)	N-A	a 45% reduction in vulnerability of beneficiaries in project sites, among which 40% are female headed households and other vulnerable groups, by end of project	VIAs conducted during year 1 of project, and monitored at project mid-term (mid-term review) and end (terminal evaluation) through participatory M&E, reports. The VIA will develop vulnerability scorecard that will be monitored	R: perception-based vulnerability indexes may be insufficient in revealing changes in resilience. A: A similar methodology can be used and repeated at various

targeted vulnerable groups					at mid-term and terminal stages of the project.	milestones during the project.
2.1 Local authorities, committees and user groups trained on adapting communities to climate change using EbA.	Number of people trained in EbA to adapt to climate change	Some people in the study districts have knowledge on EbA practices. They only require training to improve their capacity	At least 30 people per district trained on EbA among which half are women, by mid-project	At least 60 people per district trained on EbA among which half are from female headed households, by end of project	Project reports; List of participants to training (by gender) Training reports, training manuals	R: Local authorities, committees and user groups are not engaged in EbA approaches. A: Local authorities, committees and user groups will learn adaptation through EbA approaches and improve their practices and livelihood strategies.

2.1.1 Training (ToT) on climate change vulnerability assessment (including disaster risk) and EbA/adaptation planning for local authorities, committees and user groups

Outcome/Outputs	Indicator	Baseline	Midterm Target	End of project Target	Means of Verification	Risks (R) & Assumptions (A)
2.2 Locally-specific climate change vulnerability, risks and adaptation options are identified by local stakeholders.	Number of Vulnerability and Impacts Assessment (VIAs) conducted	0 VIA studies	1 VIA conducted per district, that identifies adaptation options	N-A	Activity reports, VIAs, maps	R: Communities do not feel engaged in conducting VIAs A: The benefits of VIAs are explained to communities and seen as a useful tool to identify adaptation options.
2.2.1 Undertake participatory Climate Change Vulnerability and Impact Assessments in project sites using guidelines for VIA under PROVIA and identify recommended adaptation actions						
2.2.2 Develop a diagnostic and indicators of climate-change affected ecosystem services, based on recognized methodologies for measuring ecosystem services such as the UNEP-WCMC ToolKit						
2.2.3 Establish a map (including temporal patterns (historical) of occurrence) of drought, flood, pest and diseases risk zones (baseline and climate change scenario) in selected sites and incorporate results to knowledge management system						
2.2.4 Assess the physical and socio-economic impacts of climate change on selected project sites (considering impacts to both communities and ecosystems) and incorporate results to Output 1.2.						

2.3 Ecosystem services are rehabilitated through the implementation of EbA practices (i.e. natural regeneration, reforestation, pasture seeding and sustainable management)	Number of hectares of forest and rangeland rehabilitated (through natural regeneration, reforestation and pasture seeding) and under sustainable and climate resilient management	Established land cover maps per district (see the attached Annex I: baseline survey report)					Up to 550 ha of forest (125 ha per district in the mainland and 50 in Zanzibar), 1050 ha of rangeland (250 ha per district in the mainland and 50 for Zanzibar) rehabilitated and under sustainable and climate resilient management, by mid-project (as specified in the LUMPs)	Up to 1100 ha of forest (up to 250 ha per district Mvomero, Mpwapwa, Simanjiro and Kishapu and 100 for Kaskazini A), Up to 2100 ha of rangeland (up to 500 ha per district 500 ha for Mvomero, Mpwapwa, Simanjiro and Kishapu and 100 for Kaskazini A district) rehabilitated (through natural regeneration, reforestation and pasture seeding) and under sustainable and climate resilient management, by end of project, as specified in the LUMPs	Land cover maps, project reports, land use plans, surveys, field observations	R: Communities are not willing and able to participate in ecosystem restoration and activities improving livelihoods A: Local authorities and communities are engaged in EbA thanks to training and successful information sharing through the AKMS	
		Land cover types	Mvomero (Year 2016) ha	Mpwapwa (Year 2016) ha	Simanjiro (Year 2016) ha	Kishapu (Year 2016) ha					Kaskazini A (Year 2016) ha
		Forest	37065.00	16704.00	2712.00	314.00					244.00
		Woodland	82475.00	138223.00	496212.00	189.00					6328.00
		Bushland	84240.00	95060.00	455366.00	122.00					5835.00
Grassland	166560.00	141141.00	283223.00	-	244.00						
2.3.1 Develop new, resilience and seasonality based, land use and management plans with communities											

2.3.2 Establish, through consultations with local communities, exclosure and no-take zones to support the natural regeneration of degraded areas						
2.3.3 Undertake rangeland rehabilitation on 6,000 ha						
2.3.4 Undertake watershed rehabilitation and reforestation, using local species on 3,000 ha						
2.3.5 Undertake riverbank rehabilitation in areas						
2.4 Income from primary sources and IGAs is increased from year 2 and maintained across seasons, through sustainable and resilient livelihoods	Number of people reporting a sustained increased income from alternative IGAs introduced by the project, among which a percentage are female-headed households	An average of TZS 500,000/= household income per year. Also a number of primary and secondary sources of income, including IGAs	Targeted households are reporting a 5% increase in all season income, among which 40% are female-headed households, by mid-project.	Targeted communities are reporting a 15% increase in all season income, starting from year 2 of the project and maintained on the 4th following years, for smallholder farmers/HH, among which 40% are female headed	Annual reports on production numbers for each value chain, per district and ward/village; Project reports; Producer surveys	R: Targeted communities are too risk-averse to try adopting alternative activities. A: Communities are willing and able to adopt climate smart agricultural practices and activities improving livelihoods
2.4.1 Implement climate smart agricultural practices, including conservation-based irrigation, water harvesting, crop rotation, etc.						
2.4.2 Improve resilience of current livelihoods and introduce alternative, income-generating, climate resilient livelihood activities for vulnerable groups, particularly women (livestock value chain, beekeeping)						
2.4.3 Introduce and promote efficient cooking stoves and efficient charcoal production technologies to reduce pressures on forest resources						
2.4.4 Training and support to LGAs, extension services and key producer groups on resilient livelihoods						
Component 3. Knowledge management on climate change adaptation and up-scaling.						
Outcome 3 Strengthened information base on EbA supports an up scaling strategy	Availability of an exit strategy at the end of the project	Few relevant stakeholders in project districts have relevant knowledge on exit strategy	NA	One documented and agreed exit strategy (including an up-scaling	Project reports, Information products	R: Stakeholders do not agree on the lessons learned and upscaling plan. A: Information base on EbA is disseminated and benefits targeted

				plan) is approved at the end of the project		audiences leading to action.
3.1 Project lessons, knowledge on Climate change adaptation and resilient livelihoods using ecosystems captured, stored and widely disseminated	Number of information products distributed by the end of the project	0 Information products	At least 10 information products developed	At least 15 information products disseminated	Project reports, Information products	R: The majority of stakeholders maintain business-as-usual approach or have improved attitudes but do not take action. A: Information products are developed with and for specific target groups to ensure utilization.
3.1.1 Document best practices, applicable technologies, success stories to inform policies and adaptation planning, linked to the knowledge management system in Outcome 1						
3.1.2 Develop and disseminate practical and applied training and communication material for different target audiences (policy decision makers, planning, agricultural advisory services at local level) using print, radio and social media						
3.1.3 Undertake participatory monitoring of ecosystem services, project indicators and livelihoods						
3.1.4 Develop a sustainability and up-scaling strategy using lessons learned through project implementation.						

6.0 RECOMMENDED APPROACHES AND STRATEGIES FOR MONITORING AND EVALUATION OF PROJECT INDICATORS

In this section approaches and strategies for monitoring and evaluation of project indicators in the Revised Framework are presented (see table below). Approaches and strategies recommended in the table should be used to measure the progress of outputs. The regular measurement of outputs enables the Project Management team and the M & E to check if the outcomes and project objective are likely to be achieved as planned. It was recommended during FGDs that stakeholders (i.e. technical officials and local communities) need to be engaged in all stages of project implementation, monitoring and evaluation, so as to ensure ownership and sustainability of project outputs and outcomes. Therefore, they should not only be consulted, but also involved in the M & E process. The GIS-based AKMS should be used to store and process the data collected for easy sharing with the wider audience. An independent M & E team should be given ToRs to implement this in close collaboration with the Project management team.

Approaches and strategies for monitoring and evaluation of project indicators

Indicator	Sampling frequency	Strategies for data collection and monitoring	Inputs/equipment	Output data for processing and storage	Responsible parties	Data management
Project objective: Increasing resilience to climate change in rural communities of Tanzania by strengthening ecosystem resilience and diversifying livelihoods						
Component 1. Capacity to adapt to climate change through EbA approaches.						
Outcome 1. Improved stakeholders' (AKMS users) capacity to adapt to climate change through EbA approaches and undertake resilience building responses across scales						
Number and type of AKMS users who report strengthened capacity to plan and implement EbA practices at district and village levels	Sampling for this indicator will be done three times (first, it was done during this baseline study, second, during mid-term review and third during terminal evaluation)	<ul style="list-style-type: none"> An independent M&E expert should be contracted to collect data using methods developed during the baseline study. This should include: <ul style="list-style-type: none"> FGDs and round table discussions with government technical staff across levels surveys with government technical staff across levels household surveys consultation with the project team analysis of data collected through the above mentioned processes; and establishing the number and type of AKMS users disaggregated by gender <p>After analysing the data, findings should be compared with Baseline study findings to check if the target have been met (see updated RF)</p>	<ul style="list-style-type: none"> Clipboards Pens National, Regional and District survey templates Household survey templates 	<ul style="list-style-type: none"> Household data National, Regional and District data 	<ul style="list-style-type: none"> PMU DTs Independent M&E expert National M&E expert 	The Baseline Assessment report (including data collection tools) and M&E reports should be stored on the project database.
1.1 A GIS-based adaptation knowledge management system (AKMS) that supports planning						
Existence of a fully operational GIS-based adaptation knowledge management system (AKMS)	Sampling for this indicator will be done twice, during mid-term review and during terminal evaluation)	An independent M&E expert will check that the GIS-based AKMS is fully operational and being used by users	Data from Output 3.1	List of AKMS users and information products	<ul style="list-style-type: none"> PMU DTs Independent M&E expert National M&E expert AKMS users Technical experts (ICT) 	GIS data, Maps, list of AKMS users

Indicator	Sampling frequency	Strategies for data collection and monitoring	Inputs/equipment	Output data for processing and storage	Responsible parties	Data management
1.2 Training and guidance on EbA practices provided to local communities and a cadre of knowledgeable resource persons across scales on ecosystem-based adaptation						
Number of people trained on EbA at national and sub-national levels	It will come from the trainings reports. A capacity assessment will be conducted before and after the trainings. A satisfaction questionnaire will also be administered during the training	It will be conducted by EbA trainer and consolidated by M&E expert. After analysing the data, findings should be compared with Baseline study findings to check if the target have been met (see updated RF)	<ul style="list-style-type: none"> • Clipboards • Pens • National, Regional and District survey templates • Household survey templates 	<ul style="list-style-type: none"> • Household data • National, Regional and District data 	<ul style="list-style-type: none"> • PMU • DTs • Independent M&E expert National M&E expert 	List of AKMS users, List of TOTs and Trainees
Component 2. EbA for rural resilience						
Outcome 2. Increased resilience in project sites through demonstration of EBA practices and improved livelihoods of vulnerable groups in the study districts						
Vulnerability Index as measured by Vulnerability and Impacts Assessments (VIAs)	Sampling for this indicator will be done twice: mid-term review and terminal evaluation	<p>Evaluators should be contracted to collect data through:</p> <ul style="list-style-type: none"> • FGDs and round table discussions with government technical staff across levels • surveys with government technical staff across levels • household surveys • consultation with the project team • analysis of data collected through the above mentioned processes • establishing the number and type of AKMS users disaggregated by gender <p>After analysing the data, findings should be compared with Vulnerability Assessment study findings to check if the target have been met (see updated RF)</p>	<ul style="list-style-type: none"> • Clipboards • Pens • National, Regional and District survey templates • Household survey templates 	<ul style="list-style-type: none"> • Household data • National, Regional and District data 	<ul style="list-style-type: none"> • PMU • DTs • Independent M&E expert • National M&E expert 	Vulnerability Index, data collection tool and excel sheets should be stored on the project database
2.1 Local authorities, committees and user groups trained on adapting communities to climate change using EbA.						
Number of people trained in EbA to adapt to climate change	It will come from the trainings reports. A capacity assessment will be conducted before and after the trainings. A satisfaction questionnaire will also be administered during the training	<p>An independent M&E expert and EbA trainers should be contracted to establishing the number and type of AKMS users disaggregated by gender</p> <p>After analysing the data, findings should be compared with Baseline study findings to check if the target have been met (see updated RF)</p>	<ul style="list-style-type: none"> • Clipboards • Pens • National, Regional and District survey templates • Household survey templates 	<ul style="list-style-type: none"> • Household data • National, Regional and District data 	<ul style="list-style-type: none"> • PMU • DTs • Independent M&E expert • National M&E expert • Communities 	List of AKMS users, List of TOTs and Trainees

Indicator	Sampling frequency	Strategies for data collection and monitoring	Inputs/equipment	Output data for processing and storage	Responsible parties	Data management
2.2 Locally-specific climate change vulnerability, risks and adaptation options are identified by local stakeholders.						
Number of Vulnerability and Impacts Assessment (VIAs) conducted	Sampling for this indicator will be done once, during the mid-term evaluation	An independent M&E expert should be contracted to check if the VIAs were successfully conducted to meet the target in the updated RF	<ul style="list-style-type: none"> Clipboards Pens National, Regional and District survey templates Household survey templates 	<ul style="list-style-type: none"> Household data National, Regional and District data 		Activity report of the VIA, data collection tools
2.3 Ecosystem services are rehabilitated through the implementation of EbA practices (i.e. natural regeneration, reforestation, pasture seeding and sustainable management)						
Number of hectares of forest and rangeland rehabilitated (through natural regeneration, reforestation and pasture seeding) and under sustainable and climate resilient management	Sampling for this indicator will be done on an annual basis	<p>An independent M&E expert should be contracted to collect data through:</p> <ul style="list-style-type: none"> FGDs and round table discussions with government technical staff across levels surveys with government technical staff across levels consultation with the project team analysis of data collected through the above mentioned processes Assessment of Land Use and Land Cover (see section 2.5) <p>After analysing the data, findings should be compared with Baseline study findings to check if the target have been met (see updated RF)</p>	<ul style="list-style-type: none"> GIS software Maps Clipboards Pens National, Regional and District survey templates Household survey templates 	<ul style="list-style-type: none"> Forests and rangeland rehabilitated (Data from Output 2.3) Household data National, Regional and District data 	<ul style="list-style-type: none"> PMU DTs Independent M&E expert National M&E expert 	Land cover maps, land use maps
2.4 Income from primary sources and IGAs is increased from year 2 and maintained across seasons, through sustainable and resilient livelihoods						
Number of people reporting a sustained increased income from alternative IGAs introduced by the project, among which a percentage are female-headed households	Sampling for this indicator will be done on annual basis during the terminal evaluation	<p>An independent M&E expert should be contracted to collect data through:</p> <ul style="list-style-type: none"> FGDs and round table discussions with government technical staff across levels surveys with government technical staff across levels household surveys consultation with the project team analysis of data collected through the above mentioned processes <p>After analysing the data, findings should be compared with Baseline study findings to check if the target have been met (see updated RF)</p>	<ul style="list-style-type: none"> Clipboards Pens National, Regional and District survey templates Household survey templates 	Household data	<ul style="list-style-type: none"> PMU DTs Independent M&E expert National M&E expert Communities 	Reports on production numbers for each value chain, per district; Project reports; Producer surveys
Component 3. Knowledge management on climate change adaptation and up-scaling.						
Outcome 3 Strengthened information base on EbA supports an up scaling strategy						
Availability of an exit strategy at the end of the project	Sampling for this indicator will be done	An independent M&E expert should be contracted to check if the Exit strategy have been developed to meet the target in the updated RF	<ul style="list-style-type: none"> Clipboards Pens National, Regional and 	<ul style="list-style-type: none"> Household data National, Regional and District data 	<ul style="list-style-type: none"> PMU DTs Independent M&E expert 	Project reports,

Indicator	Sampling frequency	Strategies for data collection and monitoring	Inputs/equipment	Output data for processing and storage	Responsible parties	Data management
	once, during the terminal evaluation		<ul style="list-style-type: none"> District survey templates 		<ul style="list-style-type: none"> National M&E expert 	Information products
3.1 Project lessons, knowledge on Climate change adaptation and resilient livelihoods using ecosystems captured, stored and widely disseminated						
Number of information products distributed by the end of the project	Sampling for this indicator will be done on a regular basis	An independent M&E expert should be contracted to check if the information products have been developed and distributed to meet the target in the updated RF	<ul style="list-style-type: none"> Clipboards Pens National, Regional and District survey templates 	<ul style="list-style-type: none"> Information products Household data National, Regional and District data 	<ul style="list-style-type: none"> PMU DTs Independent M&E expert National M&E expert Communities 	Project reports, Information products (e.g. Policy briefs, Maps, Flyers)

7.0 DATA GAPS AND METHODOLOGIES TO FILL DATA GAPS

Resilience building requires robust baseline information on vulnerability, which encompass three important components for adaptation, both communities and ecosystem based. Vulnerability of a system is determined by a combination of exposure, sensitivity and adaptive /response capacity. Field survey findings indicated that stakeholders have preliminary information on perceived vulnerability, including climate change risks and impacts. However, there are no formal studies undertaken to determine how communities and ecosystems are vulnerable to the historical, current and projected changes in climate condition (i.e. being affected, and are likely to be affected in the near future - medium term and long term scales). Studies on vulnerability can also determine the influence of non-climate factors on the impacts of the changing climate. Lack of locally specific vulnerability assessment to determine magnitude of changes and impacts may affect setting benchmark for development of indicators for monitoring of resilience building and evaluation of project achievement, beyond the project phase. Therefore, it is important to undertake vulnerability and impact assessment (VIA) in the project districts and villages, which will focus on different aspects, including;

- i. Identification and analysis of current factors contributing to communities' vulnerability to climate change including exposure, sensitivity and adaptive capacity.
- ii. Identification and analysis of current factors contributing to ecosystem goods and service's vulnerability to climate change including exposure, sensitivity and adaptive capacity.
- iii. Mapping the project districts' vulnerable and risky areas.
- iv. Analysing the implication of institutional structures, policies, programmes, projects and sectoral plans on landscape, natural resources management and flow of ecosystem goods and services under the changing climate.
- v. Identifying adaptation strategies employed by communities to adapt to climate change as benchmark for identifying resilience building options
- vi. Analysing the contribution of policies and sectoral plans on communities' adaptation to climate change.
- vii. Establish Vulnerability Index (VI), and
- viii. Develop vulnerability reduction monitoring and evaluation plan, with SMART indicators related to livelihoods and ecosystems goods and services.

Apart from the proposed objectives, research design need to consider that vulnerability and impact assessment is a complex process that requires an extensive understanding of natural and social systems, internal and external factors as well as climate and non-climate factors (Hewitson *et al.*, 2014). It is also important to consider that vulnerability is time and context specific depending on economic, social, ecological/environmental, political, cultural, institutional, governance, geographical, and population/demographic factors (Cardona *et al.*, 2012). These factors exacerbate inherent effects of climate stress factors (e.g. changes in rainfall and increasing temperature) to affect highly exposed and sensitive systems (social or natural systems) of the poor because of lack of inclusive development process that deprives/limit them access and control to livelihood resources (*ibid*). Understanding interrelationships between climate and non-climate stress factors will enable the vulnerability assessment team to develop indices that are informative and adequate to facilitate monitoring and evaluation of project achievements. Social-environmental vulnerability dimension is one of the proposed models that will guide the vulnerability assessment. Recommendation of this model considers its integration of both biophysical and social factors, and takes into account the dependency of local population on their local resources and infrastructure (Cutter *et al.*, 2000). Social –ecological stress factors are important variables in the determination of vulnerability in the project districts.

8.0 SAMPLING DESIGN AND A DATA COLLECTION AND MANAGEMENT PROTOCOL

Conducting vulnerability assessment of a system or community requires a thorough understanding of the system/community that one is assessing. This is due to the fact that it is difficult to determine vulnerability of a household by visual assessment. Combination of approaches is also vital in order to minimize the chances of rejection and maximize success in determination of vulnerability of a system (social or natural).

Approaches

Major methodologies for assessment design and data management protocol include the following;

- i) **Participatory approach:** In order to ensure that detailed and diverse information is collected, it is important that a participatory approach be used because it allows participants to own the process and creates conducive environment for participants to express their views freely. Participatory methods are also useful for comparing the relationship and differences in views of the participants which is necessary for making a better analysis of the conversation (Conradson, 2005).
- ii) **Socio-cultural sensitivity approach:** Cultural sensitivity need to be well considered due to diversity of respondents with diverse needs and sensitivity. To minimize errors, researchers need to consult community leaders on how to adhere to socio-cultural differences that exist among communities, including respecting views provided by each participant and taking time to understand and discuss issues until it is concluded upon.
- iii) **Gender consideration approach:** Though, there are significant overlaps, it is very likely that climate change has different effects on women and on men. In order to capture some inherent differences, it is important that gender is put at the centre of discussion when conducting vulnerability assessment.
- iv) **Language simplicity approach:** Good communication is a key when discussing with local people in the field. In order to ensure that all participants contribute and participate fully, it is important to use simplified language that can be used by all without feeling isolated. At times, when it is difficult to understand each other; pictorial presentations can be used to allow community members to explain a phenomenon by using pictures.

Recommended research Tools

In order to capture a wider range of information, a combination of research tools have to be used. This is partly so because there is no single tool that can comprehensively gather all the information pertaining to vulnerability assessment. Some of the recommended research tools include the following:

- i) **Resource mapping:** This is one of the research tools for vulnerability assessment that can be useful in the identification of community livelihood assets, drawing of resource maps in the village – including risk areas and fragile ecosystems. Resource mapping is also important for guiding resource planning and management as well as identification of ecosystem based adaptation options.
- ii) **Climate Vulnerability and Capacity Analysis (CVCA):** This tool is commonly used to assess vulnerability and adaptive capacity to climate change at a community level (CARE International, 2009). This is one of the tools that can be used to guide preparation of robust research tools for PRAs data collection approaches. It can assist to understand underlying causes of vulnerability to climate

change and enabling environment for adaptive capacity. It can also help to guide analyses of conditions and hazards through multi-stakeholder analysis, collaborative learning and dialogue.

- iii) **Seasonal calendar:** This is a visual method of showing the distribution of seasonally varying phenomena (such as economic activities, resources, production activities, problems, illness/disease, migration, and natural events/ phenomena) over time. It helps mapping timelines for specific activities taking in the community and when specific groups of people usually suffer particular hardship so that appropriate safety nets can be set in place.
- iv) **Wealth ranking:** This tool helps in collection and analysis of perceptions of wealth differences and inequalities in a community and for identifying and understanding local indicators and criteria of wealth, well-being, and poverty. Therefore, this can help identification of disaggregated vulnerability and adaptive capacity in a community.

Data analysis approaches

Recommended approaches for data analyses include the use of climate data analyses methodologies (statistical tests and modelling) and socio-economic analysis tools such as Community-based Risk Screening Tool – Adaptation and Livelihoods (CRiSTAL) Tool: Depending on the objectives and level of analysis, the CRiSTAL tool is enables screening existing project activities, design new project activities or understanding livelihood and climate change contexts without designing any activities.

9.0 CONCLUSION

The general objective of the project is to enhance resilience to climate change in rural communities of Tanzania by strengthening ecosystem resilience and diversifying livelihoods. This contributes to the overarching goal of reducing the vulnerability of rural populations. The baseline assessment was undertaken with the aim of updating indicators and targets. The assessment was performed in a participatory manner, involving a team of consultants, project management team in the Vice President's Office - Division of Environment (VPO-DoE), and key stakeholders that were engaged to validate key deliverables. All field studies applied the participatory process for data collection in order to achieve reliability and validity of the results. Key findings from the study include:

- a) Updating of the Results Framework, where indicators and targets were updated based on the SMART criteria. Additionally, the baseline for each indicator and target were updated, where notable changes were observed since the project document was developed. The most notable changes were made to Output 1.2, where there was a mismatch between activities and the target), and Output 2.3, where the indicator and target for this output were amended to make them specific and measurable. The Results Framework was updated taking into account findings from the baseline study.
- b) It was also noted that the baseline study did not establish any kind of VIA study to be conducted recently, thus, no Vulnerability Index (VI) exists in the study districts. However, sources of vulnerability were established during the baseline study, which are such as erratic rainfall patterns, frequent droughts, poverty, deforestation and forest degradation through shifting cultivation and unplanned settlements, overstocking and overgrazing, and inadequate alternative environmental friendly energy sources.
- c) The analysis of the various policies, legislation and institutional arrangements indicate that natural resources sector laws are diverse, and there are direct bearing on sustainable forest management. It was found that the legislative framework for sustainable forest management is found in segmented legislative and policy provisions that seek to regulate environmental and natural resources conservation and management in general. These provisions are found in the various sector policies and in both principal and subsidiary legislation regulating resources such as land, forests and the general environment. The analysis also identifies the potential areas of conflict in the legislation governing natural resources and environment which have implications for sustainable forest management. The conflicting provisions of the Forest Act, Village Land Act and the Local Government (District Authorities) Act have been highlighted.
- d) The most important data gap established by this study is Vulnerability Index. A comprehensive Vulnerability and Impact Assessment (VIA) is required before the implementation of the project, taking into account the vulnerability conditions described in the updated Output 2.2. Moreover, climate change vulnerability of communities was found to be characterized by household parameters of all the three dimensions of vulnerability such as exposure, sensitivity and adaptive capability, hence, the VIA study should be undertaken in that context.
- e) The approaches and strategies for monitoring and evaluation of project indicators in the Revised Framework are presented in section 6.0. The sections outlines the sampling design and data collection and management protocol to track the progress of updated project indicators and targets. The regular measurement of outputs enables the Project Management team and the M & E to check if the outcomes and project objective are likely to be achieved as planned. The measurement of progress of the project implementation need to be inclusive of all key stakeholders, including local communities.

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ANNEX 1: BASELINE SURVEY REPORT

1.0 Findings of the baseline survey

This report presents baseline information (socio-economic, changes in climate, changes in natural resources, adaptation options, evidences of ecosystem based practices and recommended options for adaptation and exit strategy) from key informants interviews, focus group discussions, expert meetings, and direct field observations. The findings are also complemented findings from literature, analysis of meteorological data and analysis of remote sensed data using Geographical Information System (GIS).

1.1 Socio-economic characteristics of the respondents

1.1.1 Wards and Villages Visited

Field surveys were conducted in one ward and two villages in each project district (for Tanzania mainland) and one village and three Shehias (Zanzibar). As summarized in Table 1.1, at least 30 respondents were interviewed in each ward or equivalent of 276 respondents / representative households in all studied wards.

Table 1.1 Wards and village studied in districts

District	Ward	Village	No. of Households
Mvomero	Melela	Melela	43
		Magali	37
Mpwapwa	N'gambi	N'gambi	38
		Kazania	35
Simanjiro	Orkesumet	Narosoito	35
		Jitegemee	33
Kishapu	Kiloleli	Kiloleli	30
		Muguda	30
Kaskazini A	Kijini	Kijini	0
		Matemwe	77
Total			358

1.1.2 Sex of Respondents

Field survey findings indicate that, overall majority of respondents (55.8%) were female. In Mvomero and Kishapu districts, more than half of respondents were male (56.7% and 56.3% respectively). Whilst, Mpwapwa, Simanjiro and Kaskazini A districts had more than half (76.9%, 70.3% and 55.8% respectively) female respondents (Table 1.2). The latter was caused by the fact that most women are engaged in either alternative income generating activities, credit, financial saving or social groups, thus were more likely to participate in this study.

Table 1.1: Sex of Respondents

Districts	Sex	
	% Male	% Female
Mvomero	56.3	43.8
Mpwapwa	23.1	76.9
Simanjiro	27.7	70.3
Kishapu	56.7	43.3
Kaskazini A	44.2	55.8

1.1.3 Age of Respondents

Results show that most respondents interviewed were in the age group of 38-57. This is followed by age group of 18-37 and 58+ (Table 1.3). These are age groups of married male and women, who are likely to have adequate experience about their villages in terms of climate condition (historical and current), natural resources endowment (status and observed changes), and perceived impacts from observed changes in climate condition.

Table 1.2: Age groups of Respondents

District	Age Group (%)			
	Under 18	18 - 37	38 -57	58+
Mvomero	0	7.5	46.3	46.2
Mpwapwa	1.9	40.4	50.0	7.7
Simanjiro	0	45.9	48.6	5.4
Kishapu	0	0	76.7	23.3
Kaskazini A	0	22.1	40.3	37.7

1.1.4 Education level of Respondents

Field survey findings indicated that most of the respondents interviewed had attended primary level of education. It was found that Kaskazini A in Zanzibar and Simanjiro district had more respondents with secondary and college level of education compared to other districts. As summarized in Table 1.4, about 69.5% of the respondents had no formal education.

Table 1.3: Education level

District	Education level (%)			
	Informal	Primary	Secondary	College
Mvomero	7.5	92.5	0	0
Mpwapwa	1.9	94.2	3.8	0
Simanjiro	24.3	64.9	8.1	2.7
Kishapu	26.7	73.3	0	0
Kaskazini A	9.1	74	13	3.9

All districts from the mainland (Mvomero, Mpwapwa, Simanjiro and Kishapu), reported to have majority of their households having nuclear family type. This was followed by extended family type and small proportion of single parents. Contrary, most households in Kaskazini A district in

Zanzibar, had an extended family type (Table 1.5). Being a single parent could be a source of vulnerability to a household, where, the adaptive capacity might low due to inadequate work force and limited options during bad harvest years.

Table 1.4: Family type of respondents

District	Family type (%)		
	Nuclear	Extended	Single parent
Mvomero	80	12.5	7.5
Mpwapwa	67.3	30.8	1.9
Simanjiro	78.4	21.6	0
Kishapu	66.7	33.3	0
Kaskazini A	23.9	76.1	0

1.1.5 Household size of the Respondents

This study found that that Mvomero and Mpwapwa districts had most households with the size of 4-6 members. Simanjiro and Kaskazini A districts had most households with 7-9 members. Whilst, Kishapu district had most households with 10 or more members (Table 1.6). Generally, majority of households in study districts had 4 or more members, which, might imply more work force for the families.

Table 1.6: Households' size

District	Size of households			
	1-3	4-6	7-9	10+
Mvomero	5	52.5	25	17.5
Mpwapwa	1.9	40.4	36.5	21.2
Simanjiro	0	24.3	43.2	32.4
Kishapu	3.4	23.3	23.3	50
Kaskazini A	0	31.2	45.5	23.4

1.1.5 Primary source of food and income of households

This study found that most of the communities across the study sites practice mixed farming systems, with a mixture of crops and livestock being the common practice. The primary source of food was crop production, which was reported by the most respondents (more than 80%) in all districts. Major food crops produced are maize, beans and sorghum, while sunflower is grown as an emerging cash crop. Likewise, the primary source of income was crop production (crop sales), as reported by majority in Mvomero, Mpwapwa, Simanjiro and Kaskazini A. Contrary, Kishapu district report Livestock keeping (livestock sales) as the primary source of income (Table 1.7). However, in many cases, there are different scales of farm sizes and livestock herds among many respondents. For instance, communities in Simanjiro practice mixed farming, with livestock especially cattle being the largest herd.

Table 1.7: Source of food

District	Primary source of food				Primary source of income			
	Crop production	Livestock keeping	Employment	Business	Crop production	Livestock keeping	Employment	Business
Mvomero	100	0	0	0	88.8	0	0	11.2
Mpwapwa	100	0	0	0	100	0	0	0
Simanjiro	94.6	2.7	0	2.7	86.5	2.7	0	10.8
Kishapu	100	0	0	0	43.3	56.6	0	0
Kaskazini A	84.2	3.9	1.3	10.5	69.7	7.9	2.6	19.7

1.1.6 Alternative Income Generating Activities

Respondents in the project districts reported various alternative income generating activities (IGAs) undertaken. These include, vegetable farming and selling, and beekeeping in Mvomero, Mpwapwa, Simanjiro and Kaskazini A. All districts reported to engage in other IGAs, including food vending, village community banks (VICOBA), casual labour, weaving of mats/baskets, carpentry, handcrafts, and fishing (Table 1.8).

Table 1.8: Alternative income generating activities

District	Alternative Income Generating Activities (IGAs)						
	Beekeeping	Vegetable farming	Tourism	Selling of NTPs	Mining	Others	Not applicable
Mvomero	3.8	42.5	0	0	0	36.3	17.5
Mpwapwa	7.7	19.2	0	0	0	40.4	32.7
Simanjiro	2.7	32.4	0	0	0	27	37.8
Kishapu	0	0	0	0	0	20	80
Kaskazini A	0	9.1	0	0	1.3	70.1	15.6

1.1.7 The major crops produced by households

The major crop in all districts studied was report to be maize, which was used as both staple food for income. Each district had other crops which are grown, where some of them have been adopted during the recent decades, as response to both income and changing climate conditions. For example, Mvomero district grow beans and rice; Mpwapwa district grow groundnuts, sunflower and millet; Simanjiro district grow Beans, and Kishapu district grow cotton, millet and rice (Table 1.9).

Table 1.9: Major crops grown by the respondents

District	Major Crops Produced by Households (% of Respondents)							
	Maize	Beans	Cassava	Rice/Paddy	Sunflower	Cotton	Millet	Groundnuts
Mvomero	100	32.5	11.3	32.5	11.3	0	8.8	0
Mpwapwa	100	0	5.8	0	51	0	88.5	52.3
Simanjiro	100	78.4	0	0	8.1	0	0	0
Kishapu	80	10	0	31	10	76	33	0
Kaskazini A	80.5	24.7	23.4	2.6	0	0	5.2	0

1.1.8 Livestock kept by households

Findings indicate that there is a diverse of major livestock kept by each district, for example, in Mvomero, majority keep poultry, in Mpwapwa majority keep cattle and poultry. Whereas, in Simanjiro and Kishapu districts, majority of the respondents keep cattle, followed by poultry. Likewise, the few households who keep livestock in Kaskazini A, reported cattle and poultry (Table 1.10).

Table 1.10: Major livestock kept

District	Major Livestock kept by Households (% of Respondents)				Total (%)
	Cattle	Goat	Sheep	Poultry	
Mvomero	1.3	2.5	0	78.8	82.6
Mpwapwa	46.2	23	0	30.8	100
Simanjiro	64.9	8.1	0	27.0	100
Kishapu	36.7	10	0	26.7	73.4
Kaskazini A	19.5	19.5	0	24.7	63.7

1.2 Institutional Profiles for ecosystem Management and Climate Change Resilience

1.2.1 Creativity for Rural Development and Sustainable Development (CRESD)

Creativity for Rural Development and Sustainable Development (CRESD) is a non-governmental organisation (NGO) established in September 2015. Major areas of their focus include, economic empowerment, environmental management support, good governance and women and youth support. On economic empowerment, the NGO focuses on transforming the mindset of farmers so that they can produce more. It works with 20 farmers groups by supporting them on beekeeping, fish farming and horticulture. Also, help them develop a business plan, build their capacity and share the start-up cost. Environmental management (e.g. climate change mitigation and adaptation) is integrated in all projects activities, such as Forest/Biodiversity and water conservation and tree planting, Energy serving stoves, and promotion of climate smart

agriculture (CSA)/Ecosystem based adaptation practices (EbA) practices: minimum tillage, cover crops, crop rotation and terraces (Mitigation), Beekeeping, fish farming and forest conservation (Adaptation). These interventions are relevant for climate change and have adequate capacity to mainstream climate change adaptation in their plans. Restoration of Melala river banks is one of the interventions supported by CRESO. River banks have been degraded by tree cutting, farming on the banks and cattle trembling on the banks. They also support alternative income generating activities (e.g. Beekeeping, VICOBA and tomatoes and small business enterprises), improved stoves, terracing and reforestation (tree planting).

1.2.2 LEAD Foundation

Vision of the LEAD organisation is centred on promoting leadership in environmental and natural resources regeneration in Mpwapwa and other areas where they are working. The work to conserve natural forests, pastureland and fosters sustainable agriculture practices, including conservation agriculture and contour farming/ climate smart agriculture practices especially in Ipembamoto ward in Kongwa district. Beekeeping is also promoted to foster forest conservation practices. They use of Kobo software installed in smart phones to monitor interventions related to *KISIKI HAI* initiative done by group members. This has potential benchmark to support Adaptation Knowledge Management (AKM) initiatives.

1.2.3 Mpwapwa Agriculture Society

The vision is to improve land cover and communities livelihoods (income and food) through tree planting. They had managed to plant pines in 20 acres farm and they work to promote agro forestry farming.

1.2.4 Kamoge Yasema - Mpwapwa

They largely promote *Mronge* crop (Moringa oleifera farming) as an environmental and income generation. Mronge has many uses. Apart from improving land cover, it can be used as vegetable, herbal, and cooking oil. It can also be used for water purification, and thus important for conservation of water resources. Farmers who have effectively engaged in the Mronge production can get an average of 2.5 - 5 million per year. China is the major market for the Mronge, and 1 kilogramme of Mronge is sold on average of 3000 - 4000 Tanzanian Shillings. Also, the organisation has initiated interventions to promote collection of Baobab fruits (*Ubuyu*) as one of the immediate income generating activity.

1.2.5 Masan Women Development Organization (MWEDO)

MWEDO is centrally implementing activities to improve community's livelihoods, especially in Masan landscapes or regions. These include livelihood diversification through economic empowerment, grants and loan services to VICOBA, health education, vocational trainings for youth (9 youths trained and facilitated - equipment and startup funds), and awareness raising on livestock keeping - especially in the context of the changing climate. They have supported development of Land use plans and issuance of CCROs (Customary Certificate of Land Rights

Occupancy) in two villages, and they support gardening as livelihood diversification strategy among women. Income generating activities (e.g. small business) are supported with the vision of increasing capacity of households to have permanent houses that will reduce pressure to natural trees and other land cover types (logs and thatches). Other activities that they have implemented include tree planting - minimum of 5 tree per household (own farms and water catchments) especially in Longido district, livestock replenishment (goat) in collaboration with HEIFER project, and rural electrification using solar.

Their activities are informed by baseline studies, including those focusing on vulnerability to climate change and poverty in respective communities. They have relevant capacity (training and professional development) on climate change issues, and mainstreaming of climate change issues in their activities is done adequately. It collaborates with government and nongovernmental organizations in community support activities such as support to village community banks (VICOBA) that stimulate diversification community income and food production. Some of the key collaborators include District councils, Finca, HIFER, Ujamaa Community Resource Team (UCRT) and other community service organization. They website where key lessons learnt are shared, and can form basis for AKMs during EBARR project implementation.

1.2.6 Better Harvest Organisation

The organisation is based in Arusha, with diversity of roles including providing consultancy services and works as NGO in long-term interventions. They work with communities and partners to improve communities' livelihoods in livestock keeping and crop production. They also work with communities in income generation activities (IGAs), especially VICOBA and COBA (Community Conservation Bank). They have worked with FAO on East Coast Fever (ECF) sensitization and vaccination interventions. Have worked with TANAPA on conservation activities, including COBA in villages around Tarangire National Park. They have developed article for environmental conservation activities, which can be used for sensitization of conservation activities. They have relevant training on climate change issues, the knowledge helps them to mainstream climate change issues in their activities.

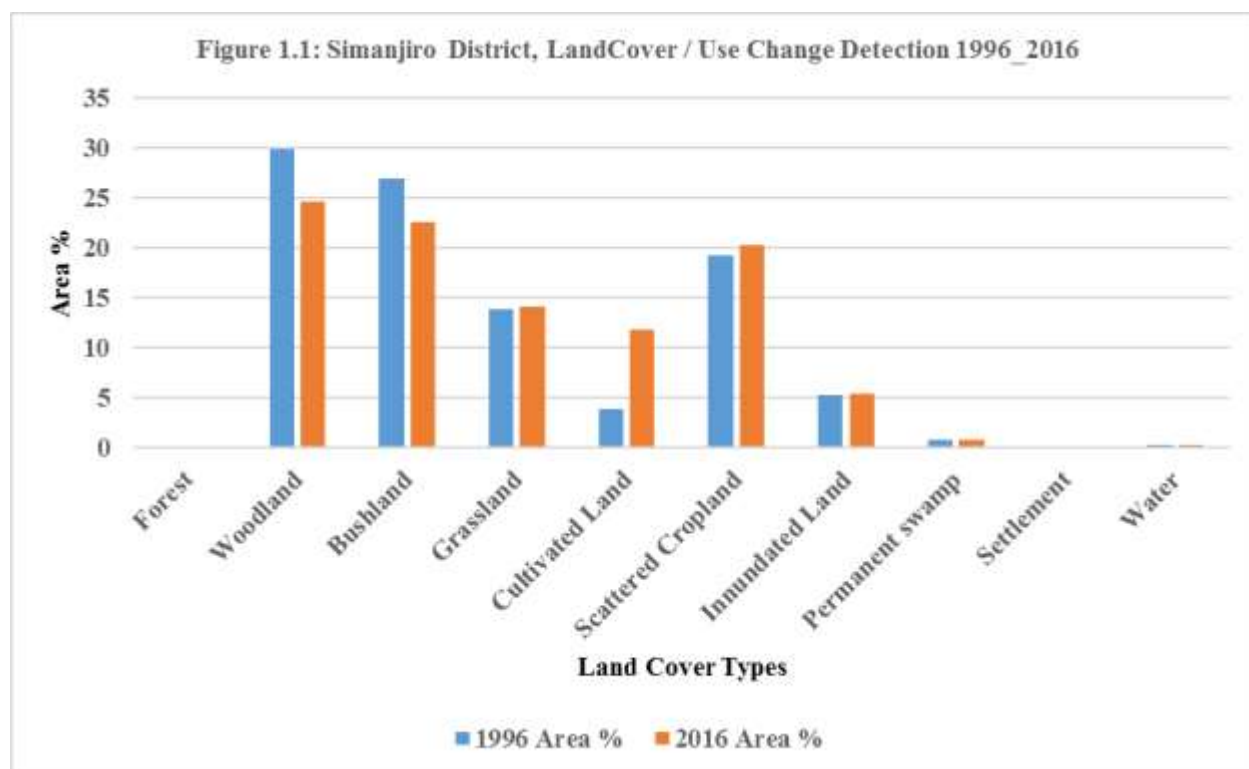
1.3 Natural resources (Status, benefits, challenges and opportunities)

Most of the household respondents in the four project sites (Mvomero, Mpwapwa, Simanjiro and Kishapu) reported that natural resources adjacent to their villages were moderately degraded, followed by those who had a perception that they are severely degraded. Contrary, majority in Kaskazini A reported that natural resources are severely degraded, followed by those who perceived that they were moderately degraded (Table 1.11). Household perception on degradation trends were based on historical situation of natural resources (forests, water, and wildlife) endowment in the study districts.

Table 1.11: Condition of natural resources adjacent to the village

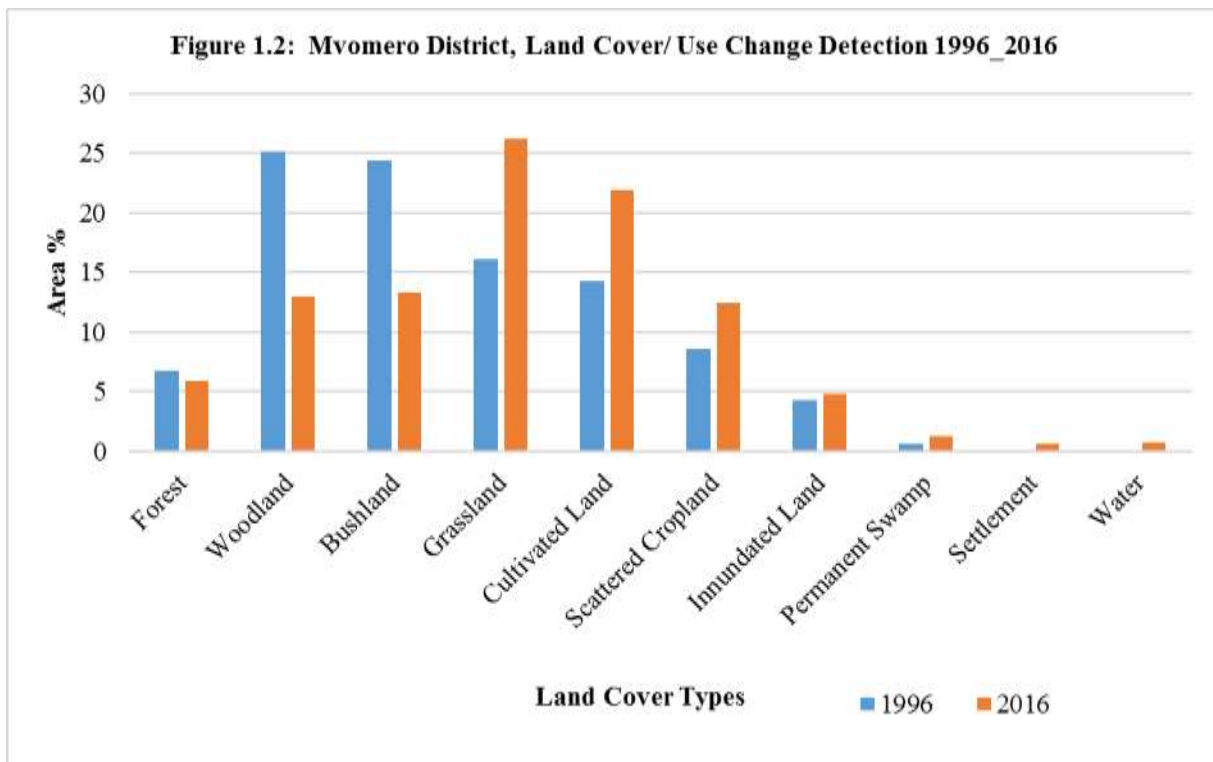
District	Condition		
	Intact or not degraded	Moderately degraded	Severely degraded
Mvomero	22.5	41.3	36.3
Mpwapa	19.6	54.9	25.5
Simanjiro	21.6	45.9	32.4
Kishapu	16.7	46.7	36.7
Kaskazini A	0	23.3	76.3

Household survey findings were in line with the findings from expert meetings which indicated that there have been major changes of land cover, especially forest resources largely due to human activities, such as agriculture and livestock keeping. GIS analysis also indicated that there have been changes of major land cover in the studied districts over the past two decades (1996 - 2016). For instance, GIS analysis indicated that bushland and woodland land cover had been reduced in Simanjiro district (Fig. 1.1).

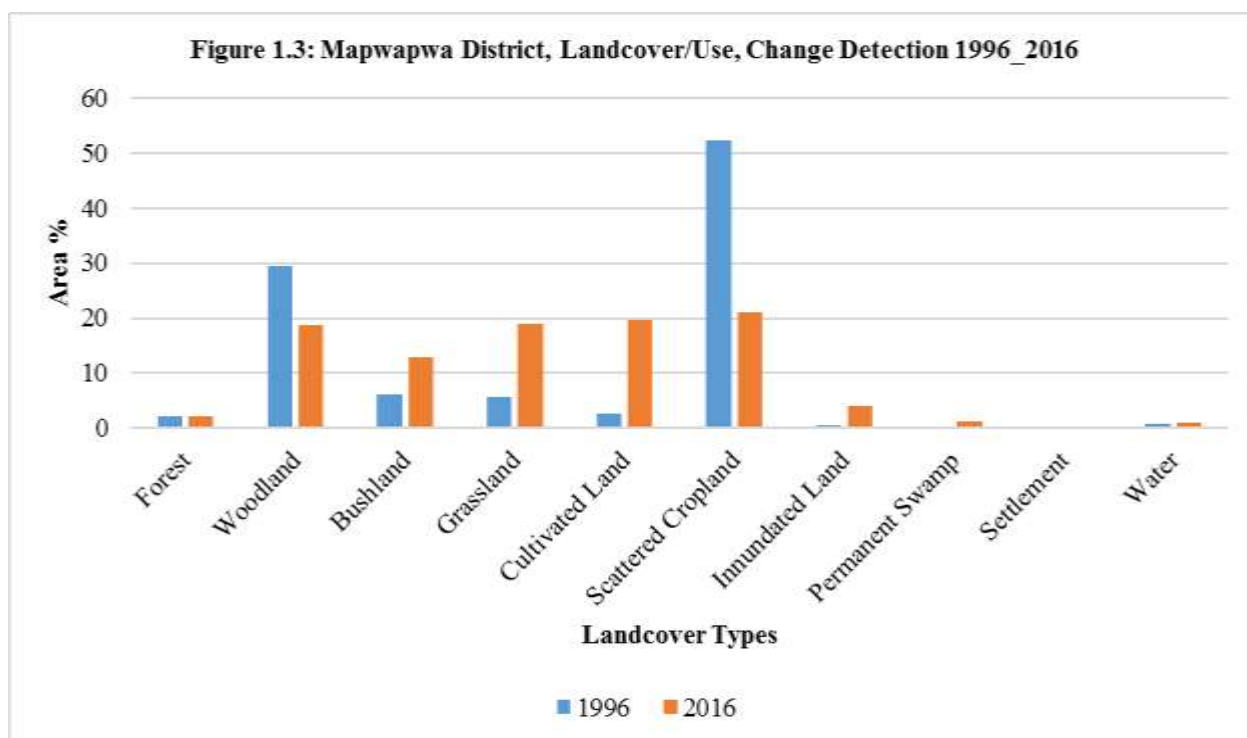


The findings indicate that about 106,633 hectares of woodland and 85,919 hectares of bushland had been converted to other land uses (e.g. agricultural activities) during the period between 1996 and 2016. Water resources were also observed to have been reduced in their size in Simanjiro District.

In Mvomero district, major changes were observed in forest, woodland and bushland land cover. According to GIS analysis, about 5,447 hectares of forest were lost from 1996 - 2016, and significant reduction in woodland and bushland land cover were observed in woodland and bushland cover. In this regard, about 76,935 hectares of woodland and 70,798 hectares of bushland were converted to other land uses in Mvomero district from 1996 - 2016 (Fig. 1.2).



In Mpwapwa District, the most affected land cover was woodland, with about 80,175 hectares being lost at the expense of expanding settlement and cropland (Fig. 1.3).



On contrary, GIS analysis indicated that forest cover types were observed to be increasing in Kishapu and Zanzibar, while cropland cover were found to be decreasing the districts. Increase in forest cover might be attributed to afforestation activities in the districts (Table 1.12).

Table 1.12: Land cover/use change in the project districts, 1996 - 2016

Landcover Types	1996		2016		Relative Change 1996_2016	
	Area (Ha)	Area %	Area (Ha)	Area %	Area (Ha)	Area %
Forest	1411.00	0.07	2712.00	0.13	1301	0.0645
Woodland	602845.00	29.90	496212.00	24.61	-106633	-5.2880
Bushland	541285.00	26.84	455366.00	22.58	-85919	-4.2608
Grassland	278143.00	13.79	283223.00	14.05	5080	0.2519
Cultivated Land	77546.00	3.85	238322.00	11.82	160776	7.9730
Scattered Cropland	388278.00	19.26	408621.00	20.26	20343	1.0088
Innundated Land	105963.00	5.25	107917.00	5.35	1954	0.0969
Permanent swamp	15145.00	0.75	14993.00	0.74	-152	-0.0075
Settlement	209.00	0.01	3524.00	0.17	3315	0.1644
Water	5678.00	0.28	5613.00	0.28	-65	-0.0032
Total Area	2016503.00		2016503.00			

Mvomero District, Land Cover/ Use Change Detection, 1996_2016						
Landcover Type	1996		2016		Relative Change 1996_2016	
	Area (Ha)	Area %	Area (Ha)	Area %	Area (Ha)	Area %
Forest	42512.00	6.69	37065.00	5.83	-5447	-0.8571
Woodland	159410.00	25.08	82475.00	12.98	-76935	-12.1059
Bushland	155038.00	24.40	84240.00	13.26	-70798	-11.1403
Grassland	102173.00	16.08	166560.00	26.21	64387	10.1315
Cultivated Land	90343.00	14.22	138972.00	21.87	48629	7.6519
Scattered Cropland	54478.00	8.57	79245.00	12.47	24767	3.8972
Innundated Land	27329.00	4.30	30349.00	4.78	3020	0.4752
Permanent Swamp	3978.00	0.63	7964.00	1.25	3986	0.6272
Settlement	116.00	0.02	4043.00	0.64	3927	0.6179
Water	137.00	0.02	4601.00	0.72	4464	0.7024
Total Area	635514.00		635514.00			
Mpwapwa District, Land Cover/ Use Change Detection 1996_2016						
Land Cover Types	1996		2016		Relative Change 1996_2016	
	Area (Ha)	Area %	Area (Ha)	Area %	Area (Ha)	Area %
Forest	17128.00	2.31	16704.00	2.25	-424	-0.0572
Woodland	218398.00	29.45	138223.00	18.64	-80175	-10.8122
Bushland	45873.00	6.19	95060.00	12.82	49187	6.6332
Grassland	41599.00	5.61	141141.00	19.03	99542	13.4240
Cultivated Land	20519.00	2.77	145164.00	19.58	124645	16.8093
Scattered Cropland	386894.00	52.18	156644.00	21.12	-230250	-31.0510
Innundated Land	4729.00	0.64	30633.00	4.13	25904	3.4934
Permanent Swamp	66.00	0.01	8704.00	1.17	8638	1.1649
Settlement	421.00	0.06	1326.00	0.18	905	0.1220
Water	5895.00	0.79	7923.00	1.07	2028	0.2735
Total Area	741522.00		741522.00			
Kishapu District, Land Cover/ Use, Change Detection 1996_2016						
Land Cover Types	1996		2016		Relative Change 1996_2016	
	Area (Ha)	Area %	Area (Ha)	Area %	Area (Ha)	Area %
Forest	50.00	0.01	314.00	0.07	264	0.0617
Woodland	265.00	0.06	189.00	0.04	-76	-0.0178
Bushland	1104.00	0.26	122.00	0.03	-982	-0.2297
Cultivated Land	291624.00	68.21	356167.00	83.30	64543	15.0957
Scattered Cropland	113546.00	26.56	46592.00	10.90	-66954	-15.6596
Innundated Land	11371.00	2.66	9979.00	2.33	-1392	-0.3256

Permanent swamp	7650.00	1.79	7593.00	1.78	-57	-0.0133
Settlement	472.00	0.11	5677.00	1.33	5205	1.2174
Water	792.00	0.19	737.00	0.17	-55	-0.0129
Total Area	426874.00		427370.00			
Unguja Kaskazini A District Landover/ Use Change Detection 1996_ 2016						
	1996		2016		Relative Change 1996_2016	
Landcover Types	Area (ha)	Area %	Area (ha)	Area %	Area (Ha)	Area %
Forest	74.00	0.44	244.00	1.46	170	1.0183
Woodland	3773.00	22.60	6328.00	37.90	2555	15.3040
Cultivated Land	863.00	5.17	5835.00	34.95	4972	29.7814
Scattered Cropland	8951.00	53.61	3856.00	23.10	-5095	-30.5181
Water	2578.00	15.44	257.00	1.54	-2321	-13.9024
Bare Soil	456.00	2.73	175.00	1.05	-281	-1.6831
Total	16695.00	100.00	16695.00	100.00		

Challenges related to Natural Resources Management

- i) Lack of good governance, including conflicting decision making among key administrators has significant effects on the management and enforcement of/ and compliance to laws and by-laws.
- ii) Lack of improved stoves, especially in Mpwapwa and Simanjiro increases chances for degradation of forest resources attributed to need for firewood and charcoal.
- iii) Unreliable sources of alternative energy such as gas. High prices of alternative energy sources also exert pressure to woodfuel, thus deforestation and forest degradation.

1.4 Climate trends and patterns and Institutional capacity

Discussions with FGD participants across the study area revealed that climate has changed and many of the key sectors are being experiencing effects of the changing climate. Majority of respondents from all districts reported to have stable rainfall conditions during the 1980s - 1990s, while erratic rainfall patterns were observed from 2000s to present. According to the respondents, erratic patterns of rainfall were largely associated with decreasing rainfall amount, unstable rainfall seasons (onset and cessation), uneven distribution of seasonal rainfall, and increasing rainfall intensity. As summarized discussed in subsequent sections, while rainfall was reported to be decreasing, on the other hand, majority of the respondents reported an increasing trend of both minimum and maximum temperature in all districts. These changes had significant effects on major livelihood options, such as crop production and livestock keeping. Changes in crop yield was one of the indicators used by the respondents to signify changes in climate

conditions. As indicated in Table 1.13, The respondents compared average harvests of various crops per acre during an average climatic condition, below average climatic condition (bad harvest year) and above average climatic condition (good harvest year) in all five districts to signify their understanding of the effects of the changing climate condition.

Table 1.13: Average harvest of various crops by households

District	Harvest(bags)	Harvest per acre over last farming seasons (%Household per crop)					Harvest in good year per acre over last farming seasons (%Household per crop)					Harvest in bad year per acre over last farming seasons (%Household per crop)				
		Maize	Millet	Paddy	Beans	Cotton	Maize	Millet	Paddy	Beans	Cotton	Maize	Millet	Paddy	Beans	Cotton
Mvomero	< 1	0	0	0	19.7	0	0	0	0	19.3	0	5.5	12.5	64	63.5	0
	1 to 4	33.8	36.4	57.1	75.8	0	10	9.1	76.2	56.1	0	80.8	87.5	36	26.9	0
	5 to 8	55	18.2	23.8	0	0	37.5	81.8	19	24.6	0	13.7	0	0	9.6	0
	9 to 12	5	0	14.8	3	0	32.5	0	0	0	0	0	0	0	0	0
	13 and above	6.2	45.4	4.8	1.5	0	20	9.1	4.8	0	0	0	0	0	0	0
Mpwapwa	< 1	0	0	0	0	0	0	0	0	0	0	32.7	33.3	0	0	0
	1 to 4	0	16.7	0	0	0	0	0	0	0	0	50	18.5	0	0	0
	5 to 8	48.1	26.7	0	0	0	26.9	12.9	0	0	0	9.6	33.3	0	0	0
	9 to 12	38.5	43.3	0	0	0	32.7	54.8	0	0	0	5	14.8	0	0	0
	13 and above	13.4	13.3	0	0	0	40.4	32.3	0	0	0	2.7	0	0	0	0
Simanjiro	< 1	8.1	0	0	16.2	0	0	0	0	0	0	40.5	0	0	64.7	0
	1 to 4	8.1	0	0	48.6	0	5.4	9.1	76.2	32.4	0	35.1	0	0	20.6	0
	5 to 8	32.4	0	0	32.4	0	27	81.8	19	37.8	0	24.3	0	0	5.9	0
	9 to 12	24.3	0	0	27	0	43.2	0	0	18.9	0	0	0	0	2.9	0
	13 and above	27.1	0	0	2.7	0	24.4	9.1	4.8	10.8	0	0	0	0	5.9	0
Kishapu	< 1	6.7	8.3	0	13.6	1.3	0	0	0	0	0	58.6	66.7	44.4	60	0
	1 to 4	33.3	8.3	71.4	36.4	16.5	17.2	8.3	33.3	50	12.3	27.6	33.3	55.6	33.3	46.3
	5 to 8	33.3	50	21.4	45.5	28.3	20.7	50	50	37.5	28.1	13.8	0	0	6.7	3.1
	9 to 12	10	0	0	4.5	23	41.4	25	16.7	0	48	0	0	0	0	2.6
	13 and above	16.7	33.3	7.1	0	46	20.7	16.7	0	12.5	33	0	0	0	0	0
Kaskazini A	< 1	30.3	37.5	50	43.8	0	100	100	100	0	0	100	100	0	0	0
	1 to 4	25.8	25	25	25	0	22.7	14.3	50	13.4	0	6.2	14.3	20	7.7	0
	5 to 8	30.3	12.5	0	6.3	0	18.2	14.3	0	21.7	0	6.2	14.3	0	7.7	0
	9 to 12	4.5	12.5	0	6.3	0	13.6	42.9	25	26.7	0	4.6	0	0	0	0
	13 and above	9.1	12.5	25	18.8	0	25.8	14.3	0	26.7	0	0	0	0	0	0

1.4.1 Climate trends and patterns in Simanjiro District

For instance, in Simanjiro district, discussions during expert meeting revealed that there is significant change of rainfall (unreliable onset and cessation, reduced rainfall amount, decrease of rain days in a season, rainfall is increasingly becoming erratic, and an increase of temperature is now evident) (Table 1.14).

Table 1.14: Perceived climate trends in Simanjiro district, 1980 - 2010s

District	Climatic condition	1980s-1990s (%)	2000s (%)	2010s (%)
Simanjiro	Stable rainfall seasons(wet and dry)	83.8	21.6	0
	Adequate rainfall	89.2	64.9	0
	Well distributed with uniform rainfall intensity seasons	78.4	8.1	0
	Poor distributed with inconsistent rainfall intensity	2.7	81.1	100
	Reliable onset of rainfall	97.3	27	0
	Unreliable onset of rainfall	2.7	100	100
	Reliable cessation of rainfall	78	51.4	0
	Unreliable cessation of rainfall	16.2	100	100
	Increasing temperature	5.4	54.1	97.3
	Decreasing temperature	62.2	59.5	0

These changes have induced a number of effects to livelihoods and natural resources management, including recurrent drought, extended dry spells, shortened growing season, shift in rainfall seasons, and emergence of human diseases such as malaria.

Intensity and severity of livestock and crop pests and diseases are also becoming common in the study areas. These affect various primary sectors for food and income for local communities such as agriculture and livestock keeping. Change of vegetation cover is also attributed to increasing drought and inadequate rainfall distribution which pressurize communities to cope through unsustainable practices. As challenges related to climate change are increasingly becoming evident, there is no specific department for addressing climate change issues, but issues related to climate change are managed through environmental department and disaster management unit. However, disaster management unit has no budget allocation, and in most cases, climate change issues are partially mainstreamed into the planning and decision making processes.

Therefore, in Simanjiro, the disaster management committee needs revival and facilitation to make it effective. TNRF is one of the District that has been active to provide capacity building on climate change issues to district officers in order to facilitate mainstreaming climate issues in development plans. Some of the issues that district officers have been trained and integrated in the development plans and have engaged communities include, rotational harvesting of livestock, carrying capacity issues in livestock keeping, water catchment conservation (including

60 meters, enforcement of by-laws), rain water harvesting - especially in schools and dispensary, sustainable land management, land use planning and support to community conservation banks (COBA).

1.4.2 Climate trends and patterns in Mvomero District

Discussions with key stakeholders in Mvomero district indicated that there is significant decrease in rainfall trends and patterns, and thus affecting crop production and livestock keeping. Changes observed include, prolonged dry spells, crop failures, decreased amount of rainfall, poor distribution of rainfall and disappearance of short rains (Vuli). It was also reported that temperature has also slightly increased in the district (Table 1.15).

Table 1.15: Perceived climate trends in Mvomero district, 1980 - 2010s

District	Climatic condition	1980s-1990s(%)	2000s (%)	2010s (%)
Mvomero	Stable rainfall seasons(wet and dry)	82.5	16.3	0
	Adequate rainfall	88.8	72.5	0
	Well distributed with uniform rainfall intensity seasons	76.3	10	0
	Poor distributed with inconsistent rainfall intensity	1.3	76.3	100
	Reliable onset of rainfall	98.8	26.3	0
	Unreliable onset of rainfall	1.3	98.8	100
	Reliable cessation of rainfall	76.3	52.5	0
	Unreliable cessation of rainfall	15	100	100
	Increasing temperature	2.5	53.8	100
	Decreasing temperature	57.5	60	0

Major pests reported by respondents included Tuta absoluta (Tomato leaf miner- a plant pest that affects tomato but can feed and develop on other Solanaceae family like potato) and Fall army worm (FAW), which is pest that affects maize and their related plant species. Changes in rainfall trends and patterns were linked to increase in frequency and severity of drought events, which have been affecting crop production and livestock keeping. The respondents indicated that there was a severe drought in 2017, where many cattle died, which led to the drop of cattle price (up to TZS 10,000) and most water sources dried up. Changes in climate condition also affects natural resources. There are evidences of major decrease in vegetation cover, emanating from human activities especially, in Melela and Mgeta, which are semi-arid areas.

Decrease in vegetation cover also affects soil cover and fertility, especially in the uplands. Land cover changes also affects river flow, and perennial rivers are slightly becoming seasonal. Driving factors include charcoal making, and shifting cultivation. As a result, the district is undertaking various activities to counteract the effects. These include conservation of natural forests (e.g. 16 village forests). There is an increase in irrigation agriculture upstream, with notable illegal

abstractions. In terms of institutional capacity in climate change issues, there is no clear coordination of Climate change related matters in the council. Impliedly, it is in the department of environment and management, under DEMO.

The FGD recommended to institutionalize a committee or designate DEMO to coordinate climate change related issues, which is a cross-cutting endeavor. There was an observed missing link or coordination of climate interventions, which are implemented by various departments/sectors in the council. Some officers in the council have received either long or short-term training on climate change. None of them have received training on integrating climate change adaptation/mitigation into plans.

1.4.3 Climate trends and patterns in Zanzibar

Interviews with communities in Zanzibar indicated that climate has changed, with changes in temperature and rainfall being observed to have changed significantly. Communities reported that there have been increase in temperature, with effects on livelihoods and sectors being evident. They indicated that in the past farmers used to harvest tree times but now only once a year. Major observed changes in rainfall included decrease in rainfall amount and erratic patterns. Communities reported that they now experience only one rainy season within very short period of time followed by long period of droughts. Major changes in frequency and severity of drought episodes experienced with effects on livelihoods and sectors, such crop production and livestock keeping (Table 1.16).

Table 1.16: Perceived Climate Trends in Zanzibar 1980 - 2010s

Distri ct	Climatic condition	1980s- 1990s(%)	2000s (%)	2010s (%)
Kaskazini A	Stable rainfall seasons(wet and dry)	37.7	23.4	2.6
	Adequate rainfall	67.5	51.9	13
	Well distributed with uniform rainfall intensity seasons	62.3	37.7	6.6
	Poor distributed with inconsistent rainfall intensity	9.1	39	72.7
	Reliable onset of rainfall	63.6	28.6	9.1
	Unreliable onset of rainfall	5.2	44.2	89.6
	Reliable cessation of rainfall	50.6	24.7	5.2
	Unreliable cessation of rainfall	2.6	26	84.4
	Increasing temperature	5.2	44.2	67.5
	Decreasing temperature	57.1	24.7	10.4

Changes in rainfall had negative effects on natural resources, through unsustainable livelihood practices. Major changes observed include decrease in vegetation cover. As a result, some trees such as *Psidium cuminii*, *Sorendeiya usmbarensis* and *Virtex spp* have disappeared in Matemwe Kijini village. Deforestation and forest degradation have also resulted into the decrease of soil cover/ fertility.

1.4.4 Climate trends and patterns in Kishapu district

Changes in climate condition was also reported in Kishapu district, where discussions with respondents at district, ward and village level indicated that rainfall and temperature trends have changed significantly. According to the interviews, change in climate have increased intensity of drought in the study area. While rainfall was reported to be decreasing, temperature was reported to be increasing and thus affecting crop production and livestock keeping, especially through inadequate water and pasture availability. They indicated that major timelines of drought incidences in the district are 1983/84, 1992, 1999, 2003; while floods largely due to change of rainfall intensity, diminished tree cover and location of most villages in lowland landscape, were experienced in 1997/98, 2006 and 2018 (Table 1.17).

Table 1.17: Perceived Climate Trends in Kishapu district, 1980 - 2010

District	Climatic condition	1980s-1990s(%)	2000s (%)	2010s (%)
Kishapu	Stable rainfall seasons(wet and dry)	90	26.7	0
	Adequate rainfall	83.3	63.3	0
	Well distributed with uniform rainfall intensity seasons	76.7	3.3	0
	Poor distributed with inconsistent rainfall intensity	0	60	100
	Reliable onset of rainfall	96.7	23.3	0
	Unreliable onset of rainfall	0	96.7	93.3
	Reliable cessation of rainfall	73.3	30	0
	Unreliable cessation of rainfall	16.7	93.3	86.7
	Increasing temperature	0	53.3	100
	Decreasing temperature	46.7	33.3	0

Major climate induced pests and diseases for crops include army worms, morrow cricket, stalk borer, and ants. Climate related challenges are propagated by inadequate pasture, inadequate water, inadequate cattle dips and charco dams, and inadequate of planned cattle routes. As a result, the district is collaborating with various stakeholders to counteract impacts of the changing climate. Establishment of disaster management committees as guided by the Disaster Management Act, 2015 (e.g. Muguda village), training on climate change issues to WDC (Ward Development Committee) have been undertaken in collaboration with REDESO (Relief to Development Society). Other interventions implemented by REDESO, with relevance to adaptation include women empowerment through VICOBA (Village Community Banks), promotion of agricultural activities (millet/sorghum, sweet potatoes, Agave/sisal), fish farming and afforestation. Respondents identified tree planting (possibility of achieving 500 hectares in five years), supporting alternative energy sources - e.g. biogas, and promotion of tree crops with diversity of benefits such as cashew nuts, and sisal can be important for both conservation and livelihood improvement.

1.4.5 Climate trends and patterns in Mpwapwa

Moreover, discussions with respondents in Mpwapwa District indicated that climate change has changed and impacts are revealed through recurrent drought, floods, strong winds and changes in the patterns and trends of rainfall and temperature. Field survey findings indicated that there have been significant changes of rainfall and temperature across the study area. Discussions with respondents in Mpwapwa indicated that temperature has slightly increased and changes in rainfall (especially, prolonged dry spells, decreased amount of rainfall, and poor distribution of rainfall) are increasingly becoming evident (Table 1.18).

Table 1.18: Perceived Climate Trends in Mpwapwa district, 1980 - 2010s

District	Climatic condition	1980s-1990s (%)	2000s (%)	2010s (%)
Mpwapwa	Stable rainfall seasons(wet and dry)	80.8	5.8	0
	Adequate rainfall	86.5	73.1	0
	Well distributed with uniform rainfall intensity seasons	55.8	7.7	0
	Poor distributed with inconsistent rainfall intensity	0	63.5	98.1
	Reliable onset of rainfall	100	23.1	0
	Unreliable onset of rainfall	1.9	96.2	100
	Reliable cessation of rainfall	71.2	36.5	0
	Unreliable cessation of rainfall	21	100	100
	Increasing temperature	0	69.2	100
	Decreasing temperature	26.9	36.5	0

These changes have triggered frequency and severity of drought events experienced with notable effects on farming and livestock keeping sectors. Indirectly, these changes also affect natural resources endowment in the district. Major changes observed in natural resources include decrease in vegetation cover, where more shrubs and decreased grassland are observed, slight decrease in soil cover and fertility, especially in the uplands, decrease in river flow (rivers are increasingly becoming seasonal) due to changes in rainfall and effects of deforestation and forest degradation. In terms of institutional capacity on climate change matters, there is no clear coordination of Climate change related matters in the council. Impliedly, it is in the department of environment and management, under DEMO. The FGD recommended to institutionalize a committee or designate DEMO to coordinate climate change related issues, which is a cross-cutting endeavor. There was an observed missing link or coordination of climate interventions, which are implemented by various departments/sectors in the council.

Some officers in the council have received either long or short-term training on climate change. None of them have received training on integrating climate change adaptation/mitigation into plans. Support of perennial tree crops with diversity of benefits to communities, such as avocado,

and cashew were recommended in Mpwapwa and support of improved livestock breeds were also given high priority among key stakeholders as an initiative that require immediate support.

1.5 Locally - based vulnerability to climate change, risks and adaptation options

Climate change as a concept and process, is linked to both human activities and natural processes. The concept is also perceived differently among communities and technocratic. Discussions with respondents in the study area indicated that climate change is largely driven by human activities especially degradation of natural resources, including deforestation and pollution from industrial activities. Field survey findings indicated that climate change is induced by a combination of both natural processes and degradation of natural resources. Major drivers of climate change reported by the respondents included,

- i) Deforestation and forest degradation through shifting agricultural activities and unplanned settlements,
- ii) Overstocking and overgrazing
- iii) Environmental pollution especially through rapid urbanization and industrial processes
- iv) Inadequate awareness
- v) Inadequate alternative environmental friendly energy sources

Eventually, combination of both the impacts of the changes in climate (unstable rainfall and increase in temperature) and effects of natural resources degradation drive communities' vulnerability. Major changes observed at erratic patterns of rainfall, occurrence of recurrent drought and floods. These changes affect crop production (cropping calendar, pests and diseases, weeds, phenology and yield) and livestock keeping (pests and diseases, pasture, invasive species, and water as well as productivity) which forms major livelihood options in the study area. As summarized in Table 1.19, respondents were able to relate sources of their vulnerability and response measures undertaken to counteract the impacts.

Table 1.19: Summary of climate conditions and response measures in the study sites.

Perceive normal climate condition	Perceived change	Perceived causes of changes	Perceived impacts	Coping strategies
Reliable onset and cessation of rainfall (September – November for short rains and January – June for long rains)	Unreliable onset and cessation of rainfall.	Natural changes of weather	<ul style="list-style-type: none"> • Recurrent drought, shortage of water, effect on planting calendar and harvesting seasons • Drying of crops 	<p>Government provides small grants for entrepreneurship activities. Simanjiro District had provided 230,000,000 to support small business groups</p> <p>Adopting drought resistant crops such as sunflower</p>
Even distribution of rainfall within the season	Erratic rainfall trends within the season	Natural changes of weather	Wilting of crops due to extended dry spells and erratic rainfall	

				<p>Gardening – producing tomato and vegetable</p> <p>Food aid from high potential areas such as Hedaru</p> <p>Forming entrepreneurship groups such as Hope environmental group which is centred on environmental conservation and gardening activities, conservation of natural forests and environmental awareness</p>
<p>Stable temperature, with distinct cold and warm months</p>	<p>Very low temperature during 1990s, extended dry season (June – September) from 2000s with high temperature. Significant temperature increase from 2007</p>	<p>Deforestation and forest degradation and natural changes of weather</p>	<p>Drying of water sources such as Marucha and manonga rivers in Muguda village (Kishapu), and and Njoro - engasimeti in Simanjiro district.</p> <p>Drying of pasturelands</p> <p>Unplanned migration in search of water and pasture lands</p>	<p>Tree planting</p> <p>Livelihoods diversification through entrepreneurial skills. The government supports entrepreneurial activities through small grants schemes.</p>

1.6 Vulnerability of Ecosystems to climate change impacts and risks

This study found that vulnerability of ecosystems to climate change is largely driven by changes in rainfall and temperature patterns, which affect communities’ livelihoods. Direct drivers of ecosystem vulnerability to climate change effects are recurrent drought and increase in temperature. These changes create favourable environment for occurrence of pests and diseases, and growth of invasive species. Indirectly, effects of climate change induce pressure of adjacent communities to respond to the stress factors (e.g. erratic patterns of rainfall, occurrence of recurrent drought and floods) affecting their livelihoods, whereas some response measures devised by communities have effects on adjacent natural resources. Some of the effects include

deforestation and forest degradation, deterioration of biodiversity resources, deterioration of water resources and degradation of land resources. Degradation of natural resources coupled with the impacts of the changing climate had significant acceleration of communities' vulnerability to different spheres of household assets as discussed in the subsequent sections.

1.6.1 Human capital

Human capital is one of the important aspects of livelihoods assets. It encompasses key spheres of human health, education, productivity, and nutrition. This study revealed that there have been emergence of human diseases such as malaria partly due to the increase of temperature. Emergence of pests and diseases (such as army worms) that affect crop production and livestock keeping affect household food security. Additionally, death of livestock and poor crop yield affect household food security and productivity. Migration disrupts social networks within the community, and affects education for youth and increases burden to women to take care of their families. Migration of people and livestock also induce spread of communicable livestock and human diseases.

Emergence of invasive species was one of the issues that was reported to affect crop production and livestock keeping across the study sites. Most of these affect crop production and livestock keeping, including pasture availability; accelerate impacts of the changing climate and increases migration of people and livestock. Invasive species such as *Ipomea* spp - *Olelemet* in pastureland areas were reported in Simanjiro district. Likewise, *striga* which is regarded as an invasive species (weeds similar to sorghum - affect crop production), *mihale* trees (affect water catchments), *kidua* (affect maize, sorghum and cotton production) and *chunga*, which grows quickly when there is decrease of rainfall, were reported in Kishapu district. In Mvomero district, major invasive species included, *Bracken fern* (Mgeta area), *Lantana camara* (Turiani area) and water hyacinth in wetlands and malambo. Observed invasive plant species in Mpwapwa district were spp include, Mexican Poppy, *Datura Stramonium* and *Lantana Camara*. In Matemwe Kijini, there has been minor increase in occurrence of invasive plant species which grow well in less fertile soils. Invasive spp is *Kisaanye Spp* is one of the invasive species observed in Matemwe JukaKuu village. These weeds ere seriously affecting the crops.

6.6.2 Natural capital

Natural capital, which is considered to be one of the central assets for livelihoods and natural resources management; encompass major natural resources land, water, forests, wildlife, biodiversity and environmental services. Most of the natural resources were owned by the government (central or district), communally and individual households. The size of land cultivated or owned by a household was one of the resources that was used to characterize the wealth status, and hence adaptive capacity of that household. However, according to FGD participants, ownership of farms in most villages was largely informal, whereas most of the villages had acquired their farms through allocation from village government, informal purchase, and inheritance from their relatives. However, in Simanjiro district, two villages were reported to

have granted CCROs to their households, which could signify some kind of secure land tenure. Most respondents in Mvomero district cultivated 1-3 acres, followed by those who cultivated 3-5 acres. Majority of respondents in Mpwapwa district reported to cultivate 5-10 acres, Simanjiro and Kishapu districts 1-3 acres, followed by those who cultivated 5-10 acres. Most respondents in Kaskazini A district reported to cultivate 3-5 acres, followed by those who cultivate 1-3 acres (Table 1.20).

Table 1.20: Size of cultivated land (Acres) by households

District	Land cultivated(Acres) (% of Respondents)				
	< 1	1 - 3	3 - 5	5 - 10	10+
Mvomero		52.5	30	16.3	1.3
Mpwapwa	0	13.5	15.4	55.8	15.4
Simanjiro	0	43.2	25	27.7	4.1
Kishapu	0	36.7	20	23.3	20
Kaskazini A	0	27	62.2	9.5	1.4

Majority of respondents in Mvomero, Mpwapwa, Simanjiro and Kaskazini A, reported that the soil is fertile and does not need use of fertilizer, followed by those who perceived that the soil is infertile and need use of fertilizer. Contrary, respondents in Kishapu district reported that the soil is infertile and need use of fertilizer (Table 1.21).

Table 1.21: The condition of soil fertility in farms

District	Soil condition		
	Fertile and does not need use of fertilizer	Fertile but need use of fertilizer	Infertile and need use of fertilizer
Mvomero	67.5	6.3	26.3
Mpwapwa	59.6	11.5	28.8
Simanjiro	70.3	10.8	18.9
Kishapu	6.5	19.5	74
Kaskazini A	80	10	10

Various causes of soil infertility were reported by respondents. For example, in Mvomero district, causes are mostly overuse of farm, soil erosion due to floods and recurrent drought and inadequate organic matter. In other districts (Mpwapwa, Simanjiro, Kishapu and Kaskazini A), most causes include overuse of farm and inadequate organic matter. Other causes reported include soil compaction, poor tillage practices, limited crop rotation, burning of crop residues and bush fires (Table 1.22).

Table 1.22: Causes of soil infertility

District	Monoculture	Overuse of farm	Soil erosion due to floods and recurrent drought	Inadequate organic matter	Other
Mvomero	0	100	100	100	25
Mpwapwa	0	38.5	0	21.2	16
Simanjiro	16.2	24.3	18.1	16.2	25
Kishapu	0	26.7	20	23.3	0
Kaskazini A	6.5	16.9	5.2	46.8	0

Most ways of improving soil fertility, as reported by respondents are such as use of industrial fertilizers and planting of legumes (in Kishapu district), use of organic manure and planting of legumes (in Mvomero, Mpwapwa and Simanjiro districts) and use of organic manure in Kaskazini A district (Table 1.23).

Table 1.23: How households improve soil fertility status in their farms

District	Ways of improving soil fertility				
	Use of industrial fertilizer	Use of organic manure	Adoption of crop rotation	Planting of legumes	Agroforestry
Mvomero	0	42.5	0	35	0
Mpwapwa	0	30.8	15.4	65.4	
Simanjiro	0	45.9	18.9	24.3	0
Kishapu	40	10	10	40	0
Kaskazini A	1.3	45.5	13	11.7	0

Discussions with experts in Simanjiro indicated that the district has many parts of the district which fertile for crop (e.g. maize and beans) production, and borders major conserved wildlife resources such as Tarangire National Park. However, they indicated that there is no wildlife management areas, forest plantations and national forest reserves. As a result, the district in collaboration with major stakeholders has initiated a number of interventions to plant trees. The district is also collaborating with stakeholders, including communities to remove invasive species, and has developed seed bank of tree species (high valued - pasture, fruit, etc). Natural resources degradation in Mpwapwa (e.g. gullies) are highly induced by human activities such as deforestation and forest degradation in the upland and accelerated by the effects of recurrent

drought and floods. Discussions with key stakeholders also revealed that deforestation and forest degradation in Mpwapwa is highly influenced by governance challenges such as lack of political will at lower levels, including conflicting interests and motives of policy and decision makers.

Vulnerability due to loss of natural resources was also observed through drying up of water wells such as Njoro - engasimeti in Simanjiro district. Drying of water sources coupled with shrinking pasture land increase pressure to available water and pasture sources resulting into natural resource use conflicts and degradation of the available resources. It was also reported that disappearance of wildlife and fruit tree species in some sites in Simanjiro is one of the evidences related to natural resources degradation, especially forest resources. Some of the tree species that have disappeared in Simanjiro district include Lama, Ngaisijo, Ngailale, Ngururu, Ondungu, and Misekerere. Accordingly, the respondents indicated that the tree species were important for their household food security.

6.6.3 Social capital

Majority of respondents in Mvomero, Mpwapwa, Simanjiro and Kishapu districts reported to have membership in social groups and networks. Whilst, those in Kaskazini had membership in credit organizations (Table 1.24). About 52.4% of the respondents reported to have membership to credit organizations, 10.6% reported to be members to village committees, and majority of the respondents across the study sites were had membership to social groups and networks, including formal and informal financial savings organizations.

Table 1.54: Respondents' Membership to formal and informal social associations and groups

District	Category		
	Membership to credit organisation	Membership to village government committee	Membership to social group and networks
Mvomero	11.3	1.3	28.8
Mpwapwa	0	0	54.6
Simanjiro	2.8	5.4	32.4
Kishapu	26	0	43.6
Kaskazini A	12.3	3.9	2.6

Membership to different social groups and associations is one of the household assets that enhance livelihoods diversification and adaptive capacity. However, migration of some community members, especially youth and men in search of water and pasture for livestock. This reduces social network and increases vulnerability to elders and women who remain and take care of their families.

6.6.4 Physical capital

Climate information is one of the important physical asset for enhancing climate change adaptation. This study found that majority of the respondents were getting climate information in the studied districts. Access to climate information generally implies that the households could use it for planning and decision making related to their livelihoods activities, such as crop production and livestock keeping (Table 1.25).

Table 1.6: Households getting climate change information

District	% of Households getting Climate Change information
Mvomero	78.8
Mpwapwa	71.2
Simanjiro	81.1
Kishapu	93.3
Kaskazini A	80.5

Field survey findings indicate that most households had access to climate change and weather information through Radio, followed by those who access through village meeting and a lastly, those access through neighbours, who might have acquired the information through radio and, community meetings (Table 1.26).

Table 1.7: How households get Climate Change information

District	Way of getting climate change information					
	Radio	Newspaper	Seminars	Village meetings	Neighbours	Mobile communication
Mvomero	73.8	0	0	8.8	6.3	0
Mpwapwa	69	0	0	3.8	9.6	0
Simanjiro	67.6	0	0	16.2	10.4	0
Kishapu	80	0	0	3.3	13.3	0
Kaskazini A	67	0	0	1.3	10.4	0

It was also reported that most of the climate and weather information was moderately reliable to support them in planning and decision making process related to their livelihoods activities. As summarized in Table 1.27, other respondents considered the information to be reliable, while others were not able to discern reliability of the information accessed through radio or neighborhoods.

Table 1.8: Reliability of weather information

District	Reliability				
	Mostly reliable	Moderately reliable	Not reliable	Other	Not applicable
Mvomero	17.5	46.3	0	11.3	25
Mpwapwa	19.2	57.7	0	7.7	15.4
Simanjiro	10.8	43.2	14.9	8.7	24.4
Kishapu	6.7	53.3	0	20	20
Kaskazini A	3.9	19.5	37.7	23.4	15.6

Accordingly, respondents indicated that planning and decisions making related to their livelihoods activities were facilitated by traditional knowledge in farming activities. Results from household interviews indicated that most respondents had traditional knowledge related seed selection and preservation, planting calendar, crop storage; and few had knowledge related to pests control. As summarized in Table 1.28, majority of the respondents reported to have knowledge related to pests control were in Kaskazini A, Simanjiro and Mvomero district, while none of the respondent was in Mpwapwa.

Table 1.9: Traditional knowledge for farming to households

District	Knowledge			
	Seed selection and preservation	Planting calendar	Crop storage	Pests control
Mvomero	63.8	53.3	57.5	5.0
Mpwapwa	78.8	48.1	57.7	0
Simanjiro	54.1	48.6	39.3	10.8
Kishapu	53.3	46.7	46.7	10
Kaskazini A	56.6	60.5	50	51.3

6.6.5 Financial capital

Membership to financial associations is one of the attribute for household financial asset. As summarized in Table 6.29, most of the respondents reported to have membership to loan service associations, others were members to environmental conservation groups such as beekeeping and others were members to financial savings groups. As summarized in Table 1.29, majority of the respondents in Kishapu district reported to have membership to financial savings groups.

Table 1.10: Membership and type of association

District	Type of Association			
	Loan service	Environmental conservation (e.g. Bee keeping)	Financial savings	Not Applicable
Mvomero	7.5	8.8	0.0	83.8
Mpwapwa	12.8	9.2	4.0	74
Simanjiro	10.8	5.4	2.1	81.7
Kishapu	3.3	4.1	76.3	24.3
Kaskazini A	3.9	6.5	5.2	84

Field survey findings indicated that membership to the organizations was attributed to various reasons. In many cases, as reported by respondents, acquisition of funds for small business and investment in crop production were the major reasons as summarized in Table 1.30.

Table 1.3011: Purpose for membership to village associations

District	Purpose			
	Capital for small business	Capital for farming activities	Other	Not Applicable
Mvomero	8.2	9.6	0	82.2
Mpwapwa	18.6	1.4	23.3	56.7
Simanjiro	5.4	0	16.2	78.4
Kishapu	3.3	0	0	96.7
Kaskazini A	3.9	2.6	7.8	85.7

Village community banks (VICOBA), informal and formal savings groups are some of the emerging financial development institutions in the study districts. Discussions with MWEDO in Simanjiro district indicated that they had supported 96 groups to undertake VICOBA activities, they had trained 60 groups on economic empowerment, including proper financial management, and had provided grants to 67 VICOBA groups in Simanjiro, each group with 2,000,000; equivalent to Tshs. 1,33,800,000. Table 1.31 presents summary of major social groups, credit organizations and loan service organizations that were reported by the respondents across the study districts.

Table 1.31: Respondents groups and associations

Sn	Name of group/association	Type of group or association	District/Ward/village	Major activities	Major achievement
1	Kalangale, Furahisha moyo, Mazingira, Tushirikiane, Imani, Upendano, Upendo, Manonga “B”, Bilitiu and Tumaini Africa	Social groups	Kiloleli - Kishapu	Savings groups for entrepreneurial activities	
2	Mwanzo mgumu, Jipe moyo, Muungano and Tujadili	Social groups	Melela- Mvomero	Environmental conservation, beekeeping and savings	

6.7 Evidence of ecosystem based adaptation practices

Majority of respondents in Mvomero district reported to practice five EbA options, including mulching, crop residues, crop diversification/intercropping, irrigation systems (both using motorized pumps and gravity flow), terracing and contour bands and use of drought resistant crop varieties. Mpwapwa district’s respondents reported to mostly engage in six Eba options, including mulching, crop residues, crop diversification/intercropping, irrigation systems, restoration of river banks and de-silting of rivers. Simanjiro district, five EbA practices, such as mulching, crop residues, crop diversification/intercropping, integrated crop-livestock management and use of drought resistant crop varieties. Kishapu district, four Eba practices, including mulching, crop residues, crop diversification/intercropping and irrigation systems. Lastly, Kaskazini A district, mostly one EbA option, which is mulching, followed by crop residues, crop diversification/intercropping (Table 1.32). Field survey findings further indicated that EbA practices are mostly implemented individual households at small scale, and few are implemented by community groups at small and medium scale. Even though large scale investment in EbA practices were reported, but this need further assessment in order to determine scale of operations and key lessons learnt that can be upscaled or disseminated to local communities.

Table 1.32: EbA practices performed by households

District	EbA practices																	
	Mulching	Use of crop residues	Crop diversification/intercropping (Includes shift to non-traditional crops like sorghum)	Integrated crop-livestock management	Avoided deforestation	Reforestation/Afforestation	Agroforestry	Rainwater harvesting	Irrigation systems (gravity flow)	Restoration of river banks	Terracing and contour bands	Zero grazing	De-silting of rivers	Use of energy saving technologies	Alternative income generation	Drought resistant crop varieties	Tree pollarding	WMA
Mvomero	72.5	90	63.8	8	0	8.8	8.8	1.3	62.5	11.3	73.8	0	36.3	30	2.3	81.3	0	0
Mpwapwa	65.4	84.6	55.8	13.5	0	9.6	10.7	3.8	69.2	53.8	28.8	0	61.5	0	1.2	2	0	0
Simanjiro	75.7	81	60.2	67.9	0	10.8	2.8	0	0	10.8	2.8	0	0	35.1	0	72.2	0	0
Kishapu	90	86.7	76.7	10	0	13.3	3.3	0	60	20	0	0	0	30	39.2		0	0
Kaskazini A	72.7	36.4	31.2	18.2	5.2	20.8	10.4	1.3	1.3	0	0	0	0	0	23	1.3	0	0

According to discussions with focus group participants and key informants, these EbA practices were initiatives to serve different livelihoods, and some were initiated by the government and non-governmental organizations. Table 1.33 presents summary of key EbA practices and their locations as reported by the respondents.

Table 1.33: EbA practices in the study districts

Sn	EbA practice	Area/Description	District	Ward	Village
1	Beekeeping	Conducted by individuals and small groups, largely depending on informal and few access formal markets	Simanjiro, Mpwapwa, Mvomero	Various	Lobusileti in Simanjiro District, Magali village in Mvomero district
2	Tree planting, including fruit trees	Afforestation and reforestation, for commercial and conservation purpose	Simanjiro, Mpwapwa	Various	Various

3	Aquaculture	Conducted by individuals and small groups, largely for informal markets	Simanjiro	Various	Ngage village
4	Crop diversification	Mixed farming, mixed cropping systems and integration of food and cash crops/highly valued crops	Cross-cutting	Various	e.g. Maize and Beans in Simanjiro district
5	Integrated crop-livestock management	Mixed farming through livestock keeping and crop production	Cross-cutting	Various	Maize, beans, cattle, goat
6	Use of solar and gas	Adopted by individuals, largely influenced by market systems, household economic level and development partners	Cross-cutting	Various	e.g. Rural electrification supported by MWEDO in Simanjiro district
7	Rain water harvesting	Largely adopted by institutions such as schools and hospitals, very few households have adopted this strategy	Institutional levels such as schools especially in Simanjiro	Various	e.g. Simanjiro district
8	Mulching	Largely adopted by households in their own farms. Few cases are also practised by medium scale farms by companies and individual households	Cross-cutting	Various	Mlali, mgeta, Melela in Mvomero district
9	Agro forestry	Largely adopted by households in their own farms. Few cases are also practised by medium scale farms by companies and individual households	Cross-cutting	Various	Agroforestry (Mhundo, Mgeta).

1.1 Existing Adaptation Knowledge Management Systems

This study found that majority of the institutions and organizations consulted had different forms of sharing their information, including annual reports and lessons learnt related to their interventions. It was reported by most of the non-governmental organizations that use of website was the most prominent way of sharing and providing feedback to different stakeholders at different scales. Discussions with LEAD also indicated that they were using Kobo software as a platform where different groups of the KISIKI HAI were sharing their success stories related to their initiative.

1.2 Evidence of training on ecosystem based adaptation practices

A number of trainings have been conducted by the district councils, NGOs and other development partners. In Simanjiro district, agricultural department had conducted a number of training on agricultural practices that can withstand challenges related to climate change impacts. CARE had also conducted training twice (women, village chairmen, and influential people) in Kitai, Yondokesi, Korongo, and Majengo on climate change. Tanzania Natural Resources Forum (TNRF) is another partner that has worked with Simanjiro district to develop capacity on climate change including officers in the agricultural, environment and disaster management unit.

1.3 Recommended options for ensuring sustainability of interventions

Mainstreaming M&E activities and budget in the budgeting systems can improve capacity to implement and sustainability of the milestones of the project.

1.4 Recommended options for Exit Strategy

Stakeholders reported that inadequate engagement of key stakeholders and partners in the process of project implementation, disregard of stakeholders' suggestions in the course of project implementation and top-down approaches for project implementation are some of the challenges that may affect smooth implementation and achievement of project targets. Therefore, stakeholders recommended that

- i) Livelihood support should be given high priority, with both short-term and long-term benefits to communities being planned and implemented in inclusive collaborative manner.
- ii) Existing ToTs developed by MWEDO on VICOBA have adequate experience and ground touches that can support trainings during the project phase and beyond project period
- iii) Farmer field facilitators developed by Best Harvest Organisation (BHO) have adequate field experience that can be utilized by the EBARR project to ensure smooth project implementation and sustainability of project interventions beyond project period
- iv) Mainstreaming key results in school curricula (e.g. school clubs) is important. Mainstreaming may also include establishment of water user associations.
- v) Adequate engagement of lower levels of government, including 'Kamati ya Maisha Bora' can increase ownership and sustainability of project interventions
- vi) Implementation of the project should be developmental centred rather than project funding based approach.

vii) Provide incentives to key implementers of the project activities, including performance awards.

ATTACHMENT

1. Survey instruments (household survey, KII & FGD)

Household Questionnaire

A: Preliminary Information

Category	Response
Date of interview	
Questionnaire Number	
Ward	
Village	
Sub- Village	

B: Personal Information of the Respondent

Category	Response
Name	
Sex	
Age	
Education level	
Occupation	
Household size	
Family Type	
Place of Birth	
Year of migration (if migrated)	
Reasons of migrations (if migrated)	

C: Socio-Economic Characteristics of the Respondent

Category	Response
What is the primary source of food for household	(1) Crop production (2) Livestock keeping (3) Employment (4) Business
What is the primary source of household income?	(1) Crop production (2) Livestock keeping (3) Employment (4) Business
What are the alternative Income Generating Activities	(1) Beekeeping (2) Vegetable farming (3) Tourism (4) Selling of mushrooms, wild fruits and herbs (5) Mining (6) Others (Specify)
What are major crops produced by your household?	(1) Maize (2) Beans (3) Cassava (4) Rice/Paddy

	(5) Others (Specify)
What type of livestock is kept by your household?	(1) Cattle (2) Goat (3) Sheet (4) Poultry (5) Other (Specify)
How many acres cultivated by your household over the last five farming seasons?	(1) Less than One acre (2) One to Three acres (3) Three to Five acres (4) Five to Ten acres (5) More than Ten acres
What has been the average harvest per acre by your household over the last five farming seasons	(1) Maize (2) Millet (3) Paddy/Rice (4) Beans (5) Others (Specify)
What is the average harvest in good year by your household over the last five farming seasons?	(1) Maize (2) Millet (3) Paddy/Rice (4) Beans (5) Others (Specify)
How do you use surplus crops in good harvest year?	(1) Selling to meet other household needs (2) Selling for supporting farming activities in subsequent season (3) Supporting relatives and neighbours (4) Other (Specify)
What is the average harvest in bad year by your household over the last five farming seasons?	(1) Maize (2) Millet (3) Paddy/Rice (4) Beans (5) Others (Specify)
What are the sources of additional food for your household in bad harvest seasons?	(1) Purchase (2) Working for food (3) Support from neighbours (4) Support from other sources (remittance) (5) Food aid by government, NGOs and private sector
D: Climate Trends and Patterns	
Category	Responses
What was the general climate condition during 1980 - 1990s?	(1) Stable rainfall seasons (wet and dry) (2) Adequate rainfall amount (3) Well distributed with uniform rainfall intensity seasons (4) Poor distributed with inconsistent rainfall intensity (5) Reliable onset of rainfall (6) Unreliable onset of rainfall

	<ul style="list-style-type: none"> (7) Reliable cessation of rainfall (8) Unreliable cessation of rainfall (9) Increasing temperature (10) Decreasing temperature
What was the general climate condition during 2000s?	<ul style="list-style-type: none"> (1) Stable rainfall seasons (wet and dry) (2) Adequate rainfall amount (3) Well distributed with uniform rainfall intensity seasons (4) Poor distributed with inconsistent rainfall intensity (5) Reliable onset of rainfall (6) Unreliable onset of rainfall (7) Reliable cessation of rainfall (8) Unreliable cessation of rainfall (9) Increasing temperature (10) Decreasing temperature
What is the current climate conditions (from 2010s)?	<ul style="list-style-type: none"> (1) Stable rainfall seasons (wet and dry) (2) Adequate rainfall amount (3) Well distributed with uniform rainfall intensity seasons (4) Poor distributed with inconsistent rainfall intensity (5) Reliable onset of rainfall (6) Unreliable onset of rainfall (7) Reliable cessation of rainfall (8) Unreliable cessation of rainfall (9) Increasing temperature (10) Decreasing temperature
E: Impacts of the Changing Climate on Household Assets: Natural Capital	
Category	Responses
What is the size of farms owned by your households?	<ul style="list-style-type: none"> (1) Less than One acre (2) One to Three acres (3) Three to Five acres (4) Five to Ten acres (5) More than Ten acres
What is the condition of soil fertility in your farms	<ul style="list-style-type: none"> (1) Fertile and does not need use of fertilizer (2) Fertile but need use of fertilizer (3) Infertile and need use of fertilizer
If soil in your farms is infertile, what are the causes of soil infertility?	<ul style="list-style-type: none"> (1) Monoculture (2) Overuse of farm (3) Soil erosion due to floods and recurrent drought (4) Inadequate organic matter (5) Others (specify)
How do you improve fertility of soil in your farms?	<ul style="list-style-type: none"> (1) Use of industrial fertilizer (2) Use of organic manure (3) Crop rotation (4) Planting legumes (5) Agro forestry (6) Other (Specify)
F: Impacts of the Changing Climate on Household Assets: Social Capital	
Category	Responses
Getting climate change information	<ul style="list-style-type: none"> (1) Yes (2) No
If yes, how do you get climate change information	<ul style="list-style-type: none"> (1) Radio (e.g.) (2) Newspapers (3) Seminars

	(4) Village meetings (5) Neighbours (6) Mobile communication (7) Others (specify)
Participation in decision making process	(1) Village meetings (2) Village government committees (3) Household (4) Other (specify)
Membership to credit organisations	(1) Yes (2) No
If Yes, mention the credit organisations	(1) (2) (3) (4)
Membership to village government committees	(1) (2) (3)
Membership to social groups and networks	(1) (2) (3) (4)
Importance of social groups and networks	(1) (2) (3) (4)
Challenges related to membership to social groups and networks	(1) (2) (3) (4)
G: Impacts of the Changing Climate on Household Assets: Physical Capital	
Category	Responses
Traditional knowledge for farming	(1) Seed selection and preservation (2) Planting calendar (3) Crop storage (4) Pests control
Sources of weather information	(1) Radio (2) Newspapers (3) Seminar and short-course training (4) Village meetings (5) Research feedback meeting
Nature of access to weather information	(1) Own radio (2) Community support NGOs activities (3) Invitation to meetings and seminars (4) Others (specify)
Reliability of weather information	(1) Mostly reliable (2) Reliable (3) Moderately reliable (4) Not reliable (5) Others (specify)
H: Impacts of the Changing Climate on Household Assets: Financial Capital	

Category	Responses
Membership to village associations	(1) Yes (2) No
Name (s) of the organisation (s)	
Type of association	(1) Financial saving (2) Loan services (3) Environmental conservation (e.g. beekeeping groups) (4) Other (specify)
Duration of membership	(1) Less than 1 year (2) 1 -2 years (3) 3 – 4 years (4) More than 5 years
Purpose for membership	(1) Capital for small business (2) Capital for farming activities (3) Other (Specify)
Organisations supporting income generation activities	
Activities supported for income generation activities	
I: Natural Resources (Status, benefits, challenges and opportunities)	
Types of natural resources adjacent to the village or ward	
Size of natural forests owned	
Importance of natural resources for income generation	
Importance of natural resources for household food supply	
What is the condition of the natural resources adjacent to the village / ward/shehia	(1) Intact or not degraded (2) Moderately degraded (3) Severely degraded (4) Others (Specify)
If intact or not degraded, what are the benefits of natural resources adjacent to the village or ward/shehia	(1) Timber products (2) Non-wood products e.g. honey and wax (3) Soil nutrients (4) Adequate rainfall (5) Others (Specify)
If degraded, what are the effects of natural resources degradation to communities income and food supply	(1) Increased price for timber products (2) Lack of non-wood products e.g. honey and wax (3) Crop failures due to poor soil nutrients (4) Crop failures due to inadequate rainfall (5) Others (Specify)
J: Evidence of EbA practices (location, support, challenges and opportunities)	

EbA Practices	Location of EbA practices (CURRENT)	Project/programme that is undertaking EbA	Area that has been under EbA (km ²)	Opportunities	Challenges
Mulching					
Use of crop residues					
Crop diversification/inter-cropping (includes shift to non-traditional crops like sorghum)					
Integrated crop-livestock management					
Avoided deforestation					
Reforestation / afforestation					
Agroforestry					
Rainwater harvesting					
Irrigation Systems (gravity flow)					
Restoration of river banks					
Terracing and contour bands					
Zero grazing					
De-silting of rivers during the process of sand mining					
Use of energy saving technologies (solar, stoves)					
Alternative income generation (apiculture, fish farming, high value crops, non/off farm labour)					
Drought resistant crop varieties					
Tree pollarding					
WMA					
Others (Specify)					

Checklist for Community FGD/Key Informants at Shehia/Ward and Village Level

Date:.....

Name of Respondent:.....

1. Gender:.....

2. Village.....Ward.....District.....Region.....

3. Position in Village/Ward.....

4. Percentage of female headed households in your village/ward.....

5. Has the village/ward experienced any of the following climate-related changes over the past years?
(Please tick the most relevant box)

Temperature	No changes in temperature experienced	Minor increase in temperature experienced	Major increase in temperature experienced with effects on livelihoods and sectors
Rainfall	No changes in rainfall experienced	Minor increase in rainfall experienced	Major increase in rainfall experienced with effects on livelihoods and sectors
Droughts	No changes in drought episodes experienced	Minor changes in frequency and severity of drought episodes experienced	Major changes in frequency and severity of drought episodes experienced with effects on livelihoods and sectors

6. Has the village/ward experienced any of the following changes over the past years? (Please tick)

Vegetation cover	No changes in vegetation cover	Minor increase in vegetation cover	Major increase in vegetation cover	Minor decrease in vegetation cover	Major decrease in vegetation cover
Soil cover/fertility	No changes in soil cover/fertility	Slight decrease in soil cover /fertility	Major decrease in soil cover/ fertility	Minor increase in soil cover/ fertility	Major increase in soil cover/ fertility
River flow	No changes in river flow	Slight decrease in river flow	Major decrease in river flow	Minor increase in river flow	Major increase in river flow
Invasive species	No changes in occurrence of invasive plant species	Slight decrease in occurrence of invasive plant species	Major decrease in occurrence of invasive plant species	Minor increase in occurrence of invasive plant species	Major increase in occurrence of invasive plant species

7. In the village/ward, is there any committee or department that coordinates climate change related issues? Yes / No

If yes, what is the name of this committee/department?

If yes, please complete the table below (please tick)

Question	Answers		
	No	Partially	Yes
Does the committee/department have access to and does it make use of climate information in decision-making?			
Are climate change risks as well as appropriate adaptation strategies and measures integrated into village/ward development plans?			
Are there clear roles and responsibilities the committee, and effective partnerships outside the committee to address adaptation?			

8. Have any village committee member/government officials in the village/ward been trained on integrating climate change into planning? Yes/No

If yes, please provide details below.

Number of people trained	
committee/department	
% of women trained	
% of men trained	

9. What are the climate change related adaptation options practiced in the village/ward?

10. Are you aware of EbA practices in the village/ward?

11. What are the capacity needs for to adapting to climate using EbA approaches?

12. What are the EbA practices implemented in the village/ward?

Please select from the table below

EbA Practices	Location of EbA practices (CURRENT)	Project/programme that is undertaking EbA	Area size that has been under EbA (km ²)
Mulching			
Use of crop residues			
Crop diversification/inter-cropping (includes shift to non-traditional crops like sorghum)			
Integrated crop-livestock management			
Avoided deforestation			
Reforestation / afforestation			
Agroforestry			
Rainwater harvesting			
Irrigation Systems (gravity flow)			
Restoration of river banks			
Terracing and contour bands			
Zero grazing			
De-silting of rivers during the process of sand mining			
Use of energy saving technologies (solar, stoves)			
Alternative income generation (apiculture, fish farming, high value crops, non/off farm labour)			
Drought resistant crop varieties			
Tree pollarding			
WMA			
Others (Specify)			

Checklist for National, Regional, District and NGO Key Informants

Checklist for Community FGD/Key Informants at District Level

Date:.....

Name of Respondent:.....

1. Gender:.....

2. District.....Region.....

3. Position in District.....

4. Percentage of female headed households in your District.....

5. Has the district experienced any of the following climate-related changes over the past years? (Please tick the most relevant box)

Temperature	No changes in temperature experienced	Minor increase in temperature experienced	Major increase in temperature experienced with effects on livelihoods and sectors
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Rainfall	No changes in rainfall experienced	Minor increase in rainfall experienced	Major increase in rainfall experienced with effects on livelihoods and sectors
Droughts	No changes in drought episodes experienced	Minor changes in frequency and severity of drought episodes experienced	Major changes in frequency and severity of drought episodes experienced with effects on livelihoods and sectors

6. Has the district experienced any of the following changes over the past years? (Please tick)

Vegetation cover	No changes in vegetation cover	Minor increase in vegetation cover	Major increase in vegetation cover	Minor decrease in vegetation cover	Major decrease in vegetation cover
Soil cover/fertility	No changes in soil cover/fertility	Slight decrease in soil cover/fertility	Major decrease in soil cover/fertility	Minor increase in soil cover/fertility	Major increase in soil cover/fertility
River flow	No changes in river flow	Slight decrease in river flow	Major decrease in river flow	Minor increase in river flow	Major increase in river flow
Invasive species	No changes in occurrence of invasive plant species	Slight decrease in occurrence of invasive plant species	Major decrease in occurrence of invasive plant species	Minor increase in occurrence of invasive plant species	Major increase in occurrence of invasive plant species

7. Is there any committee or department that coordinates climate change related issues? Yes / No

If yes, what is the name of this committee/department?

If yes, please complete the table below (please tick)

Question	Answers
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	No	Partially	Yes
Does the committee/department have access to and does it make use of climate information in planning and decision-making?			
Are climate change risks as well as appropriate adaptation strategies and measures integrated into the district development plans?			
Are there clear roles and responsibilities of each key stakeholder within the district, and effective partnerships among key stakeholders to address adaptation?			

8. Have any village committee member/government officials in the district been trained on integrating climate change into planning? Yes/No

If yes, please provide details below.

Number of people trained	
Name of Committee/department	
% of women trained	
% of men trained	

9. What are the climate change related adaptation options practiced in the village/ward?

10. Are you aware of EbA practices?

11. What are the capacity needs for adapting to climate using EbA approaches?

12. What are the EbA practices implemented in the district? (Please select from the table below)

EbA Practices	Location of EbA practices (CURRENT)	Project/programme that is undertaking EbA	Area size that has been under EbA (km ²)
Mulching			
Use of crop residues			
Crop diversification/inter-cropping (includes shift to non-traditional crops like sorghum)			
Integrated crop-livestock management			
Avoided deforestation			
Reforestation / afforestation			
Agroforestry			

Rainwater harvesting			
Irrigation Systems (gravity flow)			
Restoration of river banks			
Terracing and contour bands			
Zero grazing			
De-silting of rivers during the process of sand mining			
Use of energy saving technologies (solar, stoves)			
Alternative income generation (apiculture, fish farming, high value crops, non/off farm labour)			
Drought resistant crop varieties			
Tree pollarding			
WMA			
Others (Specify)			

13. What are current and planned options for ensuring sustainability of project milestones?

Key Result Areas	Key result actions and milestones	Current actions for exit	Future or potential actions for exit	Opportunities	Challenges
Improved stakeholders capacity to adapt to climate change through EbA approaches and undertake resilience building responses	<ul style="list-style-type: none"> i) Training ii) Reporters to the AKMs ii) Managing AKMs 				

Increased resilience in project sites through demonstration of EbA practices and improved livelihoods	<ul style="list-style-type: none"> i) M&E of decreasing vulnerability ii) Training on EbA iii) Maintaining conserved lands 				
Strengthened information base on EbA supports an up scaling strategy	<ul style="list-style-type: none"> i) Dissemination of lessons learnt ii) Up scaling lessons learnt on EbA 				

Checklist for Regional Key Informants

Date:.....

Name of Respondent:.....

1. Gender:.....

2. Ministry/department/Region:.....

3. Position in Ministry/department/Region.....

5. Has the region experienced any of the following climate-related changes over the past years? (Please tick the most relevant box)

Temperature	No changes in temperature experienced	Minor increase in temperature experienced	Major increase in temperature experienced with effects on livelihoods and sectors
Rainfall	No changes in rainfall experienced	Minor increase in rainfall experienced	Major increase in rainfall experienced with effects on livelihoods and sectors
Droughts	No changes in drought episodes experienced	Minor changes in frequency and severity of drought episodes experienced	Major changes in frequency and severity of drought episodes experienced with effects on livelihoods and sectors

6. Has the region/district experienced any of the following changes over the past years? (Please tick)

Vegetation cover	No changes in vegetation cover	Minor increase in vegetation cover	Major increase in vegetation cover	Minor decrease in vegetation cover	Major decrease in vegetation cover
Soil cover/fertility	No changes in soil cover/fertility	Slight decrease in soil cover/fertility	Major decrease in soil cover/fertility	Minor increase in soil cover/fertility	Major increase in soil cover/fertility
River flow	No changes in river flow	Slight decrease in river flow	Major decrease in river flow	Minor increase in river flow	Major increase in river flow
Invasive species	No changes in occurrence of invasive plant species	Slight decrease in occurrence of invasive plant species	Major decrease in occurrence of invasive plant species	Minor increase in occurrence of invasive plant species	Major increase in occurrence of invasive plant species

7. Is there an institution or department that coordinates climate change planning and implementation at Regional level? Yes / No

If yes, what is the name of this institution/department?

If yes, please complete the table below (please tick)

Question	Answers		
	No	Partially	Yes
Does the institution have access to and does it make use of climate information in decision-making?			
Are climate change risks as well as appropriate adaptation strategies and measures integrated into regional institutional policies, processes and procedures?			
Does the institution have adequate resources to implement such policies, processes and procedures?			
Are there clear roles and responsibilities within the region, and effective partnerships outside the government departments to address adaptation?			

Is the institution equipped to monitor, evaluate and learn from its adaptation actions?			
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8. Is there any adaptation planning strategy for the region (circle) Yes/No

If yes, when was this strategy developed?..... By whom?.....

9. Have any government officials in the region been trained on integrating climate change into planning? Yes/No

If yes, please provide details below.

Number of people trained	
Institution/department	
% of women trained	
% of men trained	

10. What are the climate change related adaptation options practiced in the region?

11. Have any of the following decision-support tools been developed for the region that you work in? (Please fill out the table below)

Tool	Has this been developed and training given? (Y/N)	If so, by whom? (which project/gov)	If so, when? (date)
Climate change vulnerability assessment			
Climate change adaptation?			
AKMS			
Others (Specify)			

12. Are you aware of EbA practices in the region?

13. Can climate change impacts be addressed through capacity development for planning and management of EbA practices?

14. What are the capacity needs for key stakeholders to adapting to climate using EbA approaches?

15. Do existing institutions have access to adequate and make use of climate information in decision-making for resilience increase through EbA approaches?

16. Do institutions have adequate personnel with relevant knowledge for planning and implementation of EbA?

17. Do key institutions stakeholders have capacity to document, disseminate and upscale best practices for alternative livelihoods and EbA approaches for resilience building?

18. What are current and planned options for ensuring sustainability of project milestones?

Key Result Areas	Key result actions and milestones	Current actions for exit	Future or potential actions for exit	Opportunities	Challenges
Improved stakeholders capacity to adapt to climate change through EbA approaches and undertake resilience building responses	<ul style="list-style-type: none"> i) Training ii) Reporters to the AKMs iii) Managing AKMs 				
Increased resilience in project sites through demonstration of EbA practices and improved livelihoods	<ul style="list-style-type: none"> i) M&E of decreasing vulnerability ii) Training on EbA iii) Maintaining conserved lands 				
Strengthened information base on EbA supports an up scaling strategy	<ul style="list-style-type: none"> iii) Dissemination of lessons learnt iv) Up scaling lessons learnt on EbA 				

Checklist for National, Key Informants

Date:.....

Name of Respondent:.....

1. Gender:.....

2. Ministry/department:.....

3. Position in Ministry/department.....

4. Is there a department that coordinates climate change planning and implementation at Regional level?
Yes / No

If yes, what is the name of the department?

If yes, please complete the table below (please tick)

Question	Answers		
	No	Partially	Yes
Does the ministry or department have access to and does it make use of climate information in decision-making?			
Are climate change risks as well as appropriate adaptation strategies and measures integrated into regional institutional policies, processes and procedures?			
Does the ministry or department have adequate resources to implement such policies, processes and procedures?			
Are there clear roles and responsibilities within the ministry, and effective partnerships outside the government			

departments to address adaptation?			
Is the ministry or department equipped to monitor, evaluate and learn from its adaptation actions?			

8. Is there any adaptation planning strategy for the ministry or sector/region(circle) Yes/No

If yes, when was this strategy developed?..... By whom?.....

9. Have any government officials in the ministry been trained on integrating climate change into planning? Yes/No

If yes, please provide details below.

Number of people trained	
Institution/department	
% of women trained	
% of men trained	

10. What are the climate change related adaptation options practiced in the region?

13. Can climate change impacts be addressed through capacity development for planning and management of EbA practices?

14. What are the capacity needs for key stakeholders to adapting to climate using EbA approaches?

15. Do existing institutions have access to adequate and make use of climate information in decision-making for resilience increase through EbA approaches?

16. Do institutions have adequate personnel with relevant knowledge for planning and implementation of EbA?

17. Do key institutions stakeholders have capacity to document, disseminate and upscale best practices for alternative livelihoods and EbA approaches for resilience building?

18. Have any of the following decision-support tools been developed for the region/district that you work in? Please fill out the table below

Tool	Has this been developed and training given? (Y/N)	If so, by whom? (which project/govt)	If so, when? (date)
Climate change vulnerability assessment			
AKMS			
Knowledge sharing meetings/forums e.g. PINGOs			
Farmer field schools			
Others (Specify)			

19. What are current and planned options for ensuring sustainability of project milestones?

Key Result Areas	Key result actions and milestones	Current actions for exit	Future or potential actions for exit	Opportunities	Challenges
Improved stakeholders capacity to adapt to climate change through EbA approaches and undertake resilience building responses	<ul style="list-style-type: none"> iv) Training v) Reporters to the AKMs i) Managing AKMs 				
Increased resilience in project sites through demonstration of EBA practices and improved livelihoods	<ul style="list-style-type: none"> iv) M&E of decreasing vulnerability v) Training on Eba vi) Maintaining conserved lands 				
Strengthened information base on EbA supports an up scaling strategy	<ul style="list-style-type: none"> v) Dissemination of lessons learnt vi) Up scaling lessons learnt on Eba 				

Checklist to measure awareness of NGOs and private sector stakeholders (including available spatial data sets)

Date:.....

Name:.....

Organisation:.....

1. In your opinion, what is causing climate change?

- a) Not sure
- b) Natural causes
- c) Humans
- d) Humans and natural causes

2. Have you felt the effects of climate change in your field of work?

- a) No/not sure
- b) No, I have personally noticed climate change (e.g. increased temperatures, more floods) but it is not affecting my field of work
- c) Yes, I have noticed climate change and it is affecting my field of work

3. Does your organisation think about integrating climate change adaptation into your work activities?

- a) No
- b) Yes, we have thought about integrating climate change into our work activities but have not taken any steps to do so
- c) Yes, we are in the process of identifying adaptation options and integrating these into our work activities
- d) Yes, climate change adaptation is already integrated into our work activities

4. How often do you talk about climate change within your work environment?

- a) never
- b) sometimes (once a week)
- c) Often (more than once a week)

5. How often do you receive information and/or training on adapting to climate change within your organisation?

- a) Never

- b) We received training and/or information on climate change once
- c) We receive training/information on climate change once a year
- d) We receive training and/or information on climate change more than once year

6. Have any of the following decision-support tools been developed for the region/district that you work in? Please fill out the table below

Tool	Has this been developed and training given? (Y/N)	If so, by whom? (which project/gov)	If so, when? (date)
Climate change vulnerability assessment			
AKMS			
Others (Specify)			

7. Are you aware of EbA practices in the region/district?

8. Can climate change impacts be addressed through capacity development for planning and management of EbA practices?

9. What are the capacity needs for key stakeholders to adapting to climate using EbA approaches?

10. Do existing institutions have access to adequate and make use of climate information in decision-making for resilience increase through EbA approaches?

11. Does your institution have adequate personnel with relevant knowledge for planning and implementation of EbA?

If so, please fill in the table below

EbA Practices	Location of EbA practices (CURRENT)	Project/programme that is undertaking EbA	Area that has been under EbA (km ²)
Mulching			
Use of crop residues			
Crop diversification/inter-cropping (includes shift to non-traditional crops like sorghum)			
Integrated crop-livestock management			
Avoided deforestation			
Reforestation / afforestation			

Agroforestry			
Rainwater harvesting			
Irrigation Systems (gravity flow)			
Restoration of river banks			
Terracing and contour bands			
Zero grazing			
De-silting of rivers during the process of sand mining			
Use of energy saving technologies (solar, stoves)			
Alternative income generation (apiculture, fish farming, high value crops, non/off farm labour)			
Drought resistant crop varieties			
Tree pollarding			
WMA			
Others (Specify)			

12. Does your institution have capacity to document, disseminate and upscale best practices for alternative livelihoods and EbA approaches for resilience building

13. What are current and planned options for ensuring sustainability of project milestones?

Key Result Areas	Key result actions and milestones	Current actions for exit	Future or potential actions for exit	Opportunities	Challenges
Improved stakeholders capacity to adapt to climate change through EbA approaches and undertake resilience building responses	<ul style="list-style-type: none"> vii) Training viii) Reporters to the AKMs x) Managing AKMs 				
Increased resilience in project sites through demonstration of EBA practices and improved livelihoods	<ul style="list-style-type: none"> vii) M&E of decreasing vulnerability viii) Training on Eba ix) Maintaining conserved lands 				
Strengthened information base on EbA supports an up scaling strategy	<ul style="list-style-type: none"> vii) Dissemination of lessons learnt viii) Up scaling lessons learnt on Eba 				

2. List of Interviewees (FGD, KII)