



THE REPUBLIC OF UGANDA

MINISTRY OF WATER AND ENVIRONMENT

BASELINE INFORMATION FOR THE ECOSYSTEM-BASED ADAPTATION IN MOUNT ELGON ECOSYSTEM PROJECT STRATEGY

November 2012

**Ecosystem Based Adaptation In Mountain Elgon
Ecosystem**



THE REPUBLIC OF UGANDA

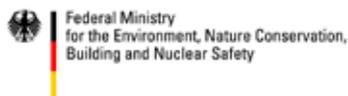
MINISTRY OF WATER AND ENVIRONMENT

Baseline Information for the Ecosystem-based Adaptation in Mount Elgon Ecosystem Project Strategy

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November 2012

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EXECUTIVE SUMMARY

This report is an output of contractual obligations between UNDP-EBA Project and the National Forestry Resources Research Institute (NaFORRI). This consultancy sought to produce supporting and baseline information to enable the detailed design, monitoring and evaluation of the project's strategy for promoting ecosystem based adaptation (EBA) to climate change in Mount Elgon region. The results are to be used by the project team to: a) to produce a project theory of change, EBA strategy and monitoring design; b) update the project results framework vis-a-vis baselines and targets c) inform the design and implementation of a separate consultancy to conduct a vulnerability impact assessment (VIA) and mapping of EBA options.

Since the consultancy was meant to provide sufficient information to assist in the definition of the project strategy and actions in Mt Elgon region, the activities in this consultancy involved mostly rapid methods for data collection and assessments. Thus, the research activities were limited mainly to Mt Elgon ecosystem covering specifically four target districts of Sironko, Bulambuli, Kapchorwa and Kween. The methods used to generate and analyze data depended on the type of information. The various methods used in data generation included: Desk reviews of published case scenarios and best practices documented by organizations like IUCN and IUFRO, Consultative meetings with key stakeholders from the relevant districts and key national institutions.

The natural resources departmental staff particularly: DFO, DEO, DAO and DNRC in each of the four districts were involved in group discussions. Amongst the prominent national institutions consulted through semi-structured interviews were; Makerere University, Wetlands Management Department, National Environment Management Authority (NEMA), Uganda Wildlife Authority (UWA), National Forestry Authority (NFA) and the Climate Change Unit. Furthermore, lessons learnt from other mountainous regions enriched some activity outputs in this consultancy.

Communities have been adapting to changes in their environment by alternating settlements, agricultural patterns, and other sectors of their economies and lifestyles. Adaptation has become very important in the prevailing environmental changes observed that are a result of climate change. Ecosystem based adaptation is one approach to adaptation that recognizes the rights of indigenous peoples, considers both cultural and biological diversity, and emphasizes fair and equitable management of the ecosystem.

EBA relies on recovering and maintaining ecosystem services and the resilience of natural resources. Highland areas of Uganda have already witnessed climate related challenges such as severe drought, heavy rains, floods, hailstorms, landslides, pests and diseases that have impacted on communities. Loss of tree cover, loss of soil fertility, soil erosion, poor health and sanitation have been identified as the most serious environmental factors affecting the Mt Elgon districts. In the Mount Elgon ecosystem, farmers have been adjusting to these challenges mainly through; Mulching; Use of crop residues; Crop diversification;

Integrated crop-livestock systems; Avoided deforestation; Reforestation and afforestation; Agroforestry; Zero grazing; De-silting of rivers during the process of sand mining; Use of energy saving technologies (solar, stoves); Alternative income generation; Drought resistant crop varieties; Tree pollarding; Group/communal labour; Rainwater harvesting; Irrigation of crops; Restoration of river banks; Terracing and grass bands and digging water channels into crop gardens.

Implementation of ecosystem-based approaches to adaptation is constrained by the vast nature of the ecosystem, the solitary nature of the interventions and lack of sustained funding. Ecosystem-based approaches in the Elgon ecosystem have generally addressed a broad range of climate change impacts, including water shortage, floods, storms, soil erosion and ecosystem productivity and resilience. However, socio-economic considerations such as population pressure, land tenure and sustainability for the various interventions have not been adequately handled and such useful EBA measures have not been scaled out.

Regarding current capacity for EBA, land users' capacity and willingness to invest in ecosystem management, is compromised by population pressure, declining farm size and a complex history of contested entitlement to the natural resource. Customary land tenure, the common system of tenure on private land is relatively secure. Subsistence agriculture is the mainstay of community livelihoods in the project area. Farmer folk are poor and natural resource dependent, mainly relying on rain-fed agriculture and wetland-supported cultivation during dry seasons.

Crop yields are reducing in both quality and quantity, in spite of the farming systems exhibiting a few inbuilt mechanisms for curbing soil erosion, e.g. intercropping of beans in banana and coffee, use of diversion channels and soil bunds. Laboriousness of constructing such structures hinders use of many soil and water conservation practices. Crop diseases are also emerging in locations they never used to occur, and farmers' preferences amongst crop varieties are shifting towards varieties that are more resilient. Generally, land users attach importance to weather conditions in their vicinity, but faced with a limitation of alternative livelihood options, continue to pursue short-term survival strategies even when aware of the negative outcomes.

Park neighboring communities are heavily dependent on park extraction of resources. People have intimate attachment to natural resources in their vicinity, although a history conflicts over disputed entitlements to park resources has generated need for more participatory conservation strategies. Significant decline in tree cover is evident, largely due to demand for fuel wood and income.

Mount Elgon ecosystem has been a focal point of conservation activity given its importance as a water catchment and biodiversity conservation hotspot. The region has also drawn increased attention from conservation agencies because of its high vulnerability to climate variability. Many of the past and ongoing interventions in the Mt Elgon ecosystem have addressed non-climatic stresses as well as climatic issues. The relationship between the local communities and conservation agencies in the Mt Elgon region has been characterized by mutual suspicion.

There are concerns over the quality of consultations that inform many of the interventions in the region. This is attributed to the tendency for projects or civil society organizations to implement blue prints of externally designed interventions, without adequate involvement and input from the local stakeholders. Ecosystem based interventions like MERECP and TACC have broken ground for ecosystem thinking, as opposed to piecemeal efforts that seldom deliver significant impact on the ecosystem. For EBA to genuinely inform about climate change impacts and progress in addressing them, foolproof mechanisms of ensuring information sharing need to be instituted.

Ecosystem services can be categorized into provisioning, regulating, cultural and supporting services; all of which are dependent on the characteristics of a particular ecosystem and the context in which they are considered. Ecosystem services can therefore be classified into essential (e.g. food, water and shelter) and desirable (e.g. cultural, spiritual and aesthetic values) services. Provisioning and regulating ecosystem services therefore fall into the first class while the

cultural and supporting services fall in the latter class. In the Elgon ecosystem, there is a serious degradation of all these services arising from the acutely high human population, unsustainable land management practices (deforestation, poor soil conservation and permanent or perennial cultivation of the same plots of land). Given the extent of environment degradation, provisioning and regulating ecosystem services (climate and water regulation, erosion control, water purification and regulation of natural hazards such as flooding and landslides, food, primary production - soil fertility, carbon sequestration and nutrient cycling, pollination and seed dispersal) are critical and require immediate attention. The cultural and supportive ecosystem services (educational, cultural, spiritual, recreational and aesthetic values) are essential and should not be neglected in development efforts for the Elgon ecosystem.

The ecosystem-based approaches to adaptation should be integrated into relevant strategies, including National Adaptation Programs of Action (NAPAs), District development plans, and disaster risk reduction planning and biodiversity conservation strategies. This is based on the premise that previous interventions have left traces of impact despite the huge sums of money that have been used in the implementation of such measures. The study recommends bringing essential ecosystem based resources to the farm by integrating their production or management in the existing farming system, enhancing behavioural and attitudes change.

TABLE OF CONTENTS

ACKNOWLEDGEMENTSiv

EXECUTIVE SUMMARYv

TABLE OF CONTENTS.....viii

LIST OF ACRONYMSxi

CHAPTER ONE1: INTRODUCTION AND BACKGROUND 1

1.1 Introduction..... 1

1.2 Land user context and its implication for environmental management..... 1

1.2.1 Population size, density and ethnic diversity..... 1

1.2.2 Land tenure and availability.....2

1.2.3 Livelihoods systems.....3

1.3 Anthropogenic threats to the multi-functionality of mount elgon ecosystem3

1.4 Ecosystem services and adaptation to climate change4

1.4.1 The ecosystem approach as a strategy for natural resource conservation5

1.4.2 Definition of terms and concepts.....5

1.4.3 Prerequisites for EBA5

1.5 Terms of reference8

1.6 Interpretation of the terms of reference.....9

1.6.1 Identification of existing eba measures and relevant land and water
Management practices9

1.6.2 Rapid assessment of current capacity for eba to climate change9

1.6.3 Preliminary identification of essential and desirable ecosystem services in
Mt. Elgon.....10

1.6.4 Production of preliminary list of eba options for the project.....10

1.6.5 Participation in project activities to produce project theory of change,
EBA strategy and monitoring design 10

1.7 Scope.....10

1.8 Methods10

1.8.1 Desk reviews 10

1.8.2 Consultative meetings with key stakeholders..... 11

1.8.3 Rapid rural appraisal 11

CHAPTER TWO: EXISTING EBA MEASURES, RELEVANT LAND AND WATER MANAGEMENT PRACTICES IN UGANDA..... 12

2.1 Introduction 12

2.2 Review of EBA initiatives in Uganda..... 12

2.3 General assessment of performance of EBA measures and practices in Mt Elgon region15

2.3.1 Mulching 15

2.3.2 Use of crop residues for energy..... 15

2.3.3 Crop diversification..... 15

2.3.4 Integrated crop-livestock systems 15

2.3.5 Avoided deforestation..... 16

2.3.6 Reforestation / afforestation 16

2.3.7 Agroforestry 16

2.3.8 Zero grazing 16

2.3.9 De-silting of rivers during the process of sand mining 17

2.3.10 Use of energy saving technologies..... 17

2.3.11 Alternative income generation 17

2.3.12 Drought resistant crop varieties 17

2.3.13 Tree pollarding 17

2.3.14 Group or communal labour..... 17

2.4 Current land and water management practices relevant to EBA..... 18

2.4.1 Rainwater harvesting 18

2.4.2 Irrigation of crops..... 18

2.4.3 Restoration of river banks 18

2.4.4 Terracing and contour bands..... 18

2.4.5 Water channels in crop gardens 18

2.5 Gaps in implementation of existing EBA and land and water management practices 18

2.6 Previous and ongoing EBA-related interventions in Mt Elgon region..... 19

2.7 Recommendations on relevant institutions working in the area of EBA..... 21

CHAPTER THREE: CURRENT CAPACITY FOR ECOSYSTEM BASED ADAPTATION IN MT ELGON .. 22

3.1 Introduction..... 22

3.2 Multi-modal institutional analysis of EBA stakeholders in Mount Elgon..... 22

3.3 Indications of stakeholders’ capacities for EBA at the national level 25

3.3.1 Policy context 25

3.3.2 Institutional capacities..... 25

3.3.3 Capacity development initiatives at the national level..... 33

3.4 Indications of stakeholders’ capacities for EBA at regional/district level 34

3.5 Indications of stakeholders’ capacities for EBA at local/community level 34

3.6 Some salient issues to note about stakeholders’ capacity for EBA 39

CHAPTER FOUR: ESSENTIAL AND DESIRABLE ECOSYSTEM SERVICES IN THE MT ELGON REGION..... 40

4.1 Introduction..... 40

4.2 Characterization of natural resources along an altitudinal gradient 40

4.3 Principal types of ecosystem services from Mount Elgon and their importance 43

4.3.1 Essential ecosystem services 43

4.3.2 Desirable ecosystem services..... 45

4.4 Description of identified essential and desirable ecosystem services 45

4.6 Information gaps on ecosystem services for further development or attention 52

CHAPTER FIVE: PRELIMINARY LIST OF EBA OPTIONS FOR THE PROJECT 53

5.1 Introduction..... 53

5.2 List of EBA options..... 53

REFERENCES 54

ANNEXES 57

LIST OF ACRONYMS

| | |
|---------|--|
| ADG | Accountable Democratic Governance |
| CBOs | Community Based Organizations |
| CC | Climate Change |
| CCPC | Climate Change Policy Committee |
| CCU | Climate Change Unit |
| CDM | Clean Development Mechanism |
| CPAP | Country Programme Action Plan |
| CSOs | Civil Society Organizations |
| CVA | Capacities and Vulnerabilities Analysis |
| DDP | District Development Plan |
| DFS | District Forestry Services |
| EBA | Ecosystem-Based Adaptation |
| ENRM | Environment and Natural Resources Management |
| ENR-SIP | Environment and Natural Resources - Sector Investment Plan |
| FACE | Forestry Absorbing Carbon dioxide Emissions |
| FAO | Food and Agricultural Organization |
| FFA | Force Field Analysis |
| FIEFOC | Farm Income Enhancement and Forestry Conservation |
| GEF | Global Environment Facility |
| GHG | Green House Gases |
| GoU | Government of Uganda |
| GPR | Growth and Poverty Reduction |
| IP | Implementing Partner |
| IUCN | International Union for Conservation of Nature |
| IUFRO | International Union of Forestry Research Organizations |
| LLS | Livelihoods and Landscapes Strategy |
| M&E | Monitoring and Evaluation |
| MAAIF | Ministry of Agriculture, Animal Industry and Fisheries |
| MDGs | Millennium Development Goals |
| MEMD | Ministry of Energy and Minerals Development |
| MERECOP | Mount Elgon Regional Ecosystem Conservation Programme |
| MoFPED | Ministry of Finance, Planning and Economic Development |
| MoLG | Ministry of Local Government |

| | |
|----------|---|
| MW&E | Ministry of Water and Environment |
| NAADS | National Agricultural Advisory Services |
| NaFORRI | National Forestry Resources Research Institute |
| NAPA | National Adaptation Programmes of Action |
| NARO | National Agricultural Research Organization |
| NDP | National Development Plan |
| NEMA | National Environment Management Authority |
| NFA | National Forest Authority |
| NGO | Non-Government Organization |
| PAC | Project Appraisal Committee |
| PB | Project Board |
| PMU | Project management Unit |
| PTSC | Project Technical Steering Committee |
| REDD | Reducing Emissions from Deforestation and Degradation |
| RETs | Renewable Energy Technologies |
| RRA | Rapid Rural Appraisal |
| SFC | Sustainable Forest Conservation |
| SGP | Small Grants Programme |
| SLM | Sustainable Land Management |
| SPSS | Statistical Package for Social Sciences |
| TACC | Territorial Approach to Climate Change |
| TOR | Terms of Reference |
| UNCCD | United Nations Convention to Combat Desertification |
| UNCDF | United Nations Capital Development Fund |
| UNDAF | United Nations Development Assistance Framework |
| UNDP | United Nations Development Programme |
| UNDP-SGP | United Nations Development Programme – Small Grants Program |
| UNEP | United Nations Environment Programme |
| UNFCCC | United Nations Framework Convention on Climate Change |
| UNFFE | Uganda National Farmers Federation |
| UNIDO | United Nations Industrial Development Organization |
| UNV | United Nations Volunteer |
| UWA | Uganda Wildlife Authority |
| VIA | Vulnerability Impact Assessment |
| WWF | World Wide Fund for Nature |

1. INTRODUCTION AND BACKGROUND

1.1 Introduction

This report is an output of contractual obligations between UNDP-EBA Project and the National Forestry Resources Research Institute (NaFORRI) of the National Agricultural Research Organization (NARO). The consultancy sought to produce supporting and baseline information to enable the detailed design, monitoring and evaluation of the project's strategy for promoting ecosystem based adaptation (EBA) to climate change in Mount Elgon region.

The results are to be used by the project team to: a) produce a project theory of change, EBA strategy and monitoring design; b) update the project results framework vis-a-vis baselines and targets; c) inform the design and implementation of a separate consultancy to conduct a vulnerability impact assessment (VIA) and mapping of EBA options. In this first chapter of the report, we present a brief background to the consultancy. A shared understanding of some key terms and concepts is also deemed necessary as it enriches appreciation of the discussion in subsequent chapters.

Furthermore, the chapter outlines the objectives of the consultancy and the methods used. The consultants' interpretation of the terms of reference is given prior to the outline of objectives and specific tasks. The scope of the study is then defined before the rest of the chapter describes the methods used to address the objectives of the study.

1.2 Land user context and its implication for environmental management

Land users are central to the success of EBA strategies given that users directly interface with the natural resource base. For that reason many workers refer to land users as natural resource managers. Either as individuals, groups or entire communities, land users ought to be at the centre of land use decision-making and implementation processes if these are to be socially acceptable, economically viable and environmentally sustainable. A good understanding of societal set up and processes therein is therefore necessary to gauge land users' capacities to implement and sustain proposed land management strategies.

1.2.1 Population size, density and ethnic diversity

The districts in the project area were under a different administrative set up by the time the last comprehensive population and housing census was conducted in 2002. Bulambuli and Sironko were parts of the then Sironko district, which had a total population of 283, 092 persons; while Kween and Kapchorwa were parts of Kapchorwa district that had a population of 190,391 people (UBOS, 2002). The districts are among the most populated in the country, with population densities estimated to be up to 530 persons/km² in Sironko. With a population growth rate of approximately 4% per annum, this population is definitely much higher presently with more persons per square kilometer of land.

Table 4.1 Population size and density

| District | Population growth rate | Total area (km ²) | Population density (persons/km ²) | Projected population (2010) |
|-----------|------------------------|-------------------------------|---|-----------------------------|
| Sironko | 3.5 | 462.0 | 530 | 244,678 |
| Bulambuli | 3.5 | 809.7 | 238 | 192,600 |
| Kapchorwa | 4.2 | 1,738.0 | 169 | 293,041* |
| Kween | 4.2 | 791.0 | 131 | 103,300 |

Source: Adapted from UBOS, The 2002 Census Results Report Appendix Tables.

Two main ethnic groups occupy the project area; the Bagisu and Sabiny. The Bagisu are the dominant ethnic group in Sironko and Bulambuli. The Bagisu (also called Bamasaba) are a tribe of Bantu origin believed to have moved further up the lower slopes of Mount Elgon. The Sabiny on the other hand are the majority in Kapchorwa and Kween districts. The Sabiny (also referred to as Ndolobo) were originally forest dwellers and pastoral people that resided on the upper slopes of Mt Elgon.

In spite of difficulties in accessibility, the mountains are the most populated of the three slope levels (i.e. the mountains, the middle slope and the plains). The middle slope is where most of the towns and urban centers are located, and much of the administrative and business activity takes place. Settlements in the plains are relatively sparse, despite being more accessible by road and having longer standing connections with markets, other agricultural communities, as well as social services like education and health care.

1.2.2 Land tenure and availability

Complex historical processes have led to the current state of land management in the Mt Elgon region of Uganda (Soini, 2007). The British Colonial Forest Department (BCFD) first took control of Mt. Elgon's forest lands in 1929. In 1936 BCFD marked the boundaries of the forest (Scott 1998). In subsequent decades, the legal status of the protected area on Mt. Elgon

changed several times from crown forest to forest reserve, forest park and eventually national park in 1992. Each change in status progressively restricted public access to protected resources. This contributed to the contentious relationship between local communities and forest managers. Scott (1998) observes that boundary disputes characterized the history of management since the inception of the protected area.

In other parts of Mt Elgon region, customary land tenure, one of four land tenure systems recognized in Uganda under the 1998 Land Act, is the common system of land ownership. Customary tenants enjoy security of tenure and cannot be evicted at will. Although security of tenure may be further guaranteed by acquiring a certificate of customary ownership, few customary tenants have obtained such certificates as most people find the process cumbersome, involving numerous forms and fees (Soini, 2007). Registration of land is not regarded as vital to consolidate tenure as the peasants have their own sense of security of tenure offered by the traditional system of tenure (Wandukwa, 2004).

The majority of families subsist on 1-6 acres of land, a situation that is expected to worsen as generations of land users continue to partition the family land estate through inheritance. In most instances, the household land estate is fragmented into 2 to 8 tiny plots, scattered over slopes of several hills. Usually, additional plots are purchased to supplement family land acquired through inheritance.

Land-constrained households hire in or “borrow” land for crop cultivation, although use of land under such temporary occupancy is normally restricted to growing of annual crops and not perennials.

1.2.3 Livelihoods systems

Historically, the Bagisu are farmers and utilized some forest and grassland resources. Traditionally, the Sabiny mostly practiced nomadic pastoralism supplemented with hunting (forest antelopes), gathering wild products and settled farming. Trade in honey and crafts also played a significant role in subsistence and rituals. Using stems from the highland bamboo forest stands, women wove baskets which they traded along with honey, wild meat, and bamboo shoots to down slope communities, in exchange for staples (maize and millet). In the late 1940s, women began bringing seed potatoes from their trading excursions, which they planted in abandoned kraals (cattle enclosures) in the grasslands.

The resettlement of populations in the 1970s and 1980s brought about dramatic changes in livelihoods systems, with farming communities struggling to cope with a fast shift to intensive montane cultivation. Staple crops suited to the hot, dry plains did not fair well in the cooler, wetter climate of the upland slopes and agricultural communities were compelled to shift from crops like cassava and millet to maize, potatoes and beans. Also, many cultivators, previously accustomed to semi-permanent flat land cultivation, had little idea of how to prevent soil erosion on the steep slopes of their new land. This triggered off processes of vast soil loss that has worsened with increasing human population.

Today, most communities in the project area rely principally on intensive agricultural production for their livelihoods. As such, most slopes are under intensive agricultural production as evident from the patchwork of crop gardens. Farming

folk are predominantly poor and natural resource dependent, mainly relying on rain-fed agriculture and wetland-supported cultivation during dry seasons. Agricultural production is skewed towards food crops (millet, sorghum, ground-nuts, cassava, sweet potatoes, beans and Irish potatoes), cash crops (cotton and coffee), fruits (passion fruits), and an assortment of vegetables (tomatoes, onions and cabbages), both for subsistence and the market. The construction of the Mbale-Kapchorwa road dramatically increased access to markets and contributed to increased cash-crop production.

Many communities utilize in-park resources although to varying extents. Other sources of income include sale of livestock, firewood, charcoal, horticulture, crafts and poultry. There is also considerable reliance on sand mining and extraction, with negative impacts on the status of wetlands in the area (UNDP, GEF & IUCN, 2010).

1.3 Anthropogenic threats to the multi-functionality of Mount Elgon ecosystem

The total population of all the districts found in the Mt Elgon ecosystem is approximately 2 million people, with different ethnic backgrounds. The growth rate of the population is high and ranges between 2.3–4.3% per year. Per capita landholding is small—approximately 0.8 ha on average—and most households are generally poor with crop and livestock production as their main economic activities. This takes the form of both small-scale commercial and subsistence farming.

Other economic activities include beekeeping, lumbering, fish farming and poultry. Pressure on land within the Mt Elgon ecosystem is inevitably very high and this has led to encroachment on protected areas and cultivating ecologically fragile areas such as steep slopes, swamps, and river banks. The area suffers many conflicts related to land and

other natural resources. Consequently, this has jeopardized the multi-functionality of the Mt Elgon ecosystem contributing to serious environmental disasters such as soil erosion, declining soil fertility, land/mud slides and others.

Increased landslides have been reported in Mt Elgon region of Uganda. Anthropogenic factors, especially population pressure coupled with slope disturbance and rampant deforestation are the major causes of landslides. Knapen *et al.* (2006), attribute landslide occurrence on stable, marginally stable and actively unstable slopes of Mt Elgon to a combination of preconditions, preparatory and triggering causal factors. Preconditioning factors which include topography (slope angle, length, aspect, gradient, and curvature), lithology, shrink-swell soil properties and annual rainfall receipts act as catalysts that allow other destabilizing factors to act more effectively.

Preparatory factors, particularly human activities such as cultivation, excavation for housing, foot paths and deforestation tend to place the slope in a marginally stable state, making it susceptible to mass movement without actually initiating it. Triggering causal factors shift the slope from being marginally stable to an actively unstable state by initiating movement. Such factors include extreme rainfall events (such as El Niño), and concentration of runoff in restricted infiltration zones of concave slopes (Westerberg and Christiansen, 1999; Knapen *et al.*, 2006).

Since the livelihoods and economic activities of the local communities depend on the goods and services that Mt Elgon provides, there is, therefore, a great challenge of sustaining this ecosystem. This makes ecosystem based approach to natural resources a relevant intervention in Mt Elgon ecosystem.

1.4 Ecosystem services and adaptation to climate change

Ecosystems affect the climate and play an important role in adaptation to climate change. Climate change affects ecosystem functioning hence the benefits they provide to people. If these services are eroded, the impacts will be felt by people, communities and economies throughout the world. Climate change adds a further pressure on many ecosystems and people already negatively impacted by pollution, deforestation and land degradation. Loss of the services that ecosystems provide is also a significant barrier to the achievement of the Millennium Development Goals.

Adaptation strategies involve a range of actions, including behavioral change, technical or hard engineered solutions such as the construction of sea defense or risk management, and reduction strategies such as the establishment of early warning systems. There is also a growing recognition of the role that healthy ecosystems can play in increasing resilience and helping people to adapt to climate change through the delivery of the range of services that play a significant role in maintaining human well-being.

Approaches that involve the services that biodiversity and ecosystems provide as part of an overall adaptation strategy to help people adapt to the adverse effects of climate change are known as ecosystem-based approaches to adaptation. The underlying principle is that healthy ecosystems can play a vital role in maintaining and increasing resilience to climate change and in reducing climate-related risk and vulnerability. Examples of such approaches include flood defense through the maintenance and/or restoration of wetlands and the conservation of agricultural biodiversity in order to support crop and livestock adaptation to climate change.

1.4.1 The ecosystem approach as a strategy for natural resource conservation

Ecosystem approach is defined by the CBD as a strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way (www.cbd.int/ecosystem/). Ecosystem approach is based on the application of appropriate scientific methodologies focused on levels of biological organization which encompass the essential processes, functions and interactions among organisms and their environment. It recognizes humans with their cultural diversity as an integral component of the ecosystem. The ecosystem approach requires adaptive management to deal with the complex and dynamic nature of ecosystems and the absence of complete knowledge or understanding of their functioning. An ecosystem is a dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit (www.cbd.int/ecosystem/).

1.4.2 Definition of terms and concepts

a) Ecosystem-based adaptation (EBA) is defined by the *CBD* as “the use of biodiversity and ecosystem services as part of an overall adaptation strategy to help people to adapt to the adverse effects of climate change.” Ecosystem-based adaptation uses sustainable management, conservation,

and restoration of ecosystems to provide services that enable people to adapt to the impacts of climate variability/change. Ecosystem-based Adaptation contributes to reducing vulnerability and increasing resilience to both climate and non-climate risks and provides multiple benefits to society and the environment.

Through EBA significant social, economic and cultural co-benefits can be generated, biodiversity conserved by building on the traditional knowledge and practices of indigenous peoples and local communities, including the important role of women as custodians of local knowledge. Furthermore, EBA contributes to climate change mitigation, for example, through the sequestration and storage of carbon in healthy ecosystems such as forests, wetlands and oceans. Ecosystem-based Adaptation involves a wide range of ecosystem management activities to increase resilience and reduce the vulnerability of people and the environment to climate change.

b) Ecosystem-based mitigation (EBM)

refers to the use of ecosystems for their carbon storage and sequestration service to aid climate change mitigation. Emissions reductions are achieved through creation; restoration and management of ecosystems e.g. forest restoration, peat conservation

Box 1 Ecosystem management activities in EBA

1. Sustainable water management, where river basins, aquifers, flood plains, and their associated vegetation are managed to provide water storage and flood regulation services;
2. Disaster risk reduction, where restoration of coastal habitats such as mangroves can be a particularly effective measure against storm-surges, saline intrusion and coastal erosion;
3. Sustainable management of grasslands and rangelands, to enhance pastoral livelihoods and increase resilience to drought and flooding;
4. Establishment of diverse agricultural systems, where using indigenous knowledge of specific crop and livestock varieties, maintaining genetic diversity of crops and livestock, and conserving diverse agricultural landscapes secures food provision in changing local climatic conditions;
5. Strategic management of shrub lands and forests to limit the frequency and size of uncontrolled forest fires; and
6. Establishing and effectively managing protected area systems to ensure the continued delivery of ecosystem services that increase resilience to climate change.

c) The ecosystem approach is a strategy for integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way. It is based on the application of appropriate scientific methodologies focused on levels of biological organization which encompass the essential processes, functions and interactions among organisms and their environment. It recognizes that humans, with their cultural diversity, are an integral component of ecosystems.

Box 2 Principles of the ecosystems approach

1. The objectives of management of land, water and living resources are a matter of societal choice.
2. Management should be decentralized to the lowest appropriate level.
3. Ecosystem managers should consider the effects (actual or potential) of their activities on adjacent and other ecosystems.
4. Recognizing potential gains from management, there is usually a need to understand and manage the ecosystem in an economic context. Any such ecosystem-management programme should: a) reduce those market distortions that adversely affect biological diversity; b) align incentives to promote biodiversity conservation and sustainable use; and c) internalize costs and benefits in the given ecosystem to the extent feasible.
5. Conservation of ecosystem structure and functioning, to maintain ecosystem services, should be a priority target of the ecosystem approach.
6. Ecosystems must be managed within the limits of their functioning.
7. The ecosystem approach should be undertaken at the appropriate spatial and temporal scales.
8. Recognizing the varying temporal scales and lag-effects that characterize ecosystem processes, objectives for ecosystem management should be set for the long term.
9. Management must recognize that change is inevitable.
10. The ecosystem approach should seek the appropriate balance between, and integration of, conservation and use of biological diversity.
11. The ecosystem approach should consider all forms of relevant information, including scientific and indigenous and local knowledge, innovations and practices.
12. The ecosystem approach should involve all relevant sectors of society and scientific disciplines.

1.4.3 Prerequisites for EBA

According to IUCN, the following elements are fundamental in guiding the development of effective Ecosystem-based Adaptation strategies:

- a) Focusing on reducing non-climate stresses. Ecosystem-based Adaptation strategies should include a focus on minimizing other anthropogenic stresses that have degraded the condition of critical ecosystems, and thereby undermine their resilience to climate change. Such stresses include, inter alia, unsustainable harvests, habitat fragmentation, nonnative species, and pollution.
- b) Involving local communities. Ecosystem-based Adaptation measures are more successful when the local population participates in both planning and implementation. Therefore, community participation is critical.
- c) Multi-partner strategy development. Ecosystem-based Adaptation presents a tangible opportunity to solve climate change problems by aligning conservation, development and poverty alleviation interests. Such synergies benefit from collaboration between indigenous and local communities, conservationists, natural resource professional, relevant private sector stakeholders, development specialists and humanitarian aid specialists.
- d) Building upon existing good practices in natural resource management. The most effective Ecosystem-based Adaptation strategies apply established best practices in land, water, and natural resource management to confront some of the new challenges posed by climate change. An ecosystem approach to integrated management of resources is particularly crucial to the implementation of Ecosystem-based Adaptation.
- e) Adopting adaptive management approaches. Ecosystem-based adaptation strategies should support adaptive management options that facilitate and accelerate learning about appropriate adaptation options for the future. Climate impacts and EBA measures should be monitored carefully so that management actions can be appropriately adjusted in response to changing conditions.
- f) Integrating Ecosystem-based adaptation with wider adaptation strategies. Successful adaptation depends upon integrating Ecosystem-based adaptation initiatives with other risk management components, such as early warning systems and awareness-raising, and in some cases with physical infrastructural interventions. It is important to encourage and enable technology transfer and dialogue between planners and practitioners with expertise in hard engineering, and in ecosystem management.
- g) Communicating and educating. Successful Ecosystem-based Adaptation depends on knowledge transfer, capacity building, integrating science and local knowledge and raising awareness about climate change impacts and the benefits and potential of sound ecosystem management.

1.5 Terms of Reference

The overall objective of this consultancy is to generate supporting and baseline information as per the project results framework to enable the detailed design, monitoring and evaluation of the project's strategy for promoting ecosystem based adaptation (EBA) to climate change in Mount Elgon region.

The assignment was divided into five main activities as outlined, with their respective sub-activities:

1. Identification of existing EBA measures and relevant land and water management practices in Uganda. This activity sought mainly to:

- Identify, review and analyse the existing EBA measures and current land and water management practices relevant to EBA in Uganda;
- Provide a general assessment of the performance of these measures and practices for EBA in Mt Elgon region;
- Identify the gaps and make recommendations on improvement in the implementation of the existing EBA measures;
- Provide information on the relevant institutions and projects in Uganda which the project may wish to collaborate with or learn from or influence.

2. Rapid assessment of current capacity for EBA to Climate Change

The aim of this activity was to provide a project baseline and information on current adaptive capacity for EBA of the stakeholder groups in the Mt Elgon region. Specifically, this activity sought to:

- Make available to the team information on current EBA capacity of stakeholders in the Mt Elgon region, to inform the development of the project strategy and monitoring.

3. Preliminary identification of essential and desirable ecosystem services in the Mt Elgon region for which management actions are required now and in the long term

The aim of this activity was to strengthen the design of the VIA and project strategy by promoting the supply of ecosystem services for the people of Mt Elgon. The specific objectives for this activity were to:

- Identify the principal types of ecosystem services from the Mt Elgon and their importance for the in the region and downstream;
- Determine any significant information gaps on ecosystem services which may require future attention.

4. Production of a preliminary list of EBA options for the project

The aim of this activity was to have the design of the project strategy and action plan informed by the best information, analyses and recommendations on EBA and the situation in Mount Elgon. Specifically, this activity sought to:

- Compile the results of activities 1, 2 and 3 in this consultancy and other information on relevant EBA measures provided by the Project Coordination team into a document and presentation for use by the project team and relevant stakeholders in designing the project

5. Participation in project team activities to produce project theory of change, EBA strategy and monitoring design. The aim of this activity required the consultants to participate in meetings and workshop activities organized by the Project Coordinator to:

- Present the results of the activities 1 to 4 in this consultancy and be available to answer questions on the methods used and results obtained;

- Provide technical expertise to the development of the project theory of change, EBA strategy and monitoring design.
- Identify the gaps and make recommendations on improvement in the implementation of EBA options.

1.6 Interpretation of the terms of reference

1.6.1 Identification of existing EBA measures and relevant land and water management practices

Global climate change is adversely impacting the world's ecosystems and the people that depend on them. As temperatures and precipitation patterns change, ecosystems services such as provision of food, clean water, fuel-wood, soil stability, microclimate amelioration, pollination and others are likely to be compromised. Rural communities that depend directly on these natural resources are bound to be affected most severely.

Mt Elgon ecosystem is a major water catchment area with several perennial streams and rivers originating from the biome. The area is characterized by various vegetation types, ridges and valleys which support a lot of flora and fauna. This complex ecosystem serves a lot of functions including maintenance of various life forms. Considering the diversity of sub-ecosystems in the area and their inter-linkages, an ecosystem based intervention would be the most suitable approach in understanding and designing strategies for adaptation to climate change.

This task therefore required the consultant to:

- Identify, review and analyze the existing EBA measures and current land and water management practices relevant to EBA in Uganda;
- Provide a general assessment of the performance of these measures and practices for EBA in the Mt Elgon region;

1.6.2 Rapid assessment of current capacity for EBA to Climate Change

Mt Elgon ecosystem serves important water catchment and biodiversity conservation functions. The high and increasing population pressure in the region, however, compels land users to resort to environmentally unsustainable practices. These include, among others, deforestation and continuous cultivation along steep slopes and riverbanks, consequently undermining the ecosystem capacity to supply vital life support services.

The Mt Elgon region is also highly vulnerable to climate variability, given that livelihoods strategies are tightly bound to climate. Extremes of weather, landslides, flooding, irregular rainfall patterns and other events associated with shifts in climate are already manifest in many parts. Prominently, these changes are having adverse effects on agricultural productivity and may increase food insecurity and malnutrition; as well as incidence of water borne diseases.

Communities usually devise endogenous mechanisms for adapting to changes in climatic patterns. Government institutions and civil society organizations in Mt Elgon region also have initiated some management practices and structures for enabling adaption of livelihoods to shifting environments. The most outstanding barrier in most of these initiatives is arguably the weak institutional capacity and inadequate implementation of policies and strategies.

This task therefore provides a project baseline and information on current adaptive capacity for EBA of the stakeholder groups in the Mt Elgon region to inform development of the project strategy and guide monitoring.

1.6.3 Preliminary identification of essential and desirable ecosystem services in Mt Elgon region for which management actions are required now and long term

Ecosystem services or the array of benefits provided by nature, have been described as the lifeblood of human societies, economies and identities around the world (UNEP/IISD, 2004). Mt Elgon region is a landscape of significant ecological importance. It is a watershed of international importance, feeding the waters of L. Kyoga and R. Nile in Uganda as well as L. Turkana in Kenya. River Nile continues to Sudan and Egypt where it is very critical in the livelihood strategies of these countries. This makes Mt Elgon ecosystem a trans-boundary icon.

Mt Elgon region is characterized by an assortment of sub and micro ecosystems. A large and growing human population of up to two million people lives in Mt Elgon region and derives their livelihoods from ecosystem services provided by this diverse habitat. Any strategies for ensuring the sustainable flow of these services will be based on prior identification and thorough understanding of ecosystem services that ensue from the landscape, for which then, management actions will be devised.

This task thus required the consultant to identify the principle types of ecosystem services from the Mt Elgon and their importance for people in the region and downstream. The task also involved determining any significant information gaps on ecosystem services which may require future attention.

1.6.4 Production of preliminary list of EBA options for the project

The outputs of activities 1.6.1, 1.6.2 and 1.6.3 feed into this activity to produce a preliminary listing of ecosystem-based adaptation options for the project.

1.6.5 Participation in project team activities to produce project theory of change, EBA strategy and monitoring design

This activity builds on outputs of the foregoing four activities. The members on the team and materials associated with the task are to be available in the implementation of this activity.

1.7 Scope

Since the consultancy was meant to provide sufficient information to assist in the definition of the project strategy and actions in Mount Elgon region, the activities in this consultancy involve mostly rapid methods for data collection and assessments. Thus, the research activities needed not to be comprehensive or detailed and were limited mainly to Mount Elgon region. Nonetheless, lessons learnt from other mountainous regions in Uganda enriched some activity outputs in this consultancy. It was not expected to be a very quantitative exercise, or involving a re-analysis of primary and secondary data secondary sets. Therefore rigorous analysis of data was not required.

1.8 Methods

The methods used to collect, collate and synthesize data depended on the type of information required. These methods varied from direct observations of existing EBA measures to review of literature and interviews with stakeholders.

1.8.1 Desk reviews

Despite being a relatively new approach, EBA science has been undertaken in many places of the world but referred to as catchment and/or watershed management. There are published case scenarios and best practices documented by organizations like IUCN and IUFRO. The study then also drew from global experiences to document prerequisites for effective designing and implementation of EBA strategies in mountain regions.

The quest for the best EBA strategies and practices for the Mt Elgon ecosystem also benefited from existing documentation on the adaptation to climate change in all sectors of the economy. Reports by projects and government agencies such UWA and NEMA furnished the study with information on the institutional profiles and EBA-related activities of various stakeholders in Mt. Elgon landscape. Local government documents e.g. the District Environment Action Plans, District Development Plans, District State of the Environment Reports and others were also consulted extensively.

Several earlier studies and consultancies that were undertaken in the Mt Elgon region provided valuable information on existing ecosystem services in the landscape. Peer-reviewed journal articles and reports from civil society organizations were similarly insightful.

1.8.2 Consultative meetings with key stakeholders

District-level consultations targeted the relevant departmental staff in Bulambuli, Kapchorwa, Kween and Sironko districts. The District Forest Officers (DFOs), District Environmental Officers (DEOs), District Agriculture Officers (DAOs), District Natural Resources Coordinators (DNRCs) and Community Development Officers (CDOs) were particularly helpful given their centrality to EBA-related activities.

At the national level, much of the required information for the assessment was obtained through semi-structured interviews with informants in key institutions including:

1. Environmental Conservation Trust of Uganda (ECOTRUST)
2. National Environmental Management Authority (NEMA)
3. National Forestry Authority (N FA)
4. Uganda Wild Life Authority (UWA)

5. Ministry of Water and Environment (MWE)
6. Climate Change Unit (CCU)
7. Metrology Department (MD)
8. National Agricultural Research Organization (NARO)
9. National Planning Authority (NPA)
10. International Union for Conservation of Nature, Uganda (IUCN)
11. Uganda National Farmers Federation (UNFF)

1.8.3 Rapid rural appraisal

Transect drives enabled the field team ground truth some of the information provided in the discussions with district officials and other stakeholders. The study drew from the desk review and expert consultations to obtain an inventory of past and current initiatives of relevance to EBA to climate change in the Mt. Elgon region. A broadly encompassing definition of "stakeholders" was adopted to refer to any categories of individuals, groups or organizations that affect or are affected by EBA processes. Non-formal interviews were carried out with different informants to get various opinions.

2. EXISTING EBA MEASURES AND RELEVANT LAND AND WATER MANAGEMENT PRACTICES IN UGANDA

2.1 Introduction

Throughout human history, societies have adapted to changes in their environment through alternating settlements, agricultural patterns, and other sectors of their economies and lifestyles (Lovejoy and Hannah 2005). Globally, adaptation is viewed as an important strategy, next to mitigation in tackling climate change. Unfortunately, the theory and practice of climate change adaptation is only emerging and much remains to be done to ensure adaptation measures are well designed and implemented successfully. The Ecosystem based adaptation project in Mt Elgon aims at strengthening Uganda's capacity to strengthen ecosystem resilience for promoting ecosystem based adaptation options and to reduce the vulnerability of communities with particular emphasis on mountain ecosystems. Ecosystem based adaptation is an integrated approach that involves sustainable use of biodiversity and ecosystem services in a comprehensive adaptation strategy (CBD, 2009)

2.2 Review of EBA initiatives in Uganda

The principle of ecosystem management has been widely practiced is not very different from that of ecosystem based adaptation. Therefore, ecosystem based adaptation has been indirectly applied in natural resources management in Uganda. For instance; in management of forests, national parks, water, land amongst other ecosystems. In Uganda, a number of initiatives/frameworks have been devised/modified to enable climate change adaptation and mitigation in Uganda. This is because Uganda's socio-economic development depends heavily on natural resources/environment, and climate is

a key ingredient. Some of the avenues to achieve adaptation and mitigation of climate change in Uganda are highlighted below:

Mainstreaming climate change in the National Development Planning Issues of climate variability and change have adequately been synthesized and linked to socio-economic development of Uganda in the National Development Plan (2010/11-2014/15). The NDP redefines/views climate change as a development issue to ensure climate proof development planning. Strategies as well as interventions are well presented to achieve the four objectives in order to respond effectively to climate change. EBA is addressed in objective two in the NDP where National Adaptation Plan of Action (NAPA) implementation is presented as an intervention.

Development and implementation of National Adaptation Plan of Action (NAPA) for Uganda

National Adaptation Plan of Action was launched in 2007 with support from Global Environment Fund. NAPA bases on the premise that its implementation will build community and ecosystems' resilience to adverse impact of climate change. NAPA presents a list of 9 priority projects (Box 2.1) with a cost of approximately USD 40 M. Limited progress has been made in NAPA implementation due to lack of funds and inadequate capacity to prepare detailed proposals and mobilize funding. The Royal Danish Embassy has helped operationalize the NAPA since February 2012 in four piloted districts in Uganda: Pallisa, Apac, Nakasongola and Bundibugyo. It should be noted that NAPA is a short term action for the most affected regions/districts in

Uganda; so NAPA is not a program for the entire Uganda as it is often misinterpreted (Isabirye, 2012 Per.communication). NAPA implementation draws on a Public-Private Partnership, this is crucial in climate change strategies for efficiency, equity and effectiveness. Both CSOs and Local Governments are involved in the districts piloting NAPA as shown below:

- In Pallisa district, Development Network of Indigenous Voluntary Associations (DENIVA) is piloting NAPA with close collaboration with the Pallisa local government. DENIVA is a NGO promoting indigenous knowledge.
- In Nakasongola district, the district Local government is the main implementer of NAPA and CSO collaboration is encouraged.

- Bundibugyo district, NAPA is being piloted by ACRA/World Vision in close collaboration with Bundibugyo local government. ACRA is a consortium of NGOs working on climate change housed by World Vision-Uganda.
- Apac district, ASDI, an NGO; is piloting NAPA and Apac local government participation is highly encouraged. In all arrangements mentioned MoUs are in place to facilitate the implementation and Climate Change Unit's role is monitoring.

Box 2.1: The 9 NAPA prioritized interventions in order of importance

- i. Community Tree Growing
- ii. Land degradation management
- iii. Strengthening the meteorology services
- iv. Community water and sanitation
- v. Water for production
- vi. Drought adaptation strategies
- vii. Vectors, Pests and disease control
- viii. Indigenous Knowledge (IK) and Natural Resources Management
- ix. Integration of climate change in development programs

Source: National EBA stakeholder survey, 2012 and NAPA Implementation Framework, 2008

REDD – Plus Readiness Proposal

The preparation of REDD–Plus Readiness Proposal (R-PP) demonstrates Uganda's commitment to reducing emission from deforestation and forest degradation. The REDD Readiness Preparation Proposal serves as a planning tool for guiding Uganda's preparations to become ready for REDD-Plus (Box 2.2). The R-PP provides a framework for guiding long term

investments to address Uganda's footprint on climate change through emissions reduction from deforestation and forest degradation. The R-PP implementation and the eventual REDD-Plus strategy will add value to EBA by ensuring management of protected forested areas like MENP through forest restoration thereby sustaining and enhancing the flow of ecosystem services.

Box 2.2: Prioritized actions and the stakeholders activities for REDD-Plus Readiness Preparation

The REDD-Plus Readiness Preparation Proposal prioritizes the following actions for implementation during 2012-2014:

- i. Defining institutional arrangements for implementing Uganda's REDD- Plus Strategy
- ii. Developing Policy, legal and operational procedures and guidelines for REDD- Plus implementation
- iii. Capacity building for REDD-Plus implementation
- iv. Defining strategies and actions for addressing deforestation and forest degradation and enhancing Carbon Stock
- v. Developing a national forest reference emissions level and forest reference level including future scenario
- vi. Developing a national forest monitoring system to measure, report and verify Uganda's REDD-Plus Options
- vii. Developing framework for assessing key social and environment risks and potential impacts of REDD-Plus Strategy options and implementation framework

Stakeholders will participate in the following activities:

- i. Piloting sustainable forest management initiatives such as Collaborative Forest Management (CFM), Collaborative Resources Management (CRM) and Ecotourism.
- ii. Establishing carbon stocks.
- iii. Promotion of sustainable forest resources utilization technologies.
- iv. Supervision, coordination and monitoring R-PP implementation.
- v. Assessment of causes and drivers of deforestation and forest degradation.
- vi. Defining Uganda's REDD-Plus Strategy Options.
- vii. Defining REDD-Plus Strategy implementation arrangements and modalities.
- viii. Development of monitoring reporting and verification system, Forest reference level, Communications Strategy, Consultations and Participation Strategy, Grievances and Conflict Management Strategy, etc.
- ix. Capacity building activities.

Source: R-PP, 2011

2.3 General assessment of performance of EBA measures and practices in Mt Elgon region

Climate variability has been happening in Uganda and people have adapted to different environmental calamities in various ways. To understand the existing EBA measures undertaken in Uganda, there is need to examine the major environmental factors taking place in the country. Uganda has already witnessed severe drought, heavy rains, floods; hailstorms, landslides pests and diseases and other disasters that have impacted heavily on communities. Land/mudslides have been a common occurrence in highland areas especially in Kabale, Kisoro and Mt Elgon ecosystem. Drought hit several parts of the country resulting in severe food and fodder shortages. Floods have devastated the eastern low lying areas affecting food production and availability.

Mbale District Environmental Plan (1999-2000) identified loss of tree cover, loss of soil fertility, soil erosion, poor health and sanitation as the most serious environmental factors affecting the districts of Mt Elgon districts. Communities have been adapting to these disasters over time through construction of flood barriers, terraces, hedgerows, stone barriers, domestication of vital biodiversity and construction of food storage facilities to ensure survival during time of scarcity. The response to these disasters varies but below is an outline of the existing EBA measures in the Mt Elgon ecosystem Uganda.

2.3.1 Mulching

The use of mulch and other crop residues contributes to adaptation in situations where precipitation is erratic and sometimes of higher intensity. The plant biomass/mulch absorbs the energy of falling raindrops allowing rainwater to gently flow to the soil surface where it infiltrates into soil.

2.3.2 Use of crop residues for energy

Crop residues are now a major source of fuel wood in the Mt Elgon catchment. In the four districts visited, farmers preserve maize stovers for cooking and in Bulambuli and Sironko it is often used as fodder for livestock. Because maize has emerged as a serious cash crop, many gardens are seen preserving all maize stovers while new crops grow underneath. One respondent observed that it was illegal to enter somebody's garden to take/remove these plant residues. Removal of plant residues from the gardens drains the soil of its vital nutrients

2.3.3 Crop diversification

Farmers tend to intercrop annual and perennial crops to provide for various products including fodder, fruits, vegetables and coffee. This provides for alternative income as well as improving the function of nutrient recycling. Because of serious land fragmentation, intercropping has become a major adaptation strategy for the farming community. This helps to diversify income sources and food requirements. Crop diversification reduces the risk of crop failure, thus adapting to any effects of climate change /variability. For instance, informants said that farmers in the upper slopes were mainly specializing in coffee and bananas /mid and lower slopes were using different crops

2.3.4 Integrated crop-livestock systems

Manure is a valuable input but it's often a neglected commodity in livestock and mixed farming systems. It improves soils, thus contributing to increasing crop yields with climate change adaptation benefits. Application of farm yard manure is practiced in the upper parts of Mt Elgon ecosystem as the soil nutrients are lost through erosion. It is now growing belief that farmers have to use some form of soil fertility enhancement if they are to realize the expected yields. However, heavy erosion often brings the nutrient downstream.

Practices that increase the productivity of livestock will increase food security and potentially provide extra income from milk and/or meat. This puts the pressure off illegal activities inside the park.

2.3.5 Avoided deforestation

Avoided deforestation involves any measure that prevents loss of forests. The major causes of deforestation are agricultural expansion, fuel wood and timber extraction and over exploitation of biodiversity. Several strategies have been devised by various stakeholders including UWA to avoid deforestation in the Mt Elgon forests ecosystem to build resilience because of climate change. Avoiding forest fragmentation was done by expelling encroachers from the park and replanting formerly degraded parts with trees to allow for regrowth of vegetation and farmers have been allowed to harvest herbal medicines, firewood, bamboo shoots, a delicacy in the ecosystem. UWA has a MoU with farmers to harvest these products to demonstrate sustainable use of the forest to the adjacent communities. Controlling expansion of agriculture/grazing into the forest is being enforced by UWA but challenges still exist especially with the indigenous tribes such as the Benet that used to live inside the forest.

2.3.6 Reforestation / afforestation

Reforestation, the planting of new trees in previously forested areas was piloted by the FACE Foundation project - within the Mt Elgon national park; and IUCN at the park boundaries with the aim of restoring the degraded parts and also create a buffer between community land and the park respectively. As much as this was a good adaptation strategy, it could be sustained because of funding shortages. Deforestation also continues illegally because the park is the only source of community essential needs such as firewood. This strategy should be designed in such a way that it caters for the community needs as well as the park. As much as this is a good adaptation

strategy, stakeholders point out that this is at small scale and needs to be rolled out. UWA in partnership with IUCN (Kween), MERECEP and the FIEFCo project (in Sironko) has continued to engage in this activity. Establishment of forest patches in the upper, mid and lower slopes of the Mt Elgon catchment will reduce the speed of erosion and stabilize the ground and this would consequently reduce the incidence of land slides.

2.3.7 Agroforestry

Cultivating trees in combination with crops and livestock is an old practice. However, several factors have contributed to a rising interest in agroforestry including the high pressure exerted on existing natural forests, diversifying farming to guard against effects of crop failure and provision of household wood requirements. Projects that have worked in the Mt Elgon ecosystem have identified agroforestry as a major intervention area. However, its impacts are not easily quantifiable despite of the many projects and resources that have promoted it as a major option. Some of the agroforestry practices include, taungya, home gardens, growing multipurpose trees and shrubs on farmland, boundary planting, farm woodlots, improved fruit tree gardens, windbreaks, water conservation hedges, fodder banks, live fences, trees on pasture and apiculture with trees

2.3.8 Zero grazing

The population growth rates in the study area are one of the highest in Uganda. As a result, land has been severely fragmented and farmers cannot meet their basic needs through subsistence crop production. Farmers therefore have embraced zero grazing where improved livestock varieties that often fetch better prices are kept instead of the local breeds. This is an adaptation to the stressful nature of the ecosystem that can no longer fully support the entire population. Naturally growing grass such as Kikuyu grass is the main fodder but a few farmers have planted Napier grass (KSOER, 2004) which is often

supplemented with crop residues such as maize husks, leaves and banana stems.

2.3.9 De-silting of rivers during the process of sand mining

The many rivers that drain from the Mt Elgon ecosystem are heavily polluted as a result of agriculture activities taking place adjacent the rivers. Because of the pressure on agricultural land farmers cannot leave the mandatory 100m recommended by NEMA along river banks, as a result, a lot of soil is washed down stream. De-silting has been done through the practice of sand mining. Sand mining is an off farm income generating activity that is taking place downstream in all rivers and tributaries of the ecosystem but there are well designed strategies for stopping silting of rivers. By de-silting through sand mining, rivers are protected from over-flooding downstream and occasional changes in course.

2.3.10 Use of energy saving technologies

“Firewood is one of the most expensive commodities in Kapchorwa” and people have to devise means for getting fuel wood. Energy saving technologies such as stoves and solar energy have been options suggested for promotion in the various district development plans. However, energy saving technologies are quite expensive to be acquired by these poor communities. The technologies have to be acquired through subsidies though some farmers have already acquired them due to prevailing energy shortages in the target districts

2.3.11 Alternative income generation

Off-farm income generating activities are becoming common phenomenon. The District Development plans in Kapchorwa, Kween, Sironko and Bulambuli mention promotion of these high value enterprises as an adaptation the pressure exerted on the Mt Elgon ecosystem. For instance, there is gradual increase in the number of people involved in apiculture, fish farming and growing of high value crops such as apples, barley and wheat. Some youths opt

to travel to Mt. Elgon national park illegally to harvest bamboo shoots, poles, firewood and charcoal for commercial purposes while others are involved in sand mining.

2.3.12 Drought resistant crop varieties

Recognition of climate variability is taking root in the Mt Elgon ecosystem. Farmers in Sironko for instance used to grow maize varieties from Kenya but because of decrease in productivity of these varieties, they have resorted to varieties of the Longe series that are more drought resistant. Sorghum has become a major famine cash crop in Sironko and Kapchorwa where it was not traditionally eaten or used.

2.3.13 Tree pollarding

Tree pollarding has taken centre stage in time of severe wood shortage. All trees are heavily pruned to avail firewood to their owners. This is an indication that the ecosystem can no longer provide adequate wood fuelwood to satisfy the entire community.

2.3.14 Group or communal labour

The concept of communal labour is not common in the Mt Elgon ecosystem. However, due to labour intensive nature for construction of soil and water conservation structures, a group of farmers in Kapchorwa organized itself and offered labour for the construction of contour bands in their respective pieces of land. This was done in such a way that entire farmer group would help a member construct before they move to the next. This was an adaptation to the labour intensive nature of the construction process.

2.4. Current land and water management practices relevant to EBA

2.4.1 Rainwater harvesting

Rainwater management has begun in the ecosystem though in a rudimentary way. The harvested water is either stored in drainage ditches within the gardens for production purposes or storage tanks for domestic use. Water storage tanks are being acquired to ensure sustainable water supply.

2.4.2 Irrigation of crops

Farmers have started harnessing the vast amounts of water for production. For instance drainage channels are created off rivers for use in rice growing in Bunambutye sub-county.

This is also manifested in the acquisition of irrigation pumps by some farmers and this led to an increase in production in Bulambuli (DAO Bulambuli, personal comm.). In Kween for instance, Action Aid started establishing gravity flow schemes within the national park and this water would be used for both domestic and agricultural use thereby contributing to households' access to sufficient water supply.

2.4.3 Restoration of river banks

Most rivers in the Mt Elgon farming system are heavily silted. This is manifested by in the extent of dirty water observed in most of the rivers. Poor agricultural practices are the major causes of the silting of rivers. IUCN in partnership with Kween/Kapchorwa local government marked out boundaries of river Atari and protected to allow for natural regeneration of the vegetation. However, this is an isolated case in a very large Mt Elgon ecosystem

2.4.4 Terracing and contour bands

Terracing and establishment of contour bands is an ideal land management practice in the Mt Elgon catchment. However, farmers find it labour intensive and costly in terms of time and its not as

appreciated as it should be. However, isolated cases of construction of contour bands and reinforcing them have been reported in Kapchorwa and are not highly pronounced in most of the target districts because farmers believe they are labour intensive.

2.4.5 Water channels in crop gardens

Farmers divert running water into their gardens. This helps farmers gardens to remain moist even during rain/water shortage. Rainfall has been described as erratic and such measures help farmers do early planting by conserving moisture for use in case drought suddenly breaks out. The water is used in banana and coffee gardens in Kween and Kapchorwa districts and rice growers in Bulamuli and Sironko districts.

2.5 Gaps in implementation of existing EBA and land and water management practices

Ecosystem-based approaches in the Elgon ecosystem have generally addressed a broad range of climate change impacts, including water shortage, floods, storms, soil erosion and ecosystem productivity and resilience. However socio-economic considerations such as population pressure and land tenure have not been seriously considered. These have to be seriously factored in during the implementation of any EBA measures.

Sustainability for the various interventions has not been adequately handled and many useful EBA measures have not been scaled out. The ecosystem-based approaches to adaptation should be integrated into relevant strategies, including national adaptation programmes of action (NAPAs), flood control, disaster risk reduction planning and biodiversity conservation strategies. This is based on the premise that previous interventions have left traces of impact despite the huge sums of money that have been used in the implementation of such measures.

2.6 Previous and ongoing EBA-related interventions in Mt Elgon region

For long, Mt Elgon ecosystem has been a focal point of conservation activity given its importance as a water catchment and biodiversity conservation hotspot. Most conservation activity has been in response to the high population pressure that compels land users in this highly mountainous landscape to resort to environmentally unsustainable practices, consequently compromising the ecosystem capacity to supply vital life support services. In addition, given that livelihoods strategies are tightly bound to climate and ecosystem services, the Mt Elgon region has of late drawn increased attention from conservation agencies because of its high vulnerability to climate variability. To improve the resilience of both the ecosystem and the local community in Mt Elgon region, a number of projects/programs have been implemented and among these projects/programs are the following:-

1. Mt Elgon Conservation and Development Project (MECDP) implemented by IUCN from 1988 to 2002 focusing on control of encroachers in Mt Elgon.
2. The Mt Elgon Regional Ecosystem Conservation Programme (MERECP) is a trans-boundary project implemented by Lake Victoria Basin Commission of the East African Community from 2005-2010 in the districts of Kapchorwa, Bukwo, Sironko, Manafwa, Bududa and Mbale in Uganda; and Trans-Nzoia West, Kwanza, Mt. Elgon in Kenya with funding from Norway and Sweden.
3. Uganda Wildlife Authority (UWA)-Face Foundation Project in which UWA and FACE Foundation signed an agreement whereby FACE Foundation undertakes the regeneration of forests through tree planting in the restoration zones of MENP. FACE Foundation was also entitled to the resultant carbon credits/benefits arising from the planted trees. UWA was ultimately responsible for the management of the planted trees/forests and UWA was benefiting from the restored-forest which is an integral part of MENP. UWA-FACE Foundation embarked on planting tree for carbon absorption in 1994 but this project was cut short due to local land conflicts.
4. The Livelihoods and Landscapes Strategy (LLS) project for Mt. Elgon (2008-2011), was implemented by IUCN in Benet Sub-County, Kapchorwa district and funded by the Netherlands Government. The overall goal of the LLS Strategy was “the establishment of national and local policies and programs that optimize forest’s contribution to rural poverty reduction; enhance long-term and equitable conservation of biodiversity and ensure the sustainable supply of forest-related goods and services” and “improve the livelihoods and landscape of the Benet community.
5. The Territorial Approach to Climate Change (TACC) project (2010-2012) is a UNDP, DFID and Danish funded project that is being implemented in the three districts of Mbale, Manafwa and Bududa in the Mt Elgon region of Uganda. The overall objective of the project is to support low-carbon and climate change-resilient local development in Uganda. The TACC project offers several opportunities for synergies with the EBA project.
6. Tree Planting Project in Mt Elgon Area of Uganda (2010-2013) and is implemented by the Mbale Coalition Against Poverty (CAP) and funded by the Waterloo Foundation UK with the aim to establish 20 Community Environment Groups each with a nursery bed to raise tree seedlings for distribution and planting in the local communities.

7. Sironko District Landslide Project was implemented in 2002-2003 and funded by the German Technical Cooperation (GTZ) through the Prime Minister's office. The project covered over 12 hilly and mountainous sub-counties and commissioned a study on landslides in the Mt. Elgon region with the aim of mapping out the landslide prone areas in Sironko District, the causes and impacts of landslides in order to devise appropriate mitigation measures.
8. Sio-Malaba-Malakisi Project (2006-2011) implemented in both Uganda and Kenya. The Sio-Malaba-Malakisi project aimed to establish a sustainable framework for the joint management of the water resources of the Sio-Malaba-Malakisi catchments in order to prepare for sustainable development-oriented investments for improved living conditions of the people and environment protection. In Uganda, the project covered five districts in Mt Elgon region namely: Bududa, Bugiri, Busia, Butaleja, Manafwa, Namutumba, Pallisa and Tororo.
9. Kapchorwa River Bank Management and Conservation of Mt Elgon National Park Buffer Area (May –August 2005). This was a UNDP/GEF Small Grant Project implemented by Kapchorwa Community Development Association (KACODA). KACODA is a community based organisation promoting sustainable community development initiatives such as tree planting, improved agricultural practices and conservation education. The GEF focal area addressed in this project was land degradation.
10. Farm Income Enhancement and Forestry Conservation Project (FIEFOC) (2004-2006) is supporting tree planting and watershed management activities in the sub-counties of Butandiga and Bukhulo in Sironko district and Bunambutye/Bwihonge in Bulambuli district.
11. Collaborative Management of Mountain Elgon National Park implemented by Uganda Wildlife Authority (UWA) and the National Forestry Authority focusing on tree planting and conservation activities in the protected areas.
12. Composting of Solid Waste into Manure is a Clean Development Mechanism project implemented by National Environmental Management Authority (NEMA) in Mbale Municipality and funded by the World Bank. NEMA also supported the former Mbale district to prepare a District Environment Action Plan between 1995 and 1997.
13. Uganda's Readiness Preparation Proposal (R-PP) was approved at the 9th meeting of the World Bank's Forest Carbon Partnership Facility (FCPF)'s Participants Committee (PC). Uganda will receive US\$3.4 million to prepare a REDD-plus strategy, reference scenario and Monitoring, Review and Verification (MRV). This project will aim at establishing partnerships with planned interventions such as the REDD readiness preparation project in order to ensure sustainability of project results.
14. The UN Joint Programme on climate change brings together a range of UN agencies offering a wide range of expertise to support the Government of Uganda's climate change priorities. At the district level, a training package will be supported by an advocacy campaign and complementary activities while at the community level, trainings will be backed by advocacy at the household level and complementary activities to support targeted communities to respond to climate variability and change.

Several of the interventions have been collaborative, involving many stakeholders. EBA project can always draw on the experiences and lessons learnt from such stakeholders some of whom are closely involved in EBA implementation and or found in EBA project area.

2.7 Recommendations on relevant institutions working in the area of EBA

The commercialization of forest products has accelerated the demand for the products and hence increased the pressure on such products. This is an opportunity for bringing these essential resources to the farm by integrating their production in the existing farming system.

Adaptation strategies that will work in the Mt Elgon ecosystem will involve a range of actions, including behavioural change and attitudes. For instance, bamboo harvesters believe that bamboo cultivated on-farm is less palatable than that harvested from the wild.

A catchment approach to the challenges of the ecosystem would be better option because there are a number of successful EBA measures but have not been scale-out to the entire landscape.

3. CURRENT CAPACITY FOR ECOSYSTEM BASED ADAPTATION IN MOUNT ELGON ECOSYSTEM

3.1 Introduction

Ecosystem-based Adaptation (EBA) to climate change is inevitably a multi-stakeholder undertaking given the diversity of processes that underlie the status of ecosystems. Being a relatively new approach, stakeholders' capacities may not be guaranteed. Successful EBA usually involves multiple stakeholders working with local communities to build on existing good practices in natural resource management, but also involving elements of communicating and educating, while also attempting to fit into wider adaptation strategies.

In this chapter, we assess the current capacity of likely EBA stakeholders to contribute effectively to envisaged EBA processes. We also review the practicality of EBA as a conservation approach in light of stakeholder relations and key processes in the Mount Elgon ecosystem.

The appraisal sought to establish who the EBA stakeholders in Mount Elgon ecosystem are at various levels and reasons why they are considered of importance to EBA in the region. Table 3.1 outlines the range of stakeholders in EBA in Mount Elgon, while Figure 3.1 illustrates their relative importance to EBA processes.

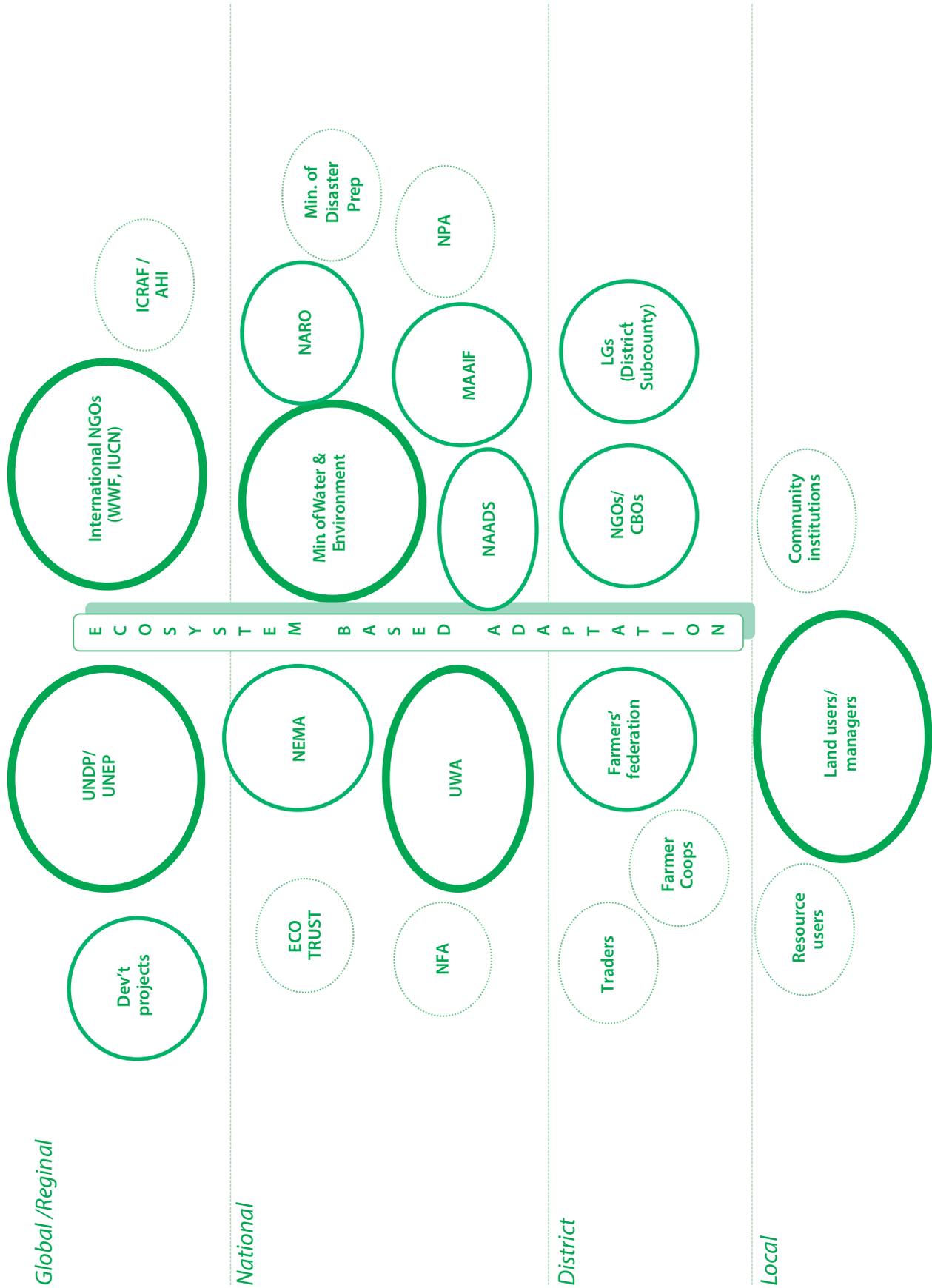
3.2 Multi-modal institutional analysis of EBA stakeholders in Mount Elgon

A rapid stakeholder identification and prioritization sought to understand the institutional context in which EBA to be done. The exercise involved dialogue with district technical staff, selected communities and key institutions. The research team based on insights gained there from and secondary data to generate a list of potential stakeholders and their mandate areas/activities, which was used to tease out categories of stakeholders in EBA at global, national, regional/district and local/community levels.

Table 3.1 EBA stakeholders in Mount Elgon ecosystem at various levels

| Level | Category | Sub-categories |
|------------------------|--|--|
| National | Civil society | ECOTRUST |
| | Government ministries | MW&E, MAAIF (includes NARO, NAADS), MoDP |
| | Parastatal agencies | NEMA, NFA, UWA, NPA |
| Regional/district | Private sector | Produce traders |
| | Farmer organizations | Farmer cooperatives, Farmers' federations |
| | Civil society | Various NGOs and CBOs |
| Local/community | Local governments | Districts, Sub counties |
| | Cultivators | Distinguished by crop enterprise (i.e. vegetables, coffee-banana, annual /intensive); slope location (i.e. upslope, mid slope and down slope); and interest (i.e. irrigation, drying produce, fertility increase, erosion control, flood control etc.) |
| | Water collectors | Domestic use and commercial |
| | Fuel wood suppliers (collectors & traders) | Distinguished by scale (i.e. domestic or commercial); and product (firewood, charcoal and bricks). |
| | Fuel wood users | Domestic, Commercial, Institutional |
| | Timber dealers | Distinguished by mode of operation (i.e. official or illicit) |
| | Local constructors | Distinguished by level of specialization (i.e. casual/part-time or professional/full time). |
| | Livestock keepers | Distinguished by system i.e. zero grazing, tethering of open grazing) |
| | Herbalists | Distinguished by level of specialization (i.e. casual or professional) |
| | Bee keepers | Farmers, Honey dealers |
| | Tourists | Visitors, Guides, Craftsmen |
| Fish farmers | Farmers | |
| Community institutions | Social groups, Cultural, Religious etc. | |

Figure 3.1 Stakeholder Diagram for EBA in Mount Elgon Ecosystem



3.3 Indications of stakeholders' capacities for EBA at the national level

3.3.1 Policy context

At the national level there are quite a number of policies, strategies and frameworks for sustainable natural resource management. Furthermore environment management issues have been decentralized to district local governments, which can formulate and implement area specific ordinances, bye laws and regulations to enhance ecosystem resilience. The National Environment Management Authority has the mandate to coordinate and supervise environmental activities all over the country. Key players in policy formulation for environment management/EBA include MWE, NEMA, NPA, CCU and other stakeholders.

The NPA provides guidelines for all sectors to integrate climate change in development efforts. NPA further emphasizes sensitization, strengthening institutional capacities, civil society involvement, partnerships and linkages with the international players as being critical for climate change adaptation. NPS has developed vision 2040 which aims at transforming Uganda into a middle class society with a per capita income of not less than US \$ 9500. Both climate change adaptation and the green economy concept are entrenched in vision 2040. Although substantial policies, strategies and frameworks for ecosystem management are in place, the bigger challenge is their implementation.

Box 3.1 Key issues for EBA to note from the existing climate data

- While total precipitation in most parts of Uganda has not changed significantly, distribution and intensities have changed substantially causing unfavorable impacts;
- There are shift in rainfall and dry seasons;
- Mountt Elgon rainfall intensities have increased leading to soils being saturated with water which is one of the drivers of land slides;
- Minimum temperatures are on an increasing trend over the years contributing to ecosystem degradation in Mt Elgon.

3.3.2 Institutional capacities

The Department of Meteorology

The Meteorology Department is the national key player in monitoring, analyzing and dissemination of climate information in Uganda. The department has a network of metrology stations across the country, which fall in three categories; synoptic, climatological and rainfall stations. Synoptic stations provide all the weather parameters every three hours and are relayed to a central server which enables sharing of data with a wide range of stakeholders (e.g. MAAIF, NARO, NEMA, CCU, IGAD member states, Global Metrology System etc). Synoptic metrology data is used for daily weather forecasts, among other things, and is disseminated through several channels including radios, televisions, newspapers, websites (www.ccu.go.ug) and other channels. The CCU is planning to set an information centre with support from the European Union. This will provide additional capacity to disseminate metrological and related information.

The meteorology department participates in seasonal climate forecasts at both regional (Horn of Africa/IGAD) and national levels. National level climate forecasts are disseminated to individual districts, which in turn are supposed to pass on the information to farmers for application. With regard to climate change, the two most critical climate parameters for Uganda are rainfall and temperatures.

Plans are underway to transform the MD into an authority and this will improve effectiveness (improve data collection, analysis, disseminate, interpretation, application and forecasts).

Nonetheless, meteorological data currently being collected is not sufficient. Some districts completely lack metrological stations. Some of the metrological stations installed at the NARO institutes have been vandalized or stolen. Existing stations by other institutions and departments need maintenance or even upgrading. This creates need for more equipment and transportation facilities.

Ministry of Water and Environment

The Ministry of Water and Environment monitors river flows (quantity and quality) and this data can be used to forecast disaster in flood plains. At the moment, however, there seems to be limited national capacity for early warning information on climate related disasters. There is limited data and capacity to analyze, disseminate, interpret and apply meteorology data among key players.

The MWE is providing a leading role

in preparing the REDD+ project for Uganda. In addition to the proposal, national level guidelines to implementing REDD+ are also being prepared to detail. Other stakeholders have participated in preparation stages including UWA, NFA, NARO and others. The project will see Uganda sell more carbon credits, benefit sharing by participating communities, conflict resolution in contested areas such as those in Mt Elgon ecosystem. The UWA, IUCN, district and sub county local governments and affected households are key players in resolving conflicts in Mt Elgon contested areas. However, before REDD+ takes off there will be pilot/demonstration projects to provide lessons that will be used for adapting REDD+ activities.

Besides, the Ministry of Water and Environment (MWE) has mapped the country into four (4) major drainage systems (L. Victoria, L. Kyoga and L. Albert and Upper Nile) catchments to strengthen ecosystem management. Mt Elgon ecosystem lies in L. Kyoga catchment system. The ministry is developing detailed catchment based management options for each of these drainage systems.

Box 3.2 Critical elements for the L. Kyoga catchment

- Recognition that population density is a key driver of vulnerability;
- In relation to population density, many parts of Mt. Elgon ecosystem have far exceeded their carrying capacities and hence increasing vulnerability;
- Fragile ecosystems like the steep slopes of Mt Elgon should not be used for farming and settlements. They would rather be utilized for forests;
- Many parts of Mt Elgon ecosystem have been over fragmented which jeopardizes appropriate catchment management;
- High population density is the major cause of encroachment of parklands, forests and wetlands leading to reduced supply of ecosystem services;
- Population control is defined as having the capacity to manage available resources;
- Domestication of livelihoods (ecosystem services) would reduce catchment degradation;
- Diversification/alternative livelihoods (ecosystem services) would reduce catchment degradation;
- Emphasizes participatory approaches in ecosystem management options;
- Involvement of the most vulnerable groups in decision making and planning is key to successful EBA implementation.

The Climate Change Unit

There are many players involved directly and indirectly in reducing disaster risk due to climate change. The CCU unit is responsible for coordination of the various national efforts to mitigate and adapt to climate change impacts. The unit is implementing pilot projects in the districts of Pallisa, Apac, Nakasongola and Bundibujjo. Lessons from these pilot projects will feed into the implementation of the National Adaptation Programmes of Action (NAPA).

Pilot projects for NAPA since 2011 indicate that public/private partnership is important in successful EBA implementation. Similarly different stakeholders are providing leading roles depending on who is most suited to do what. This has enabled promotion of synergies in project implementation. MOUs have been signed between CCU and civil society organizations e.g. DENIVA, ACRA, World Vision and others.

Box 3.3 Ecosystem based activities by pilot projects**Box 3.3 Ecosystem based activities by pilot projects**

- Increasing tree cover using agroforestry technologies
- Reducing land degradation
- Strengthening metrological services to obtain more reliable information. At the same time CCU is empowering people to be able to utilize metrological data
- Draught adaptation research to generate quick maturing/draught tolerant crop varieties
- Water for production including water harvesting, storage, sustaining soil moisture
- Water and sanitation including flood control, pollution and contamination control
- Pest and disease control to take care of climate change related crop epidemics
- Indigenous technical knowledge which can be improved upon and/or scaled out for adaptation
- Integrating climate change adaptation in all development strategies at all levels.

National Forestry Authority (NFA)

NFA collects monitors, analyses and disseminates forest land use and land use change, forest biomass. The authority is partnering in implementing REDD. The key stakeholder the data is disseminated are communities adjacent to forest reserves and legislators. The channels for dissemination are reports and events organized by other stakeholders. NFA has a full sector in Mount Elgon.

NFA has capacity for EBA in some areas like professional/technical capacity. There are specialists in ecosystem management employed by NFA. However, in most crucial areas like financial resources, the authority faces serious challenges.

NFA considers the vulnerable in forest management. There is a community coordinator, reaching out to the communities especially adjacent to the forest reserves. The community coordinator implements collaborative forest management. The vulnerable groups need to be consulted in climate change programs but there is a cost in consultation which no one wants to bear.

The Uganda Wildlife Authority

The Uganda Wildlife Authority collects limited data (ranger based data) on illegal activities, encroachment, dead animals in the park and phenology of specific trees in the park. This data is fed into a management software system (MIST) and used for park management decisions. This data is not sufficient for their requirements. Some parks have weather stations but others including Mt Elgon park do not have. UWA strategic plan will address issues of more research data collection, analysis, interpretation, dissemination and application. This will enhance park management and improve sustainable provision of ecosystem services.

The UWA remits 20% of the gate collections to respective district and sub county local governments, communities and individual households through the community conservation project. Fund allocation to households is done by community level committees. At house hold levels, these funds are used to implement alternative income generating activities but must be in relation to park conservation.

This approach enabling improved conservation of national parks as well as capture of data on products (e.g. bamboo shoots, herbs, medicines, firewood, others) communities obtain from the park.

Another strategy by UWA in Mount Elgon Park is to encourage replication/ domestication of park services in farm lands. For instance UWA is encouraging growing medicinal plants on farms to reduce pressure on the park. Furthermore UWA is encouraging and providing technical backstopping to investors to develop tourist sites (e.g. rocks, springs, falls etc.) outside gazetted areas. This will enable communities to earn money directly from tourism activities. The multi-stakeholder approach used, involving IUCN, UNDP, local governments, politicians, communities, households, MERECEP, WWF, FACE, NGOs, CBOs and others reflects strong capacity for EBA.

Other important lessons from UWA include the need to consult the affected people to promote project ownership, sharing resources with stakeholders provides incentives for participation and need to follow up on what politicians have promised communities in relation EBA activities.

The Uganda National Farmers' Federation

The Uganda National Farmer's Federation (member based organization) has country wide coverage with contact farmers at village level who can be used for technology transfer. The federation also has partnerships with various national and international stakeholders, and is a member of the World Farmers Organization and the Commonwealth Farmers Organization.

Uganda National Farmer's Federation is implementing several programs, strategies and activities to enhance farmer resilience to climate change impacts. These include sensitizing farmers (Mityana, Mukono, Wakiso, Mayuge and Bugiri districts) on

climate change adaptation, HIV/AIDS and gender; conducting climate change adaptation studies (Nakasongola, Sironko and other districts; and promoting energy saving technologies (improved cook stoves and making briquettes), less stressful farming, water harvesting and storage, and conservation agriculture.

The federation has several forums for sharing experiences, which include Annual Agricultural Shows (2012 show-cased climate adaptation technologies for irrigation, water harvesting and storage) and regional pre-season planning workshops where participants get information from district production officers, NAADS coordinators and NARO scientists. The federation also shares information through its website (www.unafe.org).

Environmental Conservations Trust of Uganda (ECOTRUST)

The Environmental Conservations Trust of Uganda (ECOTRUST) is largely involved in building partnerships to conserve Uganda's natural resources. Currently ECOTRUST is implementing Smallholder Carbon Sequestration Schemes/Carbon Farming programs, Conservation Areas/ Buffer Zones close to critical ecosystems, operates a land trust and is promoting the Solvatten Water heating equipment for carbon credits, among others.

Box 3.4 Key undertaking by ECOTRUST in Mt Elgon region

- 60,000 seedlings of indigenous species planted on degraded hill tops e.g. Walaga hill, Manafwa district.
- 75,000 seedlings planted in Bukusu Sub County
- 20,000 in Bubutsatsa parish
- Most of these activities are in partnership with the private sector e.g. Standard Chartered Bank, Nile Breweries, Coca Cola and NTV.
- Carbon farming project under plan vivo in Mbale, Bududa and Manafwa districts.
- Project is increasing tree planting to the tune of 100 trees ha⁻¹ in coffee agroforestry systems.

The trust has developed robust procedures for buying carbon based on additionality. It also exhibits capacity to conduct pre-project biomass and social assessments, stakeholder consultation, mobilization of local communities and facilitating their involvement in decision making. Under Plan Vivo system of carbon farming project ownership by communities and individual farmers is paramount, an attribute that augurs well with EBA principles.

The International Union for Conservation of Nature (IUCN)

IUCN has worked in Mount Elgon Ecosystem for more than 10 years and has rich experiences in EBA strategies for this region. Currently IUCN is implementing EBA options in Mt Elgon.

One of the activities is gravity water flow scheme along River Sipi in Sanzera parish, Kaawo Sub County of Kapchorwa district. This area is in the rain shadow of Mt Elgon region. IUCN conducted payments for ecosystem services vulnerability assessment which revealed that water was one of the most demanded ecosystem service in this area. Gravity water is very critical for household use and irrigation. This scheme has a number of important elements of relevance to any prospective EBA strategy (Box 4.1).

Box 3.5 Some lessons from IUCN experience in Mt Elgon

- Region is highly vulnerable to impacts of climate change;
- Region is a huge landscape thus requiring many actors for effective EBA to climate change;
- In the past there has been a number of scattered efforts to promote EBA strategies;
- Preventive interventions are critical especially changing the perceptions and practices of local communities in the ecosystems;
- A multi-stakeholder platform for sharing information, experiences and discussions on critical issues is essential for implementing EBA options in Mt Elgon;
- Building synergies to address critical gaps and avoiding duplication of efforts is required for implementing EBA options in Mt Elgon.

Box 3.6 Key elements of IUCN gravity water project of relevance to EBA

- Forms part of the district local government development plans;
- Local communities provide labour;
- Builds capacities for project implementation and sustainability;
- Creating demand for ecosystem sustainability;
- Promoting agroforestry technologies
- Communities contributing to revolving fund as a credit and loan scheme for farmers;
- Rewards compliant farmers especially whose land is along the river;
- Using the Poverty Forestry Linkages Tool Kit which enables assessment of products people obtain from the forest reserve;
- Targeting the very poor since they are most vulnerable to climate change impacts;
- Encouraging alternative livelihood strategies.
- Using community level envisioning approach to implement project activities;
- Using group approach to provide labour and other project activities.

National Agricultural Research Organization (NARO)

The National Agricultural Research Organization (NARO) has trained several scientists at PhD and Masters levels in climate change related areas including carbon sequestration, crop modelling, soil science, hot spots adaptation to climate change in terms of nutrition and food security. NARO has also trained one scientist from each of the 14 public research institutes on climate change and they are the climate change focal persons (climate change champions) for their institutes and the organization.

In addition NARO has trained at least one (1) technician from each institutes on managing metrological stations and data collection at their respective institutes. This training was followed by installation of modern metrological stations at every institute. This strategy was intended to improve integration for climate change into the national research system. However, gaps still exist particularly the capacity to analyze metrological data and making effective forecast and early warning there from.

Box 3.7 Key NARO activities related to climate change

- Improve water access through roof and rock harvesting and post-harvest storage;
- Soil and water management;
- Deepening shallow wells to increase water storage capacity;
- Partnering with district local governments to disseminate improved technologies;
- Utilizing the Agricultural Research Information System (ARIS) to disseminate improved technologies;
- Reforestation of degraded areas;
- Promoting bee keeping as an alternative livelihood strategy;
- Promoting use of organic and inorganic fertilizers to replenish plant nutrients;
- Promoting the use of grain *Amaranthus spp* for improved nutrition;
- Promoting growing of apples;
- Implementing a project on assessing carbon sequestration by banana varieties in partnership with the banana programme of NARL/Kawanda;
- Training farmers on soil and water management.

NARO has also put in place a forum for developing climate change related proposals and submitting them to potential funding organizations. One such initiative has won funding and a project is being implemented by Mbarara Zonal Agricultural Research and Development Institute (MBAZARFI) promoting the use of draught tolerant chick peas as a cover crop during the dry season.

In the near future the climate change programme of NARO is planning to develop specific interventions for hot spot (areas highly vulnerable to climate change impacts), develop options for supplementary irrigation and water engineering, risk and vulnerability assessment and retooling of University lectures for climate change

National Environment Management Authority

The National Environment Management Authority (NEMA) is mandated to create

national awareness on climate change and environment management. Individual Ugandans have been empowered to report cases of non-compliance to the Uganda Police, NEMA or other relevant authorities. There are increasing cases of non-compliance being reported directly to NEMA which is an indication the impact of awareness campaigns by NEMA and other stakeholders. In addition NEMA has created and trained within its ranks a unit of environmental police which is instrumental in enforcing environmental regulations.

Box 3.8 Key NEMA activities related to climate change

- creating/raising awareness on environmental issues;
- Participating in policy formulation for climate change adaptation and mitigation;
- Fostering mainstreaming environmental issues in national and local development agenda;
- Backstopping district local governments on environmental issues;
- Ensuring partnerships with other organizations and line ministries on environmental and climate change issues;
- Implementing a project on payments for ecosystem services in collaboration with private forest owners, civil sector, Tallow oil and others;
- Promoting alternative livelihood strategies;
- Tapping political good will and guidance in implementation of environmental programmes;
- Encouraging tree planting on land slide areas;
- Encouraging district local governments to formulate byelaws and ordinances to promote sustainable environmental management.

The authority has instituted at every district several environmental police officers who have been trained and empowered to handle cases of environmental non-compliance. NEMA is also training environment inspectors based in ministry of justice as well as environment officers in district local governments to handle issues of climate change and environment in general. These personnel will be/are key in awareness raising, empowerment and enforcement of environmental regulations. For instance through these personnel, NEMA created awareness in Mount Elgon about the potential dangers of settling and cultivating steep slopes in Bududa district, although it was noted that the most vulnerable often do not have the capacity to respond. These personnel are also important in monitoring environment-related processes.

3.3.3 Capacity development initiatives at the national level

Efforts are being made by different stakeholders to build the required human capital for ecosystems based adaptation.

NEMA is implementing a World Bank funded project to build human resource capacity for environment management at different levels. The climate change unit has trained ten (10) people from each of 70 districts including the Mt Elgon region on EBA options. The Environment Conservation Trust of Uganda (ECOTRUST) has trained many people on integration of trees in coffee agroforestry systems, monitoring and calculation of carbon credits in these systems and related issues in the Mt Elgon region. The International Union for Conservation of Nature (IUCN) has trained so many people on conservation practices for the Mt Elgon region.

In addition to these efforts, the National Curriculum Development Centre, and other stakeholders is developing climate change curriculum for ordinary and higher level schools. Climate change will probably not be an examinable subject at these levels but integrated into the school activities. Makerere University in partnership with the National Curriculum Development Centre,

NARO and other stakeholders are also developing a graduate course on Climate Change Impacts, Adaptation and Mitigation Strategies. This will enhance the pool of climate change professionals in the country.

3.4 Indications of stakeholders' capacities for EBA at regional/district level

The main actors at this level are the district and sub county local governments. Under the decentralized administrative system, the district and sub-county departments play a pivotal role in directing development trends at the grass roots. Many critical decisions are made at these levels.¹ District and sub-county administrations are thus the official gateway into land user communities and an important reference point for any external interventions and government programs (e.g. NAADS and PFA).

The local council structures are perhaps the most reliable mechanism for mobilizing rural communities in Uganda. They provide a framework for organizing simultaneous natural resource management activities over relatively large geographical and administrative territory, which can be of importance to watershed management. These structures are also embodiments of legal authority that enables enforcement of regulations regarding land use management in the watershed.

The main challenge faced by local administrations in natural resource management is inadequate funding. Also, as a regulatory entity, the local administrations have the authority to pass

bylaws and ordinances to effect favorable land use practices. However, not many such legislation have been passed. Some informants were apprehensive of the local administrations especially at the sub-county, blaming their inefficiencies for the demise that has befallen environmental conservation legislation. Concerns lie mostly at the sub-county level where the responsible officers tend to focus more on safeguarding their political interests as opposed to protecting the ecosystem. Such preference for self above service may compromise to intentions of EBA, especially those that are not necessarily local or short term.

3.5 Indications of stakeholders' capacities for EBA at local/community level

Resource collectors in park adjacent communities

Mount Elgon communities have exhibited intricate attachment to natural resources in their vicinity with values in support of conservation of biodiversity being maintained through systems of totems. People also used to cautiously harvest resources like bamboo to enable regeneration. With increasing populations and demand for resources, many resources have taken on commercial value, fueling further unsustainable harvesting.

A history of tense relations and conflict with park adjacent communities and UWA, the custodians of MENP, over disputed entitlements to park resources has generated need for more participatory conservation strategies e.g. revenue sharing and community conservation. This though is yet to set root and several informants made pleas to UWA to reduce on the "kibooko" – i.e. use of harsh punitive measures especially caning. If swept under the carpet or inadequately managed, such relation of mistrust are likely to compromise EBA activities.

¹ Decentralization functions through a five-tier system of local councils. At the base of this local government structure are the village local councils or LC1s, which oversee a village of 50-100 households. All adults (above 18 years) residing in a particular village elect a nine-member local council executive committee. Beyond the village or LC1, in ascending geographical size are the parish (LC2), sub-county (LC3), county (LC4) and district (LC5) councils. The sub-county (LC3) is the basic unit of local government both political and administrative. The district (LC5) is the highest level of local government that links up with the central government.

Tree growers

Tree cover in the project districts has declined tremendously over the last decade or so, a trend largely attributed to rising demand for fuel wood and income. In Ngenge, the loss of vegetation cover is also attributed to cattle wrastling by Karamajong warriors, which deprived households of cattle, which hitherto formed the basis of household and community livelihood. Generally, tree growing remains predominantly characterised by traditional practices like retention random trees on farms and patches of Eucalyptus woodlots. Coffee shade agroforestry is common mid slope and involves retention and occasional planting of *Cordia africana* and *Ficus natalensis*. Ecosystem based adaptation strategies that build on this will fall on fertile ground. However, prospects in carbon trading will have to offset high preference for faster growing exotics e.g. *Eucalyptus spp.*, *Grevillea robusta* and *Pinus spp.* as opposed to indigenous trees that most carbon standards give priority.

An increasing number of privately owned tree nurseries are also evident, though focus is limited to pine, eucalyptus and an assortment of ornamentals. IUCN and various CBOs have also registered significant successes in establishment of community and group nurseries in several sites.

Crop cultivators

Subsistence agriculture is the basis of community livelihoods in the entire project area, though crop enterprises vary across slope levels (Table 4.1). The upper slopes support farming activities through out the year though farms are smaller, and soils are less productive. Down slope farms are more commercially oriented due to availability of land and the flat terrain allows for modest mechanization (e.g. use of tractors and oxen ploughs) in comparison to the upper slopes where the hand hoe remains the dominant technology.



Figure 4.1 Brown river waters as an indication of inadequate land and water management capacity

Crop yields are generally reducing in terms of both quality and quantity. This is especially attributed to the declining soil fertility on the upper slopes, because of continuous cultivation. The soils there are classified as having low erodibility but cultivation on steep slopes without use of soil conservation measures renders erosion inevitable. Quantifiable indicators of the magnitude of this problem are not available at present, but the general perception is that soil erosion is increasing and fertility declining. Erosion gullies are evident in many places, as well as brown river waters loaded with soil sediment during the rainy season.

The farming systems exhibit a few inbuilt mechanisms for curbing soil erosion. The intercropping of beans in banana and coffee gardens is an old practice that ensures optimal use of land while at the same time serving as a cover crop. The use of diversion channels and soil bunds is done to harness fertile soils from upslope. Planting of fodder shrubs and napier grass along soil bunds has resulted in reinforcement of the soil structures on some farms. Nonetheless, the laborious nature of establishing such structures is a major hindrance to extensive use of these soil and water conservation practices. EBA strategies that reinforce social capital resources e.g. labor sharing groups,

There were reports of increased occurrence of crop pest e.g. coffee stem borers and diseases e.g. coffee berry disease, leaf rust and anthracnose. Some crop diseases, like the leaf rust, are reported on the upper slopes where they traditionally never used to occur. In response, farmers' preferences are shifting towards more resilient crop varieties. For instance, bush beans, which had been neglected, are regaining preference ahead of climbing beans that are said to be more susceptible to Anthracnose. For similar reasons, farmers are abandoning bean varieties like "Kanyebwa" for new ones e.g. "Nafungo" and

"Mafabi". Thus, EBA strategies that advance more resilient crop varieties offer much promise in the face of emerging changes in climatic and agronomic conditions.

Livestock keepers

The stress in livestock production is the acute scarcity of pasture as grazing lands are increasingly converted into croplands. Zero grazing as a strategy for coping with increased shortage of pasture or grazing lands, enhances complementarity of crop and livestock enterprises. Innovative ways of optimizing use of crop residues as fodder (e.g. maize stover and banana stems) are common on many pasture deficient farms. The animal manure creates possibilities of organic farming although effects on soil fertility and farm productivity are not impressive due to the small herd size. Rearing of improved goat breeds is an emerging enterprise and yields of about 2 liters/goat/day have been reported. Given current population trends, it is almost certain that livestock production will have to contend with even bigger challenges in future. The shift towards more intensive systems is only natural, and EBA options that enhance fodder security like use of multipurpose fodder shrubs e.g. *Leucaena spp.*, and *C. calothyrsus* for zero grazing become handy in this transition.

Wetlands users

Wetlands are commonly mistaken for wastelands, in spite of their great services to the ecosystem. Efforts geared towards ensuring wise use and conservation of wetland resources are counteracted by a number of environmentally unsustainable practices, originating from within the locality and as well as upslope sites. In Kween for instance, lowland wetlands in Ngenge sub-county are heavily silted as a result of poor farming methods in the highlands, mainly in Benet and Kapraron sub-counties. The resultant floods in Ngenge have displaced families and polluted fishponds and sources of water for domestic use.

“The rain situation has been good this year compared to previous years. Those days it only used to rain up in the mountains and here, we would only experience floods”. – **Participant in FGD in Ngenge S/C**

Draining of wetlands for cultivation, spraying of horticultural crops with chemicals, overgrazing and conflicts over resource use due to competing wetland uses are a few examples of such practices. The resultant reduction in water quality and wetland biodiversity compromises the capacity of these resources to provide vital ecosystem services (UNDP, GEF & IUCN, 2010). Another driver of the demise befalling most wetlands in the region is the prolonged drought, which compel people to resort to wetlands for crop cultivation, grazing and brick making. District environment departments responsible for raising public awareness about wetlands are inadequately facilitated to perform this role. Rather ironically, EBA interventions targeting wetlands, need to look away from the wetlands, and address processes upstream that directly or indirectly compromise the resilience of down stream locations. This spatial divide could create challenges for EBA though, as upstream land users are seldom compassionate about their down stream compatriots, whom they claim to benefit from silting of soil nutrients washed from their land.

Climate amelioration beneficiaries

Apparently, land users attach considerable importance to weather conditions in their vicinity and divergence from familiar climatic patterns raise far reaching concerns. The Mount Elgon environment is regarded peculiar in its capacity to support the growing of Arabica coffee, a crop that has sustained livelihoods for generations. Today, increases in average temperatures, torrential rains and distortions in cropping

calendars are manifestations of changing times,

“In the past, rains used to be more reliable and less destructive to crops compared to now. These days, the rains are confusing”. – **FGD Participant in Kaptum S/C, Kween**

Most land users appreciate the connection between these emerging climatic trends and human activity, although faced with a limitation of alternative livelihood options, local people continue to pursue short term survival strategies even when aware of the negative outcomes. The tendency for climatic impacts to be global, rather than local or regional may tempt land users attempt “free riding” in anticipation that change can be effected elsewhere.

Nonetheless, the increased frequency and magnitude of events like landslides in the Mt Elgon region has arouses urgent need for intervention into the environmental and livelihood processes occurring in the Mount Elgon ecosystem. It is argued that the problem of landslides involves intricate interplay between hydrological, human and geo-physical factors. Interventions that enhance knowledge, skills and land users’ ability to manage and where possible even harness water runoff stand to arouse much interest. Increased landslide occurrence is also blamed on continuous cultivation, which compromises the binding capacities of the soils. With population increase widely acknowledged as the root cause of this is malpractice, efforts to address the problem cannot afford to ignore need for family health interventions as part of a comprehensive package.

Fuel wood collectors, traders and users

Firewood is the main source of energy used for cooking and warming in households, in addition to being also used for brick burning. Notably, the resource is

becoming increasingly scarce and current supplies are mainly from off farm sources since on farm tree resources succumbed to indiscriminate tree cutting for fuel wood and timber. The hunger for fuel wood has not only led to its commercialization but also its high pricing. Normally, peasant households are hesitant to spend their meager incomes on purchase of firewood, but instead resort to burning crop residues for fuel. The use of maize stover and maize cobs is widespread, especially on the middle and lower slopes.

The protected areas supply much of the fuel wood used by communities living adjacent to the park, and EBA strategies that address this dependency are likely to reap huge dividends. Several civil society organizations have promoted use of energy saving technologies to reduce domestic energy consumption and subsequently minimize pressure on the natural resource. For sustainability, developing local capacity in construction of these technologies as opposed to supplying stoves sourced from elsewhere is key. It is also important for EBA strategies to be informed by socio-cultural explanations for the persistent use of the 3-stone stove in preference to some energy saving alternatives. In some situations, this has been attributed to the fact that the 3-stone stove doubles effectively as a facility for household warming during cold nights. In this case, as extremes of weather extend even further with climate change, luring communities away from this “energy inefficient” technology is going to be difficult.

On the fuel wood supply side, collaborative resource access agreements allowing park adjacent communities to collect dead wood for domestic use, in exchange for commitment to observe good conservation behavior are not a farfetched option. Though seemingly mutually beneficial, adherence to such agreements is mediated by complex interaction between societal, livelihood and institutional processes

within which such arrangements are embedded. In the search for income, local people are tempted to collect firewood beyond their household needs, resultantly overstressing capacity for allocated areas. As stocks of dead wood run out, the tendency to “ring dry” trees as a strategy for inducing their death sets in. This is not helped by the long history of strained relations between local communities and park authorities and the ever elusive consensus over entitlement to park resources.

Health practitioners and users of health facilities

Traditionally, many communities have depended on medicinal herbs for curing various ailments. This is still common especially considering the shortage of health facilities and the difficulties involved in accessing distant ones across the rugged terrain. Environmental health and sanitation problems are attributed to poor planning and lack of adequate sensitization.

Water resources have been contaminated due to silting. As an intervention, district local government in collaboration with civil society organizations (e.g. IUCN and FFH) have established Gravity Flow Schemes (GFS) in several vulnerable communities. The close association demonstrated, between basic needs like clean water, to presence of the park (where most of the gravity water originates) is an opportunity for enhancing communities appreciation for the ecosystem and thus justification for its protection.

Fisher folk, fish farmers and fish consumers

The drainage system in the project area is characterized by numerous rivers and streams that flow from the mountains. These water bodies provide opportunities for both capture fisheries and fish farming. Since 2000, fish farming has been gaining prominence as a livelihood activity,

due to increasing demand for fish. Fisheries development, however, is taking place amidst a number of constraints that include among others, limited access to fish fries in light of increasing demand, and the hilly terrain that does not favor establishment of fishing infrastructure.

3.6 Some salient issues to note about stakeholders' capacity for EBA

- There are many EBA options deemed suitable for Mt Elgon region. However, not all of them may be possible at micro catchment and individual farmer levels. It is recommended that community participation and envisioning approaches should be used in selecting options with the view of achieving as much of holistic/system wide interventions as possible.
- There is insufficient collection, analysis, dissemination, interpretation and application of metrological data for EBA which limits disaster management. There is need to increase capacity for data collection, analysis, dissemination, interpretation and application of metrological data in Mt Elgon ecosystem to enhance effective implementation of EBA options.
- Like all development initiative, EBA implementation in Mt Elgon will be a complex and costly process. Further to this no single individual or organization has all it takes to bring about change. Therefore, it is recommended that EBA implementation considers a partnership approach as well as strengthening collaborations and linkages among the various actors.
- Given the long term nature of EBA interventions, implementation in Mt Elgon should achieve increased ownership and sense of belonging by the respective district and sub county local governments, local communities and natural resource managers (farmers). This will improve project performance and enhance sustainability beyond project life.
- There are many players in EBA activities in Mt Elgon ecosystem. A common platform such as the one being initiated by IUCN should be emphasized and scaled out to avoid duplication of efforts and promotion of synergies to achieve the most from available resources.
- Given that grass root implementers of EBA are resource constrained, incentive driven adoption of critical interventions is recommended to deepen ownership and sustainability
- Alternative livelihood strategies and markets should be integrated into EBA implementation in Mt Elgon
- Human population is a key driver of ecosystem degradation. It will be hard to ignore this fact. At the moment there seems to be little or no efforts to sensitize natural resource managers and other stakeholders on the need for population control regardless of its definition.
- Mt Elgon is the most contested park in Uganda. EBA implementation in the contested areas of Mt Elgon may not be as smooth as in non-contested areas. Conflict resolution in contested areas will probably be a complex, time consuming, costly and painstaking process. Good enough these two categories of areas have already been mapped out. The Mt Elgon EBA project might want to consider adjusting to these realities.

4. ESSENTIAL AND DESIRABLE ECOSYSTEM SERVICES IN THE MOUNT ELGON REGION

4.1 Introduction

Ecosystem services refer to the benefits that people derive from natural resources and the positive impacts on ecological processes that plants and animals can have (Izac, 2003; Millennium Ecosystem Assessment, 2005). These benefits have sometimes been referred to as ecological services (Altieri and Nicholls, 1999; Altieri, 1991), environmental services (Sharma, 2002; Gouyon, 2003), or natural capital (Izac, 2003: 32). They include food security, human health, clean air and water, and directly contribute to local livelihoods and economic development. The concept of ecosystem services therefore offers

a useful framework for conceptualizing benefits, synergies and trade-offs from the environment across spatial and temporal scales.

This chapter presents findings from a series of rapid appraisals involving dialogue with district local government technical staff in Bulambuli, Sironko, Kapchorwa and Kween districts, UNDP-EbA and UWA staff in the Mt Elgon region, as well as farm walks, transect drives and focus group discussions with local communities of Benet, Bulaago, Kaptum, Bugitimwa, Bunambutye and Ngenge sub-counties (Table 4.1).

Table 4.1. Selected sub-counties in the three slope gradient categories where community consultations were carried out

| Location along gradient | Sub-county | District |
|-------------------------|------------|-----------|
| Upstream | Benet | Kween |
| | Bulaago | Bulambuli |
| Midstream | Kaptum | Kween |
| | Bugitimwa | Sironko |
| Downstream | Bunambutye | Bulambuli |
| | Ngenge | Kween |

4.2 Characterization of natural resources along an altitudinal gradient

Due to the mountainous nature of the Mt Elgon region, an appropriate classification of ecosystem services depends a great deal on the characteristics of the landscapes concerned and the context in which they are considered. In this sense, a community based rapid appraisal of the upstream (up-slope) and downstream (down-slope) as well as midstream (mid-slope) areas was conducted to characterize these

landscapes including the natural resources therein.

Upstream areas

Case studies were conducted in Bulaago and Benet sub-counties of Bulambuli and Kween districts respectively. These are densely populated areas characterized by high ecosystem degradation.

These areas are hard to reach and social services are hardly available which renders the residents vulnerable to the vagaries of climate change. During the focus group discussions, the communities in these areas were able to identify a range of important natural resources in their area (Table 5.2). Land (also referred to as soil by local communities) is regarded as a very important natural resource. However, agriculture, which is the main land use activity, is faced with

declining productivity mainly as a result of a combination of poor practices (e.g. continuous cultivation, deforestation and limited use of soil and water conservation measures) as well as geophysical makeup (e.g. steep terrain and torrential rainfall). Land management interventions in these upstream areas can have far reaching livelihood and environmental outcomes on the communities therein as well as the downstream residents.

Table 4.2. Main natural resources in the upstream areas of Bulaago ad Benet

| Bulaago | Benet |
|--------------------------|------------------|
| 1. Forests | 1. Forests |
| 2. Streams/rivers | 2. Mountains |
| 3. Hills/mountains | 3. Rivers |
| 4. Caves | 4. Streams |
| 5. Animals (incl. birds) | 5. Soils |
| 6. Swamps | 6. Animals |
| 7. Valleys | 7. People |
| 8. Waterfalls | 8. Air |
| 9. Trees | 9. Sun |
| 10. Scenery | 10. Rain |
| 11. Soils | 11. Rocks |
| 12. Bees | 12. Wetlands |
| 13. Good weather | 13. Crops/plants |
| 14. Fresh air | |
| 15. Rain | |
| 16. Crops | |

Midstream areas

Midstream areas (such as Bugitimwa in Sironko district and Kaptum in Kween district exhibit features characteristic of a transition zone from the intensive production system of the upstream areas and the more extensive production systems of the downstream areas. Local communities here are able to identify a range of natural resources (Table 5.3).

Just like the upstream areas, land is considered as the major natural resource, with farming (growing of coffee and bananas) as the main land use activity. Apparently, midstream areas have the most accessible settlements and social amenities are more developed compared to the upstream areas.

However, the midstream areas are as highly populated as the upstream areas, with fragmented land holdings with high likelihood for landslides. As is the case for upstream, the midstream areas are faced with declining land productivity as a result of a combination of poor agricultural practices and changes in land use that

have seen most formerly forested areas converted to farmland. Land management interventions in these areas are driven by the need to offset the erosive effects of large volumes of water runoff and siltation of water bodies.

Table 4.3. Main natural resources in the midstream areas

| Bugitimwa | Kaptum |
|-------------------------------------|---|
| 1. Trees/forests | 1. Soil |
| 2. Mountains | 2. Streams/rivers |
| 3. Sunshine | 3. Trees |
| 4. Soils / land | 4. Rocks |
| 5. Moonlight | 5. Grass |
| 6. Animals (incl. bees, birds etc.) | 6. Hills |
| 7. Rainfall | 7. Wind |
| 8. Wind / air | 8. Animals (incl. birds, bees, fish etc.) |
| 9. Man / woman | 9. Water (gravity) |
| 10. Wetlands/swamps ¹ | 10. Sun |
| 11. Grasses | 11. Rainfall |
| 12. Clouds | 12. Caves |
| 13. Plants | |
| 14. Stones | |
| 15. Rivers ² | |

Downstream areas

A rapid appraisal of downstream, areas represented by Bunambutye and Ngenge sub counties of Bulambuli and Kween districts respectively showed that these areas are less densely populated but are faced with adverse loss of vegetation cover. The communities in these areas identify a range of natural resources that they consider important to them (Table 5.4). Ngenge sub-county, a transition zone into the Karamoja farming system, is characterized by a treacherously rugged terrain and hardly maneuverable roads (even for 4x4 vehicles),

rendering settlements in this area among the most remote. The low elevation of the downstream areas exposes them to flooding and other effects of environmental degradation and climate change. This translates into increased shortage of wood, energy and pasture for livestock. As such, interventions to enhance resilience of lowland communities to climate change need to cut across the entire vertical divide.

Table 4.4 Main natural resources in the downstream areas

| Bunambutye | Ngenge |
|----------------------|-----------------|
| 1. Trees and forests | 1. Trees |
| 2. Mountains | 2. Soils |
| 3. Rivers | 3. Animals |
| 4. Wetlands | 4. Hills |
| 5. Animals | 5. Rivers |
| 6. Crops | 6. Air |
| 7. Soils | 7. Rain |
| 8. Fresh air | 8. Wetlands |
| | 9. Stones/rocks |

4.3 Principal types of ecosystem services from Mount Elgon and their importance

There have been many attempts to classify ecosystem services. In the Millennium Ecosystem Assessment (2005), ecosystem services are classified into four broad categories: provisioning, regulating, cultural and supporting services; all of which affect human wellbeing either directly or indirectly. Fisher et al. (2009) argue that an appropriate classification of ecosystem services is dependent on characteristics of the ecosystem(s) being investigated, and the context in which they are being considered. In this sense therefore, ecosystem services can be categorized as essential (e.g. food, water and shelter) while others can be considered as desirable (e.g. cultural, spiritual and aesthetic values).

4.3.1 Essential ecosystem services

In a rapid appraisal of ecosystem services in upstream, midstream and downstream areas, local communities generated a wide range of ecosystem services (benefits) derived from their natural resources and these were scored on a scale of 1 to 3 (Table 4.5). A mean score was then derived to give the relative importance of the respective ecosystem services.

From Table 4.5, the most highly prioritized benefits from the ecosystem (with a mean score of 2.0 to 3.0) are crop growth, rain, fresh water, firewood, timber, food and manure. Crop growth, rain, manure and food are indicative of the importance attached to those ecosystem services that are associated with subsistence agricultural production upon which most livelihood strategies are based. Fresh water and air are basic requirements for human survival and are thus considered indispensable. The high priority given to firewood and timber provisioning reflect heavy dependency on the ecosystem for energy and shelter.

Table 4.5. Range of ecosystem services identified by communities in 6 sub-counties of the project area. The mean score shows the relative importance of the respective ecosystem service (2.0-3.0= essential, 1.0 to <2.0 = desirable).

| Benefit | Scores per sub-county | | | | | Mean score |
|-----------------------|--|-------|-----------|--------|--------|------------|
| | Codes: 3=very important, 2=important, 1=not so important | | | | | |
| | Bulaago | Benet | Bugitimwa | Kaptum | Ngenge | |
| Crop growth | 3 | 3 | 3 | 3 | 3 | 3.0 |
| Rain | 3 | 3 | 3 | 3 | 3 | 3.0 |
| Fresh water | 3 | 3 | 3 | 3 | 3 | 3.0 |
| Fresh air | 3 | 3 | 3 | 1 | 3 | 2.6 |
| Firewood | 3 | 3 | 3 | 3 | - | 2.4 |
| Timber | 3 | 3 | 2 | 2 | 2 | 2.4 |
| Food | - | 3 | 3 | 2 | 3 | 2.2 |
| Manure | 3 | 3 | 2 | - | 2 | 2.0 |
| Fodder | - | 3 | 3 | 3 | - | 1.8 |
| Bush meat/meat/milk | - | 2 | 3 | 2 | 2 | 1.8 |
| Pollination | - | 3 | 2 | 3 | - | 1.6 |
| Soil erosion control | - | 3 | 3 | 2 | - | 1.6 |
| Construction material | - | 3 | 1 | 2 | 1 | 1.4 |
| Fish | 3 | 1 | 1 | - | 2 | 1.4 |
| Grazing pasture | 3 | - | 3 | - | - | 1.2 |
| Herbal medicine | 2 | 1 | 1 | 2 | - | 1.2 |
| Habitat | - | 3 | - | 3 | - | 1.2 |
| Lighting | - | 3 | 3 | - | - | 1.2 |
| Breathing | - | 3 | - | - | 3 | 1.2 |
| Vegetables | 2 | 3 | - | - | - | 1.0 |
| Irrigation water | 3 | - | 2 | - | - | 1.0 |
| Dowry | - | 3 | - | 2 | - | 1.0 |
| Bee forage | - | 2 | 2 | 1 | - | 1.0 |
| Vitamin D | - | 2 | - | 3 | - | 1.0 |
| Warmth/drying | - | 2 | 1 | 2 | - | 1.0 |
| Tourism | 1 | 1 | 1 | 1 | 1 | 1.0 |
| Poles | 3 | - | - | - | 2 | 1.0 |

4.3.2 Desirable ecosystem services

Moderately important ecosystem (mean score >1<2) include fodder, bush meat/meat/milk, pollination, soil erosion control, construction material, fish, grazing pasture, herbal medicine, habitat, lighting and breathing. Fodder/pasture, meat, milk and fish are indicative of peoples' need for nutritional balance through diverse diets. This category also depicts benefits from the ecosystem that are important but whose value is only felt periodically (e.g. soil erosion control, herbal medicine, house construction etc.), as well as those that are rather latent or intangible (e.g. pollination, habitat, lighting etc.).

Additional benefits that communities reportedly derive from the ecosystem include honey, fireplaces/stones, transport, soil fertility enhancement, winnowing, hides, shade, bamboo/crafts, security, windbreaks, boundary marking, mineral salts and biogas. Others are labour, rafters, stakes, salt lick, ornamental/ decoration, grinding stones, soda ash, communication boosters, sand, seed dispersal, soil formation, banana fibres as well as ropes. These were considered as not so important but desirable. Though they may

not form the basis for land management strategies, their added supply is likely to enhance acceptability and livelihood improvement propensity of any proposed EbA interventions.

4.4 Description of identified essential and desirable ecosystem services

Crop growth

The Mt. Elgon ecosystem supports the production of different kinds of food ranging from crops to fish, wild game, and fruits. Most crops are grown on smallholder farmlands that form the dominant land use across much of the landscape. The gardens of the Bagisu and Sabiny (including the Benet, a majority of who are now settled outside the National Park) are mainly permanent and perennial. The main crops grown in all the 4 project districts include coffee, maize, cassava, Irish potatoes, onions, passion fruits, tomatoes, peas and beans (Table 4.6). In Bulaago, informants indicated that crop yields are good during the rainy seasons and the reverse is true. Crop production, however is constrained by problems of vermin (e.g. monkeys, rats, etc.) as well as pests and diseases (e.g. coffee berry disease, stem borer and BBW).

Table 4.6 Main crops grown at various slope levels

| Slope level | Major crops |
|-------------|--|
| Upstream | Coffee, cabbages, onions, cassava, wheat, barley, maize, potatoes |
| Midstream | Coffee, maize, cabbages, cassava, onions |
| Downstream | Maize, Rice, Millet, Pumpkins, Bananas, Sweet potatoes, Sorghum, Soya beans, Cassava, Groundnuts, Simsim and Sunflower |

Fruits have additional importance in supporting household health. Fruits are obtained from on farm trees, local markets and the national park (wild fruits). Availability of food crops is reportedly declining, a trend mainly attributed to high and increasing population. This is reflected in rising food prices e.g. current price of posho is 1,400/= per kg, up from 300/= around the year 2002; rice is at 2,500/= per kg. People sometimes sell off bananas to

buy posho (maize flour). Crop performance is declining due to deteriorating soil quality and erosion arising as a result of high population and land fragmentation, coupled with a problem of poor crop varieties. For example, coffee yields are presently estimated at 10 bags/acre, compared to 20 bags/acre 10 years ago (Table 4.7). In spite of the low crop yields, there is high attachment to agriculture.

Table 4.7 Changes in crop yields over the last 10 years

| Crop | Units | Estimated yield/acre | |
|--------|-------|----------------------|------|
| | | 2002 | 2012 |
| Coffee | Bags | 20 | 10 |
| Maize | Bags | 30 | 15 |
| Maize | Bags | 15-20 | 3-5 |

Given rising food shortages, there is increasing commercialization of even traditional food crops. This is especially pronounced downstream where most households were reported to buy foodstuffs at some point. Declining crop yields also imply farmers have to incur hefty investment in agricultural inputs. In Ngenge, residents have also depended enormously on relief food, until this year when crop yields have been relatively good. Food availability in Ngenge has improved compared to 10 years ago when insecurity presented additional bottlenecks to agricultural production activities. This change is evident in the relatively lower food prices (e.g. maize flour, costs 1,400/= per kg, down from 2,500/= in 2002).

Rain

Rain provision is a valued ecosystem service as it represents the major source of clean water used in households (cooking, drinking, washing, bathing etc.). A close linkage is also drawn with crop production, upon which local livelihoods are heavily dependent. The sources of rain are rather abstract to most community level informants, although some individuals pointed out the close association of rain with clouds, forests, hills and trees. In the upstream areas, rains were reported to be sufficient although they are becoming increasingly erratic. Some informants noted that these extremes are the cause of increasing incidents of landslides and crop failure. The midstream locations also experience heavy to moderate rains, but also intense sunshine (especially presently).

In the past (10 years ago), rains used to be more reliable and less destructive to crops compared to current patterns that respondents described as “confusing”. These shifts in weather patterns are widely attributed to deforestation. The situation in downstream locations reflects fairly good rains this year compared to previous seasons, when it only used to rain upstream (in the mountains) and the downstream residents would just experience floods. Generally, the rains have been scanty downstream and have been reducing over the last 10 years.

Fresh water

The Mt. Elgon ecosystem stores, provides and retains water for domestic and agricultural use. The major sources of water are local streams and rivers most of which originate from the mountains, the National Park as well as swamps (Table 4.8). The water is used primarily for irrigation, watering of animals and other domestic purposes, although some individuals fetch it as a means of generating income. Irrigation is mainly practiced as a strategy for off-season agricultural production, especially in the growing of horticultural crops such as vegetables and Irish potatoes. The upstream communities reported water as being sufficient during the rainy season and low during the dry season (December – March). Fresh water is also on the decrease compared to a decade ago. All households use fresh water, with daily consumption estimated at about 2 jerry cans for an average household.

Table 4.8 Major streams and rivers in study sites

| Slope level | Major streams and rivers |
|-------------|--|
| Upstream | Kajeze, Bulaago, Ngenge, Laigong, Kapchemelei, Cheberen, Chemang |
| Midstream | Diligana, Sironko, Nakwana and Namabunze, Chebinyiny, Cheborom, Kongalel, Sesun, Kworeng |
| Downstream | River Atari |

In the midstream areas, several gravity water schemes (e.g. from rivers Nabukomba, Mudoko and Nabulambuli) were also reported to be major sources of fresh water. Water availability was described as moderate although water quality has declined. According to respondents, the water in local streams “used to be clean ten years ago but is now dirty”. Most streams also dry out in the dry season, which compels people to travel long distances for water. For instance, there is no borehole in the entire Bugitimwa sub county. The rains are also becoming less reliable.

In the downstream areas, water sources include boreholes in addition to streams, rivers and rain. It is reported that many locations face water shortage during dry seasons, which are becoming longer, resulting in extended periods of water scarcity. Boreholes are also few, with only one reported near the respondent community in Ngenge sub county. During the rainy season, the problem shifts from insufficient quantity to declining water quality caused by heavy silting because of degraded hilltops and mountain slopes. Water quantities seem to have increased and incidents of flooding are more frequent. Households use 3-10 jerrycans (of 20 litres each) per day depending on family size.

Fresh air

The service of providing fresh air is viewed as vital for enabling human life, sustaining good health and supporting plant growth. Sources of fresh air were rather abstract to the respondents but the

service was closely associated with trees and forests/park, rivers and mountain. Upstream respondents, such as those in Bulaago, indicated contentment with the quality of air, although their counterparts in Benet felt air quality is declining, citing increased incidents of air-related diseases e.g. whooping cough as evidence of this change. In the midstream areas, air quality was also reportedly declining, with more dust evident during the dry seasons, coupled with increased incidence of cough and tuberculosis as well as the generally decreasing life expectancy.

Firewood

Firewood is the main source of energy used for cooking and warming in households, in addition to being a major source of income for many households (sold either as charcoal or firewood). For instance, over 94% of the people of Bulambuli district use firewood for their energy needs (Bulambuli DDP, 2010 - 2015). Fuel wood is also used for brick burning. The ash from the fireplaces is traditionally used for smearing houses and washing of household utensils. Most upstream residents collect their firewood from the forest/park, although some quantities also come from on farm trees, woodlots and local markets. Firewood is reported to be increasingly scarce and commercialized which is fueling even more deforestation. Presently a bundle of firewood is sold at 1,000/= in Bulaago, up from 500/= a decade ago. In the upstream areas, all residents are reported to use firewood, with each household consuming about 1 bundle per day.

In the midstream areas, the major firewood sources did not differ much from the upstream areas, but included privately owned lands on unsettled hills. The firewood situation in the midstream areas was described as “so scarce that some people resort to use of maize cobs for cooking. Although prices vary from place to place, firewood is considered to be expensive. In Bugitimwa, three (3) small pieces of firewood cost 1,000/=; up from 200/= or even free access 10 years ago. In Kaptum, one (1) bundle of firewood, which can take a household two (2) days costs 5,000/=, up from 1,500/= around 2002. Today, MENP officials are very strict, which has further compounded residents’ access to firewood resources. It is estimated that a household of 10 people uses firewood worth 3,000/= daily. Firewood from on farm trees includes species like *Eucalyptus*, *Sesbania* and *Grevillea*. Off farm sources are as far as 4 km away across steep terrain.

Firewood downstream is sourced from mountain areas, on farm trees, maize stovers from croplands and local markets. Firewood is getting increasingly scarce even in downstream areas. Firewood is used by virtually every household, and although quantities consumed depend on family size, it is estimated in the range of 1-2 head loads/week.

Timber

Timber is important in construction of houses, furniture making and construction of bridges, as well as being widely sold for income. The primary sources of firewood include forest/national park, trees within the locality, woodlots (*Eucalyptus*), and purchase from traders in nearby towns (e.g. Kween, Kapchorwa, Gombe, Budadiri, Muyembe etc.). In the upstream areas, timber resources are insufficient in light of increasing demand. Timber prices have doubled over the last 10 years from 3,000/= per piece (4x2) in 2002, to 6,000/= presently. About 100 pieces of timber are required to construct an average-sized house. [4x2=12

pieces, 3x2=20]. About 80% of local house construction uses timber.

The timber situation in the midstream areas is not any better, with the resource becoming scarcer. Timber is obtained from the same sources as for upstream areas as well as Kapkwata forest/mills and buying from other farms within the villages. In Kaptum, current prices reportedly stand at 500/= per foot of 4x2 piece of timber, up from 200/= per foot in 2003; while in Bugitimwa, prices stand at 5,000/= up from 1,500 for a piece of timber (4x2) a decade ago. In the midstream areas, 80-100% of households were reported to use timber for house construction, with an average house estimated to require timber worth 200,000/=. Here 40-50 pieces of timber are used per house.

In the downstream areas, timber resources are very scarce and the situation is worsening as most people use timber for construction. Most trees are cut for income generation after cattle, which used to be the backbone of local livelihoods, were lost due to cattle rustling. Presently, the major sources of timber include on farm trees (Bikuyu and Mivule) and purchase from timber dealers. Prices of timber (4x2) is 7,500/= currently, up from 4,000/= in 2002.

Manure

Manure is used to enhance soil productivity in light of declining soil fertility. This ecosystem service is also closely associated with biogas production. Upstream sources of manure include caves located both within the park and on private land (e.g. Zebubu and Natusi in Bulaago) and farm livestock (i.e. cattle, goats, pigs and chicken). However, only little quantities are obtained from caves (about 2kg/farm/household) and these are not enough to sustain local agricultural production. Manure is also sold for income with a sack traded at 20,000/= presently, although it used to be free a decade ago.

In the midstream areas, manure is used for the same purposes as in upstream areas, although mention was made as well, of alternative uses for cow dung which included smearing of beehives. Manure is facing declining availability in the face of increasing demand as soils deteriorate further. Scarcity is worsened by declining animal populations due to land shortage and the associated shortage of pasture. The household animal population is also restricted to a few animals e.g. cattle (1-2) and goats (2-3).

Downstream, the sale of manure is less pronounced and prices were found to be quite low (1,000/= per sack). Manure is rarely used on most crop gardens because the soils are fertile. On farm livestock are the major "suppliers" of manure with purchases from neighboring farms also common. There is increased availability of manure during the dry seasons.

Grazing and gathering

Some parts of MENP have previously been used for grazing and collection of wild food and medicinal plants. Until the early 1980s, the Benet had agricultural gardens, grazed their livestock, collected medicines, gathered food, and hunted game meat – all within the forest. The Benet have actually lived a life of hunter/gatherers and sedentary pastoralists for hundreds of years to this day. In a recent study, the Benet have indicated that they understand the value of the forest to their livelihoods and that their primary interest is to protect the forest which they had done diligently for years (IUCN 2010). UWA has consciously signed Memoranda of Understanding with communities adjacent to Mt. Elgon NP, such as the Benet, through collaborative forest management, an initiative which empowers local communities to legally access their preferred forest resources in accordance with terms mutually agreed upon and laid out in a forest resource use agreement. In addition, government has also de-gazetted some parts of the park

to resettle the Benet. Presently, due to strict regulations, only some gathering (collection of wild food and medicinal plants) is allowed in MENP. Even so, respondents in Benet reported that even when access to the park is granted, many of the resources, such as bamboo, are so far in the forest that it may take up to a full days' walk to and fro.

Erosion regulation

Soil erosion is a particularly serious problem in a mountainous region like Mt Elgon (see Figures 5.1, 5.2 and 5.3). Retention of soils and sediments, especially by swamps and other vegetation is an important ecosystem service, especially in high rainfall mountainous areas. In the Mt. Elgon area, the farmed landscapes are characterized by steep slopes and intensive continuous cultivation which cause severe soil erosion (DAO, Bulambuli, pers. Comm.). In most cases, farmers are aware of the problem of erosion and that it is caused in part by runoff of rain and steep slopes (Okoba and De Graaff (2005), they are usually not inclined to the planting of trees to stabilize the soil and the establishment of Napier grass strips and *Calliandra* spp. hedgerows to create a soil-and-nutrient replacement systems. In Kween, the erosion situation is particularly apparent in the wetlands of Ngenge sub-county which have been silted as a result of poor farming methods in the highlands of Benet and Kaproron sub-counties (Kween DDP). Flooding, pollution from fertilizers and displacement of families are common features in Ngenge sub-county as a result of lack of harnessing or realization of the importance of this ecosystem service.



Figure 5.1 Farmer's field in Bulambuli district with dried out hard pans after flooding.



Figure 5.2 Silted rivers with eroding river banks



Figure 5.3 De-silting from one of the seriously silted rivers in Bulambuli district

Pollination and seed dispersal

Ecosystems provide habitats for pollinators and seed dispersers. Pollination is an essential part of a healthy ecosystem. While some plants are self-pollinated or wind-pollinated, most flowering plants require help from pollinators to produce fruit and seed. One of the greatest threats to pollinators is habitat destruction caused by changes in land use. Continued declines in pollinator activity could mean rising costs for pollinator-dependent fruits and vegetables and the disruption of the entire ecological system. In the Elgon ecosystem, which is an intensive smallholder system, land use changes and deforestation hence low pollinator population limits production, reducing yields and incomes. The amount of nearby forest or semi-natural vegetation (agricultural crops) is a key factor determining pollination rates.

Spiritual and inspirational values

These values are a source of inspiration such as that provided by spiritual and religious values. All communities around Mt. Elgon ecosystem still retain some form

of spiritual attachment to this ecosystem through traditions such as circumcision and deity worship. They use a drum made out of wood and animal skin as their traditional tool of communication and performance of spiritual and cultural rituals. Zikuma and Lilubusi are mainly used during the circumcision festivals that take place every even year. The Bagisu have their traditional dance known as Mwaga or Kadodi and this brings together family and clan members especially during the initiation stage of their sons into manhood. Other traditional functions include naming of children, dowry ceremonies and burial ceremonies where different rituals are performed by a group of elders in a particular clan.

Recreational and aesthetic values

Opportunities for recreational activities are provided by ecotourism initiatives promoted by UWA. The following activities have been listed by UWA (<http://www.ugandawildlife.org/explore-our-parks/parks-by-name-a-z/mount-elgon-national-park/activities>) as recreational activities available in Mt. Elgon national park: hiking/nature walks and birding

especially around Kapkwai Forest Exploration Centre along the loop trail to Cheptui Falls; mountain biking along trails which run from Sipi trading centre to Chema hill in Kapchorwa town; rock climbing near the Sipi Falls; sport fishing above the highest of the three waterfalls at Sipi.

4.6 Information gaps on ecosystem services for further development or attention

1. The use of trenches (mikutu) and grass bands for soil and water conservation is not very popular. Only about 40% of farmers practice the use of grass bands (Napier grass, Kikuyu grass) as a soil conservation measure while only about 5% dig trenches in their gardens for soil erosion control. Although respondents of Kaptum sub-county attributed this low percentage to laziness, some intimated that there was need to offer training on these technologies. Therefore, well packaged information on the importance of these conservation structures needs to be developed in addition to efforts to understand why the majority of the people are not adopting soil and water conservation measures.
2. Over 70% of the farmers use fertilizers (NPK and CAN) to enhance soil fertility with a much lower proportion deliberately using organic manure. In most cases, these fertilizers wash downstream, affecting biodiversity both positively and negatively in the down slopes. Sensitization of the appropriate use of these inorganic fertilizers is therefore essential.
3. There is minimal management of land in the upstream areas requiring a lot of sensitization for farmers to leave space for tree growing. In Bugitimwa, one of the reasons for lack of land management involving tree planting arises from inadequate consideration of cultural/traditional values and fears when initiating these programmes. A case in point which was highlighted by MEBEK was the restoration of river Sironko which initially ran into problems when farmers feared that the initiative was aimed at land grabbing. After proof was provided that the initiative was well intentioned, enthusiasm for planting trees along the river banks has increased and there are now more farmers applying to establish boundary trees. Therefore, it is important to understand local community perceptions, sentiments and traditions and hence the potential level of uptake of an intervention before full implementation.
4. There have been initiatives that have promoted the growing of sugar canes along riverbanks as a means of protecting rivers. From the responses obtained in Bunambutye, farmers feel that this does not work. This reluctance to use sugarcanes requires further investigation since it appears a helpful intervention at a glance, although there may be issues of competition for rice and horticultural crop use which are usually grown at river banks in the downstream areas.
5. In Bunambutye, it was pointed out that there was high preference for mechanized farming i.e. the use of tractor ploughing. This involves the removal of all trees and previous crop residue, such as maize stovers, from the gardens. In addition, due to flooding of the farms which accompanies heavy rains in the upstream areas, farmers usually construct drainage channels to direct excess water away from the gardens. This is despite the fact that the respondents were very much aware of the importance of trees but stressed that they needed clean gardens. It is therefore important to build an attitude change in these areas towards the concept of agroforestry.

5. PRELIMINARY LIST OF EBA OPTIONS FOR THE PROJECT

5.1 Introduction

The results of this consultancy as discussed in the foregoing sections are to be communicated to project staff and stakeholders. This chapter outlines preliminary EBA options emerging from the foregoing discussions. This preliminary list is the outcome of synthesis of findings in chapters three, four and five.

5.2 List of EBA options

1. Mulching
2. Use of crop residues
3. Crop diversification/inter-cropping (includes shift to non-traditional crops like sorghum)
4. Integrated crop-livestock management
5. Avoided deforestation
6. Reforestation / afforestation
7. Agroforestry
8. Rainwater harvesting
9. Irrigation Systems (gravity flow)
10. Restoration of river banks
11. Terracing and contour bands
12. Zero grazing
13. De-silting of rivers during the process of sand mining
14. Use of energy saving technologies (solar, stoves)
15. Alternative income generation (apiculture, fish farming, high value crops, non/off farm labour)
16. Drought resistant crop varieties (sorghum,

Longe series instead of Kenya varieties)

17. Tree pollarding
18. Group/communal/labour (for construction of soil and water conservation structures)

This list is to serve as a guide to Activity 4 of the consultancy that aims at designing of the project strategy and action plan informed by the best information, analyses and recommendations on EBA and the situation in Mount Elgon.

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ECOSYSTEM BASED ADAPTATION IN MOUNTAIN ELGON ECOSYSTEM

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ANNEX I

TERMS OF REFERENCE

“Supporting Information for the *Ecosystem Based Adaptation in Mt Elgon Ecosystem Project Strategy*”

1. Overall Project Description

The Ecosystem Based Adaptation (EBA) Programme for Mountain Ecosystems in Uganda, Nepal and Peru aims strengthen the capacities of these three countries, which are particularly vulnerable to climate change impacts, to strengthen ecosystem resilience for promoting ecosystem-based adaptation (EBA) options and to reduce the vulnerability of communities, with particular emphasis on mountain ecosystems.

The programme is funded by the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) through its International Climate Initiative, and is implemented through a partnership of the United Nations Environment Programme (UNEP), the United Nations Development Programme (UNDP) and the International Union for the Conservation of Nature (IUCN).

Climate change impacts are already affecting the functioning and integrity of several ecosystems and are adding to the stress resulting from other anthropogenic interventions such as unsustainable land use practices. The project countries and targeted ecosystems have been identified as particularly vulnerable to climate change impacts. A multitude of communities depend upon the services provided by these ecosystems.

Specifically the project will support: (i) the development of methodologies and tools for mountain ecosystems; (ii) the application of the above tools and methodologies at the national level; (iii) the implementation of EBA pilots at the ecosystem level; and (iv) the formulation of national policies and building an economic case for EBA at the national level.

The project will create new opportunities for experimental learning between regions and among countries within the same region. Through parallel and cooperative development and application of methodologies and tools and the implementation of pilot projects, the project will shorten the learning curve of local and national institutions and fast-track the transfer of knowledge and experience in relation to building ecosystem resilience.

The four year (2012-2014) Ecosystem Based Adaptation to climate Change Adaptation (EBA) Project is implemented by the Ministry of Water and Environment in partnership with UNDP, IUCN and UNEP. The different partners are responsible for certain components through the coordination by the Programme Management Unit (PMU) within the MWE covering the implementation in the districts of Kapchorwa, Kween, Bulambuli and Sironko.

2. Overall Consultancy Need and Objectives

This consultancy will produce supporting and baseline information as per the Results framework in Annex 1, to enable the detailed design, monitoring and evaluation of the project’s strategy for promoting ecosystem based adaptation (EBA) to climate change in the Mount Elgon region. It will

mainly provide information for the fulfilment of the following project components in Uganda:

1. Development of methodologies and tools for EBA decision-making in mountain ecosystems.
2. Application of methodologies and tools at ecosystem level.

The Project Document and Results Framework describe a number Outputs and Activities for the project components. This consultancy will be to undertake the following four Activities:

- 1) Identification of existing EBA measures and relevant land and water management practices in Uganda;
- 2) Rapid assessment of current capacity for EBA to CC;
- 3) Preliminary identification of essential and desirable ecosystem services in the Mount Elgon region for which management actions are required now and in the long term.
- 4) Produce a preliminary list of EBA options for the project
- 5) Participate in project team activities to produce a project theory of change, EBA strategy and monitoring design.

The results of this consultancy will be used by the project team to:

- a) produce a project theory of change, EBA strategy and monitoring design,
- b) Update the Project Results Framework vis a vis baselines & Targets.
- c) inform the design and implementation of a separate consultancy to conduct a Vulnerability Impact Assessment (VIA) and mapping of EBA options.

3. Consultancy Implementation Arrangements

The contract will be performance-based, spanning a period of 3 months totalling 35 person-days. Terms and conditions of service linked to the type of proposed contract will apply.

The consultant/consultants will be under the overall supervision and guidance of the EBA Programme Management Unit (PMU) and will report on a weekly basis. Coordination of the consultancy activities with the EBA partner/implementing organizations, and stakeholders in the Mount Elgon districts and national level, will be conducted with the PMU, to ensure appropriate communications about the project and easy access to stakeholders.

UNEP-WCMC will provide guidance for the detailed technical design and implementation of the consultancy activities, in co-ordination with the Uganda EBA National Programme Coordinator. The final approval of these reports will be by the Uganda EBA National Programme Coordinator with technical support by UNEP-WCMC.

4. Detailed Consultancy Activities - 4 products

Activity 1) Identification of existing EBA measures and relevant land and water management practices in Uganda

Sound information and data will be compiled to inform adaptation actions based on the EBA approach. It is recognised that EBA is not starting in a vacuum and various initiatives are underway at the international, national and Mt Elgon level that that can be used or adapted to suit the needs of the project.

This is Activity 1.1.3 in the Project Document Results Framework.

Aims and Objectives

The aim of this activity is to ensure that the best EBA measures are implemented in this project.

The objectives are:

- 1) To identify, review and analyze the existing EBA measures and current land and water management practices relevant to EBA in Uganda;
- 2) To provide a general assessment of the performance of these measures and practices for EBA in the Mount Elgon region.
- 3) To identify the gaps and make recommendations on improvement in the implementation of the existing EBA measures.
- 4) To provide information on the relevant institutions and projects in Uganda which the project may wish to collaborate with, or learn from, or influence.

Issues and Scope

The activity is a rapid assessment only, to provide just sufficient information to assist in definition of the project's strategy and actions in Mount Elgon region. It is not a comprehensive or detailed research activity, and is limited to the Mount Elgon region and other mountainous regions of Uganda.

The assessment should build on existing descriptions and frameworks for describing EBA and relevant land and water management, rather than create new classifications, etc.

The report will complement Activity 1.1.4 'Rapid assessment of current capacity for EBA to CC', and some of the information collection may well be conducted in conjunction with this assessment. The report will also complement Activity 1.2.1 'Collate tools, data and methods in VIA for Uganda', and may include some of the same stakeholders.

The assessment and report design may also be guided by any interim outputs by UNEP from Activity 1.1.2 'Handbook of existing EBA practices from around the world'.

Uses and Users of the Results

The report will be an internal project document for use in the first instance by the National Coordination Team and other project staff. It may also be distributed to project stakeholders in the Mount Elgon region for use in workshops and other consultations to develop the project's strategy.

Detailed Requirements

- a) To determine with the project staff and UNEP-WCMC common definitions of EBA and its application in mountain regions, so as to define the scope and information needs of the survey;
- b) To produce a draft report structure on EBA measures relevant to mountain regions in Uganda;
- c) To design a semi-structured questionnaire or similar to support interviews with key stakeholders involved in the Mount Elgon Region;
- d) To review the existing documentation and literature compiled in the preparation of the Project Document, and to interview UNDP and IUCN project staff;
- e) To identify and interview or request relevant information from relevant stakeholders and projects in the Mount Elgon Region and other parts of Uganda;

Outputs:

- Inception Report
- First Draft detailed Report
- Final Report of not more than 20 pages in response to comments on the first draft

Some of the stakeholders to be consulted will include; Makerere University's College of Agricultural and Environmental Sciences; the Mountain Research Centre; the Wetlands Management Department in the Ministry of Water and Environment; the National Environment Management Authority; the Uganda Wildlife Authority; the Climate Change Unit; local governments in the target districts of Bulambuli, Sironko, Kween and Kapchorwa; and the local communities in the target districts.

It is estimated that the work will be a total of **5person days** over the contract.

Activity 2) Rapid assessment of current capacity for EBA.

The communities, government and organisations in the Mount Elgon region already have many management practices and structures to adapt their livelihoods and operations to their environment. The project will strengthen this adaptive capacity by developing knowledge, skills and practices for including ecosystem-based approaches to climate change considerations in natural resource management and livelihoods.

A framework or template to describe capacity for EBA will be developed in a separate project activity (1.2.2), and then used to guide a rapid assessment of current capacity for EBA around Mt Elgon, including national government and communities.

This is Activity 1.1.4 in the Project Document Results Framework.

Aims and Objectives

The aim of this activity is provide a project baseline and information on current adaptive capacity for EBA of the stakeholder groups in the Mount Elgon region, for detailing the design of the project components 2, 3 and 4.

The objective is:

- 1) To make available to the project team information on current EBA capacity of stakeholders in the Mount Elgon region, to inform the development of the project strategy and monitoring.

Issues and Scope

The activity is a rapid assessment only, to provide just sufficient information to assist in definition of the project's strategy and actions in Mount Elgon region. It is not a comprehensive or detailed research activity, and is limited to the Mount Elgon region.

Much of the information for the assessment may be provided by interviews with a few key stakeholders and recent reports by projects and government agencies in Mount Elgon. A one day workshop with key stakeholders may be organised by the project to compile and approve the assessment. The assessment will not involve techniques such as stratified sampling. Care and sensitivity will be required to manage expectations about the project that may be created through interviews with stakeholders. High ethical standards and good practice for conducting social science research will be required, including the prior informed consent of participants for the use and attribution of the results.

The report will complement Activity 1.1.3 'Rapid assessment of current capacity for EBA to CC', and some of the information collection may well be conducted in conjunction with this assessment.

The report will also complement Activity 1.2.1 'Collate tools, data and methods in VIA for Uganda', and may include some of the same stakeholders.

The definition of capacity for EBA and a method for rapid assessment for adaptive capacity for EBA will be developed by UNEP-WCMC in Activity 1.2.2 in collaboration with project partners.

Uses and Users of the Results

The report will be an internal project document for use in the first instance by the National Coordination Team and other project staff. It may also be distributed to project stakeholders in the Mount Elgon region for use in workshops and other consultations to develop the project's strategy.

The report will be a direct input to Output 2.2 'EBA strategy identified using decision-making tools, including an economic assessment of EBA options and land use option maps'.

Detailed Requirements

- a) To become familiar with the framework for assessment of adaptive capacity for EBA developed by the project;
- b) To determine with project staff the key stakeholders to include in the assessment and the most appropriate and cost effective means of consulting them;
- c) To agree and implement with project staff a plan for contacting and involving stakeholders in the assessment, including the option of a one-day workshop, and in conjunction with Activity 1.1.3;
- d) To compile relevant information from recent reports etc., of relevant projects and government agencies in Mount Elgon;

Outputs:

- Inception Report
- First Draft detailed Report
- Final Report of not more than 50 pages in response to comments on the first draft

Some of the stakeholders to be consulted will include; Makerere University's College of Agricultural and Environmental Sciences; the Mountain Research Centre; the Wetlands Management Department in the Ministry of Water and Environment; the National Environment Management Authority; the Uganda Wildlife Authority; the Climate Change Unit; local governments in the target districts of Bulambuli, Sironko, Kween and Kapchorwa; and the local communities in the target districts.

It is estimated that the work will be a total of **8 person days** over the contract.

Activity3) Preliminary identification of essential and desirable ecosystem services in the Mount Elgon region

As the project aims to reduce the vulnerability of communities in Mount Elgon to climate change through EBA, it is necessary to determine what aspects of the communities and their environment should be maintained or strengthened in the face of climate change. Ecosystem services are the benefits that people obtain from ecosystems, and one aim of management of the environment can be seen as promoting the delivery of such services. These can include essential ecosystem services (e.g. food, clean water) and desirable services (e.g. cultural and recreation uses), depending on the

situation and values of the beneficiary. EBA can be framed as promoting 'nature-based' practices to ensure or increase the supply of ecosystem services now and in the future in the face of climate change.

A rapid and preliminary identification of the necessary and desirable ecosystem services provided by the Mount Elgon region is required, to guide the scope and priorities of the VIA (Activity 2.1.2) and mapping of EBA options (Activity 2.1.3), and the priorities for the project's action plan (Activity 2.2.4). The description of the ecosystem services will need to include downstream benefits from Mount Elgon, and needs in the future due to human population growth.

The primary information source will be published literature and project reports, with some interviews with key district and village stakeholders. The preliminary analysis and report will be an input to Activity 2.1.2 and Output 2.2, and will provide just enough information to scope and guide these activities. It will be further developed with local stakeholders in subsequent stages of the project as the needs for this are identified.

This is Activity 2.1.1 in the Project Document Results Framework.

Aims and Objectives

The aim of this activity is to strengthen the design of the VIA and project strategy by promoting the supply of ecosystem services for the people of Mount Elgon.

The objectives are:

1. To identify the principal types of ecosystem services from the Mount Elgon and their importance for people in the region and downstream.
2. To determine any significant information gaps on ecosystem services which may require future attention.

Issues and Scope

The activity is a rapid assessment only, principally using existing reports etc. to identify the principal ecosystem services which the project and stakeholders in Mount Elgon need to take into account. It is not expected to be a very quantitative exercise, or involve re-analysis of data. Some interviews with key stakeholders are likely to be required.

UNEP-WCMC will provide a template and guidance for the identification and assessment of ecosystem services (as part of Activity 1.2.2).

Care and sensitivity will be required to manage expectations about the project that may be created through interviews with stakeholders. High ethical standards and good practice for conducting social science research will be required, including the prior informed consent of participants for the use and attribution of the results.

Uses and Users of the Results

The report will be an internal project document for use in the first instance by the National Coordination Team and UNEP-WCMC, and then made available to stakeholders in regional workshops.

This activity directly guides the scope and priorities of the VIA (Activity 2.1.2) and mapping of EBA options (Activity 2.1.3), and the priorities for the project's action plan (Activity 2.2.4).

Detailed Requirements / Activities

- a) Utilizing guidance provided by UNEP-WCMC, identify data sources for the categories of ecosystem services, and key stakeholders for interviews;
- b) Compile data and conduct interviews;
- c) Produce a first draft report for the National Steering Committee and UNEP-WCMC.
- d) Produce a final report.

It is estimated that the work will be a total of **7 person days**.

Activity 4) Produce a preliminary list of EBA options for the project.

The results of Activities 1), 2) and 3) in this consultancy need to be brought together and communicated to the project staff and stakeholders in a manner suitable for use in developing the project's strategy and action plan (Activity 2.2.5).

This is Activity 2.2.1 in the Project Document Results Framework.

Aims and Objectives

The aim of this activity is to have the design of the project strategy and action plan informed by the best information, analyses and recommendations on EBA and the situation in Mount Elgon.

The objectives are:

1. To compile the results of Activities 1), 2) and 3) in this consultancy and other information on relevant EBA measures provided by the Project Country Coordination Team into a document and presentation for use by the project team and relevant stakeholders in designing the project strategy.

Issues and Scope

The activity is to summarize and communicate the principal results from Activities 1), 2) and 3) in a useful form for project design and planning. Further analysis of the information is not required.

Uses and Users of the Results

The report will be an internal project documents for use in the first instance by the National Coordination Team and UNEP-WCMC, and then made available to stakeholders in regional workshops if appropriate.

This activity directly guides the developing the project's strategy and action plan (Activity 2.2.5).

Detailed Requirements / Activities

- a) Determine with the project staff the most appropriate format for the report.
- b) Compile the report from Activities 1), 2) and 3) in this consultancy and other information on relevant EBA measures provided by the Project Country Coordinator in a document and presentation, identifying principal findings and recommendations.

Outputs and Timing

The main output will be a report of no more than 20 pages. A set of MS PowerPoint slides for the project EBA strategy workshop may also be required.

The task is expected to last about two weeks. It is estimated that the work will be a total of **5 person days**.

Activity 5) Participate in project team activities to produce a project theory of change, EBA strategy and monitoring design.

The consultants will be required to participate in meetings and workshop activities organized by the Project Co-ordinator to:

- a) Present the results of the Activities 1) to 4) in this consultancy and be available to answer questions on the methods used and results obtained.
- b) Provide technical expertise to the development of the project theory of change, EBA strategy and monitoring design.

The dates and exact duration of this activity will be defined after the commencement of the consultancy, but it is anticipated that this Activity will require no more than a total **of 4 person days**.

5. Consultancy Final Deliverables

- 1) Identification of existing EBA measures and relevant land and water management practices in Uganda** - a report that identifies and describes any existing EBA measures and current land and water management practices relevant to EBA in Uganda. It will also assess in general terms the effectiveness of these practices and their relevance to the aims of the project. It will also identify the institutions or projects which are carrying out these practices. 15-20 pages maximum, excluding appendix.
- 2) Rapid assessment of current capacity for EBA to CC** - a report that describes in broad terms the current capacity for Ecosystem-based Adaptation to Climate Change of the principle stakeholders in the Mount Elgon region inclusive a TNA report. The report will document the methods and data sources used, and include an assessment of the accuracy of the findings. 15-20 pages maximum, excluding appendix.
- 3) Preliminary identification of essential and desirable ecosystem services in the Mount Elgon region for which management actions are required now and in the long term** - a report that identifies and describes the principal ecosystem service from Mount Elgon and the beneficiaries of these services. It will cover the current situation, any clear trends in the past supply and demand of services, and the likely trends with continued population growth. A brief assessment will be made of any significant information gaps on ecosystem services which may require future attention. The report will document the methods and data sources used. 15-20 pages maximum, excluding appendix.
- 4) Produce a preliminary list of EBA options for the project** – a report of no more than 10 pages from Activities 1), 2) and 3) in this consultancy and other information on relevant EBA measures provided by the Project Country Coordinator. A set of MS PowerPoint slides for the project EBA strategy workshop may also be required.
- 5) Participate in project team activities to produce a project theory of change, EBA strategy and monitoring design.**

6. Consultancy Timetable

Week 1: Review of relevant EBA Project Documents. Meetings with EBA secretariat (PMU) and UNEP-WCMC (by telephone or in person) to have clarity of the scope and requirements of the consultancy work.

Week 2: Submission of Inception Report

Week 3-4: Incorporation of comments from EBA secretariat and stakeholders as advice on the work plan for the task.

Week 5-6: Information collection and stakeholder interviews.

Week 7-8: Writing and submission of Draft Report.

Week 11-12: Finalization (by consultant) and approval (by EBA- PMU and stakeholders) of the Final Report

7. Required Experiences, Competencies and Skills

The interested firms shall be legally registered and shall demonstrate sufficient capacities to implement the required activity in a satisfactory manner. The successful firm will have the following personnel with all the required skills, qualifications and experience listed below:

- The Task Manager , at least a Masters Degree in natural resources management, social science, development studies, or a relevant field (7 years of relevant experience with a relevant Bachelor's Degree will substitute the Master Degree requirement)
- Senior Expert and Junior Expert, at least 5 years of work experience in programme management and monitoring in development work. Work experience in sustainable livelihoods is a strong asset, including experience in direct execution of similar assignments; Experience in the fields of environment, agriculture or climate change would be a distinct advantage; Proven research experience;
- Demonstrated knowledge and experience in working on policy development and capacity building - this includes use of methodologies that maximize performance for ecosystem-based adaptation
- Strong knowledge / experience in results-based management and results-oriented approach to project implementation
- Experience with working with various stakeholders in Uganda including civil society, government institutions, and international organizations; and experience carrying out baseline surveys;
- Demonstrated ability and excellent communication skills to facilitate and coordinate interviews and focus group discussions;
- Results driven, ability to work under pressure and to meet strict deadlines; remains calm and in control under pressure
- Experience in report writing,
- Excellent inter-personal and technical communication (oral, written and visual) skills with high level English language writing skills are essential;
- Ability to work with staff from the PMU

Core skills:

- Technical knowledge and understanding of climate change and ecosystem-based adaptation, as well as community-based natural resource management
- Technical knowledge in Monitoring and evaluation
- Knowledge in Vulnerability Impact Assessments

ANNEX II

LIST OF PERSONS CONSULTED

| Name | Designation | District | Contact |
|----------------------|-----------------------|------------|--------------------------|
| Dr. Yeshe Nelson | Planning Officer | Kween | yeshonelson@yahoo.com |
| Charicha Kamuyeire | Population officer | Kween | Kcharicha@yahoo.com |
| Malinga Stephen | Forest guard | Kween | 0778024448 |
| Chemusto Samuel | Natural Resource | Kween | schemusto@yahoo.com |
| Kanda David Matayo | Clerk to council | Kween | Davidkanda2010@gmail.com |
| Chepsiker D. Ima | Community Development | Kween | 0782374105 |
| Dr. Okori P. Charles | Veterinary Officer | Sironko | 0772847439 |
| Halasi Gidongo ZECH | Assistant Agriculture | Sironko | 0772883954 |
| Lunyolo W. Desilanta | Community Development | Bulambuli | 0774041464 |
| Madanda Hellen Sarah | Environment Officer | Bulambuli | 0782443822 |
| Tsekeli Alfred | Agriculture officer | Bulambuli | 0772896504 |
| Wokuri Jotham | Fisheries Officer | .Bulambuli | 0774975998 |
| Michael Okiring | Conservation Officer | UWA | 0774739003 |
| Jamada Chebet | Conservation Officer | UWA | 0776613553 |
| Okware J. Ilukol | Conservation Officer | UWA | 0774318289 |
| Chris Oryema | Conservation Officer | UWA | 0772649880 |
| Cherotwo Joselyn | Councilor | Kween | |
| Chebet Siraji | Councilor | Kween | |
| Cheptegei William | Councilor | Kween | |
| Tapsikora Eunice | Speaker to council | Kween | |
| Kateba D | D. CAO | Kween | |
| Ojangole O.S | Forestry officer | Kapchorwa | 0754501676 |
| Chekwel John | Assistant Forestry | Kapchorwa | 0752652341 |

LIST OF CONTACTED PERSONS – NATIONAL LEVEL

| Name | Position | Institution |
|------------------------|---|---|
| 1 Xavier Mugumya | Natural Forest Management Specialist REDD Focal person 0776 408396. Xavierm1962@gmail.com xavierm@nfa.org.ug | National Forestry Authority |
| 2 Paul Isabirye | | Climate Change Unit- MWE |
| Stephen David Mugabi | Assistant Commissioner Environment Affairs 078 059 294 mugabisd@gmail.com | Ministry of Water and Environment |
| 3 Richard Kapere | | Uganda Wildlife Authority |
| Edith Kateme Kasajja | Head Production & Trade UNFCC Focal Person 0772 438 371 kasajjaedith@yahoo.co.uk | National Planning Authority |
| 4 EverlineKomutunga | | |
| 5 Sophie Kutegeka | Programme officer 0414 344 508 Sophie.kutegeka@iucn.org | International Union for Conservation of Nature |
| 6 Annet Night Ssempala | Programme officer 0312 266419, +256 414 322517 assempala@ecotrust.org, annet_ssempala@yahoo.co.uk | Environment Conservation Trust of Uganda (ECOTRUST) |
| 7 James Magezi Akiiki | Assistant Commissioner Climate specialist 0772 413311 0754 413311 mageziakiiki@yahoo.com | Department of Meteorology |
| 8 Sabino Francis Ogwal | Natural Resources Management Specialist. Biodiversity and Rangelands 0772 517 045 fogwal@nemaug.org | National management Authority |
| 9 Vincent F. Ntege | Manager Monitoring and Evaluation 0772 419644 vntege@unffe.org ntege@yahoo.com | Uganda National farmers Federation |

(Footnotes)

- Swamps in Bugitimwa include Suguta (dry), Kiguma (dry) and Kanyerere (dry).
- Rivers e.g. Sironko (A), Diligana (A), Nakwana (decreases), Naigugu (decreases), Namusiro (D), Namatabago (D), Nasale (D), Nabungi (D), Suguta (D), Namwirete (D).



**Ministry of Water and Environment,
Directorate of Environment Affairs
Ecosystem Based Adaptation (EBA) Project.
P.O Box 20026, Kampala, Uganda**



*Empowered lives.
Resilient nations.*