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ZAMBIA ENVIRONMENTAL THREATS AND OPPORTUNITIES ASSESSMENT (ETOA)



MARCH 2011

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COVER PHOTO: Young bull elephant grazing along the banks of the Lower Zambezi River. Photo credit: S. Sieber

THIS PAGE: Looking at the Entrance Of Kakumbi Green Market (Comaco Project) in Mfuwe, Luangwa Valley. Photo credit: Campbell 2010



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The author's views expressed in this publication do not necessarily reflect the views of the United States Agency for International Development or the United States Government

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ACRONYMS

ACCE	African Carbon Credit Exchange
ADC	Area Development Committee
AO	Assistance Objective
ARMC	Area Resource Management Committee
ARS	Agricultural Research Service
CA	Conservation Agriculture
CAP	Zambia Conservation Agriculture Program
CBD	Convention on Biological Diversity
CBNRM	Community-Based Natural Resource Management
CDM	Clean Development Mechanism
CF	Conservation Farming
CFU	Conservation Farming Unit
CHAPOSA	Charcoal Potential in Southern Africa
COMACO	Community Markets for Conservation
CRB	Community Resource Board
DC	District Council
DDCC	District Development Coordinating Committee
ECZ	Environmental Council of Zambia
ETOA	Environmental Threats and Opportunities Assessment
FAA	Foreign Assistance Act
FAO	Food and Agriculture Organization of the United Nations
FMC	Fisheries Management Committees
FNDP	Fifth National Development Plan
FSP	Fertilizer Support Program
FY	Fiscal Year
GCC	Global Climate Change
GIS	Geographical information systems
GoZ	Government of Zambia
GMA	Game Management Unit
IEE	Initial Environmental Examination

ILUA	Integrated Land Use Assessment
IPPC	Intergovernmental Panel on Climate Change
IUCN	International Union for the Conservation of Nature
JFM	Joint Forest Management
KCM	Konkola Copper Mines
LED	Low Emission Development Strategy
LUP	Land use planning
MACO	Ministry of Agriculture and Cooperatives
MRV	Monitoring, Reporting, and Verification
MTENR	Ministry of Tourism, Environment and Natural Resources
NAPA	National Action Plan for Adaptation
NCS	National Conservation Strategy
NEAP	National Environmental Action Plan
NGO	Non-Governmental Organization
NRM	Natural Resource Management
PA	Protected Area
PDCC	Provincial Development Coordinating Committee
ProBEC	Program for Basic Energy and Conservation (GTZ)
PROFIT	Production, Finance and Technology
PSRP	Public Service Reform Program
REDD+	Reducing Emissions from Deforestation and Forest Degradation
SOM	Soil Organic Matter
SOW	Scope of Work
UNIDO	United Nations Industrial Development Organization
USAID	United States Agency for International Development
USDA	United States Department of Agriculture
USFS/IP	United States Forest Service/International Programs
VMC	Village Management Committee
VRMC	Village Resources Management Committee
WB	World Bank
ZAWA	Zambia Wildlife Authority
ZMC	Zonal Management Committees

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EXECUTIVE SUMMARY

The purpose of this assessment was to obtain information on the status of the Republic of Zambia's natural resources with a view to promoting sustainable natural resource management and targeting appropriate development interventions and other efforts for USAID/Zambia.

Zambia is endowed with a rich diversity of ecosystems, including vast areas of wetlands, albeit amidst numerous and intense threats to their sustenance. The ecosystems are home to a wide variety of fauna and flora species. At the same time, these species are important sources of protein for the majority of the people in Zambia. Some of the species are known to be endemic to Zambia alone – for example, the Black Lechwe, which thrives in swampy areas, is known to exist only in Zambia. The country has diverse landscape formations ranging from valleys, rivers, lakes, swamps, and plateaus to escarpments and mountains. The scenic and aesthetic values these areas present offer an attraction and appreciation to Zambians and visitors alike. This varied landscape has also given rise to a wide diversity of habitats for living things.

There are 625 nationally recognized protected areas (PAs) within Zambia, covering approximately 309,052 sq km or about 41% of the country's territorial area. The entire protected area system includes: National Parks, Game Management Areas and Ramsar sites (managed by the Zambia Wildlife Authority); National Forests and local forests (managed by the Forestry Department); and National Monuments and Heritage Sites (managed by the National Heritage Conservation Commission).

Compared with many African countries, Zambia has formulated numerous environmental policies, laws, management plans, guidelines, and planning documents. In addition, Zambia is a party to many conventions of international importance, among them the Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES), the Ramsar Convention, the African Convention, and the Convention on Biological Diversity. However, most policies and laws are sector-based and therefore somewhat fragmented. There is need for a more overarching legal and policy framework so that integrated management frameworks are fully realized.

Traditional small-scale agricultural practices (including farming practices without precision – inadequate fertilizer input, inadequate plant populations; inadequate erosion control measures; inadequate/untimely weeding) have reduced food production levels among some of the poorest people in the rural areas of Zambia (please refer to Annex 2). Government policies have contributed to environmental degradation by not discouraging cultivation of marginal lands or providing subsidies for heavy maintenance crops such as maize. Heavily subsidized fertilizer support and maize marketing programs have contributed to small-scale farmers focusing their attention on maize production and in effect becoming dependent on a mono-crop system. Maize in particular tends to rapidly mine out select nutrients in the soil. See the table below (Thomas 1990)¹

¹ ISTRO-INFO EXTRA, Vol. 4. 1999; available in ISTRO Web page at: <http://www.soils.wisc.edu/istro> – New Paradigms in Agricultural Production Rolf Derpsch

Table I: Organic Matter Content of the Soil after 20 Years of Maize Production

Nitrogen appl./ year	No- tillage	Conventional tillage*
kg/ ha	% Organic Matter	
0	4,10	2,40
84	4,93	2,53
168	4,28	2,45
336	5,40	2,73

Conventional Tillage as described in the paper is the continuous turning over of the whole soil surface area by hand hoe, animal draft or mechanized means and corresponds to what occurs in the Zambian small-scale sector.

Continuous use of synthetic fertilizers eventually leads to lower soil fertility and high pH levels.² This in turn creates a situation where farmers need to abandon their existing holdings and migrate to more fertile land. This cycle is then repeated.³

Rapid population growth and rural-urban migration amidst limited job opportunities leads to over-exploitation of forest reserves and illegal off-take of wildlife and fish. Worse still, a large percentage of Zambians depend upon either fuel wood or charcoal for their domestic energy supply. This trend indicates the extent to which natural resources are threatened.

The information generated by this assessment is intended to ensure that future development strategies are realistic, as they are closely related to the availability and use of natural resources. Toward that end, the following were identified as *key* threats to Zambia's environment:

- Unsustainable Agricultural Practices
- Climate Change
- Charcoal Production
- Illegal Off-takes
- Mining Operations and Expansion
- Poor Governance

To address these primary threats, the following activities are highlighted as priority opportunities because of their ability to address multiple threats across sectors:

² When farmers apply inorganic nutrients on soils depleted of Soil Organic Matter (SOM), much of the nutrient applied leaches away or is otherwise unavailable to plants. Such soils therefore require greater fertilizer application to supply needed nutrients. Soil organic carbon stocks have become increasingly recognized as the single best summary statistic for soil fertility status associated with SOM stocks. As a result crop-yield responses to fertilizer inputs are commonly higher on more fertile soils, with recent findings from East and Southern Africa showing that when soils are highly degraded, as reflected in low soil organic carbon stocks, crop responses to fertilizer may be negligible Marenya, P.P., C.B. Barrett, 2009, State-Conditional Fertilizer Yield Response on Western Kenyan Farms; American Journal of Agricultural Economics, 91(4), November 2009; 991-1006

³ The absence of a master land use plan whether at national, regional or local level worsens natural resource utilization because land users just shift from one site to another the moment they encounter difficulties at the previous site. No system restricts them to specific sites over time. Government needs to put in place land utilization guidelines especially on communal land to rationalize available resource utilization and thus protect such resources from degradation.

- Conservation Agriculture
- Public-Private Conservation Partnerships
- Integrated Land Use Planning (LUP)
- High Efficiency Cook Stoves
- Monitoring, Reporting and Verification
- Urban Health and Environment Improvements

As an example, support in promoting and expanding conservation agriculture practices can address threats from agriculture, climate change, and illegal off-takes. Promoting public-private conservation partnerships helps address these same three threats as well as issues stemming from charcoal production and poor governance. It is acknowledged that USAID/Zambia may not currently have funding in areas appropriate to address each of these threats/opportunities. However, as money becomes available (such as Fiscal Year 2011 Global Climate Change funds), this assessment will hopefully help the Mission compete successfully for those funds.

I. INTRODUCTION

I.1 PURPOSE

The purpose of this document is to deliver to the US Agency for International Development (USAID) Zambia Program (USAID/Zambia) a country-wide Environmental Threats and Opportunities Assessment (ETOA) with a special focus on forestry, biodiversity, and climate change needs and related issues that will inform the USAID/Zambia operational and strategic plans in the coming years. This assessment provides recommendations to USAID/Zambia on how to efficiently contribute to the conservation needs identified, and plan for environmentally sound development and humanitarian interventions in its programming portfolio in the short- and medium-terms. This report also provides the information necessary for USAID to comply with Sections 118 and 119 of the U.S. Government Foreign Assistance Act (FAA) of 1961, as amended to guide and inform USAID/Zambia as it develops its Annual and Operational Plans and its Country Assistance Strategy. The last ETOA of USAID/Zambia was conducted in 2002 and the last FAA 118/119 Analysis was in 2007.

The U.S. Department of Agriculture's Forest Service International Programs office (USFS/IP) has a long history of promoting sustainable natural resource management throughout Africa. USFS/IP links the skills of its 35,000 domestic technical experts with partners through short-, medium-, and long-term technical assistance assignments to apply sound natural resources management principles. USFS/IP currently works in more than 15 African countries in collaboration with host country governments and USAID, including past missions in Zambia, Namibia, Mozambique, and other southern African countries in the areas of forest and fire management, land use planning, extractive industries, community-based natural resource management, recreation, biodiversity and habitat conservation, and watershed management. Per the request of USAID, USFS/IP executed the 2010 Zambia ETOA.

As per FAA Sections 118 and 119, this assessment examines environmental threats and opportunities inherent to USAID/Zambia's Country Assistance Strategy and Annual and Operational Plans and reviews the extent to which the Mission's strategy incorporates or addresses tropical forests and biodiversity concerns. This assessment is not a substitute for the Initial Environmental Examination (IEE). The Mission is responsible for ensuring that an IEE or a Request for a Categorical Exclusion is conducted for all activities funded by USAID.

I.2 METHODOLOGY AND ORGANIZATION

In-country interviews and field visits were undertaken between November 29 and December 7, 2010 by a team of six experts, led by USFS/IP. The USAID/Africa Bureau in Washington DC, and USAID/Zambia provided valuable background, direction, and support. A work plan was designed based on the Scope of Work (see Annex 9: SOW), and a meeting itinerary was developed by USAID/Zambia. Interviews conducted with various Lusaka-based stakeholders and organizations working in natural resource management (see Annex 8: ETOA Itinerary and Contacts) were complemented by visits with field staff, community resource boards, and small-scale farmers living and working near South Luangwa National Park, Lower Zambezi National Park, and the town of Mumbwa, outside of Kafue National Park. Within two weeks of completing field interviews, a draft report was delivered to and reviewed by USAID; comments and edits were incorporated into the final report. The primary sectors identified to focus on for the 2010 ETOA were Forestry, Biodiversity, and Climate Change. Following the introduction, the ETOA is organized as follows:

- Sections 2 and 3: General overview of Zambia's physical setting and environmental policies
- Section 4: Discussion of key environmental threats in Zambia
- Section 5: Presentation of opportunities to address key threats
- Section 6: Analysis of current USAID/Zambia programs

Supplementary information relevant to this assessment is attached in annexes at the end of the ETOA.

2. OVERVIEW OF ZAMBIA'S ENVIRONMENT

2.1 CLIMATE

The Republic of Zambia is situated on a high plateau, the Southern Africa Escarpment, resulting in a relatively moderate climate. Rainfall is unevenly distributed throughout the year, with most rainfall occurring between the months of November and April. The period from May to August tends to be cool and dry, while September and October are typically hot and dry, giving Zambia three seasons. The November to April “rainy season” is also the growing season. Both the country’s socio-economic health and its native flora and fauna depend upon the timing and amount of rain that falls during the rainy season each year (Thurlow et al. 2009). Zambia is typically divided into three eco-climatic zones, or agro-ecological regions, with average annual temperature and rainfall varying mostly by elevation (see Table 1 and Figure 1).

Table 1. Average rainfall by agro-ecological zones

Agro-Ecological Region	Land Area and Percentage of Total	Elevation (M)	Average Annual Temperature (°C)	Average Annual Rainfall (mm)
I. Southwest plateau, and S. Luangwa - Zambezi River valleys	15mha/20%	400 – 900m	4° C – 30° C (mean: 21° C)	<800mm
IIa. Central, Southern, and Eastern plateaus	27mha/36%	400 - 1500m		800-1000mm
IIb. Western Kalahari Sand plateau				
III. Copperbelt, Luapula, Northern, and Northwestern plateaus	33mha/44%	900 - 1500m	>1000mm	

Sources: ECZ 2008, Thurlow et al. 2009, FAO 2010, Wignaraja et al. 2010

Rainfall is strongly influenced by the El Nino Southern Oscillation, the Inter-Tropical Convergence Zone, and the Congo Air Boundary, creating more stable rainfall patterns in the North (ECZ 2008, Wignaraja et al. 2010). Multi-decadal trends in these phenomena contribute to annual variations in rainfall patterns and temperatures. When combined with the limited amount of long-term data available on Zambia’s climate, downscaled climatic patterns and predictions are hard to come by.

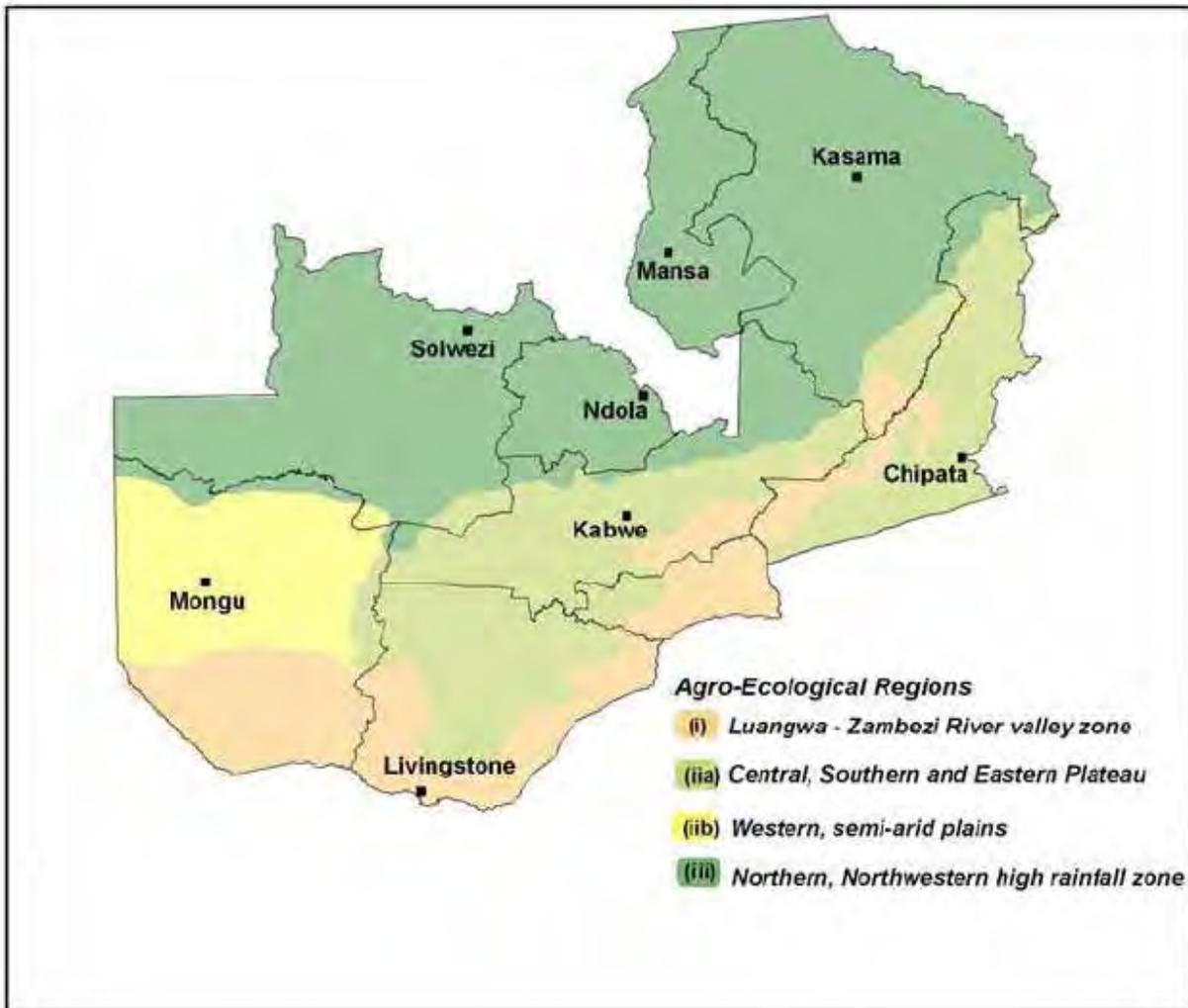


Figure 1. Zambia's agro-ecological regions (Wignaraja et al. 2010)

The limited rainfall data available for the Republic of Zambia seems to show that there has been a progressive reduction in annual cumulative rainfall amounts between 1950 and 2005 (ECZ 2008), though further analysis has shown that this data is not statistically significant (New et al. 2006). Data cataloguing daily temperature extremes from the period 1961-2000, however, show increases in temperatures across Namibia, Botswana, Zambia, and Mozambique. Likewise, there has been a statistically significant increase in regionally averaged daily rainfall intensity and dry spell duration (ibid.). These observed trends are predicted to deepen in the future, with the potential for cascading negative effects in all sectors.

2.2 FORESTS

There are 480 forest reserves in Zambia covering a total land area of about 7.2 million hectares (MTENR 2009). Local forests are meant to conserve forest resources for sustainable use by local people, while National Forests protect major catchment areas. Several if not most of the National Forests overlap Game Management Areas (GMAs) (see Section 2.3). As a result of expanding settlements and agriculture activities some forest reserves have been encroached upon and depleted. Consequently the Government has excised and degazetted some reserves, reducing the area and number of forests. Figure 2 shows the extent of National and Local Forest Reserves in Zambia.

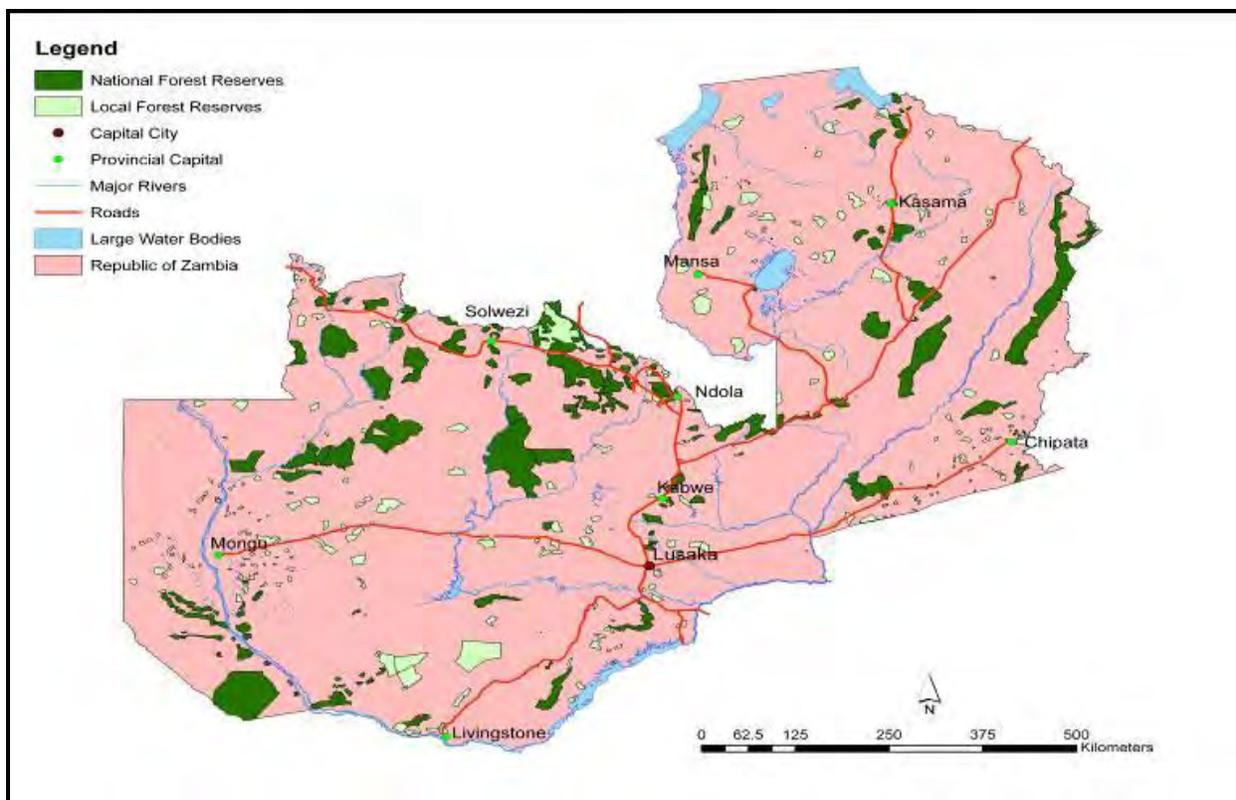


Figure 2. National Forest and Local Forest Reserves (GRZ 2009)

According to Zambia’s Fourth National Report on Implementation of the Convention on Biological Diversity (CBD), about 249 Forest Reserves (51%) are either encroached or depleted due to over-exploitation of wood products, settlement, cultivation and inadequate natural resources governance. This has resulted in the loss of forest reserves - whose numbers have reduced and changed to other land uses. About 2% of the National Forests are “depleted,” while 46% are “encroached” and 52% are “intact.” Seventeen Forest Reserves have been degazetted for other land use, representing about 3% of the total area of Forest Reserves. More local forests have been excised than National Forests. Local forests in the Copperbelt, and in Eastern and Lusaka Provinces have been more affected than those elsewhere. This may be attributed to high urbanization leading to high demand for forest products and land. It is expected that the opening of new mines in Northwestern Province will bring pressure on the undisturbed forest reserves (GRZ 2009).

2.3 BIODIVERSITY

As last reported in the 4th National Report, it is estimated that there are about 7,774 species of organisms that occur in Zambia with micro-organisms comprising 8%, plants 47%, and fauna 45% of this biodiversity (GRZ 2009). The diversity of fauna has been estimated at 3,407 species, of which 1,808 are invertebrates, 224 are mammals, 409 are fish, 67 are amphibians, 150 are reptiles, and 733 are birds. Floristic diversity is dominated by herbs and woody plants with an estimated 4,600 species of flora, of which 211 are endemic.

There are 19 National Parks established to conserve faunal biodiversity, comprising about 8% of the total land area. Most of these parks were set aside during the Colonial Era and formally established after Zambia’s independence in the early 1970s. One local forest reserve near Lusaka is proposed as the 20th addition to Zambia’s National Park System (W. Chansa, pers. comm.). Six National Parks have management plans – either current, under revision, or in draft form. Sustainable use of wildlife and its habitats in the parks is promoted through eco-tourism while settlements and hunting are prohibited. It is important to note that only the surface of land contained within parks is protected; subsurface mineral deposits are not withdrawn from entry. The Ministry of Mines and Minerals Development controls the extraction of all minerals in Zambia.

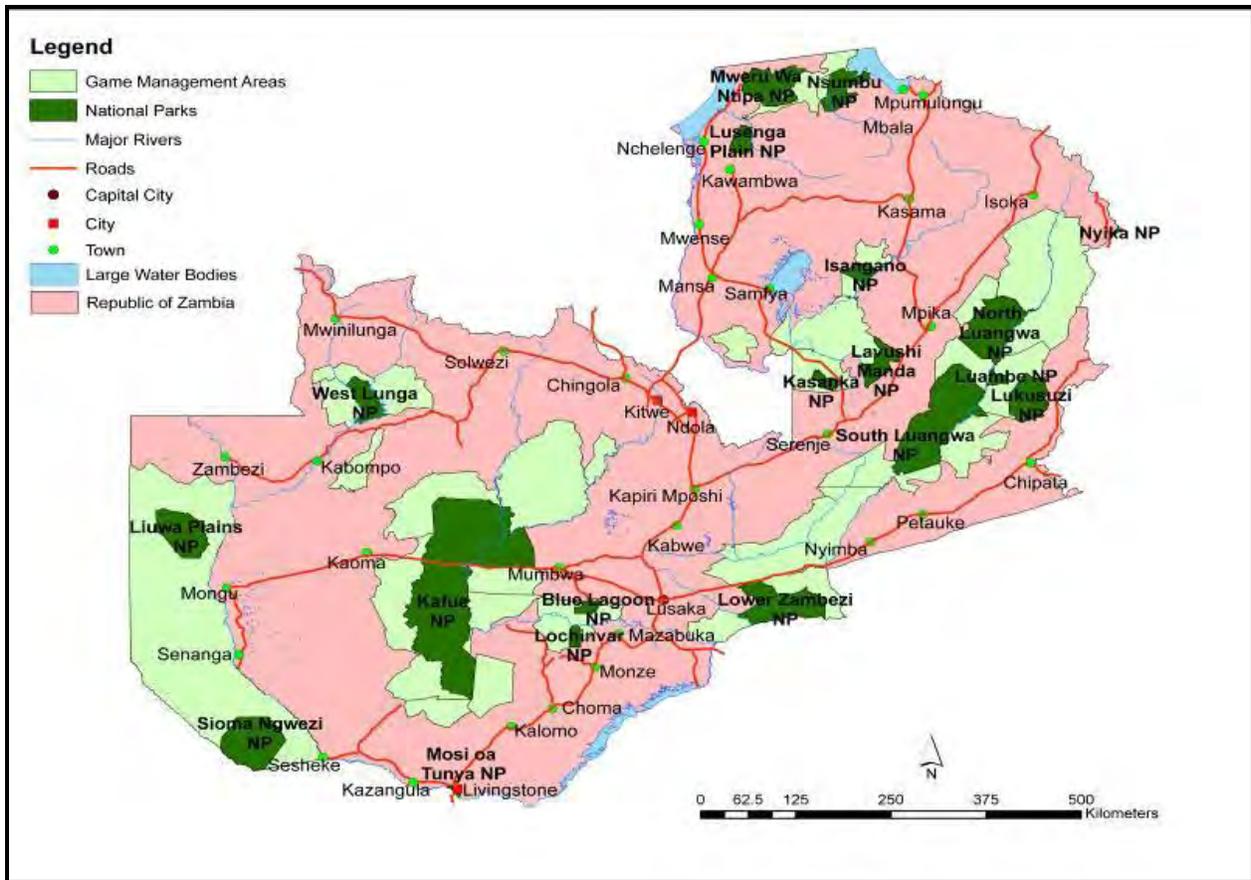


Figure 3. National Parks and Game Management Areas (GRZ 2009)

Game Management Areas are protected areas established by law to control the hunting of wild animals through a licensing system. There are 36 GMAs that were essentially set up as buffer zones to the National Parks, covering an additional 23% of the land area. The GMAs are communally owned areas where human habitation is permissible, along with economic activities that are not detrimental to wildlife management. Over 1.5 million people are estimated to live in these GMAs (GRZ 2009). Figure 3 shows the extent of both national parks and GMAs in Zambia.

Additionally, Zambia has eight designated Ramsar sites covering more than 4 million ha and 39 Important Bird Areas, 15 of which overlap with national parks. Within the National Forest system, 59 botanical reserves have been established to conserve floral biodiversity; 29 of these reserves are either encroached or depleted with a variety of reasons cited such as unmaintained reserve boundaries and inadequate capacity within the Forestry Department (GRZ 2009).

The 4th National Report estimated that 31 species are endangered or vulnerable (i.e. *threatened*); however a recent query of the International Union for the Conservation of Nature (IUCN) Red List found an increase in this number to 47 (IUCN 2010). Of these *threatened* species, five are considered *critically endangered*, 12 are *endangered*, and another 30 are considered *vulnerable*. It is difficult to determine whether the increase in the number of threatened species can be attributed to a decrease in populations or if better assessments have been undertaken, improving the baseline data. Many of these endangered and critically endangered listed species are aquatic organisms found in select lakes or river systems in Zambia and are primarily threatened by siltation, dams, direct or indirect poisoning, or competition from non-native species.

3. ENVIRONMENTAL LAWS, POLICY AND GOVERNANCE

3.1 LEGISLATION AND POLICY

There are more than 30 legislative instruments in Zambia that address the conservation of biodiversity and protection of the environment. Most of these instruments were enacted more than 30 years ago and some have been reviewed several times since then. There are also corresponding policies and institutions. The most important legislation, policies, and institutions in the conservation of components of biodiversity are in forestry, wildlife, agriculture, and fisheries. An overall environmental and natural resources management framework exists through the National Conservation Strategy of 1985, National Environmental Action Plan of 1994, and the National Policy on the Environment of 2007. In terms of legislation, the Environmental Protection and Pollution Control Act of 1990 is considered principal legislation covering a number of sectors. At the international level, Zambia is a party to the Convention on Biological Diversity (CBD) since May 28, 1993, and also to a number of other biodiversity-related international conventions. These Conventions are being implemented through the Ministry of Tourism, Environment and Natural Resources (MTENR).

Please refer to [Table 3.2 in the NAPA \(pp. 23-25\)](#) and [pp. 33-42 in the Zambia Environmental Situation Analysis Report](#) (MTENR 2005) for a list of policies, strategies, and programs relevant to natural resource management (NRM) in Zambia.

The management of natural resources in Zambia is divided among eight different Departments spread across seven Ministries:

- Department of Fisheries (Ministry of Livestock and Fisheries Development)
- Forestry Department (Ministry of Tourism, Environment and Natural Resources)
- Department of Water Affairs (Ministry of Energy and Water Development)
- Zambia Wildlife Authority (semi-autonomous body under MTENR)
- Department of Agriculture (Ministry of Agriculture and Cooperatives, or MACO)
- Department of Livestock Development (Ministry of Livestock and Fisheries Development)
- Department of Town and Country Planning (Ministry of Local Government)
- Ministry of Lands

There is no coordinating governance structure, policy, or law that brings together the ministries tasked with natural resources to plan, implement, and monitor integrated natural resources management plans. As a result, lands are often allowed to be utilized in ways that are at cross-purposes to natural resources conservation and sustainable utilization over the long run.⁴

⁴ For example, the dwindling forest estate in many cases is attributed to encroaching agricultural practices. To an agriculturalist, any ungazetted “open land” is potential farming land. One way to move past this would be to develop a land use master plan that would guide potential uses. Much more coordination would be necessary to achieve this in this outcome. Outside of protected lands for wildlife, forests, and mining, the bulk of the rural land in Zambia may be regarded as “open land.”

3.2 GOVERNANCE

3.2.1 GOVERNMENT STRUCTURES

Several levels of governmental hierarchy within Zambia are relevant to land management and the governance of natural resources. These structures include ministries, provincial governance, district committees and traditional administration but lack high-level coordination structures to consolidate natural resource management in the various ministries. The Public Service Reform Program (PSRP), as articulated in the Fifth National Development Program (FNDP), committed itself to a policy of decentralization of administrative capacity to more localized bodies. This commitment has been partly implemented, creating various local bodies as described below, but there is not yet sufficient capacity in these decentralized structures to fulfil the roles ascribed to them.

Provincial governance is provided by the Provincial Development Coordinating Committee (PDCC), headed by the Provincial Minister. The role of the PDCC is to coordinate the activities of various government departments and non-governmental organizations (NGOs). An additional coordination role is played at the District level by the District Development Coordinating Committee (DDCC). Operating under the auspices of the local authorities (District Councils), the DDCC comprises the District Commissioner, government departments, NGOs, selected private sector organisations and technical council staff. The Office of the District Commissioner, through the DDCCs, creates a facility for information exchange and collaboration to promote efficient management of financial and human resources for development. Local authorities are responsible for the passing of by-laws and are good entry points for identification and management of development initiatives.

Area Development Committees (ADC) represent more localized concerns and are tasked with local coordination of policies determined by the DDCC. Areas are in turn divided into wards, which have local councillors to represent community concerns within the ADCs. The ADCs represent the lowest levels of political administration, and are therefore the implementing agents of much of the policy determined by the DDCC.

Parallel to the political administration is a hierarchy of traditional administration in the customary areas. Certain rights and roles of these structures are enshrined within the political administrative system. Ultimately, Chiefs answer to the District Council, and they in turn can dictate policy to the Headmen of local communities. This structure is also useful for the communication of community needs in the other direction. Engagement with the traditional administration is essential for the long-term success of natural resources development initiatives and can enhance working relationships with communities.

3.2.2 COMMUNITY-BASED GOVERNANCE

Community-Based Natural Resource Management (CBNRM) programs have shown some conservation successes in the wildlife sector through the devolution of authority. This has been accomplished through the use of Community Resource Boards (CRB), which allow for community involvement in decision making and accountability. Here, Chiefs are made “patrons” to the CRB, performing functions of community mobilisation and conflict resolution, rather than being the absolute authority on the board. Community rights over accrued benefits from wildlife have made income available to rural communities which they could not access in the past.

The strengthening of the 1998 Zambia Wildlife Act devolving rights, responsibilities, and power to local communities, local organizations and the general populace through democratic and enfranchising principles opened opportunities for others as well. In other natural resources sectors – for example, forestry, fisheries, and agriculture – similar policies and legislation are being strengthened. The CBNRM is well-established in Zambia, with 63 CRBs established in GMAs and several pilots of fisheries management and Joint Forest Management (JFM) enterprises.

In the Fisheries sector, new community-based management structures have been created through development of Fisheries Management Committees (FMC) under the Fisheries (Amendment) Act of 2007. Members of the FMC include six representatives from the local fishing community, one representative of the local authority, representatives of the Chiefs, one representative from an NGO, one representative from the fishing industry, one representative from the aquaculture industry, and two other persons. These members have co-management authority over fisheries resources in their areas as zoned in conjunction with government. Village Management Committees (VMC) in the designated fishing villages under Zonal Management Committees (ZMC) further elaborate resource governance to lower entities..

From collected licence fees, 50% is retained at the FMC, who decide in which way those monies should be divided between FMC, ZMC, and VMCs, and the respective administrative and operational costs in each Committee. Other funds are allocated to other activities including promotion, infrastructure, landing sites, and fish processing facilities, such as slabs and storages (Mölsä 2009).

Collection of fish levies by the District Councils (DC) falls under the Local Government Act, whereas that of collection of fishing license fees falls under the Fisheries Act. VMCs have proposed that they could assist the Councils in collection of fish levies under their operational area. The income through fish levies has been decreasing over the last few years, regardless of increased fish catches. This indicates an inefficiency of levy collection, which could now be improved through co-management. They also suggest that 20% of fish levies be retained by the VMCs to compensate their operational costs, and that a part of fish levies be used for promoting fisheries development in the districts. The model needs to be reconsidered, as the Councils like to see such funds be devoted to concrete targets such as landing sites, feeder roads, and infrastructure. To devote levies to fisheries requires FMC to lobby DCs to come up with by-laws that would support the initiative.

In terms of forest resources, community involvement has been promoted in the form of management structures at the community level, forest product user groups, and forest patrols from the community, despite facing problems of parallel structures, and insufficient capacity building.

Producer groups in pilot JFMs include firewood, beekeeping, basketry, mushrooms, and other non-wood forest products are arranged in Village Resource Management Committees (VRMC), which oversee activities of the JFM at the village level. A combination of several VRMCs constitutes an Area Resource Management Committee (ARMC). The ARMCs in a district constitute a Forest Management Committee. The FMC is represented by the District Forestry Officer and superintends over all forestry management issues in all JFM areas in the district. The flow of authority and responsibilities follows the normal communication channel of the Forestry Department (Mwitwa 2009). Like other similar creations in natural resource management (NRM), a number of constraints have befallen forestry management in Zambia. For example, under the JFM model, committees are not village-based, and thus lack meaningful democratic participation.

When supported by policy and legal instruments, sustained support from cooperating and private sector partners, and improved local governance, these approaches have resulted in constructive impacts that have yielded benefits and responsibility from use of the natural resource base. While devolution of rights, responsibilities and power has been partial locally, there may still be a need for further advocacy in order to unlock the potential for increased benefits by local communities through:

- Appropriate use of participatory resource and management planning, implementation, and monitoring
- Harmonious conflict resolution
- Continued communication and capacity building of the local leaders
- Integrated technical and local knowledge input to lead/contact persons
- Household-level sustainable yield harvesting and diversified product development
- Strengthening of local institutions in a broad-based participation environment

In order for resource managers to deliver results where appropriate legislative framework has been put in place, there is a need to streamline coordination, strengthen local-level institutions in terms of representation, enhance participation and decision-making, and ensure the participation of marginalized groups.

The evolution of CRBs in GMAs, JFM committee schemes near forests, and FMCs is evidence of devolution of authority to communities despite implementation difficulties that may be encountered in the process. However, this assessment team concludes that effective governance over natural resources development and harmonization of policies and legal instruments ought to advocate for integrated resource management systems, where:

- Communities have adequate authority, capacity and responsibility to manage and control the resources in their area
- Communities have clear rights of either ownership or access, rights to manage and sell, and rights to benefit from the management of natural resources
- Benefits accrued from natural resource management are attractive for community involvement and investment
- Membership of community structures for natural resource management is clearly defined with provisions for decision making and good governance
- Geographic boundaries of a community managed area are clearly defined to facilitate monitoring and compliance;
- Functions of the various bodies are clearly outlined and followed up

The Agricultural sector has for a number of decades experimented with hierarchical organization of farmers in blocks, camps, and field schools in respective districts. Farmers are organized in groups such as cooperatives and special interest groups (farmer groups/interest groups), field schools for service/commodity delivery, and technology transfer purposes. Through facilitation by Extension Services (including training) of the Ministry of Agriculture and Cooperatives, working with various associate agencies, local communities organize themselves and govern their activities in conservation agriculture. Trained lead/contact farmers provide farmer-to-farmer extension and act as contacts to their colleagues.

Novel initiatives have in the recent past emerged in the water sector through community-based water users associations to manage water. However, lack of comprehensive national land use planning and inadequate integrated land use planning at the local level has led to unplanned developments that often create conflicts in resource use. In terms of implementation, this assessment team recommends that a mechanism be developed and agreed upon for community participation in dealing with some emergencies (e.g. fire surveillance and control).

3.3 LAND TENURE

Land tenure embodies those legal, contractual or traditional arrangements whereby individuals or organizations gain access to economic or social opportunities through land. There are two classes of tenure in Zambia: customary and statutory. An estimated 94% of the country is officially designated as being under customary tenure and is occupied by 73 tribes, headed by 240 Chiefs, eight Senior Chiefs and four Paramount Chiefs. Resources on communal lands are public, and are held by the President on behalf of the people. Resident communities are granted rights to the benefits of natural resources, but have no legal management privileges.

Under the customary system, *de facto* land allocation is carried out by Headmen of villages, although *de jure* ownership still resides with the state. It is not currently possible to privatize resources or land that is designated as customary. Under the Land Act of 1995, land under customary tenure can be converted to statutory leasehold tenure. Current debates on land tenure on customary land in Zambia revolve around three alternatives: (i) the retention of customary land tenure in its present form; (ii) the reform of customary tenure

by adapting it to the current socio-economic environment; and (iii) the individualization of tenure. Strong motivation for land tenure reform has not yet been articulated by the government, despite considerable pressure both internally and from international organizations.

While freehold title does not exist within the context of Zambian law, approximately 29% of State land has been alienated, and is held under leasehold agreement by private individuals. These 99-year renewable leases constitute private ownership, and lessees held title for the land as well as usage and exploitation rights for the resources on the land. Leasehold title cannot generally be retracted except when subsurface resources of national significance are discovered. In such situations, a lengthy legal and consultative process under which the landowner is paid compensation is generally undertaken, although the state is entitled to reclaim the land without compensation.

4. KEY ENVIRONMENTAL THREATS

For the purpose of this assessment, an environmental *threat* is: (1) a subjective but often quantifiable generic term that causes a negative impact on the environment, people, natural resources or biodiversity; (2) an act that directly or through other means exploits vulnerability of the environment, biodiversity, and/or natural resources to cause harm to an ecosystem, environment, biodiversity or natural resources. As an example, deforestation is often cited as an environmental threat; however, deforestation is actually an effect or result of a set of threatening action(s). Therefore, this assessment defines threats as the root activities or causes that lead to environmental degradation.

Based on the above definition, key threats to Zambia’s natural resources identified by this team are primarily human-caused, and include unsustainable agricultural practices, charcoal production, illegal off-takes, mining operations and expansion, and poor governance. Climate change, whether natural or human-influenced, is considered by this team to be a threat magnifier (see Figure 4). Changes in ecosystem and species diversity are directly affected by anthropological changes in land area under protection, encroachment, or direct exploitation of resources. Meanwhile, the country’s natural resources remain vulnerable and can be indirectly threatened by a lack of or ineffective management. This section elaborates on each of these key threats.

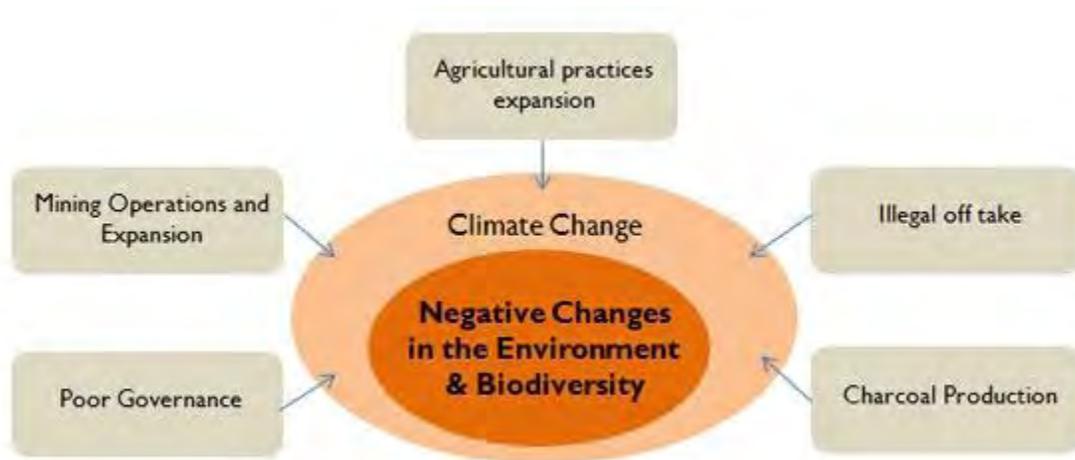


Figure 4. Key threats to Zambia’s environment and biodiversity

4.1 UNSUSTAINABLE AGRICULTURAL PRACTICES

It has been estimated that around 80% of the rural population makes a living through subsistence farming on customary land (USAID 2008). Agriculture contributes to around 21% of Zambia’s GDP with 34% of Zambia’s total land dedicated to large and small-scale agriculture (WB 2010, FAO 2009). Small-scale agriculture is by far the most common source of livelihoods and income options for rural dwellers in Zambia and as such, agriculture has been cited in past assessments (USAID 2007) and continues to have a significant impact on the environment. Throughout Zambia, small-scale agriculture is characterized by low or stagnant productivity and extractive farming systems that depend to a large extent on mining the natural resource base upon which farmers depend upon for their livelihoods (due to traditional cropping practices).

One of the main factors to be considered in relation to agro-ecological sustainability is the soil, as it is the basis for food production in Zambia. Therefore, an effort has to be made to minimize soil erosion so that soil is not transported by runoff to rivers, lakes or ponds, and to ensure sustainability of food production (Hailu and Runge-Metzger 1993). Such examples can be found not only in Zambia but worldwide. Rapid depletion of soil fertility and non-sustainable land use – particularly in developing countries – is both the cause and the consequence of widespread poverty. It is therefore necessary to change actual soil-degrading agricultural systems based on intensive soil preparation (which leave the soil bare and unprotected), to sustainable production systems based on permanent soil cover with plant residues and mulch.

Soil is a *non-renewable* resource and it is available only in limited quantities. Conventional soil tillage as it is practiced leaves the surface of the soil bare, and is one of the major causes of the occurrence of erosion on agricultural land. (Derpsch et al. 1991).⁵ In Zambia, achieving environmental stability in an agricultural sense requires a break from traditional cropping practices (as described in greater detail in Annex 2) and in particular the overall soil disturbance that arises from those practices. Overall and continuous soil disturbance from 1.2 million small-scale farmers does contribute to on-farm soil erosion and nutrient depletion on those farms. As farmers deplete their most important resource upon which all else depends – their soils – they migrate to virgin land and repeat the same destructive practices that led them to migrate in the first place, putting enormous pressure on adjacent ecosystems. Lower soil fertility due in large part to traditional farming practices also forces farmers to engage in off-farm activities which could include illegal fishing and poaching to supplement both income and food in their households. These traditional practices as they are applied in the Zambian small-scale farming sector can also increase negative downstream off-farm environmental effects: sedimentation into rivers, lakes and micro-catchments increases, and runoff from fertilizer and manure from conventional systems leads to destructive oxygen depleting algae blooms in those waterways.

Some of the negative effects that arise from traditional farming practices in Zambia, including inappropriate agrarian policies, inadequate or inappropriate investments and misguided philanthropic interventions, are presented in Annex 1 and are well known within the donor, public, and private sector communities. This section outlines the key underlying causes within the agricultural sector which create negative knock-on effects on ecosystems.

4.1.1 FOOD SECURITY

The majority of Zambian smallholders in marginal agricultural lands almost never attain yields of more than one ton per hectare for any targeted grain crop during normal rainfall years, as was the case in the 2005-06 season. Table 2 shows average crop yields across staple crops in targeted districts across most cropping seasons. Factors contributing to low productivity in Zambia can be found in Annex 2.

Current yields are generally in most years insufficient for food and income security, business expansion and investment, and prevent farmers from breaking the poverty cycles they find themselves mired in. The graph in Annex 3 depicting the annual October to April “lean season” highlights the dilemma faced by smallholders who rely primarily on maize, or cotton and maize. For the more vulnerable, the lean season commences as early as July or August. To survive this period, families often engage in off-farm income-generating activities such as charcoal production, roadside trading, poaching, tree harvesting for sale, or fishing during the December-March season when this activity is banned.

Table 2. Average Staple Crop Yields

Crop	Yield
Maize	1- 1.95 tons
Beans	320kg-670kg
Soya	870kg
Sunflower	720 kg
Sorghum	460 kg

Source: Zambia CSO 2008

Stakeholders in the agricultural sector are heralding the 2009-2010 as an unprecedented bumper harvest. A number of factors such as good rainfall, subsidized fertilizer, and to a smaller degree (estimated at around

⁵ While Derpschel and Hailu and Runge-Metzger are describing small-scale farming practices in Central America, these practices in particular overall soil tillage and the burning of crop residues are common place in the Zambian small-scale sector.

200,000 tons by the Conservation Farming Unit [CFU] and MACO) conservation farming (CF). However, on closer inspection, this record harvest of 2.7 million tons is by and large due to a significant increase in the total area cultivated – at *1.2 million hectares* this represents the *largest area planted since 1995-96*. While the average yield per hectare for this past season is estimated at 2.25 tons (an improvement over the historical maize average), this is still far below potential maize yields which in theory should be around 3-5 tons per hectare (as the article in the *Zambian Farmers Magazine* points out).⁶

Expanding land holdings under low productive systems will continue to put environmental pressure on finite resource bases. Continued low productivity in the smallholder sector remains an overriding problem and will continue to exert negative knock-on effects in local ecosystems despite this record total harvest.

4.1.2 IMPACT OF MAIZE

Zambia's historical and continuing "fixation on maize" (and therefore fertilizer), has led to inefficient, exploitive, and environmentally destructive farming practices which, when combined with the impact of Corridor disease on cattle populations, has seen many thousands of families slide from surplus production through subsistence to dependency (CFU/CAP 2006).

Prior to the 1970s, the systems that farmers applied to grow crops were more efficient and environmentally sustainable than today. In the drive for maize, a generation of Zambian farmers have forgotten or abandoned the husbandry disciplines necessary to sustain the land on which they depend. In addition, Zambia's fixation on a crop that is risky and increasingly expensive to produce is a primary cause of recurring food insecurity and environmental destruction (ibid).

Starting in the 1970s, the Government of Zambia (GoZ) agricultural policy focused its efforts on keeping the price of maize meal low in order to maintain political support amongst the sizeable urban and peri-urban populations. Maize production was encouraged and fueled through heavy fertilizer subsidies while maize consumption was subsidized through price controls. At its height, input subsidies accounted for 13% of the national budget while maize was routinely sold at 30% of its production cost. These government-led distortions led to a 60% increase in maize production. By 1989, 70% of the total cropped area in Zambia was under maize cultivation. Free elections and the liberalization of the economy signalled a massive drop in subsidies and price controls were dropped. This era of liberalization in the agricultural sector led to a massive movement towards commodity diversification and a 50% reduction in maize cultivation.

In 2005, the GoZ intervened in the agricultural sector when it introduced a substantial input subsidy via its Fertilizer Support Program (FSP). The FSP provides seed and fertilizer at a 50% subsidy. The 2006 FSP, for example, (see table below), along with the government maize marketing activities via the Food Reserve Agency, consumed about 90% of the MACO budget. The amount of money spent may of course fluctuate from one year to the next, but there is nonetheless a large fertilizer and maize marketing subsidy in effect.

⁶ *Zambian Farmer*, Chuuba, August 2010, pp9

Table I: 2006 MACO Poverty Reduction Programmes (ZMK billions)

Research	1
Maize marketing	50
Fertilizer Support Programme (FSP)	199
Commercialization	2
Livestock diseases and fisheries	4
Irrigation	2
Land Development	6
Other	6
TOTAL	269

Note: Only 15% of farmers will benefit from the Fertilizer Support Programme⁷

These government policies coupled with traditional land preparation practices, namely inverting and moving large volumes of soil back and forth across the whole field and the near universal burning of crop residues, have degraded once productive, arable land into marginal farm land, incapable of sustaining and producing enough food and cash crop required by the majority of Zambian small scale farmer households.

4.1.3 MIGRATORY FARMING

In Zambia where agricultural land is still relatively abundant, farmers who have degraded their land through continuous soil disturbance, cereal mono-cropping, and non-replenishment of nutrients; migrate and occupy pristine or rejuvenated woodland to temporarily exploit natural fertility in order to provide for the basic needs of their families. In Zambia it is all too common for members of food insecure families to abandon their crops and seek opportunities to supplement their income in the hunger months between October and January or in the case of severe land degradation, uproot the entire family in search of land that has not been mined by extractive farming methods (CFU/CAP 2010).

Clearing forests for agricultural production is a major cause of deforestation. In Zambia, it is estimated to account for about 90% of forest clearing (USAID 2007). To a significant extent, this syndrome explains why Zambia suffers the 4th highest deforestation per capita in the world (according to Food and Agriculture Organization of the United Nations or FAO). By arresting erosion, improving soil fertility and enhancing productivity, CF offers families a sustainable alternative that enables them to repose on their farms (CFU/FINNIDA 2010).

4.1.4 AGRICULTURE AND CLIMATE CHANGE

In recent years the potential impact of climate change on small-scale agriculture has captured the attention of governments, donors, and numerous development institutions. Zambia has been labelled as one of the most unprepared and most vulnerable countries in the world to climate change.⁸

The frequency of droughts (prolonged dry periods) or floods are routinely cited by farmers and field-based on-farm extension staff as the root cause of food insecurity in Zambia.⁹ However, statistics do not support this premise. Daily rainfall recorded on a commercial farm in Monze District from 1920 to 2002 and analyzed on behalf of the CFU by the University of Reading Statistical Service Centre, shows that there has been no decline in overall precipitation or distribution. Moderate to harsh fluctuations in rainfall patterns are normal

⁷ CFU, Conservation Agriculture Programme, October, 2007, pp9

⁸ COMESA CA Draft Programme Document, February 2010, pp 7

⁹ Mike Mailloux – 1998-2011, 15 years of in-field on-farm farmer interviews & technical training sessions

and no more severe today than they have been since recording began (CFU 2006, Aagaard 2010a).¹⁰ While Lusaka-based civil society NGOs and others might of course have their own reasons for food insecurity, field-based practitioners tend to hear from farmers that droughts and floods or heavy rains are a predominant cause for low yields, food insecurity et al (See Addendum – Low Yields, pp1 Aagaard October 2007).¹¹

Intensive tillage, as noted in the box on the right, is overall soil disturbance, whether that is being carried out by a hoe, animal draft power or mechanized ploughing. It all leads to highly destructive pulverization and the subsequent lowering of soil fertility levels on a farmer's land holding. This overall pulverization from intensive tillage prior to the 1930s (and the detrimental affects it has on the soil) was established by the United States Department of Agriculture (USDA) in the United States during the 1940s. Conventional tillage methods were first questioned in the aftermath of the dust bowl in the U.S. midwest where the combination of drought, removal of natural vegetation, and excessive soil disturbance from ploughing and discing destroyed over 100 million acres of farmland and caused extreme hardship for over half a million families.¹²

The last fully fledged drought in Zambia was experienced in 1991/1992 and before that in the mid 1980s. Rainfall distribution in 2001/2002 and in 2004/2005 was unfavorable, but neither can be described as drought years. Insofar as the weather is concerned, the 2005/2006 season was as close to “perfect” as nature could devise, yet yields and productivity were still very low as noted earlier in Section 4.1.1 (ibid).

In Zambia's maize belts, a “drought” is defined by a situation where maize suffers or fails, irrespective of the fact that cassava, sweet potatoes, sorghum, millet, cowpeas, pigeon-peas, green gram, guar, okra, impwa, and pumpkins produce in all but the worst droughts. In 2004/2005, considered by some to be a drought year, Zambia registered a maize deficit of around 85,000 tons; however a surplus of 324,800 tons of cassava was recorded. In addition to the cassava surplus, an additional surplus of 214,000 tons of Irish potatoes and sweet potatoes was also produced.

Global Warming and Tillage
Intensive soil tillage accelerates organic matter mineralization and converts plant residues in carbon dioxide, which is liberated into the atmosphere, contributing to the greenhouse effect and to global warming. Recent research performed in the United States by USDA/Agricultural Research Service (ARS) shows that soil carbon is lost very fast – as carbon dioxide – within minutes after the ground is intensively tilled, and the amount is directly related to the intensity of tillage. After 19 days, total losses of carbon from ploughed wheat fields were up to five times higher than for unplowed fields. While fossil fuels are the main producer of carbon dioxide, estimates are that the widespread adoption of conservation tillage could offset as much as 16% of world-wide fossil fuel emissions (CTIC 1996).

While there is much discussion on the impact of climate change on Zambia, there has been little on the activities in place to counteract this threat on the ground. These appear limited to the adoption of CF and Conservation Agriculture (CA), climate mitigation strategies on the part of some farmers (≈160,000 farming families out of 1.2 million), and the use of more fuel efficient household cookstoves. If the majority of smallholders in Zambia are already intermittently or chronically food insecure during normal rainfall years, how will they cope if the climate deteriorates (Aagaard, 2010a)? The concerns regarding climate change provide an opportunity to focus efforts to enhance agricultural productivity and on-farm climatic resilience in Zambia through the delivery of programs and activities such as Conservation Farming and Conservation Agriculture – that offer practical and proven solutions that farmers can apply quickly on-farm and realise almost immediate benefits.

¹⁰ It should be noted that this does not mean that these patterns will stay this way in the future either – Zambia could see statistically significant increases in storm-produced precipitation exacerbated by climate change in the future.

¹¹ Ibid, Mailloux.

¹² Maize production and CF in Zambia – An Update, CFU, Section6, pp4, Aagaard 2009

4.2 CLIMATE CHANGE

The Republic of Zambia has been found to be particularly vulnerable to the adverse effects of anthropogenic climate change. Zambia has a population of 11.8 million people, 73% of which live below the poverty line (Wignaraja et al. 2010). Approximately 39% of the population resides in urban areas, surrounded by heavily deforested and degraded land. Rural economies (which contain 61% of the population) primarily rely upon small-scale agriculture (usually less than 2 hectares), with low productivity and a high dependency on consistent climatic cycles (ibid.). Many farmers operate on the very edge of subsistence, with little or no ability to absorb losses.

Unlike the other threats outlined in this assessment, climate change does not directly affect natural resources in most cases, but acts more as a “threat multiplier.” The Intergovernmental Panel on Climate Change Fourth Assessment Report concludes with high confidence that “Africa is one of the most vulnerable continents to climate change and climate variability, a situation aggravated by the interaction of ‘multiple stresses,’ occurring at various levels, and low adaptive capacity.” (IPCC 2007)

Potential impacts from anthropogenic climate change are wide-ranging and affect multiple sectors:

Economic Growth: Endemic poverty, complex governance and institutional challenges, limited access to capital (including markets, infrastructure and technology), ecosystem degradation, and complex disasters and conflicts contribute to Africa’s weak adaptive capacity, increasing the continent’s vulnerability to projected climate change.

Agriculture and Food Security: Already marginal agricultural systems will likely be severely compromised by increased incidences of droughts, floods, heat, and pests. Predictions include a shorter growing season and dramatically reduced crop yields, with smallholder farmers being most adversely affected. Low yielding traditional small-scale agricultural practices in turn become a driver of charcoal production, illegal off-takes, human migration, and unplanned development/land conversion as farmers try to offset low incomes and household food insecurity through other activities both legal and illegal to meet their livelihood needs.

Water Stress: Climate change will likely negatively affect water availability and accessibility across all sectors. Conversely, more intense storms will likely increase erosion, crop damage, and incidences of floods. These factors also pose a threat to fisheries.

Ecosystems and Biodiversity: Climate change will likely interact with human drivers such as deforestation, unplanned development, and wildfire to adversely affect ecosystems and biodiversity. This will affect the populations and distribution of endemic species, which in turn will impact tourism as well as ecosystem services.

Human Health: The potential impacts above already effect human health in multiple ways, but this can be confounded further by increased incidences of infectious diseases such as malaria, cholera, dengue fever, and meningitis.

4.3 CHARCOAL PRODUCTION

Charcoal production for the supply of fuel for inefficient household cook stoves in Zambia contributes to numerous environmental threats across multiple sectors. Charcoal production is a threat to forests and biodiversity particularly where access is available. Supply-side and demand-side utilization of charcoal as a household energy source leads directly and indirectly to deforestation, anthropogenic climate change, biodiversity loss, and adverse effects on human health. Charcoal and firewood are also widely used as energy sources in commercial and industrial processes.

The process of charcoal creation is inherently inefficient: 6 kg of wood yield 1 kg of charcoal, with kilns operating on average at only 25-28% efficiency (Chidamayo et al. 2001). Most of this wood is procured as an

illegal off-take, driving deforestation and unplanned land conversion. Zambia has one of the highest deforestation rates in the world¹³ (Wignaraja et al. 2010) and is considered particularly vulnerable to the effects of anthropogenic climate change (MTENR 2010b). As an example, in the Chongwe District, woodland cover declined by 30% between 1989 and 1998 and the CHAPOS (Charcoal Potential in Southern Africa) study found that in Miombo woodlands 88% of the tree species are preferred “charcoal trees” (Chidamayo et al. 2001). Approximately one-fifth of global anthropogenic greenhouse gas emissions come from deforestation and forest degradation (ibid.). Furthermore, deforestation and climatic changes tend to negatively impact biodiversity stocks (MTENR 2009).

In the human health sector, charcoal burning has been shown to significantly impact respiratory function through the creation of carbon monoxide, soot, and other emissions (K. Trifellner, pers. comm.; ECZ 2008). With roughly 25% of households having access to electricity (49.3% of urban households, 3.2% of rural households), charcoal and firewood provide nearly 75% of the energy used in Zambian households (ibid.). Conventional charcoal and wood cook stoves tend to be dirty and inefficient, requiring approximately 1.3 tons of charcoal per household annually (ibid.). Emissions from these conventional stoves have been known to cause headaches, vomiting, and dizziness, as well contribute to respiratory disease (ibid.). The transport of charcoal along roads on bicycles and trucks is dangerous, posing a hazard to travelers and charcoal transporters alike, particularly at night. Health effects of working with charcoal kilns and the transportation of charcoal are unknown, but anecdotal evidence shows overloaded and unsafe vehicles transporting charcoal for use in urban and peri-urban areas, only to accrue a weak profit.

The direct and indirect impacts from charcoal production can be enumerated as follows:

Deforestation: Though data on Zambia’s forests is very poor, the country is experiencing a very high deforestation rate, largely due to charcoal production and agricultural practices. This in turn leads to increased greenhouse gas emissions, lower greenhouse gas sequestration potential, biodiversity loss, and negative impacts to ecosystem services (such as water quantity and quality).

Land Use Conversion: Deforestation and production practices supporting the charcoal industry directly contribute to land use conversion. This confounds integrated planning and sustainable use of natural resources not only through deforestation and forest degradation, but also through the creation of unplanned roads and processing facilities (e.g. charcoal kilns).

Adverse Human Health Impacts: Cooking indoors over a charcoal stove creates many potential adverse health impacts. Furthermore, these impacts disproportionately affect females, who are traditionally responsible for most food preparation

4.4 ILLEGAL OFF-TAKES

4.4.1 FOREST RESOURCES

Forests in Zambia are threatened and have been experiencing a decline in extent and quality since 1998. This decline has been confined primarily to the forests accessible by the rail line in the Copperbelt, Central, Lusaka, and Southern Provinces. In addition to the direct loss of forests through the cutting of trees to feed kilns and produce charcoal, timber resources are also exploited without management plans, resulting in deforested or degraded forests. Logs harvested illegally are often exported illegally as well. A lack of enforcement of existing laws as well as a lack of management plans for sustainable management of forests and porous borders allows this exploitation to continue.

¹³ 250,000-300,000 ha/year out of 50 million ha of forest

4.4.2 WILDLIFE RESOURCES

The poaching of animals is parallel to the illegal harvest of forest resources. Animals are poached for food, for income through the selling of bush meat, and for illegal export. Well-intended projects in some areas have resulted in supplying poachers with material for snares: fences erected to reduce human wildlife conflict or to control Tsetse flies have been turned into snares by poachers. A lack of enforcement of existing laws and ineffective sharing of revenues through community resource boards also contribute to poaching as a means to gain income. Village scouts who are hired to patrol for poachers wait several months for payment through the resource boards and as a result may turn to poaching themselves. The end result is a devastating effect upon wildlife populations and genetic diversity. There are notable efforts being made in areas surrounding National Parks and GMAs by concerned people and organizations in cooperation with Zambia Wildlife Authority (ZAWA). Traditional leaders in some GMAs have shown an interest in educating their people about the negative effects of both illegal harvest of timber and poaching. These traditional leaders must be a part of an effort to change these practices. Continued support for good governance within Zambia to increase the effectiveness of government agencies such as ZAWA and the Environmental Council of Zambia (ECZ) is a long-term challenge but necessary if these threats are to be addressed in a lasting way.

4.5 MINING OPERATIONS AND EXPANSION

The expansion of mining operations and mineral processing have tremendous impacts on the environment and natural resources making it one of the anthropological activities that impact the environment and biodiversity (see Figure 4).

Zambia is ranked as the eighth largest producer of copper globally with a global share of 4% (Meller and Simpasa 2009). The copper mining sector share of GDP in 2008 was estimated at 8.4%, dropping from a high of 12.1% in 1996. The rapid economic growth in Asia has led to a global demand for commodities and a “scramble” for natural resources across Africa (Broadman 2007). The price of copper, which is the backbone of the Zambian economy, quadrupled between 2001 and 2006 (Mwitwa et al. *in prep*). This has led to Zambia experiencing an overall boom in demand for copper and resultant positive per capita income growth rates (Bigsten and Tengstam 2008). The boom in demand has led to increased copper production from the major mines, i.e. the Chambeshi, Kansanshi, Konkola Copper Mines (KCM), the Lumwana Copper Mine, and the Mopani Copper Mine. New foreign direct investments have exceeded US\$4 billion in the last five years, resulting in new mine concessions in forests of the Northwestern, Central, Eastern and Southern Provinces.

Mining and mineral processing affect the environment, biodiversity, and livelihoods (Caritas 2009, Mwitwa et al. *in prep*) through the impacts enumerated below:

Displacement of Forests and Customary Land-Users in the Mining Concession Site. The displaced populations usually seek alternative areas to settle and embark on land clearing for agriculture. The new agriculture clearing of forests magnifies the expansion of deforested land – the sum of vacated land plus the new clearing.

Consumption of Timber in Mining Related Activities. Mines in the Copperbelt have had a long history of dependence on indigenous timber sources. At the advent of mining in the 1920s, timber was sourced from forests located in the Copperbelt, resulting in the current secondary woodlands. In the post-1970 era, the demand shifted to primarily the forests of the Northwestern Province where timber has been sourced using contractors holding concession licenses. The demand for specific tree species has largely resulted in forest degradation in concession areas. The degradation impacts on regeneration and biodiversity of target forests. Communities in such customary forests have to travel long distances to source mushrooms, medicines, and other non-timber forest products.

Release of Mine Effluents that negatively impacts of aquatic biodiversity. Mining operations use chemicals like mercury, cyanide, sulfuric acid, arsenic, and methyl mercury in various stages. A large amount of these chemicals are released into nearby water bodies through pipes leading to water pollution. The rivers that are largely affected include the Kafue River and Mushishima Stream in Chingola, which are polluted by KCM

effluents; and the Lumwana River in Solwezi, which is affected by Lumwana Copper Mine effluents. The release of mine effluents, containing heavy metals and poisonous chemicals into the Kafue and Lumwana rivers, is harmful for the aquatic flora and fauna of the water bodies, and also impacts human life as the water is used for domestic consumption. Additionally, downstream industrial activities depending on the polluted water sources are also negatively affected – thus affecting not only the environment but the socio-economic life of Zambia.

Despite tailings being used to facilitate managed disposal of chemicals into the water bodies and tailings dams, leakages have been reported at Lumwana in 2008 and at KCM annually. Leaked chemicals have the potential to slowly percolate through the layers of the earth into the groundwater system which they pollute. In addition, surface run-off of soil and rock debris, although non-toxic, can be harmful for vegetation of the surrounding areas. Chemicals that leak onto land change the chemical composition of the land. Since the chemicals are poisonous, they make the soil unsuitable for plants growth. Organisms that use the soil as a habitat can no longer successfully use the polluted environment as it becomes hostile to their survival.

Green Site Development results in the clearing of large tracts of forests leading to deforestation. Mining operations and associated developments require large areas of land, mainly forested land, to be cleared. Therefore, large tracts of land are being deforested. Due to the fact that the forests and woodlands that are cleared for mining purposes are a habitat of a large number of fauna and flora, green site developments also result in the loss of biodiversity.

Indirect Effects of Road Expansion. In tandem with clearing the mining area, vegetation in the adjoining areas is also cut in order to construct roads and residential facilities for the mine workers. The collateral effects of mining and related operations then result in extensive tree cutting and removal of vegetation along roads, thus negatively on the environment and biodiversity. Roads also provide an improved access point for illegal off-takes.

Mining-induced Population Growth in Forest and Woodlands. Growth in human population associated with mining brings with it other harmful environment- and biodiversity-impacting activities, such as the indiscriminate clearing of the forests and woodlands for timber and non-timber forest products, charcoal production, and fuel wood leading to the loss of habitats of a large number of animals and plant species. The increase in demand for timber, non-timber forest products, charcoal, and fuel wood puts the survival of a large number of animal and plant species at stake.

The National Policy on Environment (MTENR 2007), the 2005-2008 Integrated Land Use Assessment (Mukosha and Siampale 2009), and the Reducing Emissions from Deforestation and Forest Degradation (REDD+) National Joint Program (Wignaraja et al. 2010) all list mining and mineral processing as a threat to the environment and biodiversity from (a) dereliction of land through erosion, toxic dumps, and redundant facilities; (b) pollution of water due to unmanaged waste water and sediment discharge; and (c) air pollution by dust and gases.

4.6 POOR GOVERNANCE

4.6.1 INADEQUATE INSTITUTIONAL CAPACITY

Despite the existence of a variety of institutions dealing with natural resource management (NRM), there does not seem to be effective institutional capacity to coordinate, allocate, and manage Zambia's natural resources. Sectoral institutions of government continue to formulate periodical sector-based development plans. This frequently results in sector conflicts, especially in open areas where there are no specific instruments of regulation. Many customary areas experience conflicts over un-delineated land uses. For example, unregistered agricultural expansion into wooded areas outside gazetted forests or within GMAs is characteristic in many of Zambia's rural environments.

In terms of addressing such national issues requiring effective resources management, government needs to do more to build capacity to achieve better environmental guidance, despite having well elaborated

governance structures – politically, administratively, and customary (ECZ 2008b and 2008c). A weak policy environment, lack of a planning and consultative model, as well as weak policy implementation and monitoring have been cited as major reasons for program failures and high levels of poverty within Zambia. Currently, administration of the forest resources is still carried out via an inadequately facilitated centralized system under the Forestry Department despite legislative proposals for collaborative forest resource management with local communities through shared responsibility of JFM (Mwitwa 2009). Support to strengthening such institutions to share management with community-based entities would enhance devolution of authority and enforcement at the more local level.

4.6.2 UNPLANNED DEVELOPMENT

Governance of natural resources at the local government level has not gotten the attention that is needed, partly because of the absence of effective structures to plan, implement, and monitor natural resource allocations. This is especially true where there is no donor influence or funding. Matters raised are discussed sectorally at either the District or the Provincial Development Coordinating Committee level. Interactions at many such forums are marred by sectoral interests devoid of a well-coordinated master plan. There are no specific resource use allocations to major land uses besides the protected lands under wildlife (30% of Zambia) and forests (8%), some of which overlap. Consultation with stakeholders that are or may be affected by public policy is not compulsory, and there is a danger that the views of marginalized groups in society may not be heard.

Sectorally, it is stated that 66% of Zambia is under forest cover (Mukosha and Siampale 2009). What are the implications of that on other land users, such as agriculture or even wildlife, especially in the advent of potential carbon crediting schemes? The absence of effective high-level natural resource planning and coordination mechanisms is largely to blame for the ineffective unilateral management of Zambia's natural resources. At this level, good legislation and regulations are passed but not easily implemented for a variety of reasons ranging from inadequate capacity and absence of national land use planning, to inadequate funding. Sometimes the participating partners appear to push for developments that are not fully supported by government despite agreeing to them.

4.6.3 INADEQUATE ENFORCEMENT OF ENVIRONMENTAL LAWS

Enforcement of environmental laws requires specialists who are not adequately staffed and sometimes not adequately trained. Flow of information to the public may not be adequate as well. The few specialists at the Lusaka and Kitwe offices of ECZ cannot attend to an increasing number of environmental cases. It will be necessary to strengthen these officers with innovative training and practice as well as appropriate exposure.

The COMACO (Community Markets for Conservation) strategy points other resource users towards improved resource utilization and development once matters of sustainability and resilience have been resolved. Beneficial local communities need to be empowered to take charge of co-management responsibility over the natural resources around them for protection, enforcement, and development through support to community-based involvement in rural investment and management. As new Forestry Acts and Fisheries Acts come into effect, they need to clearly spell out rules and regulations of co-management schemes drawn by appropriate stakeholders.

4.6.4 LAND TENURE

An absence of secure land tenure results in few people investing in customary land areas. Rather, people move from one area to another without practicing sustainable land management. Additionally, an absence of secure land tenure hinders the capacity of tenants to access needed loans or investment to support economic or social opportunities. Field interviews have shown that an absence of secure land tenure both promotes deforestation and forest degradation, as well as impedes the ability of communities to protect and sustainably utilize forests. However, land tenure is an extremely sensitive issue that needs to be handled carefully. In Zambia, land is the powerbase of traditional leaders and it will be very difficult to change land tenure without major social infractions. Additionally, government and traditional leaders often do not share the same agenda with regard to land use and control. This may pose a barrier to NRM.

Since resources on communal land are not private and cannot be privatized, communities have resource *use* rights but not resource *management* rights. This presents legal obstacles to the implementation of benefit sharing between government and local communities. This has been demonstrated through the implementation of Joint Forest Management. Although local communities can be ceded temporary management rights for a forestry area by means of a statutory instrument, the monetary benefits cannot legally be shared between the government and any other entity.

Another equally important barrier that land tenure brings with it is that of rent-seeking. This could potentially be a significant problem in Zambia under the current land tenure system. Of particular concern is that the customary authority has the right to lease the land under the Lands Act of 1995, which could be tied to commercial joint ventures in either local forests and/or GMAs. This could result in rent-seeking, corruption, evictions of local communities and a host of activities that are not envisioned as NRM.

Even where land tenure is secure or where devolution of rights to communities occurs, most local communities presently lack sufficient frameworks to implement proper management and administration without considerable capacity building. Provision of land tenure and devolution of management rights will require political investment in the decentralization policy of the PSRP and effective implementation of CBNRM policies on the part of government. It would also require major policy reform pertaining to land, decentralization, and CBNRM. A systematic addressing of the legislative context and development of benefit sharing models would likely benefit Zambia in a similar manner. However, other policies and acts will also require review if REDD+ is to succeed. Carbon ownership and land tenure are key points of interest for investors as they will need to be protected by policy on these issues.

4.6.5 LACK OF TRANSPARENCY

Efforts to pass a land policy following the enactment of the Lands Act have been unsuccessful, largely due to inadequate protection for populations that depend on rural land and access to natural resources. The 1995 Lands Act and subsequent proposed land policies are considered with suspicion because they focused on alienation of customary land and encouraged large-scale investment in land.

Proposals made in the draft new constitution, however, call for revision of existing land laws to provide for: (1) equitable access to land and associated resources, (2) equitable access to and ownership of land by women, (3) land tenure security, (4) sustainable and productive management of land resources, (4) transparent and cost-effective management of land, (5) conservation and protection of ecologically sensitive areas, and (6) cost-effective and efficient settlement of land disputes. Appropriate support is encouraged in this area to enhance transparency and governance (USAID 2010).

In addition, community-based initiatives to harness and manage natural resources have been pursued, particularly among the wildlife, forestry, and fisheries sectors in a variety of forms in the recent past. The advent of community-based initiatives as opposed to “command and control” approaches, are showing some success and creating community collective action models that include co-management, participation, and collaboration in the use of available natural resources. However, the community managing the resources must have the legal rights, the local institutions, and the economic incentives to take substantial responsibility for sustained use of those resources. Adequate benefit-sharing mechanisms that are currently not fully resolved need to be established to evade potential conflicts among all those tasked with natural resources management. Various concerns ranging from licensing to payment of royalties need to be addressed to benefit both government and the local communities. Success has been scored when participating communities have become owners and primary implementers, receive technical assistance, and also participate actively in part of the monitoring.

4.6.6 DISPLACEMENT OF CUSTOMARY RIGHTS

Growth of urban population is exerting pressure to open up new areas and opportunities for development under a liberalized economy. This has led to creation of new mines and investments in what may be termed “non-traditional areas” and thus situations that may demand relocation of people, if in open areas, or

disturbance to natural habitats in terms of wildlife and biodiversity. Under customary tenure, such lands are held by individuals, families, clans or communities of past, present, and future generations and cover the majority of Zambia's land. The conversion of land from customary tenure to statutory tenure has seen at least 10% of land being redistributed on title to foreign investors, local elites, politicians, and land speculators. Whilst such developments may have provided needed investments in these rural areas and created opportunities for local employment, contract farming, secondary businesses, infrastructure and social services development, and transfer of skills, they pose a threat to customary rights in the areas affected. People are made to relinquish their customary rights, thus affecting and sometimes changing their livelihoods. Government needs to be assisted to better handle such matters to avoid eroding of local rights to common-pool resources, loss of access to water sources, grazing land, and forest products (USAID 2010).

4.6.7 INADEQUATE COORDINATION ACROSS SECTORS

Development programs in Zambia have suffered from poor governance through irregular implementation, coordination, and monitoring, resulting in fragmented implementation of plans, as seen in the GoZ Fifth National Development Plan (FNDP), which takes a sectoral approach without a “master” plan. Difficulties arise from the centralized and hierarchical nature of decision making and administrative structures that often undermine the functioning and popular perception of central government. Nevertheless, significant progress has been made to address these failures, and the process of transformation is ongoing. Through the FNDP, a comprehensive coordination strategy was formalized that is shifting focus away from centralized governance to a more decentralized operational structure.

4.6.8 INADEQUATE MONITORING, REPORTING, AND VERIFICATION (MRV)

It has been difficult in many situations to obtain data on the status of natural resources (even from specialists themselves) due to inadequate monitoring facilities, equipment, capacity, and funding. Concerned institutional entities do not appear able to afford adequate facilities for monitoring their resources periodically. It currently takes too long to capture such information, to the detriment of the industry concerned. Support for affordable instruments to survey, assess, and report the state of the concerned natural resources, including appropriate research, is recommended. Protected area authorities seem attracted to engaging local communities to co-manage natural resources. Some capacity must be built into them to actively participate and report on the state of these resources. Such reporting would eventually reduce discrepancies that exist regarding the state of the environment nationally. For example, the Forestry Department states that 66% of Zambia's land is under forest cover while others say it is 57%. Support for the regular monitoring, reporting, and verification of environmental indices and program outcomes would enhance integrative planning and the sustainable management of Zambia's natural resources.

5. OPPORTUNITIES TO ADDRESS THREATS

This section presents several opportunities to address the threats that were identified by the organizations, institutions, and individuals interviewed for this assessment. Table 3 (below) lists six cross-sector opportunities, with “Xs” identifying the key threats from Section 4 that each opportunity addresses. These opportunities are described in greater detail in the following pages. Where possible, complementary interventions currently funded by USAID, other international donors, or NGOs are noted. One possible way to identify the opportunities that are most needed, or that would address the most issues across the sectors examined by this ETOA, is to prioritize opportunities that address the greatest number of threats (those having the most “X” marks). An assumption carried forward is that all identified opportunities will require full involvement of PDCCs, DDCCs, ADCs, and traditional leaders in order to entrench sustainable NRM, implementation, and utilization. Many more factors may threaten the environmental health of Zambia, but these six were considered priority threats by this team.

Table 3. Opportunities and the Environmental Threats That They Address

		Threats					
		Unsustainable Agricultural Practices	Climate Change	Charcoal Production	Illegal Off-Takes	Mining Operations and Expansion	Poor Governance
Opportunities	Conservation Agriculture	X	X		X		X
	Public/Private Conservation Partnerships	X	X	X	X		X
	Integrated Land Use Planning	X	X	X	X	X	X
	High-Efficiency Household Cook Stoves		X	X	X		X
	Monitoring, Reporting, and Verification	X	X	X	X	X	X
	Urban Health and Environment Improvements		X			X	X

5.1 CONSERVATION AGRICULTURE

5.1.1 CONSERVATION FARMING

Conservation farming/agriculture systems, and the many benefits that arise from their application, have been independently documented by a number of reputable institutions and more importantly by many thousands of farmers who have adopted the practices. The most significant references relating to this subject are presented in the bibliography (see Annex 7). A summarized description of the main benefits is described in Annex 4 and includes the following:

- 25% to 100% yield increases (first season) and soil improvement (medium-long term)
- Increased labor productivity and income through timely planting and the precise outlay of inputs

- Adaptation to climate change
- Small holder risk aversion – farmers can learn and adopt basic practices quickly
- Decreased land degradation, migration, and deforestation
- Increased family nutrition through the integration of high protein legumes
- Increased on-farm revenues through off-farm business opportunities and increased marketable surpluses

As noted above, the number of farmers currently adopting CF on a portion of their holdings, while significant, still represents only 13% of the total farming households across Zambia’s 73 Districts. Expansion of CF-related activities through the *Zambian Conservation Farming Unit* and other NGOs with government support represents an opportunity to address the poor productivity and environmental destruction characteristic in the *Zambian small-scale farming sector*.

The CFU has earned a reputation for delivering practical and measurable on-the-ground results with farmers in Zambia and across six other African nations. The *Zambian CFU* would not require direct support from USAID but would be well placed with its 15 years of on-the-ground experience working with farmers to support and ensure that other NGOs working with farmers correctly learn how to train their targeted beneficiaries. This is critical, as there have been instances in Zambia and Malawi where NGOs have incorrectly trained farmers (Aagaard 2010b).

An independent CFU qualified and managed field monitoring unit could be supported to ensure proper training quality control and field monitoring in other programs supported by USAID/Zambia. This unit, in conjunction with MACO Field Extension Staff, would also provide timely CF and CA technical training and support to other development and private sector entities.

5.1.2 OFF-FARM ECONOMIC OPPORTUNITIES

Under the USAID-funded *Production, Finance and Technology (PROFIT)* project, there are a significant number of in-community retail agents, tillage, and spray service providers who provide to an increasing number of small-scale farmers yield-enhancing services and products that can greatly increase on-farm revenue for their clients while providing viable and long-term market support employment opportunities. These in-community services and increased access to productivity-enhancing products further increases yield gains under CF and CA systems. A summary of key PROFIT project agro-business activities and results across a wide range of small-scale agricultural sectors is presented in Annex 5.

By working with the private sector as PROFIT Zambia has done (though not becoming the market as other projects such as the *CLUSA DMMU FAO food security project* or *COMACO* – which is, in effect, the market player – have become) ensures that the long-term systemic growth needed to lower poverty and environmental destruction is integrated into the small-scale farming sector. This “light touch” approach with minimal market interference should be replicated in future USAID agricultural projects. On-farm economic activities, such as access to transparent and open markets, reliable and affordable access to yield-enhancing inputs, and market support services, are also vital if small-scale farmers are to increase on-farm productivity on existing holdings. This would help mitigate migratory farming with the ensuing encroachment and environmental impacts those migrations entail.

5.1.3 SUPPORTING A DIVERSIFIED FOOD AND INCOME BASE

The promotion and integration by future USAID projects of improved cassava, sweet potatoes, and climbing beans into current small-scale crops would ensure household food security during erratic climatic years as well as increase protein levels at the household level. This would help to negate off-farm poaching and deforestation activities required by many households to supplement maize food stocks. However, the private sector growers and transporters need to be engaged in the production and supply of growing material.

Other income-generating activities that also increase protein and nutrient intake, such as small ruminant and poultry-raising, should be explored as well by future USAID-supported agricultural projects. Additional income-generating activities such as these would also offer an opportunity to focus on income- and food-generating activities that are predominantly managed and carried out by women.

Diversifying the food and income base would help farmers spread risk and mitigate external shocks such as higher food prices, and changing/erratic climatic conditions, as well as increasing nutrient and vitamin uptake.

However, it is unlikely that unless tillage practices, soil fertility, and water conservation systems are adequately improved upon, those other traditional development interventions – such as improved access to seed, inputs, and markets – will properly address either the environmental degradation or low yields associated with traditional farming systems. Furthermore (as noted in footnote 2 of this document), increased fertilizer use and the benefits derived from that use of fertilizer will only significantly contribute to yield increases when soil fertility and soil organic matter is improved through better tillage systems.

5.1.4 PROMOTION OF FAIDHERBIA ALBIDA

In order to create a more diversified as well as economically and environmentally sustainable and resilient farming system, farmers need to graduate from CF to CA. Promotion of the establishment of *Faidherbia albida* trees by farmers could become a key component in future agricultural-related projects. At a landed cost for urea of \$598.80 per ton, Zambia now has the third highest fertilizer cost in the East and Southern Africa Region. According to the Regional Agricultural Input Market Information System, only Burundi and Malawi have higher landed fertilizer costs and according to the FAO, demand for fertilizer will continue to increase, which in turn should make fertilizer costs climb even higher (Kaleyi 2010).

In addition to stabilizing maize yields at 4 to 5 tons/ha without the need to apply synthetic fertilizers, the combination of this tree with CF offers farmers a practical method of reducing the negative effects of dry periods and full blown droughts on their maize, also offering the opportunity for small-scale agriculture to be associated with re-forestation as opposed to deforestation (see Annex 6).

USAID/Zambia could support the inclusion of *Faidherbia albida*-related activities in future agricultural and agro-forestry projects.

However, as the CFU has noted over the past five years in promoting CA (which is the promotion of *Faidherbia albida*, and not to be confused with CF – all those other practices that make up minimum till farming systems), there are a number of constraints to the adoption of CA, namely:

- Farmer perceptions of the time taken for trees to have an impact
- Poor nursery and transplanting techniques



Figure 5. Comparison of maize quality under the canopy of *Faidherbia albida* (background) vs. no canopy (foreground). Photo courtesy CFU 2008.

- Weeding out of small seedlings by family members
- Predation by cattle and goats
- Attrition caused by uncontrolled bush fires

5.1.5 FARMER GROUP DEVELOPMENT

With one of the lowest population densities in Africa, it is important that farmers are well organized into groups or associations that allow individual members access into affordable and transparent input, output, and market support services. Increased income from on-farm streams and lowered transaction costs through economies of scale are essential if farmers are to raise both their household food security and to lower existing poverty levels that force farmers to exploit their local environments. Well organized and managed farmer groups allow for key extension technical training and messages to be disseminated in a cost-effective and efficient manner. Adoption of new technology requires a change in farmer behavior; encouraging behavior change through organized groups is generally more efficient than attempting to train isolated individuals.

USAID should ensure that farmer group institution-building and activities are incorporated into future agricultural and agro-forestry related projects. Examples include the former USAID Zambia-supported, CLUSA-managed, Rural Group Enterprise Program (1996-2001) and the current Wildlife Conservation Society-supported COMACO project.

5.2 PUBLIC-PRIVATE CONSERVATION PARTNERSHIPS

Recent evolution of public-private partnerships has enhanced service delivery and enforcement amidst limited ability for collective planning among local residents to avoid the careless and wasteful use of limited, finite natural resources. Past efforts to bring about improved community planning have relied upon leadership structures that generally failed to address household-level needs to gain sufficient household “buy-in” to reduce practices harmful to their environment. The COMACO, for example, seeks to reinforce these leadership structures by building a collective producer group organization that recognizes the relationship between access to trade benefits and compliance with conservation-based production practices:

Community Markets for Conservation (COMACO): Operating mainly in Eastern province, COMACO currently has 34,381 farmers registered as COMACO farmer producer group members (52% are women) and covers three major eco-agricultural zones, extending across approximately 70% of the Luangwa Valley region. COMACO staff operate out of six community trading centers associated with 75 community trading depots. Registered farmers learn improved farming practices that help address local and regional environmental challenges. For example, across much of the western side of the Luangwa Valley where soils are leached and acidic, COMACO has introduced farming methods that encourage long-term residency, reducing the need for large-scale slash-and-burn type practices used to open up new land. These methods include the use of lime, planting basin-making, mulching, composting, and regular crop rotation with legumes for fixing nitrogen in the soil. Variations of this approach are applied to each of the three regions with specific applications suited to their respective environmental conditions (WCS 2010). See: www.itswild.org/.

5.2.1 INTEGRATED NRM

Attention and investment supporting public-private partnerships in and around PAs has multi-sectoral benefits. In this case, PA refers to **both** National Parks and Forests. Interventions should not focus solely on National Parks, as this approach would perpetuate the current dichotomous management of the entire protected area estate between two government agencies. In determining where to work, communities located at the nexus between GMAs, National Parks, *and* National Forests should be the priority.

5.2.2 SUSTAINABLE ECO-TOURISM

There is an overwhelming opportunity for promoting community-based sustainable tourism ventures in these nexus areas as well. The [Dq̄ae Qare Game Reserve](#) in Botswana is one example of a community-based

tourism project of the Bushmen of D'kar. Depending upon the area chosen to work and its current situation, complementary activities could include technical assistance in conservation agriculture, business management training, data collection and resource monitoring, or fire management.

5.2.3 COMMUNAL CONSERVANCIES

Another potential opportunity for improving rural livelihoods and encouraging conservation and stewardship is to support the creation of community-owned game ranches or communal wildlife conservancies (Lindsey et al. 2009) located on customary lands. These areas could be managed and operated for the multiple purpose of raising game to restock GMAs (supporting biodiversity), to provide a sustainable source of protein for rural populations (supporting health initiatives), and be managed for guided hunting and wildlife viewing (supporting improved livelihoods). Zambia could apply lessons learned from long-standing and successful CBNRM efforts in neighboring countries. For example, USAID has been supporting the Communal Areas Management Program for Indigenous Resources ([CAMPFIRE](#)) in Zimbabwe since 1989 and the Living in a Finite Environment ([LIFE](#)) project in Namibia since 1993. Communal conservancies, if implemented, should be designed in accordance with integrated land use plans, ensuring that they create conservation benefits while minimizing harm from development (e.g. habitat corridors and connectivity).

5.3 INTEGRATED LAND USE PLANNING

5.3.1 PLATFORM FOR MANY SECTORS

The absence of a national land use plan and subsequent implementation plans at lower levels create intra-resource use conflicts within GMAs among various resource users across wildlife-related sectors. Sustainable management of these natural resources requires a formal system of recording land ownership and land use linked to a textual and graphic land information format. Planning of land uses and management of the natural resource base is a paramount requirement to achieving sustainable development and reducing potential resource/human conflicts. A variety of land uses types occur in GMAs, such as biodiversity and wildlife conservation, wetlands – with a potential dambo utilization threat, forestry, hunting, tourism, agriculture, human settlement, mining, fishing or road developments depending on geographical setting, available resources, and human practices.

5.3.2 LAND USE PLANNING ON CUSTOMARY LAND

Historically, LUP on customary land has been done on an ad hoc basis and lacks a long-term coordinated policy. Enforcing regulations on customary land is challenging due to the open access nature of customary land as well as loose regulation by local traditional leaders. Despite national legislation protecting certain forest areas within customary lands, charcoal burning and other land clearing operations are common. Land use planning on state land, by contrast, is generally comprehensive. Local and district administrative bodies generally lack the capacity to regulate land management in a comprehensive manner.

Land use planning provides a basis for improved management and use of resources and, where implemented, can assist in the appropriate use of land types. For example, by promoting agriculture on appropriate soil types, fewer inputs may be required, potentially decreasing practices such as slash-and-burn. Careful LUP needs to be undertaken and adhered to. LUP will need to respond to current and future trends and threats, taking advantage of available opportunities. Subsistence agriculture has spread to areas assigned to commercial agriculture and forestry, and in some GMAs the potential benefits of CBNRM have attracted large numbers of people from surrounding areas. This has in turn placed a large burden on local resources, leading to a sharp increase in charcoal burning and the clearing of forests in such areas.

National policies that impact LUP need to be revisited by the Zambian government. For example, the current focus on expansion of agricultural exports is leading to an expansion of agriculture into previously forested land. Designated forest lands, some within critical headwaters regions, have been de-gazetted to provide land for farming, negatively impacting river flows and resulting in some flooding. If the National Agricultural

Policy specifically stated that such an outcome was to be avoided, a focus on agricultural intensification would emerge, reducing deforestation and degradation at the same time as increasing productivity.

5.3.3 STRENGTHENING LAND TENURE

In Zambia, traditional land tenure (i.e. lack of ownership) discourages investment in husbandry practices that improve soil fertility over the medium and long term. Why invest in land that you don't own? Traditional land tenure can encourage extractive farming methods, as evidenced by the high prevalence of slash-and-burn agriculture as well as illegal charcoal production.

Initiatives such as on-farm investment in equipment, farm infrastructure, and improved farming cropping systems arise where private ownership of the land is prevalent and can help to discourage migratory farming systems. In their 2008 Country Profile, USAID has already identified future key intervention areas to strengthen land ownership practices that could be incorporated into future governance projects (USAID 2008).

Land tenure rules and guidelines will not only need to be discussed and agreed upon to protect usufruct, communal, and ancestral rights under customary tenure within the GMA realms, but also amicably tackle upcoming leasehold tenure applications as the situations unfold. Increased investment in GMAs will lead to demand for collateral in the form of leasehold tenure; or it may be appropriate to meet compensation demands where damage has been proven.

5.3.4 STAKEHOLDERS

Land uses need to be organized and agreed upon through a well-informed and integrated resource allocation system (Lewis et al. 2008). This ought to include a wide community-participatory engagement in order to reduce potential conflict as much as possible. Potential stakeholders in this process would include: ZAWA, traditional leadership, CBNRMs, forestry, fisheries, private sector, civil society, and agriculture, among others.

While some work has been done in the preparation of management plans, their implementation has been very slow. A potential area to pilot this approach would be the Mumbwa GMA, building from there and addressing as much as possible the unresolved challenges experienced in the implementation of earlier initiatives. Cost-effectiveness and actual implementation of the plans will need close tracking, coordinated through the agricultural projects.

5.3.5 IMPLEMENTATION AND MONITORING

Periodic cross-sectoral coordination of implementation will be critical through ZAWA as lead facilitators. The planning process must:

- Identify and assess resource potentials
- Address human/community needs through stakeholder consultations
- Knowledgeably zone into various land uses
- Develop and introduce sustainable resource use practices and technologies
- Formulate conditions and controls for legal resource use
- Safeguard revenue resources
- Control human pressure increases
- Motivate and equitably share local financial benefits
- Establish appropriate research and monitoring tools

Support of this process will greatly enhance sustainable utilization of available resources that should guarantee harmony, good returns, and development in the area. This process will also help address potential land

degradation threats such as the illegal use of resources, deforestation, soil erosion, human/animal conflicts, and even impacts of mining development (W. Chansa, pers. comm.).

5.4 HIGH-EFFICIENCY HOUSEHOLD COOK STOVES

Charcoal production for the supply of inefficient cook stoves in Zambia has been shown to contribute to multiple environmental threats across sectors, directly driving deforestation and human health impacts, and indirectly driving climatic change, soil erosion, and biodiversity loss. As such, the promotion of high-efficiency cook stoves and sustainable fuel procurement mechanisms has the potential to leverage positive results in the mitigation of deforestation, climate change, biodiversity loss, and negative impacts to human health in Zambia.

There are a number of types of cook stoves that might qualify as “high-efficiency,” variously fueled by small-diameter twigs, charcoal, or solar power. However, high-efficiency cook stoves can be relatively expensive, and the economic and socio-cultural drivers of charcoal production are complex. There are also a number of mechanisms to sustainably provide fuel for household cook stoves, using community forestry (with integrated planning), United Nation’s REDD+ and Clean Development Mechanism (CDM) mechanisms, and the utilization of existing woody biomass waste. Supply-side and demand-side household energy improvements provide both a significant need and an opportunity for donors to fund projects that positively impact multiple sectors.

5.4.1 OPPORTUNITIES

There are two primary opportunities to support and expand the mitigation of charcoal production:

- **Demand Side:** Funding and distribution of high-efficiency household cook stoves (charcoal and non-charcoal fueled)
- **Supply Side:** Improved biomass utilization through high-efficiency charcoal kilns, community forestry and twig farming, as well as cross-sectored natural resources planning

Demand Side – Funding and Distribution of High-efficiency Household Cook Stoves: The funding and distribution of high-efficiency household cook stoves has the ability to mitigate deforestation, climate change, and biodiversity loss, while improving the health and well-being of Zambian families as well (particularly women, who do the majority of the cooking). The CDM has already been used with success to fund high-efficiency household cook stoves and sustainable fuel mechanisms (see case study below). While this is a viable funding option in urban Lusaka, it is not workable in rural areas (Chidamayo et al. 2001). Instead, a high-efficiency twig stove pilot project could be funded through donor support, transitioning to REDD+ funding for avoided deforestation. This would not only address significant environmental threats, but also provide another on-the-ground, replicable REDD+ pilot project, supporting REDD+ and Low Emission Development Strategy (LEDS) architecture in Zambia (Butterfield and Kosnik 2010).

Case Study: CDM Lusaka Sustainable Energy Project: Climate Management Limited, based in Lusaka, has been piloting a high-efficiency twig stove called the “Save 80” since 2006 (Trifellner 2008). The Save 80 uses 80-90% less biomass than the average charcoal-burning cook stove in Zambia, utilizing 2cm x 12cm twigs as its fuel source. Twigs are procured either from a plantation, tree pruning/clipping waste, or by individual collection. Emissions from this stove are low¹⁴ (ibid) due to decreased cooking times (an average of 6 minutes to boil 4 L of water), a lower emitting fuel source, and heat transfer efficiencies. Included with the cooking system is a super-insulated pot/storage container that dramatically decreases fuel use when cooking grains and legumes. Manufacturing, shipping, local assembly, distribution, and monitoring of the Save 80 is largely funded through the CDM¹⁵ outlined in Article 12 of the Kyoto

¹⁴ 17 grams of CO per L. of 25 g/L is the limit

¹⁵ CDM covers 1/3 of the cost of manufacturing, shipping, assembling, and distributing the stoves and 2/3 the costs associated with monitoring the CDM. The balance is provided by 50% of the stove’s costs and the selling of stove fuel.

Protocol (1997). This mechanism allows industrial nations to meet their CO₂ emission reduction targets through the investment and transfer of sustainable technologies to developing countries, using a carbon credit system. The pilot project in Zambia is currently being carried out in N. Lusaka,¹⁶ and will have distributed cook stoves to 30,000 households upon completion, offsetting 150,000–250,000 MTCO₂e (K. Trifellner, pers. comm.). Distribution is being accomplished through 30 different church denominations in N. Lusaka, and each household is charged a small monthly fee to pay for the stove over the course of 10 years¹⁷ (ibid). Biomass purchase costs to households also drop from 160,000 Kwacha/month for charcoal to 40,000 Kwacha/month for twigs: <http://climatemanagement.de/page1.html>.

Supply Side – Improved Biomass Utilization through High-efficiency Charcoal Kilns, Community Forestry, and Natural Resources Planning: The Zambia Forestry Department noted that it is not necessarily the fact that charcoal production is occurring that is an environmental threat, but that the location intensity of the production is proceeding in an unplanned, unsustainable, and unmonitored fashion, causing destruction to Zambia’s forests (D. Kasaro, pers. comm.). With proper land use planning, sustainable management of biomass-producing forests, JFM mechanisms, and improvements in the efficiency of charcoal production through high-efficiency kilns, charcoal production might be able to be brought to a sustainable level in the country, especially if combined with a diverse portfolio of sustainable household energy strategies.

5.4.2 OTHER EXISTING PROJECTS AND PROGRAMS IN THIS SECTOR

In addition to the CDM-funded twig stove project highlighted above, there are a number of existing projects and programs that are either working on household energy issues in Zambia, or might be able to provide support for such initiatives. Significant opportunity exists in supporting rural electrification through renewable energy and household energy subsidy mechanisms, implementation of community-based forestry for the production of biomass for household energy use, expansion of high-efficiency cookstove adoption in peri-urban and rural areas, and the piloting of solar stoves in suitable regions. Some of these existing projects are listed below:

- **GTZ Program for Basic Energy and Conservation (ProBEC) (2006-2011):** ProBEC promotes use of efficient biomass energy for household and institutional cooking, and for tobacco curing. They promote local production of “Pulumusa” stoves and tobacco-drying “Rocket Barns” by Zambian entrepreneurs. The Pulumusa stoves have become widely accepted, with households reporting an average 50% savings in charcoal purchases. Farmers curing tobacco in the improved drying barns received a significant price differential compared to traditionally cured tobacco. Donor funded by Germany (Butterfield and Kosnik 2010): www.probec.org/displaysection.php?czacc=qubykexzru&zSelectedSectionID=sec1194685541.
- **The United Nations Industrial Development Organization (UNIDO) Renewable Energy for Isolated Mini-grids Pilot:** UNIDO is piloting the renewable solar, biogas, and mini-hydro technologies for provision of electricity to rural Zambian communities. The pilot will support a solar mini-grid (46 KW), mini-hydro (1 MW), and biomass generation (1 MW) to test appropriateness for rural Zambia. Donor funded by Germany (Butterfield and Kosnik 2010): www.unido.org/index.php?id=6028.
- **African Carbon Credit Exchange (ACCE):** Based in Lusaka, ACCE was established by Lloyds Financials Ltd. to provide a regional institution to support low carbon development and carbon finance for Sub-Saharan Africa. ACCE has three components: A Trading Platform that brings carbon sellers and buyers together; a Low Carbon Africa Fund Portfolio (investment fund); and the Green Knowledge Institute, an NGO providing technical support development of the African carbon market including assistance to REDD+ Designated National Authorities (MTENR for

¹⁶This project is also active in Chad, Nigeria, and Kenya

¹⁷ 5,000 - 15,000 Kwacha/month, around 360,000 Kwacha or \$72.00 USD total over the 10 year payment period. This both attaches value to the stove and minimizes reselling, as well as funds community development

Zambia). ACCE develops modular projects for the CDM and voluntary markets, which can be expanded to include other similar activities. They are currently working on a range of projects, including: 1) a CDM proposal targeting peri-urban areas promoting improved cook stoves (300,000) that result in a 60% reduction in wood use. The Program Design Document is now complete and the program is awaiting financing; 2) a partnership with Dunavant Cotton for carbon credits gained from integrating *Faidherbia albida* into fields of 70,000 Zambian Farmers; 3) a partnership between Dunavant Cotton and Three Rocks Zambia to establish a Trust Fund to support 15,000 households adopting improved wood stoves. (Source: ACCE interviews and program documents). NGO and private sector funding (Butterfield and Kosnik 2010): www.africacce.com/.

- **Global Alliance for Clean Cookstoves (U.S. Department of State):** On Sept. 21, 2010, Secretary of State Hillary Clinton announced the Global Alliance for Clean Cookstoves, a public-private partnership led by the United Nations Foundation, which focuses on creating a thriving global market for clean and efficient household solutions. The U.S. Department of State, U.S. Environmental Protection Agency, U.S. Department of Energy, U.S. Department of Health and Human Services – Centers for Disease Control and National Institutes of Health, and USAID are founding partners. The Alliance has a stated goal of “100 by 20,” which calls for 100 million homes to adopt clean and efficient stoves and fuels by 2020. U.S. commitment: \$50.82 million over the next five years (\$9.02 million from the Department of State and USAID): www.state.gov/r/pa/prs/ps/2010/09/147494.htm.

5.4.3 RELATED MRV OPPORTUNITIES

Significant opportunity also exists for a donor-funded, updated comprehensive charcoal study. Such a study should include monitoring of charcoal production mitigation through supply-side and demand-side pilot projects, as well as an analysis of opportunities for further interventions in the household, commercial, and industrial sectors. Related MRV opportunities include implementation and enforcement of integrated land use plans and community forests, deforestation rates, and monitoring of charcoal exports to neighboring African states.

5.5 MONITORING, REPORTING, AND VERIFICATION

Human and institutional capacity to monitor wildlife populations, fisheries stocks, and forest cover among other natural resources in Zambia is currently low. The monitoring capacity is restricted to a few individuals with limited or no access to relevant technology such as high resolution spatial imagery, updated computing facilities, animal census technologies, and recent geographical information systems (GIS). However, there exists some limited capacity within the GIS and Remote Sensing Unit in the Ministry of Tourism, Environment and Natural Resources (Wignaraja et al. 2010). The inadequate MRV capacity is a risk that can affect the availability of good baseline and verifiable data on wildlife species and their numbers in National Parks and GMAs, tree species, and timber stocks, as well as fish populations. This has the potential to hamper private sector participation in the NRM sector, transparency in reporting, reduced economic contribution of NRM sector, and budgetary support to the sector by the Zambian government.

The effectiveness of ZAWA’s management plans encompassing human activities, wildlife, fisheries, and forests in the National Park and GMA form the center of wildlife management. The basic information that exists requires implementation of long-term sustainable and systematic monitoring, reporting, and verification systems. The MRV system can use various tools such as CBNRM, private sector, NGOs and conventional systems to generate baseline data. Some of these structures exist and require strengthening. The MRV system will establish standards to measure PA management effectiveness in terms of application and generation of finances, transparency in quota setting, and negotiation of other contracts for investment.

Activities within the MRV opportunity framework could include:

Monitoring and Verification of ZAWA Management Plans: Financial and technical support to create institutional capacity and frameworks for creating baseline data and monitoring general PA management, fire

management, wildlife numbers, water management, human-wildlife conflicts, fisheries and forest management, incidents of illegal wildlife off-take, and human settlements in GMAs.

Integrated Land Use Assessment II (ILUA II): Technical support towards developing an MRV system based on integrated and correlative models using ground-truthed data and other tools that allow the determination of changes in wildlife numbers, fish stocks, forest cover, and land use patterns. Financing for ILUA II is already available from the governments of Finland and Norway through FAO but will require supplemental technical assistance to broaden the scope of sectors and methodologies in ILUA II. This will assist in addressing the short comings of ILUA I which was biased toward forestry.¹⁸

Financing and technical support toward a verifiable baseline and ongoing data acquisition across forestry, fisheries, and wildlife sectors, and carbon emissions/sequestration (to illustrate trends, movement, etc.). This support will entail enhancing capacity and efficiency through technical training in MRV tools and methodologies across the NRM sector.

5.6 URBAN HEALTH AND ENVIRONMENT IMPROVEMENTS

5.6.1 GREEN INFRASTRUCTURE

Current urban landscapes are often devoid of greenery and poorly designed to handle the rainy season. This poor drainage, in combination with a lack of solid waste management and pit latrines in urban settlements, contributes to water borne diseases. Support for urban infrastructure with tree planting and the creation of “bioswales” (and other green infrastructure) to filter and reduce the movement of contaminants would contribute to the health of the urban population.

5.6.2 WASTE MANAGEMENT AND SANITATION INFRASTRUCTURE IN LUSAKA

Lusaka has seen an increase in the role of the private sector in waste collection, which seems to indicate a paradigm shift from total local government responsibility, yet as of 2006 only 40% of solid waste was collected, reflecting high levels of illegal disposal (ECZ 2008).

“The inappropriate and often careless handling of both municipal and industrial wastes including those that are hazardous has all too often created problems for human health and the environment. It is also a known fact that, sustainable environmental and natural resource management plays a vital role in the socio-economic development of a country. Therefore the Government of the Republic of Zambia initiated the formulation of the National Conservation Strategy (NCS) in 1985 and subsequently the National Environmental Action Plan (NEAP) in 1994. In both these documents waste management among others was identified as one of the major environmental problems faced by the nation.” (MTENR 2004)

The lack of suitable solid waste management, in combination with other factors such as poor drainage and abundant rainfall during a significant part of the year, contributes to the movement of waste and poor sanitation. Legislation is being put forward to extend product responsibility regulations requiring importers and stores to contribute to recycling programs and to promote the reusability of plastic bags.

¹⁸ “The Ministry of Tourism, Environment, and Natural Resources’ (MTENR) is currently developing the year one (2011) work plan for Second Integrated Land Use Assessment (ILUA II). ILUA II is scheduled to be carried out over the course of four years, 2011 – 2014.”

6. USAID/ZAMBIA PROGRAMS

As per the recently released [Fiscal Year 2011 Congressional Budget Justification](#) for Foreign Operations, U.S. assistance to Zambia will continue to support the goals of reducing widespread poverty as well as building and sustaining a democratic, well-governed country that contributes positively to regional stability. The FY 2011 Operational Plan for Zambia mirrors the U.S. Mission's foreign assistance priority goals for *governing justly and democratically, investing in people, and economic growth*. This section briefly describes USAID/Zambia's programs and corresponding assistance objectives (AO) under the broader U.S. foreign assistance goals and summarizes how and if the opportunities identified in Section 5.0 would align with current programs (see Table 3).

6.1 CURRENT PROGRAMS AND ASSISTANCE OBJECTIVES

6.1.1 ECONOMIC GROWTH

The Economic Growth program directly supports AO5: Increased Rural Economic Growth and includes the following sectors: Trade and Investment, Financial, Agriculture, and Environment. In FY 2011, U.S. assistance will focus on improving agricultural productivity that targets rural poverty and increases food security through market-driven approaches. USAID programs will continue to increase the use of appropriate agriculture technology, establish market transparency, increase the ability of small-farmers to access input and output markets, improve access to affordable financial services, advocate appropriate policy reforms, and promote the growth of small and medium-sized enterprises in the agricultural sector. The United States will augment environmental programs to act on planned analyses in forestry and carbon financing. In addition, U.S. assistance to combat climate change will include advocacy to extend conservation farming and introduce agro-forestry techniques that increase the productivity and profitability of small farming enterprises. Global Climate Change (GCC) earmark funds under the Environment Sector in FY 2011 are targeted for Adaptation and Sustainable Landscape activities (T. Resch, pers. comm.).

RECOMMENDATIONS

All of the opportunities identified in Section 5.0 aim to address key environmental threats; thus, each of these opportunities best aligns with the environment sector of the Economic Growth program. In supporting agricultural initiatives, the use of fertilizers, pesticides, and genetically modified organisms needs to be closely monitored as these all have direct impacts on the environment, especially water and biodiversity. Support for the application of CF, minimum tillage techniques, and agro-forestry was recommended in the last FAA 118/119 analysis (USAID 2007) and is still considered a priority opportunity in this assessment. Taking CF and agro-forestry to the next level by promoting CA supports activities in the agriculture, environment, trade, and investment sectors. Conservation agriculture provides a low-tech intervention that can directly help improve farm productivity and stimulate small and medium-scale enterprises in the agricultural sector. Conservation agriculture also supports GCC initiatives since increased productivity encourages permanent farms, reducing the need to shift and expand into intact forests and other protected areas.

Promoting fuel-efficient, culturally adaptable cook stoves along with other low-cost alternative sources of energy was also recommended in the last FAA 118/119 analysis (USAID 2007) and is still considered a priority opportunity. Expanding the presence and use of high-efficiency household cook stoves supports GCC initiatives by reducing deforestation pressure and direct carbon emissions, as well as improving human health. There is also market potential in manufacturing and distributing efficient cook stoves and managing twig and wood lots specifically for the purpose of providing sustainable supplies of wood fuel.

Investment in public-private conservation partnerships, such as sustainable eco-tourism, wildlife monitoring/anti-poaching schemes, and community game ranches, provides alternative and viable livelihoods while directly promoting the conservation of natural resources. Since there continues to be high demand worldwide for “green” products, promoting sustainable harvest of non-timber products (e.g. honey, mushrooms, medicinal plants, essential oils) and eco-labeling and “green” sourcing requirements recommended in the last 118/119 analysis are still recommended. Training on the Environmental Impact Assessment (EIA) process should be included for partners working in small and medium enterprise development.

6.1.2 EDUCATION

The Education program supports AO6: Increased Learning Achievement for All. In FY 2011, U.S. assistance will seek to increase access to basic education by underserved populations, including girls; improve the quality of education through teacher training; improve the management capacity of the Ministry of Education; create new opportunities for neglected community schools; expand teacher training; and improve student performance in the regions that have the weakest academic performance.

RECOMMENDATIONS

None of the opportunities listed in Section 5 would directly contribute to the objective of the education program; however, public awareness campaigns and/or integrating environmental topics into the education curriculum would complement any of the identified opportunities. Environmental issues and topics could be incorporated into teacher trainings. There is untapped potential in bringing together students, government agencies, and communities into a service-learning partnership to help build capacity and improve management of natural resources on the ground. Universities can greatly aid government institutions in completing baseline studies, monitoring resources, and providing other needed technical assistance.

6.1.3 HEALTH AND HIV/AIDS

The health portfolio is by far the largest of USAID’s programming in Zambia. The Population Health and Nutrition program supports AO7: Improved Health Status of Zambians while the HIV/AIDS program is separately working in support of AO9: Reduced Impact of HIV/AIDS through Multi-Sectoral Response. In FY 2011, U.S. assistance in health will focus on sustainable improvements to the Zambian health system in key maternal and child health services, tuberculosis, and malaria; expand access to services for family planning and reproductive health; and improve nutrition and access to clean water and sanitation. A new program will establish water and sanitation facilities in 200 underserved rural schools and promote hygiene education as a central theme. U.S. assistance under the President’s Malaria Initiative will scale up proven preventive and treatment interventions toward achievement of 85% coverage among vulnerable groups to support the PMI goal of reducing malaria-related morbidity by 50%.

RECOMMENDATIONS

There are inherent links to improved health condition in promoting both CA and fuel efficient cook stoves. Conservation agriculture contributes to food security by increasing household food staple production and alleviating malnutrition. Minimum tillage techniques favored by CF are also less labor intensive, assisting those affected by HIV/AIDS or other long-term illness. While it is true that farmers who have lost their cattle stocks note an increase in labor in the first year (due to having to lay out planting stations, lines, and basins – work normally done by the oxen), the amount of surface area actually dug out is around 15% under CF systems. By contrast, a farmer who prepares the land using traditional tillage practices, whether it is ridging with a hoe or ploughing with oxen, is required to till 100% of the surface area holding.

Promoting green infrastructure and improved waste management and sanitation with a focus on urban areas would greatly improve human and environmental health conditions and affect a larger population base. Promoting conservation areas that are sources of natural and wholesome foods such as fruits, mushrooms, and wild game adds dietary diversity and also promotes food security. USAID should continue to closely monitor proper use of commodities provided such as bed nets and ensure wastes generated by immunization

and HIV/AIDS treatment programs are properly labeled and disposed of as biohazards. Proper storage, use, and disposal of chemicals used in indoor spraying programs also need to be monitored.

6.1.4 DEMOCRACY AND GOVERNANCE

The Democracy and Governance program directly supports AO8: Improved Democratic Governance. In FY 2011, U.S. assistance will strengthen democratic institutions that support effective stewardship and development of Zambia's natural resources and human capital, and ensure long-term stability and broad-based economic growth. Programs to strengthen democratic and accountable governance complement economic growth, health, and education interventions by increasing transparency and accountability in government service delivery.

RECOMMENDATIONS

Since poor governance is considered one of the key (albeit indirect) threats identified in this assessment, continuing to provide assistance and support in this program cannot be emphasized enough. Initiatives that promote coordination and synergy between individual government departments that manage Zambia's natural resources would be a good start. Improved oversight, transparency, and building capacity within the institutions in charge of Zambia's natural resources would directly aid how those natural resources are used and managed. As mentioned earlier, universities can play an instrumental role in providing needed technical assistance, completing baseline studies, and monitoring. Integrated land use planning in GMAs and support of improved MRV in natural resources would also strengthen institutional coordination and oversight.

6.2 CONCLUSION

It is acknowledged that USAID/Zambia cannot pursue all of these recommendations and is constrained by limited resources and other non-environmental priorities, but it is hoped that USAID and other partners can use the identified opportunities presented here to better address environmental threats in Zambia and the region, now and in the future.

ANNEX I: EFFECTS OF CURRENT AGRICULTURAL PRACTICES IN ZAMBIA

(CFU 2010)

Deforestation in Zambia is estimated by FAO to be the fourth highest per capita in the world and it is acknowledged that small-scale agriculture is one of the primary causes.

- A case study by the European Forest Institute in 2000 estimated that annual deforestation in Zambia ranges from 450,000 to 900,000 hectares per annum. A precise definition of deforestation is elusive, as in some eco-systems abandoned farmland eventually regenerates whereas in others it reverts to scrub savannah, particularly where total degradation has occurred. Nevertheless, most authorities agree that small-scale agriculture is the largest contributor to the loss of mature woodland in Zambia.
- According to FAO, for example, the 65% increase in maize production during the period of 1981-1991 was mainly attributable to expansion of cultivated land rather than increased yield per hectare of land. The area expansion last year was the largest on record this record harvest of 2.7 million tons is by and large due to a significant increase in the total area cultivated – at 1.2 million hectares this represents the largest area planted since 1995-96 (See article in the *Zambian Farmer*, August 2010 by Chuuba).
- Of the total 4,410,000 hectares of maize planted by smallholders between 2000 and 2008 in Zambia, 1,440,000 hectares or 33% was abandoned. Even in 2005-2006, one of the best rainy seasons on record, farmers abandoned 155,800 hectares or over 20% of the maize they planted. Equally significant is the fact that 70% of smallholders sell no maize at all while 80% of sales come from only 10% of those who produce a surplus. (CSO/MACO/FSRP Crop Forecast data).
- In Zambia about 80% of all smallholders grow maize but of this total 64% do not have access to fertilizers to replenish the minerals extracted by this demanding crop.
- 59% of smallholders grow legumes – primarily groundnuts and beans – but these crops occupy less than 10% of planted area. The supply of manure is extremely limited and the use of compost is negligible and will remain so due to the excessive labor inputs and available bio-mass required to manufacture sufficient quantities to replenish minerals.
- The yields of all smallholder crops in Zambia are about one-third of those achieved in Asia and Latin America and one-fourth of yields in Europe and the United States during normal rainfall years.
- Although only 17% of agricultural land in Zambia is utilized, 46% of farmers cultivate 1.5 hectares or less with 72% of rural households in Zambia cultivating no more than 2.5 hectares.
- According to FAO (2008), more than 35% of Zambia's population is in a chronic and acute undernourished state, despite receiving 388,000 tons of food aid during the last decade alone.
- Overuse of heavily subsidized maize fertilizer use has contributed to the acidification of Zambian soils in formerly productive areas. It has been estimated for example that the overuse of fertilizer in Northern Province may have accounted for a 15% loss of arable land over a 20-year period.

- More recently, deforestation has been closely associated with rapidly increasing fertilizer prices and the dramatic expansion of the cotton industry from 55,000 out-growers in 1990 to 270,000 today – representing 30% of all small-holders. Faced with excessive fertilizer costs and new production opportunities, farmers temporarily restore yields by abandoning degraded land and encroaching forest areas to mine out natural fertility.

ANNEX 2: FACTORS CONTRIBUTING TO LOW PRODUCTIVITY OF CONVENTIONAL FARMING IN ZAMBIA

1. Farmers who own oxen

- Sowing behind the plough causing uneven seeding depths, poor crop emergence and sub optimal plant populations.
- Continuation of plowing and sowing when there is sufficient moisture to plough but insufficient moisture in soil to emerge crops due to departure of early rains.
- Dependence on reliable rainfall to continue plowing and sowing leads to stop/start operations, staggered planting over long periods, low yields in late planted plots and the need to continue plowing late plots and weed early plots at the same time.
- Compact layers from years of shallow plowing restrict crop roots and cause stress in dry periods.
- Spread of Cooch grass, a pernicious weed from continuous plowing of degraded soils, leads to abandonment of fields.

2. Farmers who hire oxen

- Late to very late plowing and sowing, leading to yield losses of 1.5% per day for every day of delay from the first opportunity to plant.
- Plowing in large weeds and locking up N. Abandonment of crops or total crop failure in short seasons.

3. Farmers who split and re-form ridges annually with hoes

- Furrows between ridges act as drains accelerating soil loss from ridges after heavy downpours.
- Young plants sown on top of ridges suffer moisture stress in dry periods due to hydraulic gradient.
- Compact layers under the ridges from years of superficial soil movement restrict crop roots and cause stress in dry periods.

4. Farmers who dig over whole field with hoes

- Excessive labor demand. Exposure of soil to pulverization, sheet erosion and oxidation of organic matter. Shallow hoe pans restrict crop root development and cause excessive moisture stress in dry periods.

5. Maize mono-cropping

- Monocropping combined with continuous overall soil disturbance and non-replenishment of nutrients leads to soil depletion and land degradation.

6. Weed pressure

- Hoe farmers or farmers who hire in oxen to plough with limited labor resources are unable to cope with peak labor demands for weeding and crops suffer or are abandoned.

7. Soil acidity

- Farming interventions inevitably lead to acidification of soils. In higher rainfall areas this is particularly rapid. Regular liming of soils to maintain optimal pH for plant growth is negligible.

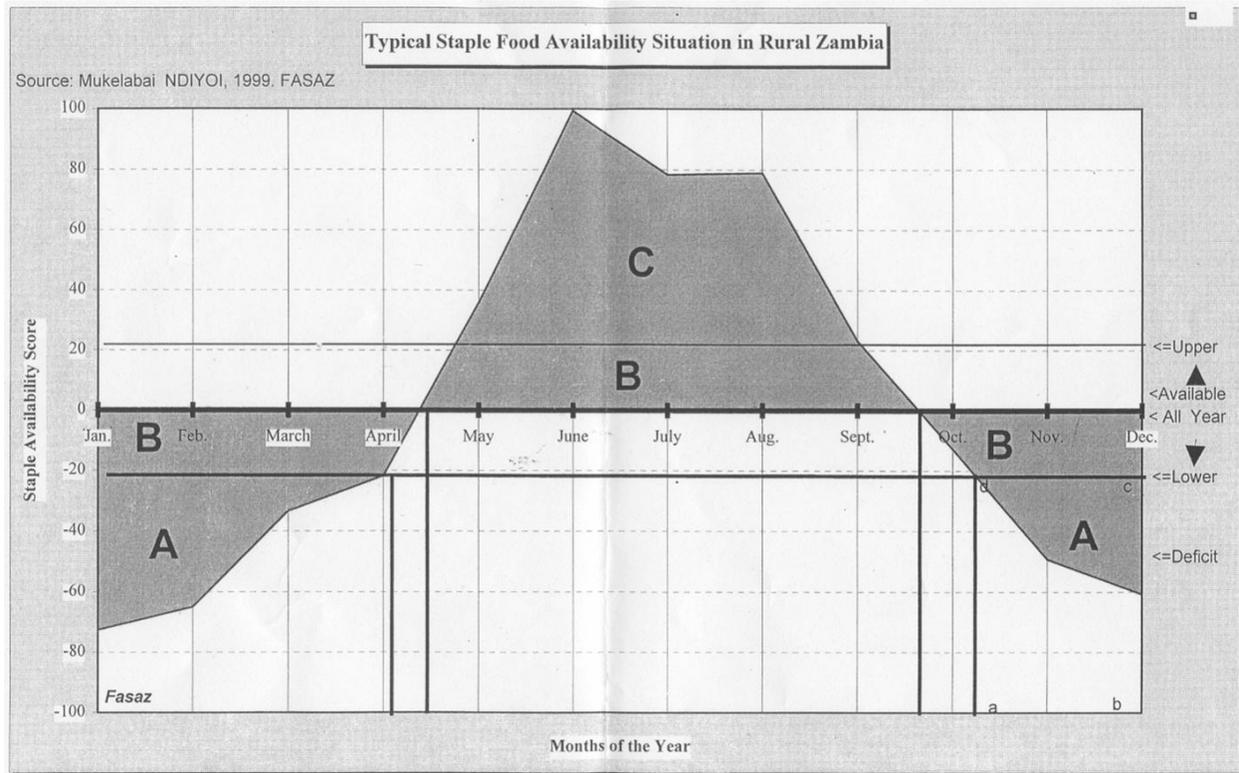
8. Inefficient application of nutrients

- Application of soil nutrients whether organic or inorganic is often untimely and inaccurate leading to unnecessary waste.

9. Features common to most conventional farming practices.

- Continuous overall soil disturbance leading to soil pulverization, erosion, oxidation, compaction, and eventual land degradation. Unnecessary waste of on-farm and purchased resources.

ANNEX 3: SEASONAL HUNGER GAP



ANNEX 4: POTENTIAL OF CF TO TRANSFORM SMALL-SCALE AGRICULTURE

(CFU AND INDEPENDENT SOURCES LISTED IN ANNEX 10)

Yield Increases and Soil Improvement

CF practices alone (excluding the influence of fertilizers and improved seeds), increase crop yields by 25% to over 100% in the first year of adoption with an average of about 40%. These benefits arise from early planting, precise seeding, cracking of compact layers, improved root volumes, more optimal plant populations, less need for re-seeding and early rainwater harvesting. Further gains arising from steady improvement in the physical and chemical properties of the soil in the permanent planting zones, (either MT basins or MT rip lines) ensue over time. When fertilizer is used, these underlying benefits increase fertilizer responses to maize in CF systems, by 45% to 68%.

Labor Productivity and Income

When the complete array of agronomic measures are applied, CF reduces labor inputs and seasonal labor peaks, increases returns to labor, increases returns to on-farm and purchased inputs and generates a positive influence on profits, disposable income, and asset accumulation.

Adaptation to Climate Change

Anecdotal evidence from thousands of adopters, case studies, and the observations of experienced CFU agronomists over the past 14 years confirm that CF outperforms conventional practice in normal, wet, and dry seasons. In the 2001-2002 and 2003-2004 drought years skilled CF practitioners achieved yields well above national averages whereas many conventional farmers experienced total crop failure.

Social Benefits:

Small Holder Risk Aversion

While it is preferable for farmers to apply the complete package of CF technologies, new adopters or the more cautious, can begin with the basic *non-negotiable* aspects which in themselves confer significant and immediate benefits, including basic food security assuming they have some access to fertilizers. Having achieved this fundamental requirement and having gained confidence and experience, farmers can then progress towards full CF and CA.

Although poverty alleviation remains a key development objective, the more substantial and progressive farmers should not be ignored. These individuals often have the stature in communities to provide the leadership and practical examples required to catalyse more rapid adoption of new technologies. It should also be recognized that a significant proportion of the rural population derive income from numerous sources, among which the contribution of farming may be considered subsidiary.

Land Degradation, Migration, and Deforestation

Estimates of soil depletion and land degradation in Africa range from alarming to catastrophic and are difficult to verify. Some suggest that 70% of agricultural land suited for raising livestock and crops is already severely degraded.

In Zambia, agricultural land is still relatively abundant and farmers who have degraded their land through continuous soil disturbance, cereal mono-cropping, and non replenishment of nutrients migrate and occupy pristine or rejuvenated woodland to temporarily exploit natural fertility in order to provide the basic needs of their families. To a significant extent, this syndrome explains why (according to FAO) Zambia suffers the fourth highest deforestation per capita in the world.

By arresting erosion, improving soil fertility, and enhancing productivity, CF offers families a sustainable alternative and the opportunity to repose on their farms. In Zambia it is all too common for members of food insecure families to abandon their own crops and seek opportunities to supplement their income in the hunger months between October and January.

Family Nutrition

By increasing the yields of basic staples – predominantly maize in East, Central and Southern Africa, and by reducing labor inputs, farmers can divert land for the production of high protein legumes, such as cowpeas, gram, soya beans, pigeon pea, field beans, and other crop such as sweet potatoes, which provide essential vitamins. Training on various aspects related to nutrition becomes more relevant when families themselves can produce a larger proportion of the ingredients required for a healthy diet.

Gender and HIV/AIDS

The HIV/AIDS pandemic has negatively affected the ability and capacity of many small scale farmers in Zambia to deal with external climate shocks. With the advent of HIV/AIDS, food security has become an even more acute issue. Adequate food intake and good nutrition are two of the primary factors in maintaining the strength of the immune system for someone who is HIV+. However, food insecurity, poverty, climate change and HIV/AIDS are intertwined in a vicious cycle with one creating conditions for increasing people's susceptibility to the other. As a result, HIV/AIDS is a cross-cutting issue that must be considered when developing any proposal that addresses food security and climate change.

The CF and CA technologies promoted are of real significance to those households affected by HIV/AIDS. Most importantly, CF and CA technologies are labor-saving and enable the demand for labor to be spread more evenly throughout the agricultural season. For a household with a reduced labor capacity, this is a tremendous benefit. In addition, the leguminous crops promoted as part of the CF rotation enable the production of a more nutritious diet as well as improving soil fertility and quality. This enables a family to improve the productivity of their land at no extra cost.

Increased yields, as well as the opportunity to participate in new economic opportunities afforded by CF and CA should increase the availability of cash income within the household. This will decrease to a certain degree a household's vulnerability to HIV/AIDS while improving the health status of those who are already HIV+, as these are so often primarily determined by the household's economic status.

The benefits described above are in no way exhaustive, but perhaps represent the most significant benefits to those families affected by HIV/AIDS. It is important to note, however, that all of the benefits to farmers resulting from the implementation of CA would be experienced by any small-scale farming families in rural farming areas, not just those affected by HIV/AIDS. However, for those families who are affected, the benefits are even more pronounced.

Haggblade and Tembo (2003) show the comparative adoption of hoe CF by gender from a survey of 125 families in Central and Southern Provinces. Although differences in total cultivated area between men and women are not shown, (*in general, males cultivate larger areas whereas women in addition to working on their husbands fields tend their own dedicated plots*), the report highlights the significance of women attributed to CF as a technology that enhances productivity of food and cash crops.

Labor inputs for land preparation and weeding are highly significant factors in relation to gender, child labor, and the impact of HIV/AIDS. Since 2007, progress has been made in reducing labor inputs with the

introduction of animal draft Minimum Tillage service provision and in particular the widespread introduction of herbicides. When properly applied, herbicides reduce labor inputs for seasonal weeding tasks from about 55 to 65 days per hectare in a normal year to 10 or 15 days. When hand weeding services are 'hired in' due to labor constraints, herbicides reduce costs from ZMK 300,000/ha to ZMK 240,000/ha. This reduction includes the cost of a subsequent light hand weeding round.

In the above regard, extending the provision of Electronic-vouchers (refer to Section 8) targeted on female-headed households to discount the cost of tillage service provision or the purchase of herbicides, would have a positive impact on vulnerable households and would allow more spare time for the care of family members with HIV/AIDS. The approach would also provide additional business opportunities to the service providers and agro-dealers. Nevertheless the potential misdirection of such incentives to undeserving beneficiaries remains a key area of concern

An additional practice that should be introduced to assist women is the inter-cropping of climbing beans with maize, a system that is common place in neighbouring countries but relatively unknown in Zambia. Intercropping determinate (short stature) cowpeas and bush beans with maize in conventionally spaced stands invariably fails because these crops are overshadowed by the cereal. Climbing beans relayed into maize at the correct time do not suffer this disadvantage, do not suppress maize yields and should provide an additional 350kgs to 450kgs of seed/ha with a protein content of 22%. The targeted distribution of new sweet potato varieties high in Vitamin A content is another obvious priority.

There is always considerable discussion surrounding gender imbalances but all too often little or no attention is given to offering women practical solutions that would address identified inequalities.

Economic Benefits

Economic benefits that accrue to adopters are comprehensively documented. Equally important are the off-farm business opportunities arising from more productive small-scale farming communities that benefit agro-dealerships (the CAP is presently cooperating with 53) and animal draft and mechanized service providers. In this context, the potential role of E-vouchers as a vehicle to target "smart subsidies," to enhance private sector engagement, target special interest groups and facilitate the emergence of specialized services provision is highly significant.

ANNEX 5: PROFIT RESULTS AND ACTIVITIES IN THE ZAMBIAN SMALL-SCALE SECTOR REPORTED FROM PROFIT

Agricultural Retail Industry

- Over \$1.9m of input sales were generated by the 2,460 agricultural retail industry in-community agents in 2010, representing a 60% increase on 2009 sales and demonstrating the commercial viability of the smallholder market as well as the success of the retail distribution models facilitated by PROFIT. The sales peak was also spread much further throughout the year as firms learned to take advantage of the periods of liquidity within the smallholder sector.
- In a sign that the behavior of retail firms is changing in response to this growing market, fifteen firms have made considerable investments in their management processes over the year, to specifically target and manage the smallholder market, and expand distribution networks rapidly into new market growth areas.
- 120,000 smallholder farmers attended nearly 1,500 promotional events held by the fifteen major agricultural retail firms and their in-community representatives during the year, of which over 25% were women, demonstrating that women are also accessing information on productivity enhancing technologies.
- A number of strategic alliances between agricultural retail firms and with veterinary and livestock inputs firms has strengthened the role and throughput of the agents and allowed for greater efficiency in agent management within the firms
- As part of a drive towards the safe use of chemicals by spray service providers, over 1,200 active spray service providers were trained and certified by Croplife Zambia over the year.
- The total area of smallholder land recorded as being ripped in 2010 by over 1,000 ox and tractor-based tillage service providers stands at almost 6,000ha, compared to 1,500ha prepared by just over 300 service providers last year.

Cotton Industry

- The main achievement of the year has been the full incorporation of the PROFIT-facilitated service provision model into the cotton outgrower management processes within Dunavant and Cargill, whereby field staffs from both companies identify and train tillage and spray service providers with minimal PROFIT assistance.

- Within the cotton sector, 860 spray service providers and over 700 ox-based tillage service providers were active during the agricultural season, with another 700 SSPs and 700 TSPs being trained to provide services for the 2010/11 agricultural season.
- PROFIT's promotion of mechanized service provision has gained traction within the cotton sector, with over 20 mechanized service providers taking out equipment leases with Dunavant which are now in the process of being adopted by the commercial financial sector

Commodity Markets

- Despite a hostile marketing environment characterized by heavy government intervention, ZAMACE recorded trades worth just over \$44.5m, in 140,000t of commodities. This represents an increase on 2009 of 130%.
- After several months of advocacy and negotiation, by the end of the year the modalities were being put in place for Government, through the Food Reserve Agency, to use ZAMACE for some of its transactions, representing a major boost to both the throughput and the credibility of the Exchange
- ZAMACE made strong progress in engaging the smallholder market, with eight certified warehouses and eighteen community aggregation points established, although due to FRA buying activity, very little crop actually passed through ZAMACE-related sales mechanisms. However, the first ZAMACE transaction of smallholder crop out of a certified warehouse was completed during the year.

Beef and Veterinary Industries

- Over the year, PROFIT has become a key partner to the new Ministry of Livestock, assisting in the drafting of enabling legislation and in the development of the Livestock Service Centre model upon which strong policy priority is placed.
- A range of innovative models developed over the year have increased access to veterinary products and services, and correspondingly, smallholder purchases of products and services have increased six fold over the year to over \$650,000.
- The PROFIT-facilitated mobile spray race model has been a commercial success, with local entrepreneurs rapidly replicating the six PROFIT-funded demonstration units and providing regular dipping services to over 10,000 cattle per week.

Dairy Industry

- Despite a temporary slump in domestic demand for milk over the year, deliveries of smallholder milk into the three main commercial processors increased by over 1.3 million liters over 2009 figures
- Investment by processors in securing and improving smallholder milk supply continues to grow, with five new milk collection centers established and privately funded extension officers providing services to the sector.
- Encouraging gains have been made in sector productivity, with increases of household level productivity and gross margin rising by 5% and 26% respectively.
- In a strong demonstration of industry cooperation across the value chain, the Dairy Association of Zambia (DAZ) was formed from an amalgamation of the Zambia Dairy Processors Association (ZDPA) and the Dairy Committee of the ZNFU.

Financial Services Industry

- Over the year, significant improvements in the agricultural finance sector have been made by the major banks, partly as a result of PROFIT's high-profile report into the failings of the sector.
- After four years of work by PROFIT, financial institutions are now taking an active interest in lease financing for mechanized service providers, with the first commercially financed units expected to be operational early in the next quarter.
- The transformational financial services platform developed by Mobile Transactions with assistance from PROFIT recorded \$2m of transactions per month by the end of the year as the business model was taken to scale
- Despite setbacks in 2009 in the process of incorporating e-vouchers into the government agricultural subsidy program, beneficiaries of various donor programs are now redeeming \$1m of vouchers per month through the system.
- Importantly, the Ministry of Agriculture is actively involved in the management of a successful e-voucher program through FAO.

PROFIT's work in carbon market development is beginning to gather pace, with two carbon projects with direct benefits to Zambia's rural population in the process of implementation by the end of the year.

ANNEX 6:A BRIEF ON FAIDHERBIA ALBIDA AS AN ALTERNATIVE TO FERTILIZER FOR THE PRODUCTION OF MAIZE

De-forestation in Zambia is reckoned to be the fourth highest per capita in the world and small-scale agriculture is the principle cause. When soils are judged to be exhausted, families in Zambia’s maize belts migrate locally or long distances to fell virgin or rejuvenated woodland. The fact that over 60% of smallholders do not use fertilizer on maize aggravates this situation. The widespread planting of *Faidherbia albida* combined with CF can replenish soils, increase Maize yields, minimize dependency on fertilizer and enable small-scale agriculture to become associated with re-forestation.

Faidherbia is the only known tree to display reverse phenology. In mono modal rainfall situations it defoliates after the onset of the rains and re-foliates toward the onset of the dry season. This leguminous tree can be found across the Sahel from the Atlantic to the Red Sea, and from



A formally established stand of young *Faidherbia albida* over hoe CF at GART in Zambia.



Maize comparison trial under and outside mature *Faidherbia Albida* trees with zero fertilizer inputs. Maize grown under the tree is in the center background, maize grown outside of the tree canopy is in the foreground. Photo credit: The CFU.

Namibia and Southern Angola, through Natal, Lesotho, Zimbabwe, Zambia, Tanzania, Kenya, Ethiopia, Somalia, Yemen, Israel, and Jordan.

Faidherbia is found 270 meters below sea level near the Dead Sea and up to 2,300 meters in Jebel Mara in the Sudan. Rooting depths of 40 meters have been recorded. In natural circumstances the seeds are disbursed by game and livestock eating the pods.

Most of the research on this tree dating back 60 years has been undertaken in the Sahel. Through leaf and pod fall and Nitrogen fixation in association with micro-organisms, fertility accumulation per hectare under mature canopy is claimed to be in the region of: **75kg N; 27kg P₂₀₅; 183kg Ca₀; 29kg MgO; 19kg K₂₀ and 20kg S**. This would be equivalent to about

300kg of complete fertilizer and 250kg of lime. Irrespective of the veracity of these claims, mature *Faidherbia* has a dramatic effect on Maize yields as trials in Zambia and Malawi have shown. The above photo of a CFU trial, one of 40 sites, highlights the difference between the **maize under and outside the tree, all with zero fertilizer**. At harvest Maize yields under the trees averaged 5.12 tons/ha and outside 2.65 tons/ha.

Experience from Malawi shows that farmers growing unfertilized maize under *Faidherbia* over many years consistently achieve up to 2.5 times the yield of unfertilized maize grown in the open.

Results of 40 CAP/CFU Trials under Mature *Faidherbia albida* - 2008/09

Region	Maize yield (mt/ha)			Cotton Yield (mt/ha)			G/Nut Yield (mt/ha)			Soya Yield (mt/ha)		
	Under	Out	Sign	Under	Out	Sign	Under	Out	Sign	Under	Out	Sign
Central	4.85	2.07	*	.87	1.64	Ns	1.05	1.77	Ns	1.57	1.17	Ns
East	5.68	3.41	*	1.88	2.77	Ns	1.43	1.61	Ns	1.53	2.05	Ns
South	5.8	2.79	*	1.33	1.59	Ns	.61	.65	Ns	1.61	1.24	Ns
West	3.75	1.96	*	1.03	1.11	Ns	1.35	.93	Ns	1.18	.78	Ns
Totals	5.12	2.65	*	1.30	1.84	*	1.09	1.29	Ns	1.5	1.36	Ns

Raw data from the 2009/10 trials have not yet been analyzed but show the same results. It is interesting to note that crop yields both under and outside the trees were significantly higher than national averages as a result of good management on small plots and the application of CF.

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ANNEX 8: ETOA ITINERARY AND CONTACTS

Sunday, November 28, 2010 – Arrival

Monday, November 29, 2010 – Lusaka

- **USAID/Zambia**
 - Melissa Williams, Mission Director
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Tuesday, November 30, 2010 – Lusaka

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Wednesday, December 1, 2010 – Lusaka

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- **Zambia Wildlife Authority (ZAWA)**
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Thursday, December 2, 2010 –Lusaka

- **University of Zambia, School of Natural Sciences, Geography Department**
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Friday, December 3, 2010 – Travel to Lower Zambezi/Chiawa GMA and South Luangwe NPs

- **Lusaka Sustainable Energy Project**
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Saturday, December 4, 2010 – Lower Zambezi and South Luangwe

- **Chiawa Community Resource Board**
 - Jackson Zindoga, Chairman, +260-977-515785
 - Evaness Katiyo, Financial Management Committee Chairperson
- **COMACO Mfuwe Green Market**
 - Pector Mbewe, Shop manager, 097-9295571
- **Mambwe District Agriculture Office**
 - Ruth Tembo, District Agriculture Coordinator, 097-7342476
- **Mushroom Lodge guest**
 - Mr. Sadik, Chipata resident

Sunday, December 5, 2010 – Lower Zambezi and South Luangwe

- **ZAWA(Mfuwe office)**
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 - Moses Makumbi, Park Ranger

Monday, December 6, 2010 – Return to Lusaka

- **ZAWA (Chirundu office)**
 - Mr. Mambwe Ngoma, Chirundu Area Warden
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Tuesday, December 7, 2010 – Mumbwa

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- **ZAWA**
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Wednesday, December 8, 2010 – Lusaka

<Draft report writing>

Thursday, December 9, 2010 – Lusaka

<Draft report writing>

Friday, December 10, 2010 – Lusaka

- **USAID/Zambia Staff Debrief**
 - Andy Levin
 - Mlotha Damaseke
 - Ryan Washburn
 - Patricia Sitimela

Saturday, December 11, 2010 – Departure

- **US Peace Corps**
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ANNEX 9: ETOA SCOPE OF WORK

Scope of Work for USAID/Zambia

ENVIRONMENTAL THREATS AND OPPORTUNITIES ASSESSMENT

With an Emphasis on Tropical Forestry and Biodiversity Conservation

1. PURPOSE

The purpose of this work is to deliver to USAID/Zambia a countrywide Environmental Threats and Opportunities Assessment (ETOA) with a special focus on Tropical Forestry and Biodiversity Conservation needs and related issues analysis that will inform the USAID/Zambia Operational Plans (OP), joint country assistance strategy and USAID-only country strategic plan in the coming years, under ADS 201.3.4. and ADS 204.5. Based on the results of this assessment, this work will provide recommendations to USAID/Zambia on how to efficiently contribute to the conservation needs identified, and plan for environmentally sound development and humanitarian interventions. The last ETOA of USAID/Zambia was conducted in 2002 and the last update on the 118/119 analysis was in 2007.

2. BACKGROUND AND JUSTIFICATION

Updating the ETOA and revisiting FAA 118/119 analyses are justified by three reasons:

The first reason is related to the **strategic and operational planning process** requirements. The ETOA is a useful programming tool which will help the USAID/Zambia to update its data and assumptions on environment status in Zambia as a whole and better integrate environment concerns into its overall programming during the annual operational planning (OP) processes and long term strategic planning.

The second reason is linked to the **environment requirements**. The core environmental requirements of USAID operating unit strategic plans are spelled out in 201.3.4.11.b Technical Analysis for Strategic Plans, Environmental Analysis, and are derived from provisions of the Foreign Assistance Act (FAA) of 1961:FAA 117 on “*Environment and Natural Resources*,” dictates that operating units will implement their programs with an aim toward maintaining (and restoring) natural resources upon which economic growth depends, and to consider the impact of their activities on the environment. USAID/Zambia recognizes that protection of the environment and wise management of the natural resources base are absolute requirements of any successful development program. The legal requirements of the FAA are reflected in USAID’s *ADS Chapter 204 “Environmental Procedures*,” which provides essential procedures and policy on the application of *22 CFR Part 216*. This regulation codifies the Agency’s procedures “to ensure that environmental factors and values are integrated into the USAID decision making process.” Further, *22 CFR 216.5* requires USAID operating units to conduct their assistance programs in ways that are sensitive to the protection of endangered or threatened species and their critical habitats. Sections 118 “*Tropical Forests*” and 119 “*Endangered Species*” of the FAA codify the more specific U.S. interests in forests and biological diversity. These two provisions require that all USAID Missions conduct a periodic country analysis of the conservation and sustainable use of tropical forests and biological diversity. Specifically, FAA Sections 118 and 119 require that all country plans include: (a) an analysis of the actions necessary in that country to achieve conservation and sustainable management of tropical forests (118) and conserve biological diversity (119); and (b) the extent to which current or proposed

USAID actions meet those needs. By mandating these analyses, Congress is recognizing the fundamental role that tropical forests and the conservation of biodiversity play in sustainable development.

The third reason concerns the new developments in Zambia's environmental context which need to be taken into consideration at programmatic level.

- With the possibility of increased global climate change, food security, water, governance and global health funds, an ETOA, beyond the required 118/119, looking at climate vulnerability and potential energy and landscape management actions in Zambia to address climate change, opportunities for improving the availability of clean drinking water and other water interventions, and linkages with an increasing agriculture portfolio will be very useful for programming.
- Zambia has been identified as being significantly vulnerable to climate change variation (drought, flood, famine). Additionally it has one of the highest rural population growth rates and highest deforestation rates in Africa. As a result it has been the recent focus of an increased interest and investment in climate change, including REDD, activities by the international and Zambian communities. USAID will likely be getting Climate Change funding in the coming years and thus interested in how it can intervene both in current program areas and potential climate focused ones.
- Reduced Emissions from avoided Deforestation and Degradation (REDD) activities have become high profile in Zambia with the Government of Zambia, international donors, NGOs, and civil society all becoming very involved and educated. Because of its high levels of carbon stocks, high risk to those carbon stocks, and higher level of institutional infrastructure, Zambia holds good potential for Carbon Financing activities. A national strategy for the UN REDD program is expected by the end of the year. USG programs might also be interested in collaborating with REDD activities in the short and long-term in Zambia.
- With the possibility of increased Food Security funds, the ETOA should examine how to possibly integrate climate change, environmental, and conservation related activities into an expanded USAID food security program (GFSR).
- The current economic downturn has created increased incentives for higher levels of mining activities, including copper, oil, gas, uranium, and other precious minerals.

3. USAID PROGRAMS IN ZAMBIA

A dearth of economic opportunity for most Zambians, half of whom are under 17, threatens the country's stability. The economic downturn threatens some of the economic gains the country has made over the past decade. Thousands of Zambians have lost jobs as mines have closed. With 68% of Zambians living below the poverty line and employment options limited, Zambia faces significant challenges in implementing its strategy for inclusive and diversified growth.

Zambia struggles to respond to cross-cutting constraints created by the lack of quality education opportunities and the impact of diseases such as malaria, tuberculosis, and HIV/AIDS. Mortality rates for mothers and children under five stand among the highest in the world. While primary school enrollment has climbed to 97%, poor instruction quality stemming from chronic underinvestment in public schools hampers student learning and achievement, and produces a labor force unprepared to compete in the global market. With one in six adults HIV positive, every Zambian feels the impact of AIDS. The needs of over one million infected Zambians and more than 800,000 AIDS orphans and vulnerable children strain welfare, health, and education systems. HIV/AIDS devastates family structures and threatens long-term national development.

In spite of its challenges, Zambia continues to enjoy domestic peace, to consolidate its transition to multi-party democracy, to promote economic growth and to expand health and education services. The U.S. foreign assistance program reflects the cross-cutting nature of Zambia's challenges and ensures that foreign assistance investments create synergies and ensure mutual support for high priority objectives.

The FY 2009 Operational Plan for Zambia mirrors the U.S. Mission's foreign assistance priority goals for economic growth, health, education, peace and security, and democracy.

Peace and Security: International Military Education and Training (IMET) funds will support programs for professional military education and training for Zambia's military. FY 2009 IMET-funded assistance will increase the Zambian military's technical skills, capacity, and professionalism, enhancing its ability and readiness to support regional stability and participate in peacekeeping operations. The support will be augmented by centrally-funded peacekeeping training under the Africa Contingency Operations Training and Assistance program.

Investing in People: U.S. investments in Zambia's people link with investments in economic growth by addressing the shortfall of health and basic education services. The United States will strengthen maternal and child health, family planning, reproductive health, and reduced disease prevalence – including tuberculosis, as well as equitable access to quality basic education. As a President's Malaria Initiative (PMI) focus country, U.S. support will reduce malaria-related morbidity through preventive and therapeutic interventions. Zambia is a focus country under the President's Emergency Plan for AIDS Relief (PEPFAR). In FY 2009, U.S. foreign assistance programs will increasingly focus on disease prevention and fostering Zambian ownership of expanding health care and education systems capacity.

The U.S. Mission in Zambia implements projects across sectors to address and support the purpose of the water earmark. U.S. assistance under the water earmark supports activities that support access and availability of "Drinking Water Supply and Sanitation." The United States supports a socially-marketed point-of-use home water treatment solution, intended to reach predominantly to households with children under the age of five and people living with HIV/AIDS. U.S. support is targeting water infrastructure repair and provision, including procurement or repair of boreholes and water pumps, as part of the support for renovations of public health clinics and laboratories that provide tuberculosis and HIV/AIDS-related services. U.S. assistance is providing water for drinking, sanitation, and income generating activities to facilitate and support basic education participation and school strengthening. The United States also supports safe water education campaigns through interpersonal communication, drama, and radio and television broadcasts.

Economic Growth: Economic growth remains the top foreign policy priority for the U.S. Mission and Zambia's central development challenge. The country's dependence on mining, construction, and urban commercial activity exacerbates the impact of the global economic crisis, leaving Zambia's agriculture-dependent rural poor lagging in most social welfare measures. U.S. Mission goals to mitigate and reverse the impact of HIV/AIDS, and increase access to health services and quality education require broad-based and sustainable economic growth and increased rural food security. U.S. assistance will increase trade and investment through policy, regulatory, and administrative reforms. Programs will emphasize economic opportunities for rural smallholders, closely linked to programs that target agricultural productivity and increase market access. Financial sector assistance will promote smallholder credit access to commercial lending through a Development Credit Authority loan guarantee.

Zambia's "ultra poor" include asset-deprived smallholder farmers who rely upon rain-fed subsistence agriculture. These farmers and their communities face recurrent droughts and floods, leaving them with a marginal capacity to manage livelihood shocks. A key pillar of the upcoming U.S. Global Food Security Response targets the accelerated participation of ultra poor in rural growth. In FY 2009, the U.S. Humanitarian Assistance program will use P.L. 480 funds to improve the nutritional status of targeted groups and will link disaster response to sustainable livelihood approaches, reducing chronic vulnerability among the rural poor while offering them long-term economic opportunities.

4. STATEMENT OF WORK

The assessment team shall perform the following activities organized into 3 steps:

4.1. Data collection

4.1.1. *Pre-travel informational meetings and information gathering.*

Prior to traveling to the field, the assessment team is expected to:

- Gather and get acquainted with existing background information on Zambia such as the country's natural resources, geographical, ecological and biological specificities, current status of environment and biodiversity, institutional organization on entity and state level, key stakeholders and donors in environment and biodiversity, legislation related to the environment and biodiversity, and other relevant information required for the country assessment.
- Meet or speak with key stakeholders or managers at the World Bank, USDA Forest Service, and U.S.-based organizations including, Development Alternatives, Inc, CLUSA, Land O'Lakes, Wildlife Conservation Society, African Wildlife Foundation, World Wildlife Fund or other organizations involved in biodiversity conservation in Zambia or relevant regional efforts.
- Hold meetings with the Bureau Environmental Officer (BEO) and the Bureau Environmental Advisor (BEA) in the USAID Bureau for Africa and relevant EGAT/NRM staff to ensure full understanding of USAID environmental procedures, the role of the regional bureau in environmental compliance, and purpose of this assignment.
- Hold a meeting with US Department of State, Office of Global Change and USAID/EGAT/ESP Global Climate Change Team to gain an idea of possible USG Climate Change activities in Zambia and inter-agency coordination/collaboration potential.
- While travelling to Lusaka, make a stop in Pretoria to meet with the Regional Environmental and Natural Resources Management Advisers to get their guidance

4.1.2. *After arrival in the field*

The field team will conduct an overview and general analysis of the country's environment, forestry and biodiversity and their current status. Upon arriving in Zambia, the team will:

- Meet with USAID/Zambia to get a solid understanding of Mission program goals and objectives under its current Operational Plan; perspectives of this assignment and specific interests for the team, including advice and protocol on approaching USAID partners and host country organizations with respect to this assignment. The team shall be aware of sensitivities related to an assessment exercise (i.e., the potential for raising expectations, and the need to be clear about the purpose of the assessment) and respect Mission guidance. The team will discuss organizations to be contacted and any planned site visits with the Mission and coordinate as required.
- Hold meetings with donor organizations (e.g. NORAD, the World Bank, the Finnish Embassy, the Danish Embassy, UNDP, FAO, GTZ), international NGOs (AWF, WCS, WWF) and local (NAMIN, Zambian Water Partnership), relevant government agencies such as the Department of Forestry (Ministry of Agriculture), Zambian Wildlife Authority (ZAWA), Ministry of Tourism, Environment, and Natural Resources (MINTENR), and Environmental Council of Zambia (ECZ), and other organizations (Copperbelt University - School of Natural Resources, Peace Parks, Zambian Ornithological Society, Kafue National Park organization (KNP)) that are knowledgeable about environment, biodiversity and tropical forestry conservation or are implementing noteworthy projects and gather information locally.
- Hold meetings with relevant actors concerning climate change issues including REDD activities and climate change mitigation and adaptation projects (NORAD, GoZ Climate Change Facilitation Unit, UN REDD (UNDP), Kenneth Nkowani (Zambian Climate Negotiator for Copenhagen), George Wamukoya – COMESA, COMACO, Zambian Conservation Farming Unit).

- Conduct at least three priority site visits which would supplement understanding of USAID's programs, or of environment and biodiversity issues that arise in interviews and literature or would confirm information in previous assessments. The site(s) for field visits will be determined by the team prior to the assessment in consultation with USAID. Possible sites could include: Copperbelt area (mining); Kafue and Luangwa National Parks and surrounding Game Management Areas; Central Province, Kapirim Poshi (Farming blocks); Impecka, Lucherite and Kopa chiefdoms (community involvement in protecting forests); Zambian Conservation Farm Unit demonstration site; COMACO depot site; Biofuel pilot site (Jatropha).
- Ecotourism and non-timber forest product market development present interesting opportunities within the environmental arena that present economic growth potential and should be particularly researched in Zambia. Non-timber forest products (honey, mushrooms, caterpillars, etc) have an already successful and established market within Zambian society. Zambian tourism is an established and profitable industry (Victoria Falls, Luangwa Park, etc) and opportunities should be examined on how to expand the beneficiaries of this industry. New legislation could be upcoming that would facilitate the development of a more robust mid-level tourist infrastructure.

4.2. Analysis

- Evaluate how the recommendations of the previous ETOA (2002) and the updated FAA 118/119 assessment (2007) have been implemented by USAID/ZAMBIA and draw the lessons for the new ETOA and FAA 118/119 assessments.
- Assess and summarize the needs for environment, biodiversity and tropical forestry conservation in Zambia based on key threats and opportunities and analysis of country, donor and NGO responses to meet these needs.
- Prepare a report on the status of environment, biodiversity, tropical forestry and conservation efforts in Zambia and potential implications for USAID or other donor programming and environmental monitoring which shall define the actions necessary for conservation.

4.3. Report

This report will provide details on the threats and opportunities and major participants in the environment, biodiversity and forest conservation sectors of Zambia, as well as information on current U.S. Foreign Assistance and USAID programming, with recommendations on actions necessary to conserve environment, forests and biodiversity. This document would contribute to meeting the legal requirements of FAA 118/119. That is why it shall include the following:

- The current status of environment, biodiversity and tropical forests in Zambia based on current and available information. At the environment level, the report will document the state of key natural resources by quantifying trends in their management, biophysical condition, productivity, abundance, and distribution and by identifying threats (*e.g.*, degradation, depletion, pollution) to which they are subjected. The status of biodiversity will include major ecosystem types, highlighting important, unique aspects of the country's biodiversity, including important endemic species and their habitats, genetic diversity, agricultural biodiversity, ecological processes and ecosystem services, and values and economics of biodiversity and forests.
- A map of potential natural vegetation and of land use or land/forest cover should be provided if available.
- Descriptions of natural areas of critical importance to biodiversity conservation, such as forests and wetlands critical for species reproduction, feeding or migration, if relevant. Particular attention should be given to critical environmental services and non-commercial services they provide (watershed protection, erosion control, soil, fuel wood, water conservation and amenity and recreation). It will also summarize how current land tenure arrangements affect conservation in Zambia.

- An overview table and map of the status and management of protected area system in Zambia including: an inventory of all declared and proposed areas (national parks, wildlife reserves and refuges, forest reserves, sanctuaries, hunting preserves and other protected areas).
- The inventory will identify the institution responsible for the protection and management of each decreed area, its date of establishment, area, and the protection status of each (i.e., staff in place, management plan published, etc.) In addition to this summary of the current protection and management status of each protected area, an overview of the major threats and challenges facing protected areas in Zambia including vulnerability of areas to predicted changes in climate, and a brief summary of any recognized economic potential of these areas (including productive assets, environmental services and recreation and tourism opportunities) should be provided.
- Descriptions of plant and animal species that are endangered or threatened with extinction. Endangered species of particular social, economic or environmental importance should be highlighted and described, as should their habitats. Technical information resources such as the IUCN red list and their websites should be referenced for future Mission access as required. This section should not emphasize species counts, but look at the relation of endangered species and important habitat conservation areas and issues, and evaluate the pressure on those areas, including vulnerability to predicted changes in climate, and current efforts to mitigate pressures, including the participation and compliance with CITES and other international efforts.
- Recent, current, and potential primary threats to environment and biodiversity, whether they are ecological (i.e., fire, pests), related to human use (i.e., agriculture, contamination), or institutional (i.e., failed policy) or trans-boundary issues, as appropriate. These should emerge from a general assessment of national policies and strategies and their effectiveness, issues related to institutional capacity, trade, private sector growth, participation in international treaties, and the role of civil society.
- Conservation efforts, their scope and effectiveness. This section also should include recent, current and planned activities by donor organizations that support biodiversity and tropical forestry conservation, identification of multilateral organizations, NGOs, universities, and other local organizations involved in conservation, and a general description of responsible government agencies. A general assessment of the effectiveness of these policies, institutions, and activities to achieve biodiversity conservation should be included. Priority conservation needs that lack donor or local support should be highlighted.
- Analysis of the current legislations and policies related to the environment, forestry, biodiversity, and climate change. This section should include identification of laws and policies related to protection and management of biological resources and endangered species. It should also point out any differences in laws and policies that require further harmonization. This section should also review international treaties signed and ratified, as well as those that Zambia needs to sign in order to conserve and manage its biological resources more efficiently.
- An overview of the major environment, biodiversity and tropical forest conservation activities of the commercial private sector to identify ways to better foster private sector alliances. Of interest are the norms and standards followed by those commercial entities most engaged in management and use of Zambia's tropical forests and tracts near protected areas, including tourism developers and tea producers. Consideration of policies promoted by the key relevant governmental ministries should also be included.
- An overview of climate change activities in Zambia: past, present and future. How they affect the development and conservation environment, strengths and weaknesses, gap analysis, REDD activities, potential synergies with USAID programming, opportunities for intervention for USAID and other donors, strategies to address climate vulnerable areas, etc.
- A brief overview and recommendations for environmental concerns related to USAID's health program (DDT, medical waste, condoms, etc). As the most significant portion of USAID's programming in Zambia, the health portfolio represents a not insignificant area in which USAID can affect the environment. This should include an analysis of how climate change variation might affect

the health sector (drought, famine, flood, malaria outbreaks, etc) so that USAID/Zambia can better prepare its programs to adapt to these changes. Other areas of interest for USAID/Zambia include: Fertilizers and Pesticides; Reg 216; Rural roads; Invasive species; GMOs; Biofuels.

- An assessment of how **USAID's** programs and operational plans meet the needs for environment, biodiversity and tropical forestry conservation, and climate change consistent with Mission program goals and objectives, through strategic objectives. The assessment shall include recommendations on where U.S. comparative advantages and capabilities are likely to have the greatest impact. These issues and recommendations should be prioritized to identify those requiring the most immediate attention. This section shall identify opportunities and entry points for USAID-Zambia efforts that would positively influence the conservation of the environment, tropical forests and biodiversity and improve environmental management. Particular focus should be made on activities that are commercially viable (sustainability), occur in population dense areas (affect the most people possible), have market access (make use of the road networks) and have agricultural potential (food security).
- A brief section of how USAID/Zambia could expand its inter-governmental collaboration and cooperation through other USG agencies (USFS, Dept State, USFWS, etc) in the areas of climate change, biodiversity, forestry, and conservation.

Illustrative Outline:

- a) Introduction, describing the biophysical/human/economic contexts, environmental laws, policy and institutions, overview of environmental programs and initiatives, and the purpose of the present review
- b) An overview of the state of the natural resources, including forests and terrestrial biodiversity, aquatic ecosystems, and agricultural resources
- c) An analysis of past and current initiatives in Zambia
- d) Climate Change section
- e) Opportunities and entry points for USAID/Zambia, including integrated threats analysis, optimal results areas, analysis of legal requirements under the FAA, interventions of other donors, recommendations of environmental experts and recommendations of opportunities and entry points.
- f) All references used and cited in the report, including Web URLs, people consulted, and their institutional affiliation, endangered and protected species and authors' biographical data. Other references such as the SOW for the analysis, other background or supporting material, including maps and photographs should be included. Copies of key document, maps and images, and copies of photographs obtained during the assessment should also be appended in a CDROM with electronic versions of written materials.

5. EXPERTISE REQUIRED

A XXX-person team with the following composition and expertise is required to conduct this analysis:

- **International Technical Assistance (XXX persons):**
 - Senior Level Natural Resources and Environmental Management Specialists with post-graduate qualifications in biology, zoology, forestry or closely related field in natural resource management or natural resource economics.
 - Background in tropical biodiversity and natural resource conservation.
 - Knowledge of USAID Strategic Planning process related to related to Environmental Threats and Opportunities Assessment and Tropical Forestry and Biodiversity (FAA Sections 118 and 119).
 - Knowledge of 22 CFR 216 and of FAA 117 is also desirable.
 - Significant experience in integrating health, environment, population and poverty reduction issues is desirable.

- Demonstrated expertise in assessing development programs for impacts on environment and tropical ecosystems.
- Demonstrated expertise in the design and production of environmental impact assessments (EIA).
- Experience in Southern African region and in Zambia desirable.
- **Local Technical Assistance (XXX person).**
 - Senior Level Natural Resources and Environmental Management Specialist or **Environmental Policy Analyst** with demonstrated experience in Zambia environmental law, the policy and legal frameworks governing environmental management and biodiversity/forestry conservation in Zambia and the analysis of relevant policies.
 - Good contacts within Zambia government agencies, NGOs, international donors, and private sector preferred. Proficiency both in English and French

6. DELIVERABLES:

The main deliverable is an Assessment Report (40 to 60 pages without appendices) for USAID/Zambia that examines the environmental threats and opportunities, the biodiversity and the tropical forests conservation and other management related issues and identifies contributions and/or potential contributions to meeting identified conservation needs by the Mission's operational plans. Other deliverables are the following:

- Work plan/schedule within two working days of start date.
- Progress report to the CTO and MEO after 10 working days from the start date (o/a XXX).
- Oral debriefing within five working days preceding the departure date. The team shall meet with USAID/Zambia to provide them with a brief of the report findings. The exit brief shall be accompanied by a short written summary of initial key findings and recommendations.
- Following a one week comment and review period, a revised final report incorporating all comments will be submitted within two weeks of the field work.
- XXX copies of the bound final draft will be made available when the final is approved by the Mission.
- A short (10 pages) Environmental Annex to Annual Operational Plans, which consists of a summary and syntheses of the findings and recommendations of the full ETOA and FAA 118-119 analysis. The introduction to the Summary will include this statement: "The Environmental Annex is an analysis that examines environmental threats and opportunities inherent to the Mission's strategy and assesses the extent to which the Mission's strategy incorporates or addresses tropical forests and biodiversity concerns. This assessment does not substitute for the Initial Environmental Examination (IEE). The Mission is responsible for ensuring that an IEE or a Request for a Categorical Exclusion is conducted for all activities funded by USAID."

7. ANTICIPATED LEVEL OF EFFORT

The LOE for this assignment is a total of XXX person-days, to be allocated as follows:

Pre-travel meetings: XXX persons x XXX = XXX person-days

Travel: XXX persons x XXX = XXX person-days

Field-work: XXX persons x XXX = XXX person-days

Report: XXX persons x XXX = XXX person-days

Total = XXX person-days

The consultancy will be carried out within the period of XXX through XXX. About XXX days will be in-country, XXX days preparation and wrap-up, and XXX days travel. The international consultants will oversee

the work of the local-hire consultant. The international consultants will work under the technical direction of the Bureau Environmental Officer. The Senior Regional Environmental Officer based at USAID/Southern Africa and the Mission Environmental Officer will have an advisory role.

8. SCHEDULE AND LOGISTICS

Meetings in Washington, DC, will take place between XXX and XXX. The team will coordinate logistical arrangements with the USAID/Zambia Mission Environment Officer. The Mission will assist the team by providing key references and contacts as well as logistical support where necessary. USAID/Zambia's Program Office will also help facilitate meetings with other Mission SO Team Leaders or their staff to fully brief the team on USAID's program and future vision for their strategy. Field work in Zambia will take place from XXX to XXX. The report is due within 2 weeks after the field work.

9. SELECTED REFERENCE DOCUMENTS

- USAID 2002 ETOA
- USAID 2007 118/119 Assessment
- USAID/Zambia Annual Report(s)
- 2009 Zambia ETOA Scoping trip contact list
- IFPRI – Affects of Climate Change in Zambia
- UNDP REDD – Road Map and associated GoZ Country Strategy <http://www.tiempocyberclimate.org/newswatch/feature091004.htm>
- 5th Zambian Government National Development Plan and included Environment and Tourism Sector Plans
- GoZ National Adaptation Program of Action on Climate Change
- GoZ Integrated Water Resource Management Plan

ANNEX 10: RESEARCH REFERENCES ON CONSERVATION FARMING AND CONSERVATION AGRICULTURE

- Conservation Farming Basins and Ridges in Northern Province Zambia. Peter Langmead . 25th August 2002.
- Zambia Conservation Farming Trials Analyses. *Peter Langmead August 2002.*
- Conservation Farming in Zambia. Haggblade, Tembo. IFPRI January 2003.
- Development, Diffusion and Impact of Conservation Farming in Zambia. *Haggblade, Tembo, MSU/FSRP November 2003.*
- An assessment of Sustainable Uptake of Conservation Farming in Zimbabwe Twomlow et.al. *ICRISAT Zimbabwe 2007.*
- Precision conservation agriculture for vulnerable farmers in low-potential zones. *Twomlow et.al. ICRISAT Zimbabwe 2008.*
- Effects of conservation agriculture techniques on infiltration and soil water content in Zambia and Zimbabwe. *Thierfelder & Wall. CIMMYT, February 2009.*
- Analysis of crop yield data from trials under mature *Faidherbia albida* canopy. *CFU, Shitumbanuma 2009*
- Conservation Agriculture in Malawi. *Trent Bunderson et. al. 2009.*
- Conservation Agriculture Programmes and Projects in Malawi, Impacts and Lessons Learned. *Mloza-Banda et. al. 2010*
- Investigating Conservation Agriculture (CA) Systems in Zambia and Zimbabwe to Mitigate Future Effects of Climate Change. *Thierfelder & Wall CIMMYT, April 2010.*
- Final Draft - Productivity Impact of Conservation Farming on Smallholder Cotton Farmers in Zambia *Haggblade & Plerhoples MSU/FSRP 2010.*

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COVER PHOTO: Young bull elephant grazing along the banks of the Lower Zambezi River. Photo credit: S. Sieber.

FAA 118-119 ANALYSIS CONSERVATION OF TROPICAL FORESTS AND BIOLOGICAL DIVERSITY

March 2011

DISCLAIMER

The author's views expressed in this publication do not necessarily reflect the views of the United States Agency for International Development or the United States Government

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INTRODUCTION

This report was produced by the U.S. Department of Agriculture's Forest Service International Programs (USDA/IP) to inform operational and strategic plans of the Agency for International Development Zambia Program (USAID /Zambia). This report provides information necessary for USAID to comply with Sections 118 and 119 of the U.S. Government Foreign Assistance Act (FAA) of 1961, as amended, to guide and inform USAID/Zambia as it develops Annual and Operational Plans, and a Country Assistance Strategy. The last FAA 118/119 Analysis was completed in 2007.

Zambia continues progress in its efforts to address natural resources utilization, and management. Zambia has formulated numerous environmental policies, laws, management plans, guidelines, and planning documents. In addition, Zambia is a party to many conventions of international importance, among them the Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES), the Ramsar Convention, the African Convention, and the Convention on Biological Diversity. However, most policies and laws are sector-based and therefore somewhat fragmented. There is need for a more overarching legal and policy framework so that integrated management frameworks are fully realized.

As per FAA Sections 118 and 119, this report examines environmental threats and opportunities inherent to USAID/Zambia's Country Assistance Strategy, and Annual and Operational Plans. This report reviews the extent to which the Mission's strategy incorporates or addresses tropical forests and biodiversity concerns. It is not a substitute for the Initial Environmental Examination (IEE). The Mission is responsible for ensuring that an IEE or a Request for a Categorical Exclusion is conducted for all activities funded by USAID.

OVERALL CHALLENGES FOR CONSERVATION EFFORTS IN ZAMBIA

Despite the great steps taken by the Government of the Republic of Zambia to address issues related to biodiversity conservation, forestry, and the environment in general, major challenges lie ahead within both the governmental system and society. Government policies have contributed to environmental degradation by not discouraging cultivation of marginal lands or by providing subsidies for heavy maintenance crops such as maize. Heavily subsidized fertilizer support and maize marketing programs have encouraged small-scale farmers to focus on maize production, leading them to become dependent on a mono-crop system. Continuous use of synthetic fertilizers eventually leads to lower soil fertility and high pH levels. This situation causes farmers to abandon their existing holdings and migrate to lands that are more fertile.

Rapid population growth and rural-urban migration amidst limited job opportunities leads to over-exploitation of forest reserves and illegal off-take of fish, wildlife, and forest resources. Worse still, a large percentage of Zambia depends upon either fuel wood or charcoal for their domestic energy supply. This trend indicates the extent to which natural resources are threatened.

In this report, we define environmental threats as the root activities or causes that lead to environmental degradation. Based on this definition, the *key* threats to Zambia's environment were identified as:

- Unsustainable Agricultural Practices
- Charcoal Production
- Illegal Off-takes
- Mining Operations and Expansion

- Poor Governance
- Climate Change

Key threats to Zambia's natural resources are primarily human-caused. Climate change is considered a threat magnifier.

Tropical Forests

There are 480 forest reserves in Zambia covering a total land area of approximately 7.2 million hectares. Local Forests are meant to conserve forest resources for sustainable use by local people, while National Forests protect major catchment areas. Expanding settlements and agriculture activities have encroached upon and depleted some forest reserves, and as a result, the Government has excised and degazetted some previously protected reserves. Fifty-one percent of Zambia's Forest Reserves are either encroached upon or depleted due to the over-exploitation of wood products, settlement, cultivation, and inadequate natural resources governance (Convention of Biological Diversity, Fourth National Report). Of the National Forests, 2% are "depleted," 46% are "encroached," and 3% have been degazetted for other land uses. More Local Forests have been excised than National Forests. This may be attributed to a high rate of urbanization leading to high demands for forest products and land. Local forests in the Copperbelt, and in Eastern and Lusaka Provinces have been most affected. The opening of new mines in Northwestern Province is expected to bring pressure on the undisturbed forest reserves (GRZ 2009).

Biodiversity

An estimated 7,774 species of organisms occur in Zambia. Microorganisms make up 8% of this biodiversity, while plants and fauna comprise 47% and 45% of the population, respectively. Out of the estimated 3,407 faunal species, there are 1,808 species of invertebrates, 224 species of mammals, 409 species of fish, 67 species of amphibians, 150 species of reptiles, and 733 species of birds. There are an estimated 4,600 floral species in Zambia, with diversity dominated by herbs and woody plants. Two hundred eleven floral species are considered endemic.

A recent International Union for the Conservation of Nature (IUCN) Red List query revealed there are 47 endangered or vulnerable (i.e. threatened) species in Zambia, an increase from the 4th National Report. It is difficult to determine whether the increase in the number of species can be attributed to a decrease in populations or rather, that better assessments simply have been undertaken. Many of the listed species are aquatic organisms found in select systems and are threatened by siltation, dams, poisoning or competition from non-native species.

There are 19 National Parks established in the country to conserve faunal biodiversity, covering 8% of Zambia's total land area. Six of the National Parks have management plans of some form. Sustainable use of wildlife and its habitats in the parks is promoted through eco-tourism while settlements and hunting are prohibited. Only the surface of land contained within parks is protected; subsurface mineral deposits are not withdrawn from entry and are controlled by the Ministry of Mines and Minerals Development.

Game Management Areas (GMAs) are protected areas established to control the hunting of wild animals through a licensing system. Thirty-six GMAs exist in Zambia that are essentially buffer zones to the National Parks, covering an additional 23% of the land areas. The GMAs are communally owned areas where human habitation is permissible and over 1.5 million people are estimated to live in them.

Additionally, Zambia has eight Ramsar sites covering more than 4 million ha and 39 Important Bird Areas. Within the National Park system, there are 59 botanical reserves established to conserve floral biodiversity.

Climate

The Republic of Zambia has a relatively moderate climate with seasonal rainfall unevenly distributed throughout the year. Most of the rainfall occurs between November and April, the growing season, while the

rest of the year is typically dry. Both the country's socio-economic health and native ecosystems depend upon the timing and amount of rain that falls during the rainy season each year. Across the country's three agro-ecological regions, the average annual temperature and rainfall vary mostly by elevation. Climatic patterns and predictions for the country are difficult to formulate due to the strong influence of the El Niño Southern Oscillation and other multi-decadal climatic phenomena have on annual rainfall patterns. The limited amount of long-term data available on Zambia's climate also impedes the discernment of climate patterns and hinders predictions. The records and data that are available for Zambia and surrounding countries indicate that there have been significant increases in regionally averaged daily rainfall intensity and dry spell duration. These trends are predicted to worsen in the future with the potential for wide-spreading negative effects.

Threats to Tropical Forests and Biodiversity

Because tropical forests and biodiversity are strongly interconnected, threats to one area often translate to threats in the other. The following represent only the major threats to loss of biodiversity and tropical forests in Zambia. Key causal factors of these threats have been inadequate capacity to manage the forestry estate, weak or poor law enforcement mechanisms and monitoring by the agencies, and lack of implementable land use and development plans.

Unsustainable Agriculture

An estimated 80% of Zambia's rural population makes a living through subsistence farming on customary land. Small-scale agriculture is by far the most common source of livelihoods and income for rural dwellers in Zambia and has a significant impact on the environment. Issues with food scarcity, inappropriate agrarian policies, and migratory farming caused by unsustainable agricultural practices are catalysts for tropical deforestation.

One of the main factors to be considered in relation to agro-ecological sustainability is the soil, as it is the basis for food production in Zambia. Soil tillage, as conventionally practiced, leaves the soil surface bare, and is one of the major causes of erosion on agricultural land.

In most years, the majority of Zambian smallholders in marginal agricultural lands almost never attain yields sufficient for food and income security or business expansion and investment. This prevents farmers from breaking out of poverty cycles and causes families to engage in off-farm income generation activities that are ecologically degrading such as charcoal production, roadside trading, poaching, tree harvesting for sale, or fishing during banned periods.

Expanding land holdings under low productive systems will continue to put environmental pressure on finite resource bases. Continued low productivity in the smallholder sector remains an overriding problem and will continue to exert negative effects in local ecosystems.

Prior to the 1970s, the systems that farmers applied to grow crops were more efficient and environmentally sustainable than today. Since that time, government policies that encouraged maize production while keeping maize meal prices low have created a system that relies heavily on subsidies. This system, coupled with unsustainable land preparation practices, has degraded once productive, arable land into marginal farmland, incapable of sustaining and producing enough food and cash crop required by the majority of Zambian small-scale farmer households.

Farmers who have degraded their land through continuous soil disturbance, maize mono-cropping, and non-replenishment of soil nutrients may migrate and occupy pristine or rejuvenated woodland to temporarily exploit natural fertility in order to provide for the basic needs of their families. Clearing forests for agricultural production is a major cause of deforestation. In Zambia, it is estimated to account for about 90% of forest clearing.

Charcoal production

Charcoal production to supply fuel for inefficient household cook stoves in Zambia contributes to numerous environmental threats across multiple sectors. The direct and indirect ecological impacts from charcoal production are primarily deforestation and land use conversion, particularly where access is available. Among other impacts, charcoal production can lead to biodiversity loss and negative impacts to ecosystem services. Deforestation and production practices supporting the charcoal industry directly contribute to land use conversion, forest degradation, unplanned road creation and the unsustainable use of natural resources.

With roughly 25% of households having access to electricity, charcoal and firewood provide nearly 75% of the energy used in Zambian households. Conventional charcoal and wood cook stoves tend to be dirty and inefficient, requiring approximately 1.3 tons of charcoal per household annually. The process of charcoal creation is inherently inefficient with six kilograms of wood needed to create only one kilogram of charcoal. Most of this wood is procured as illegal off-take, driving deforestation and unplanned land conversion. Zambia has one of the highest deforestation rates in the world, and this is largely due to charcoal production.

Illegal Off-Takes

Forests in Zambia have been experiencing a decline in extent and quality since 1998. The decline is confined primarily to the forests accessible by the line of rail in the Copperbelt, Central, Lusaka, and Southern Provinces. Forest losses are experienced through the cutting of trees to feed kilns and produce charcoal, and the illegal exploitation of timber resources. A lack of law enforcement, absent management plans for sustainable management, and porous borders allow this exploitation to continue.

Animals are poached for food, for income from the selling of bush meat, and for illegal export. Well-intended projects in some areas have resulted in facilitating the poaching of animals by unintentionally supplying poachers with material for snares. A lack of law enforcement and ineffective sharing of revenues through community resource boards also have potential to contribute to poaching as a means to gain income if village scouts hired to spot poachers must wait several months for their payments.

Mining Operations and Expansion

The expansion of mining operations and mineral processing has tremendous impacts on the environment and biodiversity. Rapid economic growth in Asia has led to a global demand for technological commodities and a “scramble” for natural resources across Africa. Copper is the backbone of the Zambian economy. New foreign direct investments have exceeded US\$4 billion in the last five years resulting in new mine concessions in forests of the Northwestern, Central, Eastern and Southern Provinces. Mining and mineral processing affect the forest environment by the impacts listed below:

- **Displacement of Forests and Customary Land-Users in the Mining Concession Site** – The displaced populations usually seek alternative areas to settle and embark on for agriculture, which magnifies the expansion of deforested land.
- **Consumption of Timber in Mining Related Activities** – Mines historically have depended upon indigenous timber sources. The demand for specific tree species has largely resulted in forest degradation in concession areas, causing impacts on regeneration and biodiversity of targeted forests. Communities in customary forests now have to travel long distances to source mushrooms, medicines, and other non-timber forest products.
- **Release of Mine Effluents** – Mining operations that release large amounts of chemicals (e.g. mercury, cyanide, sulfuric acid, arsenic, and methyl mercury) into nearby water bodies negatively impact aquatic biodiversity. The release of mine effluents is harmful for the aquatic flora and fauna of the water bodies, impacts human use and life, and affects downstream industrial activities. The released and leaked chemicals change the chemical composition of the land and make soil unsuitable for plant growth. Organisms can no longer use the polluted environment, as it is no longer suitable habitat.

- **Green Site Development** – Mining operations require large areas of land, mainly forested land, to be cleared creating large tracts of deforested land. The loss of forest and woodland habitat, which supports a large number of fauna and flora, causes a loss of biodiversity.
- **Indirect Effects of Road Expansion** – Vegetation adjoining the mining areas is cut to construct roads and residential facilities. The extensive tree cutting and vegetation removal caused by road expansion negatively effects biodiversity and provides improved access point for illegal off-takes.
- **Mining-induced Population Growth in Forest and Woodlands** – Human population growth associated with mining increases environmental and biodiversity impacts. A large number of animal and plant species are jeopardized by indiscriminate forest clearing to meet the increased demand for timber, non-timber forest products, charcoal, and fuel wood.

Poor Governance

The lack of strong, cohesive leadership in relation to Zambia’s natural resources has significant indirect impacts on the country’s tropical forests and biodiversity in several ways. Zambia has no coordinating governance structure, policy, or law that brings together the ministries tasked with planning, implementing, and monitoring integrated natural resource management plans. As a result, lands are often allowed to be utilized in ways that are in conflict with natural resource conservation and sustainable long-term utilization. The following are considered major factors regarding how weak leadership affects Zambia’s tropical deforestation and biodiversity loss issues:

- Ineffective institutional capacity
- Unplanned development
- Inconsistent enforcement of environmental laws
- Absent land tenure
- Customary rights displacement
- Inadequate monitoring, reporting, and verification of data.

Sectorial institutions of government typically formulate periodic and isolated sector-based development plans. This non-collaborative method frequently results in conflicts between sectors. Without specific instruments of regulation, many customary areas experience conflicts over un-delineated land uses. For example, unregistered agricultural expansion into wooded areas outside of gazetted forests is typical in many of Zambia’s rural environments. Currently, the Forestry Department administers forest resources under an inadequately facilitated centralized system. Current legislative proposals emphasize collaboration and shared responsibility with local communities in forest resource management.

Unplanned development is also a factor in tropical deforestation and biodiversity loss. Natural resource matters are discussed within sectors, and because there is no well-coordinated master plan, interaction at the District or Provincial level is often marred by sectorial interests. There are no specific resource use allocations to major land uses besides the protected lands under wildlife (30% of Zambia) and forests (8%), some of which overlap. High level, effective natural resource planning and coordination mechanisms are absent, which leads to the ineffective, unilateral management of Zambia’s natural resources.

Enforcement of environmental laws requires adequately trained specialists at appropriate staffing levels. This does not always happen, and as a result, the flow of information to the public may not be sufficient. The few Specialists at the Lusaka and Kitwe offices of the Environmental Council of Zambia (ECZ) cannot attend to the increasing number of environmental cases, which creates situations where the illegal use of forest and wildlife resources becomes inconsequential to violators.

The absence of secure land tenure promotes deforestation, forest degradation, and biodiversity loss, as well as impedes the ability of communities to protect and sustainably utilize forests. With few people investing in customary land areas, people often move from one area to another without practicing sustainable land management. Since resources on communal land are not private and cannot be privatized, communities have resource use rights but not resource management rights. This presents legal obstacles to the implementation of benefit sharing between government and local communities.

Under customary land tenure, which covers most of Zambia, “non-traditional areas” are held by individuals, families, clans, or communities. The pressure to open up new areas for development following urban population growth has led to the creation of new mines and investments in these “non-traditional areas.” The conversion of land from customary tenure to statutory tenure has seen at least 10% of land titles being redistributed to foreign investors, local elites, politicians, and land speculators. This has created situations that may demand the relocation of people or disturbance to natural habitats in terms of wildlife and biodiversity.

Climate Change

Unlike the other threats outlined in this assessment, climate change does not directly affect natural resources in most cases, but acts more as a “threat multiplier.” Potential impacts from anthropogenic climate change are wide-ranging and affect multiple sectors:

- **Agriculture and Food Security:** Already marginal, low-yielding agricultural systems will be adversely affected by climate change. This will become a driver of charcoal production, illegal off-takes, human migration, and unplanned development/land conservation as farmers try to offset low incomes and meet their livelihood needs.
- **Water Stress:** Water availability and accessibility across all sectors will be negatively affected. More intense storms may increase erosion, crop damage, incidences of floods, and threats to fisheries.
- **Ecosystems and Biodiversity:** Interaction between climate change and human drivers such as deforestation, unplanned development, and wildfire will affect populations and distribution of endemic species, impacting ecosystem services.

SUMMARY OF FORESTRY AND BIODIVERSITY CONSERVATION ACTIVITIES IN ZAMBIA

The Republic of Zambia, in partnership with the private sector, civil society groups, international donors, and non-governmental organizations, support many activities and initiatives that protect biodiversity and tropical forestry in the country. The following opportunities were identified through interviews with individuals, organizations, and institutions that best address threats to the conservation of forests and biodiversity. Many more opportunities may exist to enhance the environmental health of Zambia, but these six best address the current threats.

Conservation Agriculture

The benefits of conservation agriculture include:

- 25% to 100% yield increases (1st season) and soil improvement (medium-long term)
- Increased labor productivity and income through timely planting and the precise outlay of inputs
- Adaptation to climate change

- Small holder risk aversion – farmers can learn and adopt basic practices quickly
- Decreased land degradation, migration, and deforestation
- Increased family nutrition through the integration of high protein legumes
- Increased on-farm revenues through off-farm business opportunities and increased marketable surpluses.

The number of farmers using conservation farming methods represents 13% of the total farming households across Zambia. Expansion of conservation farming activities through the Zambian Conservation Farming Unit and other NGOs with government support represents an opportunity to address the poor productivity and environmental destruction characteristic in the Zambian small-scale farming sector.

Organizations that work with the private sector to build in-community agricultural services, without becoming the supplying markets, integrate the long-term systemic growth into the small-scale farming sector. This is the type of investment needed to lower poverty and environmental destruction as demonstrated by the Production, Finance, and Technology (PROFIT) project. On-farm economic activities, such as access to transparent and open markets, reliable and affordable access to yield-enhancing inputs, and market support services, are also vital if small-scale farmers are to increase on-farm productivity on existing holdings. This would help mitigate migratory farming with the ensuing encroachment and environmental impacts those migrations entail.

Diversify the Food and Income Base

Diversifying the food and income base would help farmers spread risk and mitigate external shocks such as higher food prices, and changing or erratic climatic conditions, as well as increasing nutrient and vitamin uptake. The promotion and integration by future USAID projects of income-generating poultry and small ruminant production, as well as improved cassava, sweet potatoes, and climbing beans into current small-scale crops, would ensure household food security and increase protein availability at the household level. This would help negate off-farm poaching and deforestation activities required by many households to supplement maize food stocks. However, the private sector growers and transporters need to be engaged in the production and supply of growing material.

Tillage practices, soil fertility, and water conservation systems need to be improved before the traditional development interventions of improved access to seed and markets can address environmental degradation or low yields associated with traditional farming systems. The benefits derived from fertilizer use will only significantly contribute to yield increases when soil fertility and soil organic matter is improved through better tillage systems.

Promotion of farmers establishing *Faidherbia albida* could become a key component of future agricultural-related projects. *Faidherbia albida* is a leguminous tree with reverse phenology; it defoliates after the onset of rains and refoiliates near the onset of the dry season. Through leaf and pod fall and nitrogen fixation, soil fertility accumulates under the mature canopy and off-sets the need for fertilizer inputs (ETOA 2011). Planting this tree is a practical method of reducing the negative effects of dry periods on maize crops

Public/Private Conservation Partnerships

Public-private partnerships that incorporate household-level needs provide opportunities for enhanced service delivery and enforcement amidst limited ability for local, collective planning. These partnerships promote household “buy-in” to reduce practices harmful to their environment. Community Markets for Conservation (COMACO) is an example of such a partnership and introduced farming methods that encourage long-term residency, reducing the need for large-scale slash-and-burn type practices used to open up new land. These methods include the use of lime, basin plantings, mulching, composting, and regular

crop rotation with legumes for fixing nitrogen in the soil. Registered farmers learn improved farming practices that help address local and regional environmental challenges.

Public-private partnerships that assist communities at the nexus of Game Management Areas, National Parks, and National Forests should be given priority investment and consideration. Partnerships around these protected areas would provide multi-sectorial benefits.

Another potential opportunity for improving rural livelihoods and encouraging conservation and stewardship is to support the creation of community-owned game ranches or communal wildlife conservancies (Lindsey et al. 2009) located on customary lands. These areas could be managed and operated for the multiple purpose of raising game to restock GMAs (supporting biodiversity), to provide a sustainable source of protein for rural populations (supporting health initiatives), and be managed for guided hunting and wildlife viewing (supporting improved livelihoods). Zambia could apply lessons learned from long-standing and successful Community-based Natural Resource Management (CBNRM) efforts in neighboring countries. Communal conservancies should be designed as integrated land use plans to ensure they create conservation benefits, such as habitat corridors and habitat connectivity, while minimizing harms from development.

Integrated Land Use Planning

The absence of a national land use plan and subsequent implementation plans at lower levels create intra-resource use conflicts within GMAs among various resource users across wildlife-related sectors. Sustainable management of these natural resources requires a formal system of recording land ownership and land use linked to a textual and graphic land information format. Planning of land uses and management of the natural resource base is a paramount requirement to achieving sustainable development and in reducing potential resource/human conflicts.

Historically, land use planning on customary land has been on an ad hoc basis and lacks a long-term, coordinated policy. Enforcing regulations on customary land is challenging due to the open access nature of customary land as well as loose regulation by local traditional leaders. Despite national legislation protecting certain forest areas within customary lands, charcoal burning and other land clearing operations are common. Land use planning provides a basis for improved management and use of resources and, where implemented, can assist in the appropriate use of land types. For example, by promoting agriculture on appropriate soil types, fewer inputs may be required, potentially decreasing practices such as slash and burn.

National policies that impact land use planning need to be revisited by the Zambian government. For example, the current focus on expansion of agricultural exports is leading to an expansion of agriculture into previously forested land. Designated forest lands, some within critical headwaters regions, have been de-gazetted to provide land for farming, negatively impacting river flows, and resulting in some flooding. If the National Agricultural Policy specifically stated that such an outcome was to be avoided, a focus on agricultural intensification would emerge, reducing deforestation and degradation at the same time as increasing productivity.

High Efficiency Household Cook Stoves

Charcoal production for the supply of inefficient cook stoves in Zambia contributes to multiple environmental threats across sectors. Charcoal production drives deforestation and human health impacts, and indirectly drives climatic change effects, soil erosion, and biodiversity loss. As such, the promotion of high-efficiency cook stoves and sustainable fuel procurement mechanisms can positively mitigate deforestation, climate change effects, biodiversity loss, and negative impacts to human health in Zambia.

There are two primary opportunities to support and expand the mitigation of charcoal production:

Demand Side: Funding and distribution of high-efficiency household cook stoves (charcoal and non-charcoal fueled)

Supply Side: Improved biomass utilization through high-efficiency charcoal kilns, community forestry, and twig farming, as well as cross-sectored natural resources planning

Several types of cook stoves fueled by small-diameter twigs, charcoal, or solar power qualify as “high-efficiency.” High-efficiency cook stoves can be relatively expensive, and the economic and socio-cultural drivers of charcoal production are complex. Integrated planning associated with community forestry, the United Nations Reducing Emissions from Deforestation and Forest Degradation (REDD+) program, the Clean Development Mechanism (CDM), and the use of existing biomass waste are all vehicles to explore the sustainable provision of fuels for household cook stoves. Supply-side and demand-side household energy improvements provide a significant need and opportunity for donors to fund projects that positively impact multiple sectors.

The Zambia Forestry Department noted that charcoal production is not necessarily the environmental threat, but that the production, location, and intensity is proceeding in an unplanned, unsustainable, and unmonitored fashion, which is destroying Zambia’s forests (D. Kasaro, pers. comm.). Charcoal production may be brought to a sustainable level with proper land use planning, sustainable management of biomass-producing forests, joint forest management mechanisms, and improvements in the efficiency of charcoal production through high-efficiency kilns. Charcoal production may have a place in a diverse portfolio of sustainable household energy strategies.

Monitoring, Reporting, and Verification

The inadequate monitoring, review, and verification capacity affects the availability of good baseline and verifiable data on wildlife species and their numbers in National Parks and game management areas, tree species, timber stocks, and fish populations. The lack of information potentially hampers private sector participation in natural resource management, transparency in agency reporting, economic contributions of the natural resource management sector, and government budgetary support to natural resource management. Integrated Land Use Assessment II (ILUA II) provides technical support towards developing a monitoring, review, and verification system. The system is based on integrated and correlative models that use ground-verified data and other tools that allow the determination of changes in wildlife numbers, fish stocks, forest cover, and land use patterns. Financing for ILUA II is available from the governments of Finland and Norway through the United Nations Food and Agriculture Organization (FAO) but will require supplemental technical assistance to broaden the scope of sectors and methodologies in ILUA II.

Urban Health and Environment Improvements

Sustainable environmental and natural resource management plays a vital role in the socio-economic development of a country. Current urban landscapes are often devoid of greenery and poorly designed to handle the rainy season. This poor drainage, in combination with a lack of solid waste management and pit latrines in urban settlements, contributes to water borne diseases. Support for urban infrastructure with tree planting and the creation of “bioswales” (and other green infrastructure) that filter and reduce the movement of contaminants would contribute to the health of the urban population.

USAID/Zambia: Actions, Opportunities, and Threats

U.S. assistance to Zambia will continue to support the goals of reducing widespread poverty as well as building and sustaining a democratic, well-governed country that contributes positively to regional stability. The FY 2011 Operational Plan for Zambia mirrors the U.S. Mission’s foreign assistance priority goals for *governing justly and democratically*, *investing in people*, and *economic growth*. This section briefly describes USAID/Zambia’s programs and corresponding assistance objectives (AO) as they relate to tropical forestry and biodiversity needs under the broader U.S. foreign assistance goals. It also describes how and if the opportunities identified in the section above align with current programs

Economic Growth Assistance Objective (AO5): Increased Rural Economic Growth

The Economic Growth program includes the Trade and Investment, Financial, Agriculture, and Environment sectors. In FY 2011, U.S. assistance will focus on improving agricultural productivity that targets rural poverty and increases food security through market-driven approaches. The United States will augment environmental programs to act on planned analyses in forestry and carbon financing. In addition, U.S. assistance to combat climate change will include advocacy to extend conservation farming and introduce agro-forestry techniques that increase the productivity and profitability of small farming enterprises. Global Climate Change (GCC) earmark funds under the Environment Sector in FY 2011 are targeted for Adaptation and Sustainable Landscape activities (T. Resch, pers. comm.).

Opportunities identified in the previous section align with the environment sector of the Economic Growth program. Fertilizers, pesticides, and genetically modified organisms all have direct effects on the environment, especially water and biodiversity, and will need to be closely monitored.

LAND USE: Support for the application of conservation farming, minimum tillage techniques, and agro-forestry was recommended in the last FAA 118/119 analysis (USAID 2007) and is still a priority opportunity. Taking conservation farming and agro-forestry to the next level by promoting conservation agriculture supports activities in the agriculture, environment, trade, and investment sectors. Conservation agriculture provides a low-technology intervention that can directly improve farm productivity and stimulate small and medium-scale enterprises in the agricultural sector. Conservation agriculture also supports GCC initiatives since increased productivity encourages permanent farms and reduces the need to shift and expand into intact forests and other protected areas.

CHARCOAL PRODUCTION/DESERTIFICATION: Promoting fuel-efficient, culturally adaptable cook stoves along with other low-cost alternative sources of energy was also recommended in the last FAA 118/119 analysis (USAID 2007) and is still considered a priority opportunity. Expanding the presence and use of high-efficiency household cook stoves supports GCC initiatives by reducing deforestation pressure and direct carbon emissions, as well as improving human health. There is also market potential in manufacturing and distributing efficient cook stoves and managing twig and wood lots specifically for the sustainable supply of wood fuel.

CONSERVATION PARTNERSHIPS: Investment in public-private conservation partnerships, such as sustainable eco-tourism, wildlife monitoring/anti-poaching schemes, and community game ranches, provides alternative and viable livelihoods while directly promoting the conservation of natural resources. Since there continues to be high worldwide demand for “green” products, recommendations from the previous 118/119 report to promote sustainable harvest of non-timber products (e.g. honey, mushrooms, medicinal plants, essential oils), eco-labeling and “green” sourcing are still recommended. Training on the Environmental Impact Assessment (EIA) process should be included for partners working in small and medium enterprise development.

Education Assistance Objective (AO6): Increased Learning Achievement for All

In FY 2011, U.S. assistance will seek to increase access to basic education by underserved populations. There is untapped potential to bring students, government agencies, and communities together into a service-learning partnership and help build capacity to improve management of natural resources on the ground. Universities can greatly aid government institutions by completing baseline studies, monitoring resources, and providing other needed technical assistance.

Population Health and Nutrition Assistance Objective (AO7): Improved Health Status of Zambians

In FY 2011, U.S. assistance in health will focus on sustainable improvements to the Zambian health system in key maternal and child health services; tuberculosis, and malaria; expand access to services for family planning and reproductive health; and improve nutrition and access to clean water and sanitation.

There are inherent links to improved health conditions in promoting both conservation agriculture and fuel efficient cook stoves. Conservation agriculture contributes to food security by increasing household food staple production and alleviating malnutrition. Minimum tillage techniques favored by conservation farming are also less labor intensive, assisting those affected by HIV/AIDS or other long-term illness. While it is true that farmers who have lost their cattle stocks note an increase in labor in the first year (due to having to lay out planting stations, lines, and basins – work normally done by the oxen), the amount of surface area actually dug out is around 15% under conservation farming systems. By contrast, a farmer who prepares the land using traditional tillage practices, whether it is ridging with a hoe or ploughing with oxen, is required to till 100% of the holding surface area.

Democracy and Governance Assistance Objective (AO8): Improved Democratic Governance

In FY 2011, U.S. assistance will strengthen democratic institutions that support effective stewardship and development of Zambia's natural resources and human capital, and ensure long-term stability and broad-based economic growth.

Since Poor Governance is considered one of the key (albeit indirect) threats identified in this report, continuing to provide assistance and support in this program cannot be emphasized enough. Initiatives that promote coordination and synergy between individual government departments that manage Zambia's natural resources would be a good start. Improved oversight, transparency, and building capacity within the institutions in charge of Zambia's natural resources would directly aid how those natural resources are used and managed. As mentioned earlier, universities can play an instrumental role in providing needed technical assistance, completing baseline studies, and monitoring. Integrated land use planning in GMAs and support of improved monitoring, reporting, and verification of natural resources would also strengthen institutional coordination and oversight.

CONCLUSION

With the scarcity of environmental funding and resources, and demands of non-environmental priorities, USAID/Zambia cannot pursue all of these recommendations. However, it is hoped that by identifying the most critical forest and biodiversity needs and opportunities USAID's can take advantage of partnerships and opportunities that most enhance resources conservation and biodiversity in Zambia.

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