



THE REPUBLIC OF UGANDA

NATIONAL STATE OF THE ENVIRONMENT REPORT FOR UGANDA 2014

“Harnessing our environment as
infrastructure for sustainable
livelihood & development”



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National Environment Management Authority (NEMA), P.O. Box 22255, Kampala Uganda.
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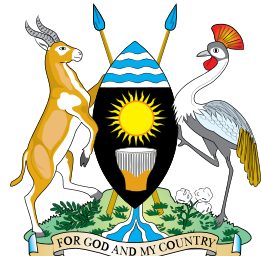
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NATIONAL STATE OF THE ENVIRONMENT REPORT FOR UGANDA 2014

“Harnessing our environment as infrastructure for sustainable livelihood & development”



Empowered lives.
Resilient nations.

2014

FOREWORD

The Ministry of Water and Environment presents the 11th National State of Environment Report (NSOER) for Uganda 2014. The theme for the 11th NSOER is **“Harnessing our environment as infrastructure for sustainable livelihood & development”**. This theme builds on the previous theme of the 10th NSOER which addressed “Harnessing the environment for wealth creation”. Both reports emphasize that environment, if well managed, will enhance human wellbeing, and national development, achievement of the middle income status.

Development of the NSOER is a statutory mandate of the National Environment Management Authority (NEMA). In developing the report, NEMA consults and collaborates with Ministries, Departments and Agencies (MDAs), Private Sector, Civil Society Organisations and Development Partners who share experiences, data and information.

NEMA continues to collect data against the core environmental indicators that were developed during the 10th NSOER process. The continuous updating of indicator data has allowed for trend analysis, easy identification of emerging issues and a discussion on the future outlook. Furthermore, the **Drivers-Pressures-State-Impacts-Response (DPSIR)** framework has been used when examining each of the themes.

The report follows a thematic approach relevant to the sector-based management system. The introduction sets the stage and context for the report. Thereafter, a chapter on population, gender and human development emphasizes the people-environment perspective. In addition, the report further synthesises the environment as infrastructure for sustainable livelihoods and development. The state of the environment section, describes sectors; Land resources, comprising of Atmospheric resources, Water resources, Energy and mineral resources. It also covers the, (future outlook proposes key messages for policy action.

Information contained in this report provides a backbone upon which such sustainability can be achieved. I therefore urge you to utilise the data and information gathered and presented in this NSOER 2014.

FOR GOD AND MY COUNTRY



Hon. Cheptoris Sam
MINISTER OF WATER AND ENVIRONMENT

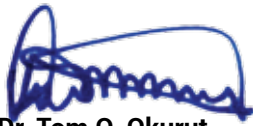
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The National Environment Management Authority (NEMA), with pleasure, presents the National State of Environment Report (NSOER) for Uganda 2014. The production of the 11th National State of Environment Report would not have been possible without the contributions of different stakeholders. NEMA acknowledges support from the Government of Uganda and United Nations Development Programme (UNDP) for facilitating the production of the National State of the Environment Report.

Further appreciation is extended to the Environment Information Network (EIN) institutions, local governments, Civil Society Organisations and Non-governmental Institutions for their valuable contributions.

I finally would like to thank the staff of NEMA and Ministry of Water and Environment for their tremendous contribution to the completion of the report.

It is my hope that this report will be used as a guiding tool in promoting a better environment for the current and future generations. I look forward to fruitful implementation of strategies and policy actions presented in the report and welcome your feedback for future improvements in the NSOER reporting.



Dr. Tom O. Okurut
EXECUTIVE DIRECTOR
NATIONAL ENVIRONMENT MANAGEMENT AUTHORITY

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ACRONYMS

CBD	Convention on Biological Diversity
CSOs	Civil Society Organizations
CCU	Climate Change Unit
CDM	Clean Development Mechanism
CFRs	Central Forest Reserves
CITES	Convention on International Trade in Endangered Species
COP	Conference of the Parties
DCC	Department Climate Change
DFR	Department of Fisheries Resources
DGSM	Department of Geological Surveys and Mines
DPSIR	Drivers-Pressures-State-Impacts-Response
DRC	Democratic Republic of Congo
DWRM	Directorate of Water Resources Management
DWD	Directorate of Water Development
EBA	Ecosystem Based Adaptation
EIA	Environment Impact Assessments
EIN	Environment Information Network
ENR	Environmental and Natural Resources
EOC	Equal Opportunities Commission
ESIPPS	Environmental Surveys, Information, Planning & Policy Systems
EU	European Union
FAO	Food and Agriculture Organization
FD	Fisheries Department
FRA	Forestry Reclamation Approach
GDP	Gross Domestic Product
GER	Gross Enrolment Ratio
GIS/RS	Geographic Information Systems/ Remote Sensing
GOU	Government of Uganda
GSMD	Geological Surveys and Mines Directorate
ICT	Information Communication Technology
IUCN	International Union for Conservation of Nature
IWRM	Integrated Water Resources Management
MAAIF	Ministry of Agriculture, Animal Industry and Fisheries
MDGs	Millennium Development Goals
MEMD	Ministry of Energy and Mineral Development
MFNP	Murchison Falls National Park
MLG	Ministry of Local Government

MLHUD	Ministry of Lands Housing and Urban Development
MOES	Ministry of Education and Sports
MFPEd	Ministry of Finance, Planning and Economic Development
MoGLSD	Ministry of Gender, Labour and Social Development
MOU	Memorandum of Understanding
MTWA	Ministry of Tourism, Wildlife and Antiquities
MWE	Ministry of Water and Environment
NAADS	National Agricultural Advisory Services
NaFFIRI	National Fisheries Resources Research Institute
NAMAs	Nationally Appropriate Mitigation Actions
NAPA	National Adaptation Plan of Action
NARO	National Agricultural Research Organization
NDP	National Development Plan
NEL	Nile Equatorial Lakes
NEMA	National Environment Management Authority
NEMP	National Environment Management Policy
NER	Net Enrolment Rate
NFA	National Forestry Authority
NGOs	Non-Government Organizations
NPA	National Planning Authority
NSOER	National State of Environment Report
NWSC	National Water and Sewerage Corporation
PEAP	Poverty Eradication Action Plan
PEPD	Petroleum Exploration and Production Department
PMA	Plan for the Modernisation of Agriculture
PPA	Participatory Poverty Assessment
PPP	Private-Public Partnership
PROBICOU	Pro-Biodiversity Conservationists in Uganda
QECA	Queen Elizabeth Conservation Area
REDD	Reducing Emissions from Deforestation and Forest Degradation
RESP	Rural Electrification Strategy and Plan
SDGs	Sustainable Development Goals
UEEF	Uganda Environmental Education Foundation
UETCL	Uganda Electricity Transmission Company Limited
UNCCD	United Nations Convention to Combat Desertification
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
USAID	United States Agency for International Development
UWA	Uganda Wildlife Authority
WHO	World Health Organization

EXECUTIVE SUMMARY AND KEY MESSAGES FOR POLICY ACTION

The National State of Environment Report (NSOER) for Uganda 2014 has been developed in line with the statutory obligation for the National Environment Management Authority (NEMA) to produce biannual NSOER documents. Each report is documented along a specific theme that highlights the significance and obligation around a key environmental issue. The theme for the NSOER 2014 is **“Harnessing our environment as infrastructure for sustainable livelihood and development”**. This theme emphasizes the role of the natural resource base and environment management as key tenets for livelihoods of the people of Uganda.

The NSOER 2014 complements the implementation of Uganda Vision 2040 whose theme is **“A transformed Ugandan society from a peasant to a modern and prosperous country within 30 years”**. It also coincides with the process for developing the NDP II for the country with a theme on **“Strengthening Uganda’s Competitiveness for Sustainable Wealth, Employment and Inclusive Growth”**.

Although government has made progress in environmental laws, implementation remains a challenge. Population trends affects environmental management through the availability and renewability of natural resources. A vast majority of Uganda’s population is dependent on natural resources. For example the decline in forest cover at 1.8 percent per annum (between 1990 and 2005) is attributed to the increasing demand of land for agriculture and fuel wood by the rapidly increasing population growth (UBOS, 2015). The high rate of population growth also increases poverty levels and threatens opportunities for wealth creation by negatively affecting future gains in agricultural production and food security.

Part 1 of the report sets the stage by introducing the country and presenting the context, process under which the State of Environment has been published and the structure of the report.

Part 2 presents the people and service sector as the framework on which sustainable development initiatives can be built. It discusses the people, urban infrastructure, transport, electricity, tourism, culture and ICT (Information Communication Technology) for development.

Part 3 highlights the environmental resources as infrastructure to support development include land resources, atmosphere, water, wetlands, energy and minerals. This section begins with a synthesis of the theme for this report – Environment as infrastructure for sustainable livelihoods is provided.

Part 4 deals with the future outlook. It discusses environmental governance in Uganda and then undertakes a big picture analysis of national environmental trends. It includes a discussion on emerging issues in the country; and another on scenarios presenting a longer term outlook for environment management in the country.

Part 5 (annexes) presents a table that analyses global treaties and the status of implementation in Uganda.

Key Policy Messages

This section presents the summary of the NSOER 2014 including messages for policy action. The messages follow the thematic structure of the environment system. Below is a summary for each theme comprising of an overview and a highlight of key messages for policy action.

Uganda's demographics and environment

The quantity and quality of population is paramount in the development of a country and they determine resource allocation, effective and efficient service delivery. The human development issues that determine the quality of population and their importance to sustainable livelihoods include among others education, health, gender and the development of youth and vulnerable groups. Key policy recommendations as relates to demographics, gender and the environment include:

1. Prepare the young population by skilling and tooling them as well as providing various opportunities for them through environmentally friendly industrialisation and improved infrastructure to support more investments in the job creating sectors. This will ready the country to reap benefits when the demographic dividend sets in.
2. Prioritise investments in gendered human capital to ensure a healthy and well-educated population; accelerate economic growth and job creation to ensure that the "surplus" labour force is gainfully employed; the large population has a strong purchasing power; and, enforce accountability and efficiency in the use of public resources and delivery of social services.
3. Accelerate the demographic transition from high to low fertility in tandem with mortality reduction. This will enable the country to harness and benefit from the opportunity provided by the age-sex structure.

Gender, youth and vulnerable populations

The country's Gender Policy aims to achieve gender equality and the empowerment of women, youth and the vulnerable groups. To enhance inclusiveness of different gender groups, youth and the vulnerable in environment management for sustainable development, the following are crucial:

1. Support main streaming of gender responsive strategies into environmental plans, policies and programmes at institutional and national levels.
2. Support the formal social protection system to cover all vulnerable persons.
3. Support youth empowerment in leadership, policy and in business and entrepreneurship.

Information and communication technologies for sustainable environment management and development

This capacity and potential of information technology needs to be leveraged to stimulate sustainable environmental management and development. This can be achieved by providing mechanisms that enable all stakeholders to collect, collate and share the data efficiently according to international standards and formats. Additionally, this will necessitate state and non-state actors to:

1. Establish innovative ways of using social media at grassroots levels for environmental advocacy inclusive of men and women.

2. Build capacity in new spatial information technologies such as Unmanned Aerial Vehicles (UAVs) and high resolution imagery as they become available for detailed assessments and monitoring of the environment system.
3. Tap into and build open data systems to enable access and use of the available data and information and to take advantage of big data that is becoming available by global and regional initiatives. This requires that an enabling environment is in place to guide and regulate the collection, access and use of data in the form of spatial data infrastructure (SDI).

Environment as infrastructure for sustainable livelihoods

The growing population and desires for affluence combined with inadequate planning, policy failures put pressures on the environment and result in environmental degradation. Evidence of environmental deterioration is already present – ecosystem destruction, species decline and extinctions, pollution and climate change, to name a few. These losses also impact on human well being. The needs of the population and the country must be met and therefore this calls for environmental managers to **employ innovative management** approaches to ensure that the environment continues to support human development and well being into the future.

At the same time, the role and importance of the environment as infrastructure for sustainable development can be enhanced by bolstering productivity in the major production sectors including agriculture, fisheries, forestry and mining to provide opportunities for employment, wealth creation, food security, a healthy society, and foreign exchange earnings.

Land resources

The finite nature of land has been subjected to population pressure, coupled with inappropriate technologies employed to manage soil and water conservation, waste management and other environmental problems. Areas like forest and wetlands are being opened up for settlement and farming to increase cultivated land area. The Land Policy aims to address issues of under-utilisation of land that have been caused by poor planning, land fragmentation, environmental degradation, climate change and land use conflicts. It also aims to improve ecosystem management by addressing transboundary issues and improving enforcement of laws, policies, standards and guidelines. To enhance sustainable land use it will thus be necessary to:

1. Support participatory land-use planning at farm, community and national levels based on ecological and integrated watershed management principles.
2. Harness gendered land management options.

Agricultural development

The contribution of agriculture to total GDP has been declining in the recent past, though the sector's contribution to the economy and to household welfare remains significant. The structure of production in the sector continues to be dominated, to a large extent by subsistence farming. The current conditions of rapid urbanisation create high demand for agricultural produce both domestically and within the region. Thus while there is a growing market for food and cash crops, the supply side is more or less inelastic. The growth of the sector is further limited by lack of a comprehensive land use plan and information on soil which are key for guiding agricultural planning and decisions. Key strategic actions include:

1. Support biotechnology and biosafety efforts aimed at enhancing climate resilience, drought and pest tolerance as well as yields and incomes.
2. Expedite initiation of a national land use planning process and the already started soil mapping process.
3. Develop regulations and byelaws on sugarcane and rice growing based on evaluation of areas where these crops are most suitable and available land to free up land for cultivation of crops for domestic food consumption.
4. Enhance provision of water for production facilities to farming communities.
5. Support agricultural intensification at farm, community and national levels.

Fisheries

Uganda's fisheries resources are not only diverse in aquatic ecosystems but also in fish species biodiversity. Fisheries activities are mainly carried out in open water sources and provide an important source of livelihood for about 1.5m people in Uganda.

The fisheries sub sector faces a challenge of open accessibility into fisheries leading to indiscriminate over fishing thus leading to declining fish stocks. Solutions to improve operations within the sector are:

1. Facilitate and support licensing of all fishing vessels.
2. Support gazettement or licensing of all landing sites as well as breeding grounds.
3. Support development and implementation of guidelines for determination of total allowable catches by species and water-bodies.

Biodiversity

Biodiversity is key contributor to the economy through tourism, income and wealth creation, through payment for ecosystems services (PES) and carbon credits. However, biodiversity is threatened by habitat loss, degradation or fragmentation, unsustainable harvesting and over-exploitation of living and non-living resources, invasion by alien species, pollution or contamination as well as issues of environmental management of mining and oil and gas development. These ought to be mitigated through:

1. Increase biodiversity financing for conservation of wetlands, forests and other biodiversity hotspots.
2. Up-scale the payment for ecosystems services, biodiversity offsets and carbon credit schemes.
3. Streamline the mandate and strengthen the system for monitoring and management of biodiversity outside protected areas.
4. Establish rural livelihood projects in agriculture, forestry, livestock, and alternative energy equipment sales and repairs especially targeting the youth and vulnerable households.
5. Support local communities to register their customary land, especially those within forest ecosystems, to incentivise their sustainable use.
6. Operationalise registration of community forests on communal land to ensure their sustainable management.
7. Undertake reform of the regulatory and policy framework to establish interventions on monitoring woodland resources on private land and mandatory planting and use of trees at

household level.

8. Formulate and promote new ideas of biodiversity offsets to compensate encroachment on wetlands in the city by establishing and enhancing wetlands in other areas outside the city.
9. Support implementation of the Wetland Boundary Demarcation Strategy to facilitate maintenance of wetlands' integrity within the country.
10. Harmonise institutional mandates and functions as stipulated in the Constitution and various laws and policies.
11. Support operationalisation of the National Wetlands Information System (NWIS) to enhance sustainable use of wetlands.

Atmospheric resources, climate change and variability

Evidence shows that global warming and climate change are a function of anthropogenic factors with the main drivers of climate change in Uganda being contributed by global carbon emissions but also locally emanating from land use change, unsustainable agricultural practices, population increase, and burning of fossil fuels including oil and gas. The impacts include changes in the rainfall patterns, prolonged drought, emergence of diseases like malaria in areas that were previously mosquito free like Mt. Elgon and Kabale regions, loss of soil fertility from heavy rains, increasing frequency of floods and high temperatures which provide a fertile growth environment for pests and diseases. To adequately respond to climate change the following are proposed:

1. Strengthen climate change main streaming into government and non-government actor policies, plans and programmes.
2. Support operationalisation of the National Climate Change Policy.
3. Support research on the influence of climate on ecosystems, agriculture and health so as to formulate effective mitigation and adaptation measures.

Water resources

Increasingly, deterioration in water quality and quantity as well as degradation of watersheds is becoming a major issue for water resources management in the country. The major drivers of reduced water quality and quantity are encroachment on water catchments, increased water abstraction for domestic, industrial, infrastructure development and production, discharge of effluent into the environment and inadequate sanitation facilities especially among fishing communities. To enhance sustainable water resources management, the country needs to **support up-scaling of the Integrated Watershed Resources Management (IWRM) approach.**

Oil and gas

The Oil and Gas sector is Uganda's newest development prospect and also the newest threat to the environment if not properly managed. It presents some environmental concerns including ecological disturbance and biodiversity loss emanating from impacts on wildlife population and movement; sensitive aquatic resources such as deltas and shorelines; degradation of sites with international conservation status such as Ramsar sites; pollution and disappearance of endemic species; overfishing and water contamination; and habitat fragmentation due to construction works. Other critical risks include land and water pollution from oil waste as well as socio-economic challenges like increase in population and urbanisation, easy spread of diseases and infections like HIV/AIDS, increase in the cost of living, disruption of existing livelihoods, disruption and dilution of cultural norms and land tenure conflicts.

To maintain and enhance environmental integrity alongside development of the oil and gas industry, it is recommended as follows:

1. Support development of the required infrastructural and technical capacity to facilitate effective and efficient oil waste management.
2. Create alternative livelihoods for communities within the Albertine Graben.
3. Fast track and support implementation of the Albertine Graben Environmental Monitoring Plan.

Renewable energy

Uganda has ample renewable energy potential and with deliberate effort, 92 percent of primary energy demand can be provided by renewable energy by 2050. Renewable sources of energy in Uganda include hydro power, biomass, solar, geothermal and peat. To stimulate a growing economy based on renewable energy, it is imperative to:

1. Support academia and private sector to develop and disseminate highly efficient technologies for both energy conversion such as co-generation and charcoal making; and for end use such as cooking and heating.
2. Support development and operationalisation of national plans for optimised operation of hydro power plants under variable flow regimes.
3. Strengthen institutional, technological and human capacity of the energy sector to enhance coordination and efficiency.
4. Institute tax incentives to stimulate investments in alternative clean energy sources including hydro, cooking gas and solar power systems.

Minerals

Uganda's mineral resources are estimated to be over 50 in number. Nevertheless, many areas remain un-explored for potential minerals. However, since 1986, the mining industry in Uganda has steadily been improving. Currently the mining and quarrying industry is growing at a rate of about 11 percent per annum. Mining is fast becoming a key a livelihood sub-sector in Uganda, with many of people (about 700,000) earning a livelihood from the mining value chain through artisanal and small-scale mining. There has also been a great increase in both foreign and local investment. Exploration and mining licenses issues have increased from 50 in 1990 to 873 by the end of 2013. This has offered employment to about 300,000 Ugandans and created other livelihood opportunities along the mining value chain. Operational bottlenecks still laden the mineral sub-sector including child labour. To transform the sub-sector into a sustainable livelihood option for the population, there is need to:

1. Support the update and awareness creation of the Occupational Health and Safety Policy for the mining industry.
2. Formulate mechanisms to eliminate child labour within the industry.
3. Support formulation of policies that mandate miners to restore old mine and quarry sites.

Infrastructure

Infrastructure including transport (roads, railway, aviation, and water); Information and Communication facilities; and electricity transmission lines helps determine the success of manufacturing, agricultural development, tourism among other services. Investments in water, energy, housing, transport and communication also improve lives and help reduce poverty. New ICTs promote growth, improve delivery of health and other services, expand the reach of education, and support social and cultural advances.

In particular, efficient and effective transport, ICT and infrastructure as well as electricity transmission services facilitate domestic and international trade, contribute to national integration and provide access to markets, jobs, health, education and other essential social services. Due to these significant roles, the National Development Plan (NDP) 2015/16-2019/20 recognises and prioritises them as a prerequisite for economic and social transformation. However, challenges still abound undermining achievement of government goals and targets enshrined in the NDP. Critical emphasis could be placed to facilitate:

1. Extend the national backbone infrastructure to cover the entire country as well as addressing last mile challenges.
2. Promote reliable and affordable ICT infrastructure in rural, remote and other underserved areas.
3. Integrate communication, broadcasting and Information infrastructure and systems.

Urbanisation

According to the 2014 population and housing census, 21 percent or 6.4m people live in urban centres. The projected urbanised population in 2040 will be over 30m people, six times that of 2014. However, the rate of urbanisation does not match that of the infrastructure required to sustainably maintain and serve the urbanised populations. This has come with a host of challenges including: Inadequate transport infrastructure and severe congestion, surge in unplanned settlements leading to accelerated emergence of slums, increased levels of solid waste, air and water pollution and degradation of green areas. To reverse this and facilitate sustainable urbanisation, it is imperative to:

1. Support harmonisation of physical planning guidelines across the country.
2. Support implementation of the legal and institutional framework on urbanisation.

Tourism

The Ugandan tourism industry is largely nature based with wildlife both in national parks and wildlife reserves being the major attraction. Other tourist attractions include cultural sites, boat riding, water rafting, bungee jumping, waterfalls, lakes, rivers and natural tropical forests. However, the industry faces regional imbalance within the country with about 80 percent of the major tourism destinations being within the various protected areas within the Albertine Rift in the western part of the country. Additionally, the industry has a limited variety of tourism products. These two scenarios present risks to the environmental integrity within the few major tourist destinations including degradation of hot spot sites, animal stress, increased traffic, increased waste generation and land use changes. To enhance sustainable growth of the industry:

1. Support conservation efforts to diversify options for nature-based tourism.

2. Support private sector development of alternative tourism products including art, crafts and fashion.

Culture and archaeology

Uganda like any other country has a rich heritage past which were left behind by our ancestors. Unfortunately, most of our culture and archaeology remains unknown and thus undeveloped, undermining the country's dividends from the same. Key challenges to culture and archaeology include inconsistent government policy, limited funding from government coupled with inadequate guidelines on public-private partnerships and inadequate gazettement of cultural and archaeological sites. To address these shortcomings, it is imperative to:

1. Support the institutionalisation of cultural values of different communities and facilitate their integration into management plans of both protected and non-protected areas to enhance promotion of culture.
2. Promote cultural tourism to enhance conservation and protection of cultures.

Emerging issues

Emerging issues can be defined as “any positive or negative issue that is critical for sustainable development and relates to any three dimensions of sustainable development including environmental, social and economic with special focus on the environmental aspect”. Any issue can be recognised as emerging based on newness – which can be as a result of new knowledge, new scales, accelerated rates of impact, or heightened level of awareness. Therefore, emerging issues can be new or pre-existing challenges being perceived in a new way that may be increasingly and continuously impacting on the environment. In the context of this NSOER, five emerging issues are presented: solid waste management, water pollution, climate induced disasters, charcoal burning and industrialisation.

Solid waste

The government has since 1995 been introducing laws and policies to help minimise the harmful effects of waste and encourage Ugandans to conserve natural resources. This has driven waste-management legislation and practices in the country. For example, the ban on importation of used electronic equipment was approved in 2010. These policy initiatives focus on waste prevention, but fall short on turning Uganda into a society that recycles waste. Therefore, learning from elsewhere including from within the East African region, Uganda needs to develop a Waste Mitigation Plan that aims to reduce the amount of waste we produce and ensure that we recover as many valuable materials from it as possible. The plan should set long-term targets for recycling and composting of at least 60 percent of all waste by 2040 and sending no more than 5 percent of it to landfills. This will necessitate putting a ban on biodegradable waste going to landfills. The policy recommendations are to:

1. Ensure more materials can be re-used or recycled.
2. Ensure that energy is recovered from materials that can't be re-used or recycled.
3. Limit the need to send waste to landfills.
4. Encourage investment in the infrastructure needed for increased recycling and recovery.
5. Improve public confidence in recycling and further encourage the culture of recycling across Uganda.

Climate induced disasters

Climate change is a concern that continues to dominate the global and national environmental change agenda. Locally, the phenomenon is already being felt through an increase in the frequency and severity of weather-related events and economic impacts. Empirical scientific evidence shows that global emissions are the principal drivers of anthropogenic climate change. Therefore, we need to reduce (mitigate) our greenhouse gas emissions to prevent additional climate change and its associated disasters. Importantly, we also need to prepare for the climate change that we cannot avoid (adapt) because our emissions and practices have already set us on course for a changing climate. Indeed, mitigation and adaptation need to be integrated into development initiatives to provide for an enabling environment for mitigation and adaptation actions to become mutually reinforcing.

Water pollution

Uganda's water resources face immense pollution from industrial effluent, mining and agriculture among others. The government has made strides to ensure conservation of this important resource, but there are growing challenges resulting from changes in land use, the growing human population, climate change and the need for economic growth at the expense of environment among others. There is increasing deterioration in water quality due to accelerated pollution loading from urban centers, industries and agriculture fields into water catchment areas. A key driver for water pollution has been accelerated siltation of lakes and rivers due to soil erosion, landslides and floods. This is compounded by degradation of natural water filters especially swamps and destruction of buffer zones along our water bodies. This calls for enhanced surveillance and monitoring of land use management practices along the fringe or buffer zones of water bodies.

Charcoal burning

The high dependency of Uganda's urban and peri-urban population on charcoal as a cooking fuel has led to rampant deforestation and vegetation degradation. In response, the Ministry of Energy and Mineral Development (MEMD) developed a strategy for sustainable charcoal production and licensing, targeting 14 charcoal producing districts. However, the implementation of the strategy has not yet yielded significant results. The Uganda Vision 2040 aims to address this by expanding the rural electrification programme to cover the whole country and promoting alternative energy sources such as solar, liquefied natural gas and biogas. Therefore, policy efforts should be geared towards:

1. Scaling up resource centers where local communities can be trained in fuel wood energy saving practices including energy saving stoves and briquette making.
2. Investing in the production and distribution of renewable electricity such as solar and wind.

Industrialisation

Industrialisation is heavily associated with extensive use of natural resources to allow for mass production. In Uganda, the sector is largely agro-based and non-innovation led. Agro-based industries require mass inflow of agricultural products; and therefore, large chunks of land must be prepared to allow for farming or extraction of other resources. This has impacts, for instance, loss of natural vegetation due to deforestation, alteration of the local climate; and the intensive use of chemicals in agriculture to stimulate production which poses a threat to pollution of soil, water and air. In addition, sector suffers lack of serviced industrial parks across the country resulting in poor waste management and environmental pollution. Currently, industries are mushrooming in various places without proper physical planning.

Most of them encroaching on wetlands and forestry land. Industries located haphazardly make monitoring and regulating their activities difficult. Therefore, to enable sustainable industrial growth, there is need to:

1. Invest in infrastructural development targeting transport; energy supply; water and sewerage services; ICT services; and, standardisation, testing and quality management including certification and accreditation of the locally produced industrial goods.
2. Ease access to land for industrial development. Establish regional industrial parks countrywide and put in place measures to utilize them.

PART 1:
BACKGROUND

Chapter 1: Country Background

1.1 Introduction

Uganda is a land locked country located in East Africa. It is bordered by Kenya in the east, South Sudan in the north, Tanzania and Rwanda to the south and the Democratic Republic of Congo (DRC) to the west. The country has a variety of physiographic features comprising beautiful landscapes, water resources, wetlands, forests, grasslands and rich biodiversity. (Figure 1.1).

Uganda is rich in minerals such as oil and gas that offer immense opportunities for employment, income and improved livelihoods if sustainably harnessed.

The soils are of fair to low productivity (UBOS and MAAIF, 2011) and a favourable climate helps communities to depend on rain fed agriculture. Mean temperatures show great variation depending on elevation and landscape. Rainfall and temperature in Uganda range from 855-1703 mm/year and 4-32°C respectively (UBOS, 2014).

Governance is decentralised and there are currently 111 districts and Kampala Capital City (Table 1.1), a number that has risen from 39 at the time the first State of Environment Report for Uganda 1994. The districts are further subdivided into counties, sub counties, parishes and villages.

Table 1.1: Number of Administrative Units in Uganda, 1969-2014 (Source UBOS 2014)

Administrative Unit	1969	1980	1991		2002	2014
Districts	21	33	38		56	111
Authority						1
Counties	111	142	163		163	181
Sub counties	594	668	809		958	1,382

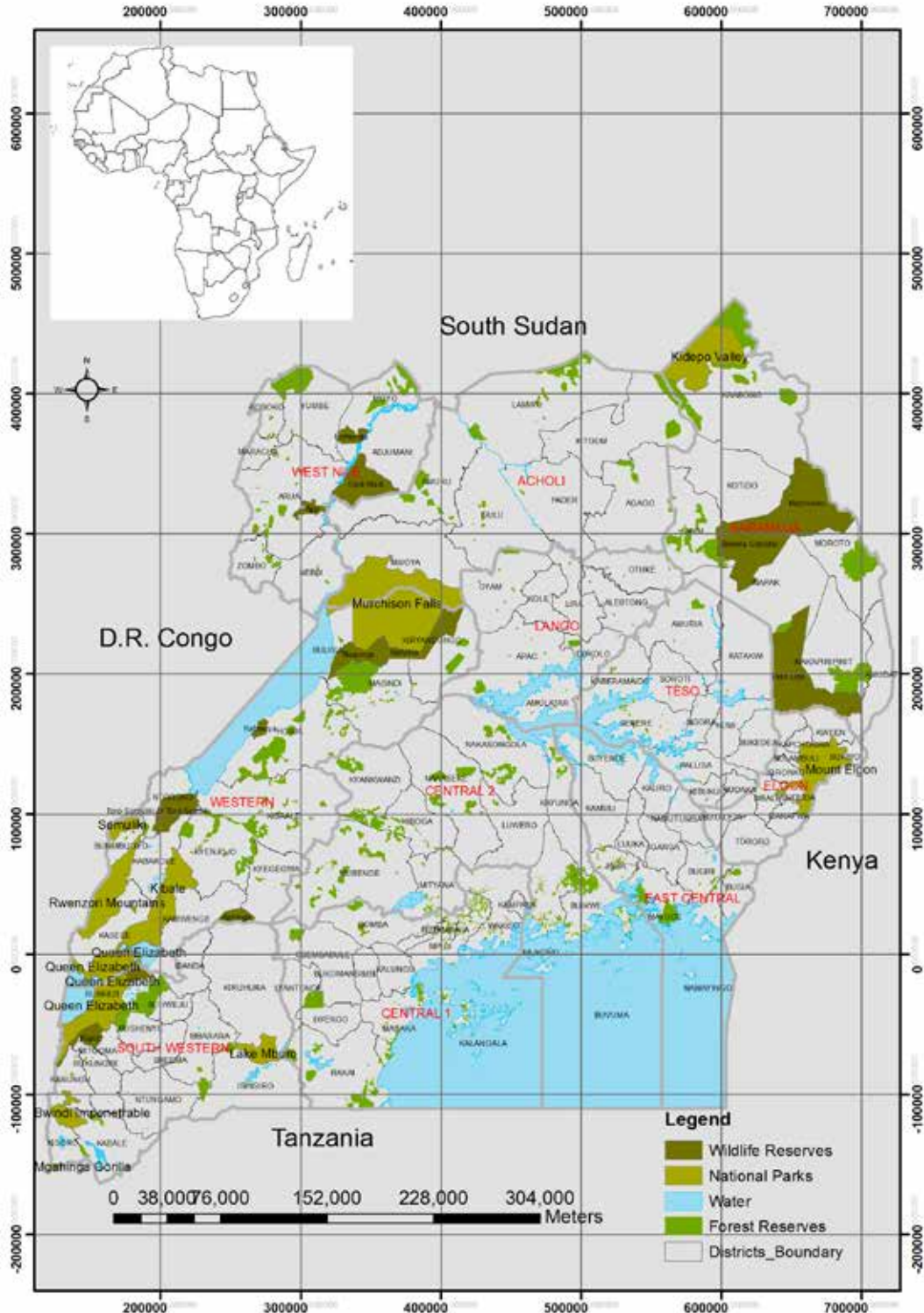


Figure 1.1: Uganda Main Topographic and Physiographic Features

1.2 Opportunities for Development

Increasing population

Uganda has a total population of 34.6 million persons of which 58 percent are neither in employment nor education/training (UBOS 2014); this therefore requires that the human infrastructure needs to be harnessed through skilling in order to foster innovation, productivity and purchasing power so as to turn the population into a resource for socio-economic transformation.

Agricultural modernization

The agricultural sector employs about 72 percent of the total population (UBOS 2014). This sector is mainly dependant on the natural bio-physical and agro-ecological conditions across the country which supports different agricultural practices and systems. Furthermore, the sector has potential to spur economic development if modern farming practices, social and environmental concerns are integrated and implemented in policies, plans, projects and programmes.

Culture and Tourism

Uganda is blessed with more than 50 ethnic groups highly diversified in culture related to governance, food, shelter, languages, religions, dances, music, traditional wear, livelihoods. Developments have also been established to boost the tourism potential of Uganda, these tourist attractions are both as a result of man made efforts and the God given attributes that make Uganda Unique, and a country, "Gifted by Nature". These include academic institutions, monuments, urban areas, transport infrastructure, hospitality institutions including hotels and tourist lodges. Rain forest, National Parks, Bird species, Wildlife including mountain Guerrillas, fresh water lakes, rivers and the diverse ecosystem make part of the natural Uganda.

Mineral resources including Oil and gas

Uganda is endowed with minerals such as sand, clay, gold, oil, gas and uranium. An environmental tax levied on extraction of these minerals can be applied to restore degraded areas and enhance on natural resource base.

Political stability

Compared to the neighbouring countries, Uganda is experiencing relative political stability, democratic progress, and economic growth and has fair infrastructure to enable investments. The country has successfully positioned itself as a transit hub to tap into increasing trade within the region, supported by a broadened East African Community, the economic union that promotes free trade.

Geographical location

Uganda has a tropical climate, with temperatures ranging from 21-25°C, apart from in the mountainous areas, which are much cooler; the top of Mount Rwenzori is often covered with snow. The hottest months are July to September and December to February. Evenings can feel chilly after the heat of the day with temperatures around 12- 16°C.

Most regions of Uganda, apart from the dry area in the north, have an annual rainfall of between 1,000mm and 2,000mm. There is heavy rain between March and May and between October and November.

Based on the above, Uganda can be called a Holiday Country where developments can be undertaken during any period of the year. It is protected from severe weather shocks like tsunami that can be very disastrous.

Biodiversity

Uganda is one of the countries with the highest levels of biodiversity at genetic, species and ecosystem levels. Investments geared at conservation and enhancing of biodiversity will attract positive collaborations not only at national but also at regional and international levels.

PART 2:
**PEOPLE AND
SERVICE SECTOR**

This section presents the people and service sector as a framework on which sustainable development initiatives can be built. Infrastructure can be defined as those physical and organisational structures such as the people, roads, electricity, buildings, virtual resources or governance procedures and policies that combine to facilitate sustainable development. Investing in these areas will remove barriers to socio-economic development and in so doing propel the country to middle-income status as targeted by the Uganda Vision 2040.

Infrastructure helps determine the success of manufacturing, agricultural development, tourism among other services. Investments in water, energy, housing, transport and communication also improve lives and help reduce poverty. New information and communication technologies promote growth, improve delivery of health and other services, expand the reach of education, support social and cultural advances, and enhance evidence-based planning and decision making by supporting research and better understanding of the earth system.

Chapter 2: State of Uganda’s Human Capital

2.1 Introduction

This chapter highlights the state of population, demographic trends and their impacts on sustainable livelihoods and development. The indicators selected under this theme include population trends, population growth rate and population structure. There are discussions on human development such as education and health, vulnerability and gender and their interrelationships with the environment and development. The chapter shows how the exponentially increasing population can contribute to the economy while minimising negative environmental impacts. Policy interventions for ensuring optimal management of population growth are also examined.

2.2 Population Trends in Uganda

According to recent census results, the population has maintained an upward trend growing from 9.5 million in 1960 to 34.9 million in 2014 (figure 2.1) (UBOS, 2015).

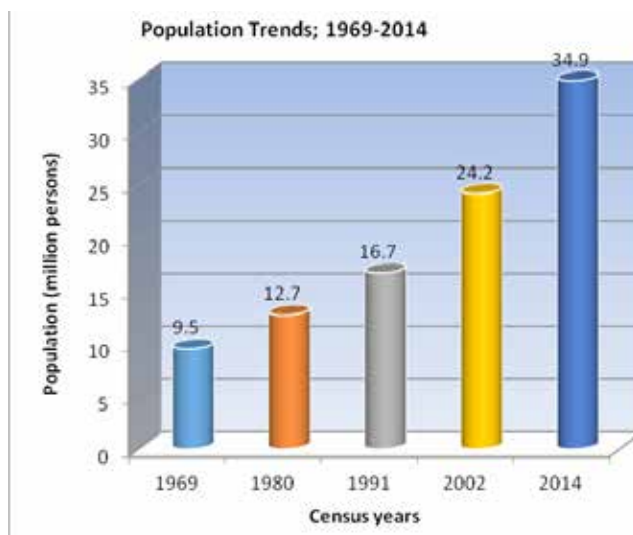


Figure 2.1: Uganda’s population trend since 1969-2014 (Source: UBOS, 2015)

Between 2002 and 2014, the population grew at an average rate of 3.0 percent declining only slightly from the rate of 3.2 percent between the previous inter-censal period of 1991 and 2002. This high growth rate is fuelled by high fertility rates (over six children per woman) observed over the past four decades; and a decline in mortality levels (MFPED, 2014). At this rate, Uganda’s population is projected to increase to 47.4 million in 2025 (see figure 2.2) (Population Secretariat, 2014).

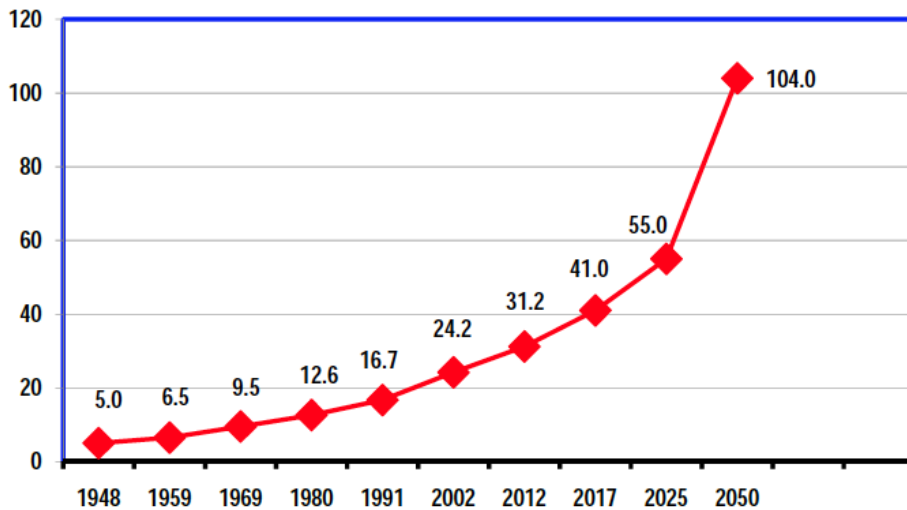


Figure 2.2: Uganda’s Population Trends and Projections (1948- 2050) (Source: Population Secretariat 2014)

Population

As discussed part 1 of this report, Uganda’s population is growing at a rate of 3.2 percent and the annual increment has been increasing over the years (UBOS, 2014). At the district level, the population growth rate varies from below zero to above five. There are 22 districts with a growth rate between 3.5 and 5, and 10 districts with a growth rate above 5 (Figure 2.3).

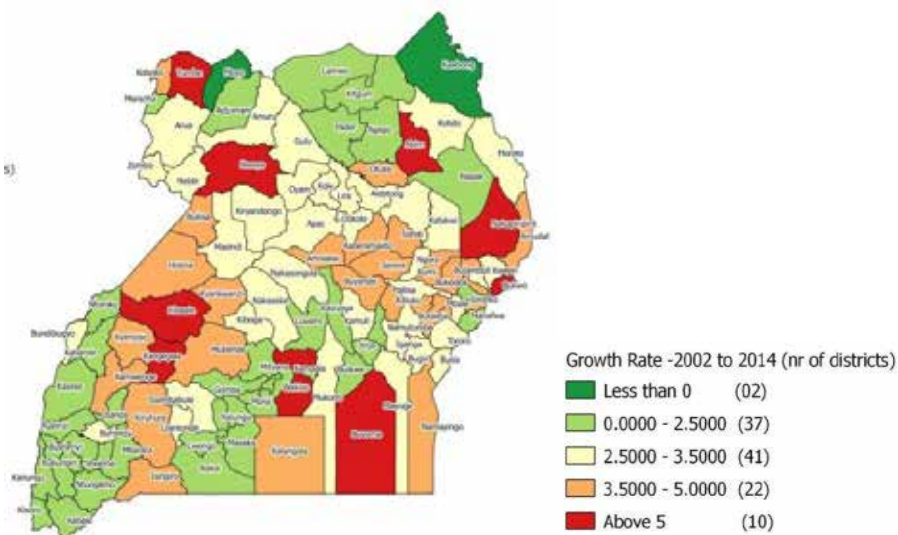


Figure 2.3: Growth rate of districts in Uganda based on 2014 census (Source: UBOS, 2014)

As the general population increases, the urban population also increases. Figure 2.4 shows the urban population increase. This urban population will place a high demand on the water resource. In addition, food required to feed the urban population will increase over time. Demand for agricultural land will thus increase and may result in increased encroachment into protected areas such as wetlands and forests.

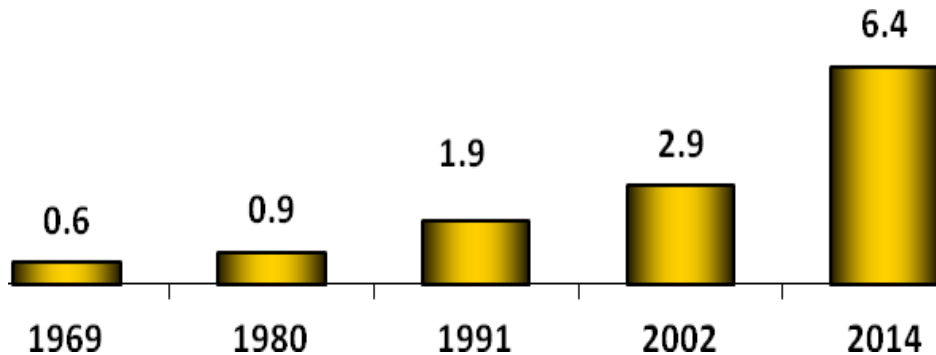


Figure 2.4: Changes in urban population between 1969 and 2014 (Source: UBOS, 2014)

Population structure

The age structure of a population indicates the dependency situation of a country and later on its direct impacts on the savings, labour supply as well as human capital development aspects, which are key indicators of socio-economic transformation. The wide base of the 2014 population structure is typical of developing countries where the birth rates are generally high indicating a high number of young people. The narrow top is indicative of fewer people in the older age groups. Indeed, the latest data shows that Uganda’s population is increasingly becoming younger, with about 60.3 percent being under 18 years of age by 2014 (UBOS, 2015). This age structure is projected to continue into the future. The proportion of the population over 60 years old is estimated to be 4.5 percent. This is shown in figures 2.5 and 2.6.

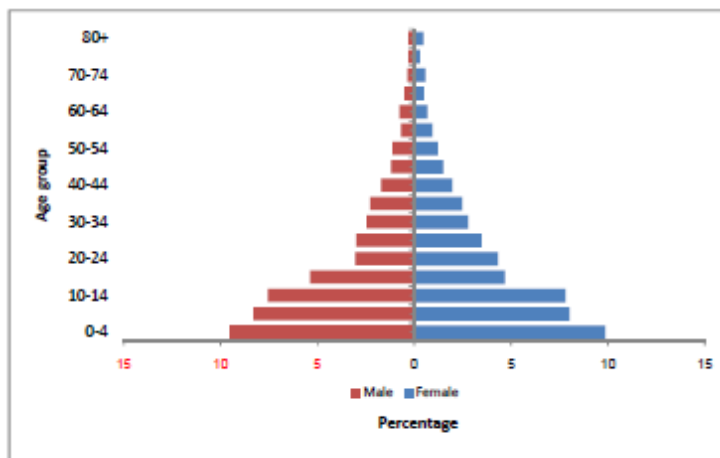


Figure 2.5: Population pyramid in five-year age groups (2002) (Source: UBOS, 2015)

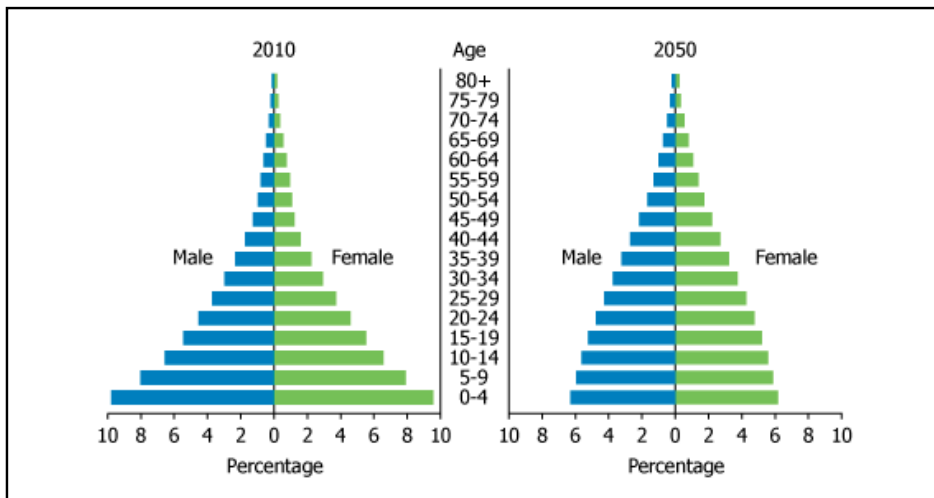


Figure 2.6: Age and sex structure projection for Uganda's population (Source: UNPD, 2011)

The large number of children and the youth implies a high dependency ratio, translating into an enormous burden at the domestic and government levels. Consequently, this demographic surge of young people transcending into their productive and reproductive years, presents a possibility of a great potential for development and environment as long as the government invests appropriately in education, health, agriculture, trade.

Sex composition of the population

The sex composition of a population is useful for understanding the demographic trends and dynamics of any society. The numerical balance between the sexes has a major effect on the demographic, social and economic inter-relationships when cross classified with reference to social and economic variables. Sex composition is also valuable in understanding gender issues in development. There are several measures of the sex composition, but the most popular is the sex ratio (defined as number of males per 100 females). It is an index for comparing the numerical balance between the two sexes in different population groups irrespective of their size, location and time reference.

In 2014, there were 16.9 million males as compared to 17.9 million females, about 51.4 percent of Uganda's population is female (UBOS, 2014). The sex ratio for Uganda stands at 94.5 percent for 2014. The overall sex ratio in Uganda showed a rising trend between 1948 and 1969 and a declining trend thereafter (figure 2.7).

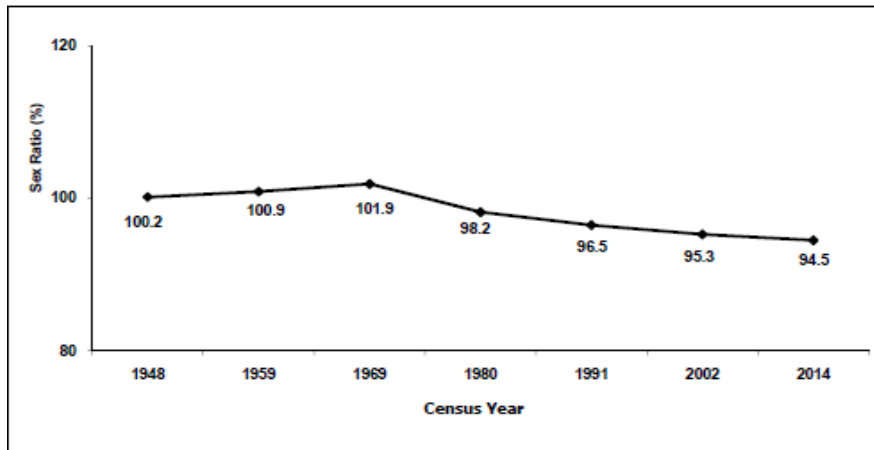


Figure 2.7: Trends in Sex Ratios in Uganda, 1948-2014 (Source: UBOS, 2014)

Impact of Uganda's fast growing population

Large and fast growing populations like that of Uganda, have both positive and negative impacts to the development of the country and subsequently the livelihoods of its citizens. With a large population the country can benefit through a number of economic opportunities that include a greater domestic market, availability of labour, widened tax base and innovations resulting from increased competition. However, a large population if not properly harnessed, leads to several negative impacts like a high dependence ratio, land fragmentation, food insecurity, malnutrition and poor housing. For example the quality of housing for most Ugandans is still inadequate. More than 69 percent of households have either earth, sand, or dung floors. Rural houses (81 percent) are more likely than urban dwellers to have poor housing conditions (UBOS, 2012).

Population trends affects environmental management through the availability and renewability of natural resources. A vast majority of Uganda's population is dependent on natural resources. For example the decline in forest cover at 1.8 percent per annum (between 1990 and 2005) is attributed to the increasing demand of land for agriculture and fuel wood by the rapidly increasing population growth (UBOS, 2015). The high rate of population growth also increases poverty levels and threatens opportunities for wealth creation by negatively affecting future gains in agricultural production and food security.

2.3 Gender and Women Empowerment

Women comprise over 50 percent of Uganda's population (UBOS, 2014). Therefore their roles in the development process and sustainable livelihoods are significant drivers of economic growth and sustainable development. Government has taken important steps towards affirmative action to provide women with the opportunity and empowerment to participate and influence public decision making through their participation in politics. Political participation empowers women to influence decisions, policies and laws that help to address women's priorities and actualizes sustainable livelihoods. Table 2.1 indicates trends in the number of female MPs since the inception of the affirmative action in 1989.

Table 2.1: Women Representation in the Uganda Parliament (Source: UBOS, 2013)

Period	Parliament	Female MPs	District Women MPs
1989- 1996	5 th	38	34
1996-2001	6 th	51	39
2001-2006	7 th	74	56
2006-2011	8 th	102	79
2011-2016	9 th	131	112

Professionally, few women are employed in male dominated environment and natural resources professions like forestry, biodiversity and conservation, oil and gas, and energy development. Nonetheless, women are known to have participated and tremendously contributed to biodiversity and conservation leadership as well as environmental management particularly in wildlife, community based natural resource management and tourism. Over time women who joined the conservation sector have been able to build their professional skills and abilities to effectively participate in mitigating threats to biodiversity. In 2013, Uganda Wildlife Authority (UWA) in partnership with USAID/Uganda Tourism for Biodiversity Program implemented by African Wildlife Foundation launched a 'Women in Conservation Leadership Program' to celebrate and recognize outstanding women involved in conservation and wildlife fields in Uganda.

Women land ownership and agriculture

Land is a key productive asset in agriculture and the main stay of the economy. Ownership of land determines livelihood options as well as control over agricultural income. Low rates of female land ownership significantly obstruct access to financial assets, including credit and saving (UBOS, 2013). The gender disparities in land ownership by women and men are as a result of most land being acquired through the traditional inheritance system that favours men. In Central Uganda, it was found that for both individual and joint ownership 88 percent of the men owned land against 33 percent of the women, while individual ownership for land was 43 percent amongst the men compared to 17 percent among the women (ICRW, 2011). Lack of land ownership among women limits their participation in long term investment on land such as tree planting and high value perennial crops like banana plantation and coffee. The women are also unable to access credit facilities to finance agricultural production or establishment of income generating enterprises. This leaves an overall gap in access and control over productive resources such as land, capital and property by women.

Access to fuel wood

Statistics indicate that 96 percent of the population use biomass as a major energy source for cooking and heating with limited use of energy saving technologies (UBOS, 2012). Women and children are the main collectors of fuel wood for domestic use. This impacts participation in school and other productive activities as the distance walked to collect fuel wood averaging to 4 Kilometers.

Water and sanitation

Water is a strategic and vital resource for sustaining life, promoting development and maintaining the environment. Access to clean, safe and improved sanitation facilities and practices promotes health and human wellbeing. The Ministry of Water and Environment has adopted a number of strategies to improve rural water supply and sanitation among others, affirmative action for underserved areas and promotion of private investment in water supply or self-supply to increase water in rural areas. However, more female headed households as compared with their counterparts were generally accessing improved water source.

According to MWE (2014), 83 percent of the Water and Sanitation Committees in 103 districts had women occupying key positions. This was an increase from 80 percent in 2013 but still short of the 95 percent targeted for the financial year. Data for 139 towns indicated that town boards with women holding key positions had increased from 49 percent in 2012/2013 to 63 percent in 2013/14. The increment is attributed to new towns with new boards, and old towns that have formed new boards. Building the capacity of women especially at community level to participate in conservation and management of environment and natural resources will help to upscale gender mainstreaming in the sector.

Fisheries

Women play a critical role in every link of the value chain in small-scale fisheries, although their best-known roles are in processing and marketing of fish and other fishery products. A highly generalized perception has emerged targeting men as fishers and women as processors and marketers of fishery products.

Women in employment

By 2012/13, women formed 51 percent of the working population, but this declined to 45.4 percent in 2014 (UBOS, 2015). The proportion of females in paid employment was 37.3 percent, while the females were the majority for persons in self-employment (52.6 per cent). The service sector employed the highest proportion of women (47.8 percent) –more men (54 percent) than women (39 percent) are in paid employment (see figure 2.8).

The proportion of women was highest for those engaged in hotels, restaurants and bars at 80 percent followed by those in agriculture, forestry and fishing industry (55 percent). Women constituted 72 percent of the working population who are without formal education. This implies that the share of women declines as the level of formal education attained increases.

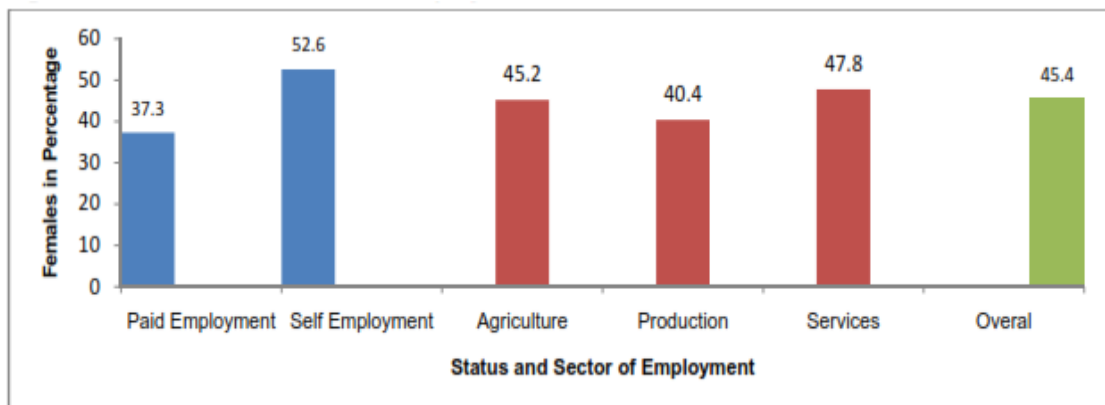


Figure 2.8: Status of women employment (Source: UBOS 2015)

2.4 Status of Education

Education builds the human capital for sustainable development

Education plays a big role in building up the human capital is required to support sustainable development. Educating people is a critical empowering factor in efforts to eradicate poverty and improve management and governance of the environment. Educated people are aware of their rights and are more likely to support environmental compliance and literacy.

Education sector and the environment

Major sources of energy in the formal education sector

About 85 percent of primary schools use firewood as their major source of energy while only 10 percent use charcoal (figure 2.9). The use of firewood is high both in Government and private secondary schools. The implications are grave as the need for firewood puts more pressure on the forests leading to deforestation. The use of fuel wood contributes to global warming through the addition of carbon dioxide in the atmosphere. Efforts to improve energy efficiency and use of clean energy thus need to be directed to schools and institutions.

The use of biogas in private secondary schools is on the increase (figure 2.10). Other efforts that contribute to forest protection include the dissemination of fuel-efficient stoves to households and schools, tree planting and the establishment of woodlots, provision of alternative income generation activities to reduce people's reliance on exploitation of natural resources as a livelihoods activity.

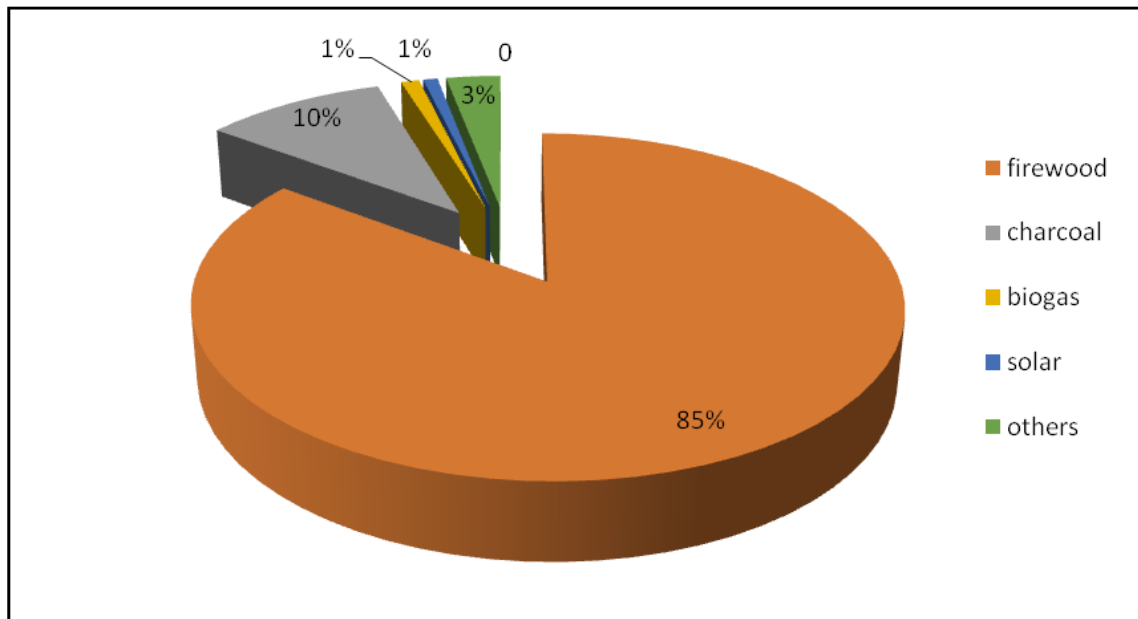


Figure 2.9: Energy sources primary schools (Source: MOES 2014)

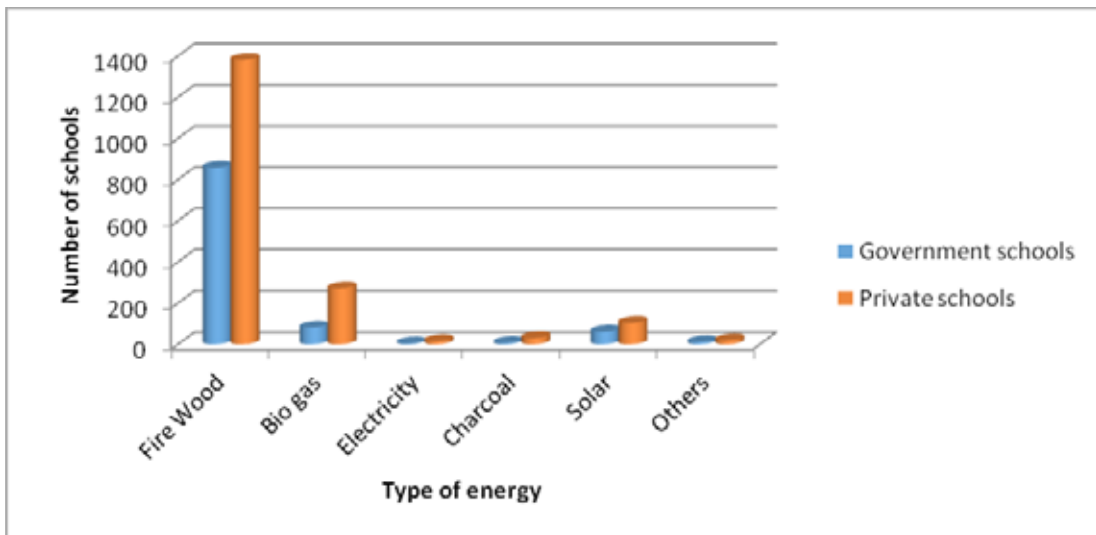


Figure 2.10: Energy sources in secondary schools (Source: MOES 2014)

Conditions of open green spaces in schools

Most green spaces in schools are sporting facilities such as football fields or netball courts. Green spaces minimize negative impacts such as soil erosion and also reduce dust and dirt in the school environment. Analysis on the condition of sporting facilities in primary schools shows an improvement over that of the previous year rating. The condition of fields and courts were rated at 66 and 61.4 percent respectively (MOES, 2014).

2.5 Health Sector and Environment

A healthy population plays an important role in the socio-economic transformation of the country, providing a constant supply of labour which is the key requirement for environment and development. Government made efforts in the health sector to build a health sustainable population for economic transformation. There have been considerable improvements in the key health indicators as discussed below signifying improved quality of health.

Mortality rates have been declining since 1995; from 97 deaths to 54 deaths per 1000 live births in 2011. Also the under-five mortality declined from 162 to 90 deaths per 1000 live births over the same period (UBOS, 2015). This sustained improvement has been partly due to extensive immunization campaigns countrywide and other factors such as public health awareness creation, enhanced prenatal care, increased mother’s education levels, use of family planning to space births, clean sources of drinking water that help reduce sanitation related diseases among children in the households and improved postnatal care such as breast-feeding that plays a significant role in child survival beyond the fifth birthday.

Uncontrolled outbreaks of environmental and public health related diseases such as the haemorrhagic fevers (Ebola and Marburg), respiratory diseases such as tuberculosis (TB) and pneumonia, water borne or diseases of poor sanitation such as cholera and typhoid adversely affects the productivity of the population thus impacting on economic development.

Medical waste management

According to Ministry of Health National Assessment (2012) using the WHO Rapid assessment tool, 42 percent of the hospitals did not segregate their waste and did not have protective gear for handling the waste. Storage containers are available for infectious wastes and sharps and only 14 percent did not have a specific container for infectious waste, no rigid container for sharps and had reported shortages of sharps boxes. Even where there were specific containers, segregation was not well done. Shortages were reported in 25 percent of the hospitals according to the National Assessment (2012). This was due to the use of multipurpose containers for sharps. Safety boxes were also overfilled in most cases. Where segregation was not well done, sharps were mixed with other waste in plastic bins. Highly infectious waste is put aside and pre-treated before being disposed of with the medical waste. However some hazardous waste such as TB sputum cups is not systematically disinfected before being discarded. Radioactive waste is kept behind a lead shield for half-life to expire but there are no clear guidelines and regulations on this.

Storage of medical waste in hospitals

In large health facilities, medical waste and sharps are sometimes stored in specific locations. When there is no on-site disposal facility and when no special collection services are organized medical and domestic wastes are stored in the same location although segregation has been previously done. About 58 percent of the hospitals did not have restricted access to the storage area (MOH, 2012). This may appear satisfactory but in view of the types of waste generated, the inadequate behaviours (no regular hand washing practices and free access to wards) these pose high risks of public and environmental contamination. In municipalities where offsite disposal is ensured by the local authorities, the skip containers are removed when full and therefore the recommended maximum storage time of 24hrs is exceeded. This leads to leakages from the skip container and sometimes strong putrefaction occurs. Some hospitals do not have the necessary equipment to correctly incinerate or treat the hazardous health care waste generated. Therefore, all categories of hazardous or infectious waste are burnt except placentas and anatomical waste that are too difficult to burn and are therefore buried or disposed off in pits.

Waste management and storage in Health Centres and clinics (in rural areas)

The national assessment (2012) further revealed that, 54 percent of the Health Centre III's (HC III's) and HCIV's and 61 percent of HCII were not carrying out segregation and had no protective gear for handling of waste. Furthermore, 26 percent of the HCIII's and HCIV's did not have a specific container for infectious waste, and a rigid container for sharps.

The organization of the collection and onsite transportation depended on the type of HCF and the human resources available. Challenges noted included; Waste handlers are often not properly protected during waste handling, Personal protective equipment such as heavy duty gloves, aprons or overalls and boots are not available; Waste including syringes and needles often drop from overfilled bins or sharps boxes and can be found scattered on the ground inside the hospital compounds. There are no special carts for collection of the waste and waste is carried using the containers for waste and collection of waste is not done on regular basis for health centres. There is no colour coding or labelling system for health care waste.

The national assessment revealed that 67 percent of the HCIII's and HCIV's and 64 percent of the HCII's, and in most cases the waste was not burnt regularly and therefore the disposal pits acted as temporary storage facilities. Incineration and burning are the only treatment or disposal technologies known in the Uganda medical institutions. Apart from incineration, medical and pharmaceutical wastes as well as sharps are burnt in shallow pits at low temperatures that are insufficient to properly deal with the wastes leading to release of air pollutants.

There are alternative technologies available to treat hazardous and infectious waste to an acceptable level, but there have been challenges implementing these. For instance, the MOH tried to build De montFort Incinerators in some hospitals, but operational limitations have affected their performance (MOH, 2012). In summary, there are no proper sanitary landfills where the medical waste could be safely buried. Current disposal is affected by inadequate funds, lack of specific budget lines and limited technical knowledge.

Implications on the environment

Poor waste management and disposal practices of the health facilities pose serious health hazards to people living in the vicinity of healthcare institutions. The disposal of wastes into dumpsites or shallow pits without pre-treatment leads to an unhealthy and hazardous environment around the health institutions affecting patients, staff and the community. Without a proper segregation system for sharps waste, scavengers that collect waste from dump sites are at risk of injury from sharp instruments and direct contact with infectious materials. Untreated injection equipment in particular poses a transmission risk for blood borne infections. The burning practices release significant quantities of air pollutants that constitute an environmental health threat.

Chapter 3: Urbanisation

3.1 Introduction

This chapter presents the trend of urbanization in Uganda and its implication on environment management, urban planning and livelihoods in urban areas. Discussed are patterns of urbanization, urbanized population and rate of urbanization, rural-urban migration, impacts of urbanization and livelihoods, job opportunities and employment in services sectors and urban development.

3.2 Urbanisation and Environment

East African cities are urbanising at an average rate of 5 percent above the continent average of 3 percent, it is estimated by 2030, 40 percent of East African population will be living in urban area. Kampala is experiencing high immigration rates especially due to rural urban migration which is exerting pressure on services and the environment and natural resources.



Aerial view of Kampala City (Photo Credit: KCCA)

Rapid urban population growth has led to an increase in housing demand that cannot be met by the existing housing development system. As the growth of the economy lags behind population growth, this has resulted in less funds being available for development and maintenance of infrastructure, an increase in unemployment, and in people being less able to afford basic housing and services. The housing deficit in the country is 550,000 units.

About 29 percent of this backlog is in urban areas with Kampala estimated to have a housing deficit of 100,000 units (SSA, 2014). Kampala has a 1.5 million night population and about 2.5 million during the day, yet it was planned for 350,000 people (UBOS, 2014). This means that without interventions to improve housing supply or contain migration to the city, the housing situation in the city would considerably worsen in the coming years. The countrywide housing shortage is predicted to rise to 8 million units by 2030 (SSA, 2014).

Population in urban centres have increased and it has led to sporadic settlements causing lack basic waste management facilities, poor drainage and sewerage, no access to affordable and reliable sources of water and sanitation facilities. With such an increase, encroachment on green spaces including fragile ecosystems becomes rampant resulting into flooding and heat islands among others.

Emergence of industrial parks

The country has invested in the development of industrial parks. These parks are expected to provide fully serviced areas, with roads and utilities such as water and electricity and are favourable for production. The 10-year National Industrial Parks Development Project 2008/09 to 2017/18 will create 22 industrial parks across the country (MFPED, 2014). The aim is to strengthen the private sector through providing a favourable operational environment for manufacturing and value addition of Ugandan made goods. Some of the challenges so far faced include lack of financial resources and resistance from the communities in some areas due to fear over land loss, industrial waste and pollution.

3.3 Challenges of Urbanization

To enable and sustain industrial growth, the country needs to address a number of challenges, which include; inadequate infrastructure such as transport, electricity supply, water and sewerage services, ICT and telecommunication services and produced industrial goods.

Inadequate transport infrastructure and severe congestion

Many urban centres in Uganda are characterized by public transport that is overcrowded and overused, and by severe congestion resulting from inadequate road infrastructure (plate 3.3) Kampala has over 1,200km of road network which road network was designed to accommodate 100,000 vehicles. Currently over 400,000 vehicles use the same road network causing traffic jam and increased emissions. Continuing population growth, urban sprawl and pressures from climatic hazards threaten to worsen this situation.



Downtown Kampala (Photo credit: KCCA, 2014)

Industrialization and development

There is also inadequate infrastructure for undertaking standardization, testing and quality management including certification and accreditation of the locally manufactured goods, limited access to credit, inadequate skills, lack of technology and inadequate physical infrastructure such as electricity, transport and water that afflict the sector.

Solid Waste Management

As population, economic development and productivity increases, resource consumption and solid waste increase. Urban areas are experiencing increased immigration in search of employment opportunities and other social services and thus increasing the population in urban areas. According to UBOS (2014), the urban population in Uganda has increased from 2,921,981 people in 2012 to 6,426,013 people in 2014. Kampala city is the most populous urban centre with a population of 1,516,210 people. In addition, the other smaller urban centres are growing faster than they were in 2002 (UBOS, 2014).

Kampala's annual municipal waste generation is about 350,975.38 tonnes (GoU, 2013) with Kitezi landfill, the main landfill in Kampala, receiving approximately 1,500 tonnes of solid waste daily (Nabukeera et al, 2014). Of this waste generated, 70-80 percent is organic while the rest is inorganic such as glass, paper, among others (Figure 3.1). Management of organic waste is a challenge, largely due to methane gas produced during aerobic decomposition. It is a greenhouse gas and has an unpleasant smell, which can be a neighborhood nuisance.

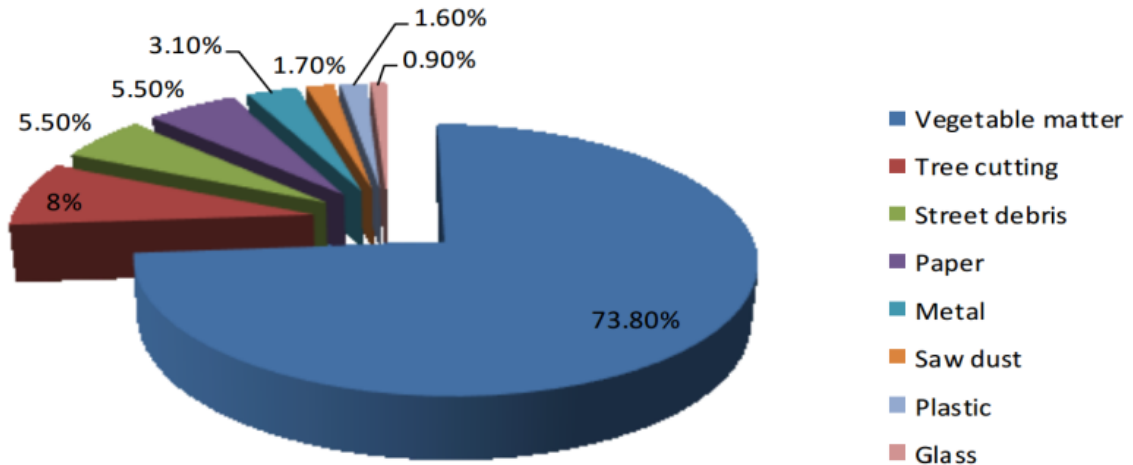


Figure 3.1: Composition of solid waste in Kampala (Source: KCCA 2013)

An estimated \$10,654,811 per year is spent on solid waste collection in Kampala alone, which has increased garbage collection effort to 65.2 percent (Nabukeera and others, 2014). However, other municipalities do not have adequate resources and the amount of solid waste generated daily overwhelms their collection capacity due to budget constraints (Lambright, 2014; Liyala 2011). This calls for various interventions and initiatives including adoption of proven cost effective methods in managing waste in an environmentally friendly manner. These include reducing, reusing and recycling of waste generated and its adequate disposal.

Indiscriminate disposal of waste, largely due to limited awareness and lack of adequate facilities, have caused man-made floods in water channels within major towns especially Kampala. The drainage channels are usually blocked by common waste materials such as plastic bottles and polythene bags locally known as Kavera, causing flooding.

Electronic waste management

Electronic waste (e-waste) refers to electronic products that have become unwanted or non-functional and have essentially reached the end of their useful life. In Uganda, the common e-waste includes used computers, entertainment electronics, and mobile phones among others. The Digital Migration Policy for Terrestrial Television Broadcasting in Uganda is currently under implementation in Kampala and the neighbouring districts and will further be implemented countrywide (ICT, 2011). This means analogue TV sets, set top boxes and antennas will be replaced with digital ones thus is also contributing to e-waste generation.

Many electronic products become waste in a short while as new and better products come on market. This is largely due to the high rate at which the world is embracing technology and the growing consumerism that comes with affluence. Consequentially, there has been a steady increase in e-waste in Uganda especially in Kampala and the urban areas.

E-wastes possess significant environmental and social impacts because of the toxic materials they contain. They are capable of causing danger to the human respiratory system, reproductive system, circulatory system and the nervous system (Sansa-Otim, 2014). Other issues include pollution of surface and ground water creating health hazards to communities.

The challenge for most developing countries including Uganda is their lack of capacity to handle and recycle hazardous materials contained in e-waste. In Uganda, the government is committed to the management of e-waste and has developed a new strategy that aims at identifying and prioritizing areas of intervention in e-waste, identifying different stakeholders, providing for establishment of e-waste management infrastructure, establishment of implementation and monitoring framework to track implementation progress and to provide for environmental awareness on e-waste (UNDP, 2013).

In 2010, the government of Uganda approved a ban on importation of used electronic equipment, including computers. The move was driven by environmental challenges associated with such equipment and the ban was meant to discourage dumping of electronics to Uganda from the developed countries. E-waste is the fastest growing form of waste in the world and an estimated 60-80 percent is transported to the developing countries that lack capacity to manage it (SBC, 2011).

The Government has also embarked on controlling Importation of used cars. The Uganda Revenue Authority is planning to increase the environmental levy on imported used vehicles (Balagadde, 2013). The lawmakers want taxes revised from 20 percent on imported cars whose date of manufacture is 7 years to 35 percent and 50 percent on vehicles whose year of manufacture is more than 5 years and 10 years respectively (Balagadde, 2013; Kiggundu, 2013). This is a move to reduce carbon emission into the atmosphere and to reduce the amount of e-waste generated annually.

Plastic waste

Plastic waste, especially polythene, is still a challenge in Uganda. In 2009, the government proposed to ban on plastics of 100 microns and below (NEMA, 2012). However, government is struggling to implement this ban due to logistical challenges. A number of people are engaged in collecting plastic bottles and other recyclable material for sale to recycling companies, thus providing a source of income. However, plastic waste is collected from unhygienic places. This calls for companies involved to provide adequate Personal Protective Equipment (PPE) such as gloves.

3.4 Opportunities as a Result of Urbanisation

Urbanization is highest in Africa at an average rate of 3.96% with Uganda having an estimated average rate of 5 percent per year. Urbanization comes with challenges; however, opportunities arise of it and once tapped lead to sustainable development and effective utilization of the available natural resources and the environment.

Improved Service delivery

Urbanization makes it easy to have a bigger number of the population in one area and it makes service delivery cheaper compared when the population is dispersed. Such services include medical care, education and security among others.

Urbanization as a foundation for innovation and invention

Urbanization creates opportunities for innovations and inventions, which lead to increased use of environmental friendly options, such as use of clean energy, mass public transit systems as opposed to individual transit, smart measures of reducing emissions to the environment e.g. use of city garbage to produce clean energy among others

Improved Water, sanitation and health

Urbanization fosters improved livelihoods of the population once such a population is educated, sensitized and the government is able to use the advantage of having a bigger population in a concentrated area to provide such services. This reduces the pressure such a population would directly exert on the ecosystem through unfriendly environmental activities like encroaching on the forest reserves.

Improved physical planning

Urbanization leads to improved planning for safe settlements and developments friendly to the environment. This leads to sustainable developments and fewer encroachments on the fragile ecosystems, particularly those located in the urban areas. Improved physical planning also leads to green parks with in cities and such measure that would reduce heat islands.

Waste management

The Clean Development Mechanisms (CDM) project is one of the major opportunities emerging from solid waste management in Uganda to develop landfill gas extraction and flaring on existing landfills. The project represents an opportunity for Uganda to adopt basic but proven landfill technology and it provides a range of environmental and economic benefits. In addition, CDM promotes solid waste management efficiency and allows for emissions reduction. It is therefore a good market-based mechanism for developed countries to offset their greenhouse gas obligation. Uganda can receive significant benefits from the CDM if implemented appropriately and widely.



Mbarara Municipality municipal solid waste composting plant, Photo Credit: Dan Kiguli NEMA 2014

There are three main concepts that are globally fronted to promote sustainable solid waste management or zero waste management, namely: Reduce, Reuse and Recycle (Agamuthu et al, 2009).

Despite this, dumping sites are fundamental in the management of waste because of their cost especially in developing countries. Landfills pose a potential renewable energy source since they have the ability to generate gas as fuel (UNEP, 2011 and Uganda, 2011). However, unsustainable activities at the landfills are known to have environmental safety issues such as leachate generation and ground water pollution among others (Luo & Nair, 2009; Fauziah and others, 2005; Hamer 2003). Consequentially, landfills have become an unsustainable point (Adewale, 2011; Nguyen, 2011). Therefore, landfills need to be sustainably managed to accommodate more solid waste while safeguarding the environment and upholding public health.

Waste disposal

Management of solid waste is a challenge due to financial constraints and lack of adequate waste recycling plants. This has caused serious public health and environmental concerns. For example, irresponsible dumping of waste including plastics causes stagnation of water and acts as a breeding site of the mosquitoes. This has led to increasing incidences of malaria. As a result, the government is undertaking a number of initiatives such as waste recycling, a ban on plastic bags and decentralization to enable local councils manage these wastes in their own municipalities and towns (Okot-Okumu and Nyenje, 2011). Significant stakeholder involvement and investment is required if solid waste management is to improve. This can be realised from well-formulated and planned Public Private Partnerships (PPPs).

Uganda's fast growing urban population and industrial sector are increasing the challenge of waste management. Greening of Uganda's economy therefore calls for development of efficient and safe systems of waste disposal. In particular, facilities for the destruction of hazardous materials should be established, recycling of solid waste and non-biodegradable materials should be enhanced and legislation put in place for the management of toxic chemicals. In general, implementation of laws on safe waste disposal requires more effective supervision and enforcement to realize the goal of a green economy (NEMA, 2012).

3.5 Recommendations for Sustainable Urban Development

In order to achieve the sustainable development objectives for this sector, the government should:

1. Implement an urban economic development program
2. Implement the National Urban Transport Policy and Transport Master Plans
3. Implement E-governance for efficient and effective management of urban and rural growth
4. Invest in transport infrastructure including the completion of the Standard-Gauge Railway, upgrade of strategic national roads, and marine transport. Strategic roads will support developments in tourism, traffic decongestion and the exploitation of remote mineral resources.
5. Currently, industries are mushrooming in various places without proper physical planning. Most of them are encroaching on wetlands and forestry land. Industries located haphazardly make monitoring and regulating their activities difficult. Therefore, regional industrial parks should be established countrywide and measures put in place to ensure that they are utilised.

Chapter 4: Infrastructure

4.1 Introduction

This sector plays a crucial role in the economic growth in any country. Efficient and effective infrastructure improves service delivery and enhances economic development. Such infrastructure developments should take into account environmental considerations at project conception, inception, development, implementation and closure to ensure sustainability.

4.2 The Transport Sector in Uganda

Effective modes of transport including quality road, railway and air ports enable entrepreneurs to get their goods and services to market in a secure and timely manner and facility worker to the most suitable jobs. Transport in Uganda is divided into four modes namely, road, railway, water and air. Road transport is the most prominent in Uganda as majority of cargo freight and passengers utilise this mode. Air, rail and water transport are less developed. The transport and communications sector's contribution to total GDP was 2.9 percent in 2013/2014 (UBOS, 2015).

Road transport

Uganda's road network comprises of national roads (21,000kms) of paved and unpaved surface, district roads (32,000kms), urban roads (2,800kms) of which 750kms are paved, and community roads (approximately 85,000kms) (MOWT, 2014). The national road network also includes ferries at locations where the national roads cross major waterways. Currently, there are nine ferry crossings countrywide. The construction of by-passes to divert traffic from busy urban centres, can also decrease traffic congestion in town centres. However they also have environmental impacts such as air pollution, noise and vibrations, impacts on land use including habitat destruction, biodiversity disturbance, aesthetics and encroachment on fragile ecosystems such as wetlands. An increase in the road network reduces traffic congestion minimising the amount of time a vehicle spends on the road thus decreasing emissions. Road infrastructure development should put emphasis on environmental conservation.

Some of the identified impacts on wetlands include drainage disruption and infilling with murrum. For instance the Nsooba-Lubigi and the Nakivubo wetland ecosystems are under threat from the Kampala Northern Bypass Highway and the Kampala-Entebbe Expressway (under construction). The construction of these roads, while required infrastructure, have affected the two wetlands that serve Kampala affecting the main drainage systems out of the city. Recent developments have seen the clearing of the buffer zones of forests and open spaces, as well as encroachment on the wetlands.



Kampala Entebbe Express Highway (Photo credit: UNRA)

Motor vehicles and environmental protection

It is estimated that the total number of vehicles in the country including motorcycles is between 700,000 and 1,000,000 (ROU, 2014). Motor vehicle registration rose by 38.7 percent between 2012 and 2013. Motor vehicles use fossil fuels to run and are a leading contributor to greenhouse gases. In order to address this environmental threat, the second schedule to the Finance Act imposes an Environmental Levy of 20 percent on motor vehicles (excluding goods vehicles) which are eight years old and above. The Excise Tariff (Amendment) Act, 2005 provides a system for imposing excise duties on some goods and services. The rates of the excise duty seem to be proportional to their impact on the environment. For instance, excise duty on one litre of motor spirit (gasoline) is Ug.Sh 720, excise duty on one litre of gas oil (Automotive, light, amber for high speed engine) and other gas oils is Ug.Sh 450 and that on one litre of illuminating kerosene is Ug.Sh 200. Petroleum, gas oils and kerosene produce carbon dioxide a leading greenhouse gas.

Water transport

Most of the main water bodies are navigable and are used by motorised and non-motorised vessels. However, the ROU Annual Performance Report (2014) identifies water as an important means of transport. Majority of the users of water transport are the informal sector using small motorised and non-motorised boats transporting goods and services between the islands and across international borders on Lake Victoria. Other water bodies where water transport is used are Lakes Edward and Albert, where traders transport merchandise including fish between land sites in Uganda and the DRC.

Fuels and oils, metals and plastics carelessly discarded contaminate water quality and sensitive wetland systems. Water can also be contaminated as a result of poor waste disposal practices.

Railway transport

The rail transport system comprises of 1,250 km of metre gauge track running from Malaba to Kampala (250km), Kampala to Kasese (344 km), Tororo to Pakwach (500 km), Busoga loop line (144km) and the spur lines to Jinja and Port Bell ferry terminals (12 km).The system also includes ferry services on Lake Victoria connecting Port Bell and/or Jinja to rail networks in Tanzania at Mwanza and in Kenya at Kisumu.

The Standard Gauge Railway (SGR) construction is a joint project to improve the transport infrastructure between four countries; Kenya, Uganda, Rwanda and South Sudan and is part of the infrastructure project for the Northern Corridor. The railway will run from Mombasa to Kigali with extensions to the Eastern part of the DRC and from Tororo to Juba in the Republic of South Sudan. The Uganda part of the railway covers a total distance of 1,600km and is expected to cost about USD 8.5bn. The SGR project involves construction of a modern, efficient and high capacity standard gauge railway of 1.435m wide track gauge to replace the existing dilapidated lines of 1m (ROU, 2014). An elaborate multi-sectoral strategy is being developed involving both social and legal measures aimed at maintaining community engagement to minimize environmental impacts and social conflicts (GOU, 2014).

A fully operational railway network eases the pressure on roads which reduces the amount of emissions that would have otherwise been generated by vehicles. Furthermore, railway transport reduces pressure exerted on roads as a result heavy haulage.

Air Transport

Entebbe International Airport managed by Civil Aviation Authority (CAA) is the main entry and exit point for Uganda's air traffic. There were about 1.4 million international passengers that came through Entebbe International Airport in 2013/14. Other airports designated as entry and exit points for regional and international traffic for purposes of promoting tourism and business include Arua, Pakuba, Kidepo, Gulu and Kasese. Other airports of Soroti, Kisoro, Jinja, Lira, Tororo, Masindi, Mbarara and Moroto are for domestic flights only. The remainder of the up-country airports are either privately owned or under the management of District Authorities.

Total aircraft movements in Uganda have increased by close to 50 percent over the last 5 years with international passenger traffic doubling in the same period. Domestic passenger volumes have been on the decline but increased between 2011/12 and 2013/14 as a result of increased tourism promotion (ROU, 2014). With the current airport/airfields having a lot of potential to expand, environmental and social considerations need to be integrated during the planning and execution processes.

4.3 Electricity Transmission Infrastructure

The Grid Development Plan provides a 17 year outlook of the Uganda transmission system with proposed expansion to the northern region which currently has low electricity coverage (figure 4.1), electricity transmission projects under implementation include Bujagali Interconnection Project, Karuma Interconnection Project, Mputa Interconnection Project, Mbarara-Nkenda/Tororo-Lira Transmission Lines and Hoima-Kafu (220kV) interconnection.

The transmission grid comprises of 150km of 220kV (initially operated at 132kV), 1,443km of 132kV and 35.2km of 66kV high voltage transmission lines and 17 substations (includes Kabulasoke switching station). Electricity supply activities grew by 5.6 percent in FY 2014/15 compared to a lower growth of 1.9 percent registered in FY 2013/14. This is mainly attributed to increased availability and supply of electricity to the consumers. The contribution of electricity supply activities to total GDP at current prices in FY 2014/15 remained stable at 0.9 percent (UBOS 2015).

In 2014, new connections brought on board about 60,000 people within urban areas and access to electricity in rural areas was 7 percent. National access was 16 percent. Projected access for rural areas is expected to 22 percent by 2022 and projected national access will go up to 52 percent by 2030 and 80 percent by 2040 in line with Vision 2040.

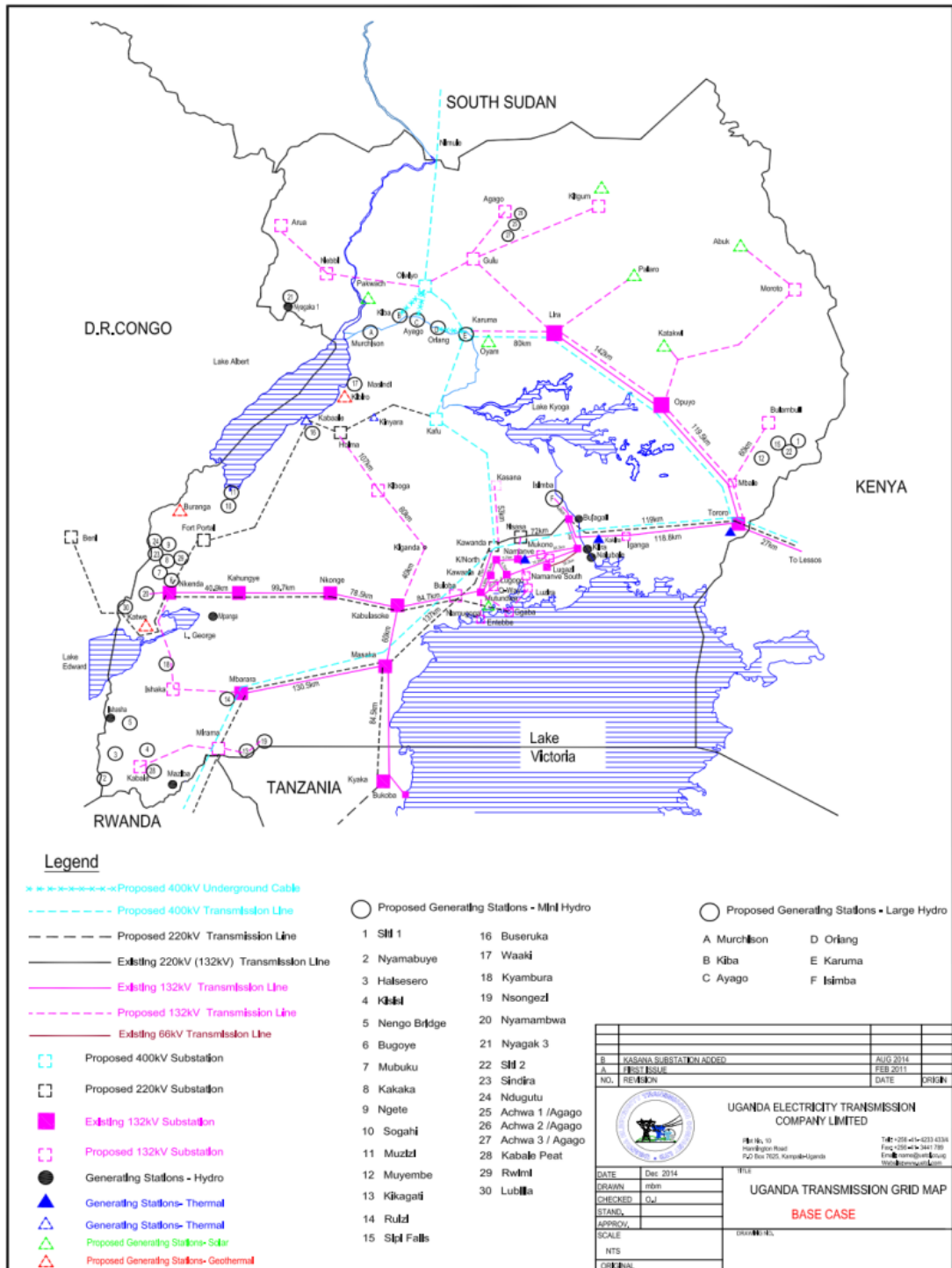


Figure 4.1: Grid coverage for Uganda both existing and proposed lines (Grid Outlook – 2030)
(Source: UETCL, 2014)

Environmental impacts of electricity transmission projects

Transmission lines pose environmental concerns that require comprehensive Environmental Social and Impact Assessments with plans for mitigation. Some of the environmental issues identified include:

1. Land use changes which may lead to significant changes such as elimination of cropland in the transmission rights-of-way and conversion of strips of fragile ecosystem Forests impacts: complete into bare land or land covered by completely different vegetation communities.
2. Resettlement: The need to clear land for transmission rights-of-way, placement of towers, substations and other associated facilities can result in the removal of people living in these locations, depletion of cultural sites and their resettlement to new locations.
3. Biodiversity is affected through habitat conversion, fragmentation, changes in hydrology, soil compacting and erosion. Hunting and harvesting enabled by rights-of-way and construction roads, bird electrocutions and collisions, changes in predator-prey relations in and along the edges of rights-of-way. Species in small, rare, sensitive, and otherwise critical habitats may be especially affected.
4. Aesthetic impacts: Transmission lines and towers are unattractive especially when located near homes or scenic sites such as national parks and other recreational facilities.
5. Chemical contamination and water pollution - toxic pollution from transmission lines can result from the chemicals used for maintenance like pesticide in rights-of-way, soil and water contamination from transformer oil leakages. Water pollution can result from inadequate wastewater treatment from construction camps and workshops.

Mitigation plans

Identify possible activities that may have a negative impact and in implementing the mitigation plan ensure that stakeholders are involved. An example is the collaboration agreement that UETCL has with Kampala City Council Authority to ensure that no development plans that may affect transmission lines installations are approved. This is to curb any encroachments on way leave corridors. Some of the stakeholders and their roles such as the government, NEMA, NFA, UWA, UIA and the public have crucial responsibilities in the EIA approval process (UETCL, 2014).

Chapter 5: Tourism and Culture

5.1 Introduction

Uganda is naturally endowed with various landscapes, diverse flora and fauna and a rich cultural heritage. This natural endowment forms the basis of the tourism industry in Uganda. The tourism sector is recognized in the NDP 2010/11-2014/15 as one of the fastest growing service sector of the economy and a major foreign exchange earner. Uganda Vision 2040 highlights it as one of the four economic growth drivers to spur economic transformation.

5.2 The Tourism Industry

Tourism in Uganda is largely nature-based, focusing mainly on attractions of wildlife and landscapes. The major attractions include: wildlife; rich diversity of bird species with more than 1,000 recognized species; mild climate; cultural and historical sites; tropical forests; and water bodies such as Lake Victoria (the world's second largest fresh water lake), the River Nile (the longest river in the world), and Lake Bunyonyi (second deepest lake in the world).

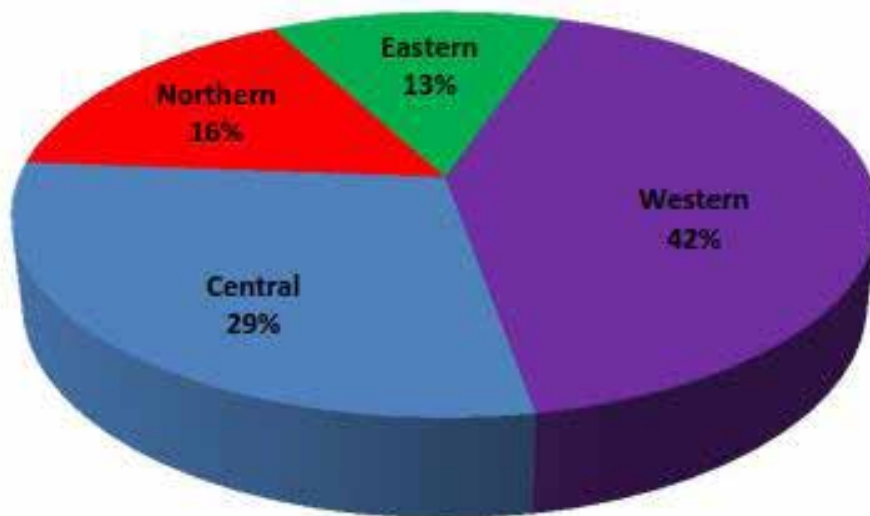


Figure 5.1: Distribution of tourist sites in Uganda (Source: MTWA, 2014)

The Western region has the highest share of the recorded tourist attractions (42 percent) comprised of national parks and wildlife reserves, hot springs, monuments, lakes (including crater lakes), rift valley and escarpment, forests and mountains. The Central region is rich in traditional heritage and historical sites, and is known for the water beaches and islands on Lake Victoria. The Northern region has mainly historical monuments while the attractions in the Eastern region are mainly comprised of waterfalls and adventure activities on the River Nile, scenic landscapes, hiking and mountaineering. Game viewing and primates in protected areas (national parks and wildlife reserves) are also major tourist attractions especially for foreign visitors. Other activities include bird watching, cultural tourism, eco-tourism, mountaineering, sport fishing, adventures tourism such as boat riding, water rafting, and bungee jumping. Beach adventure on Lake Victoria has become a major domestic tourism attraction and recreation activity.

5.3 Tourism, Livelihoods and Sustainable Development

Tourism is a major contributor to employment, public and private sector investment and foreign exchange earnings and revenue generation. Tourism also provides incentives for biodiversity, environment and cultural heritage conservation in addition to improving the country's image thus attracting foreign investments into the economy.

Contribution to tourism to the economy

Tourism is Uganda's single largest foreign exchange earner generating US \$ 1 billion in 2014 and contribution Ug.Sh 6,395.4 billion to GDP (9.9 percent of GDP) in the same year (WTTC, 2015) as shown in figure 5.2. These contributions were from investment, the supply chain and induced income impacts. The indirect contributions came from construction of tourist hotels and accommodation, tourism related government expenditure like tourism marketing and promotion, domestic purchases of goods and services dealing with tourists such as food and cleaning and services from travel agents. In 2014, the sector also generated 247,000 jobs directly (3.6 percent of total employment) (WTTC, 2015). The direct job creation includes employment by hotels, travel agents, airlines and other transportation services (excluding commuter services), restaurant and leisure industries directly supported by tourists. Total contribution to employment (including wider effects from investment, the supply chain and induced income impacts) was estimated at 592,500 jobs in 2014 (8.6 percent of total employment).

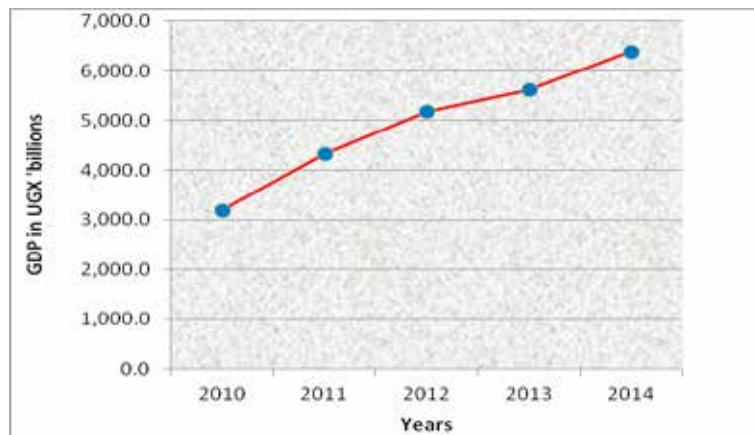


Figure 5.2: Trend in tourism contribution to GDP (Source: WTTC, 2015)

Revenue sharing with communities

UWA shares 20 percent of park entrance fees with local communities surrounding wildlife protected where tourism revenue is generated. The goal for revenue sharing is for the communities living adjacent to protected areas to derive benefits from tourism and conservation and thus be more committed to conservation. The shared revenue is managed by the respective District Local Governments and is used to fund livelihood and public goods projects decided upon by the beneficiary communities.

It has also been noted that as a result of more revenue shared, there was reduction in illegal activities, resulting into a positive impact on conservation and environmental management (MTWA, 2014). Communities also benefit directly from tourism through community based tourism enterprise initiatives that were established since 1998 under Uganda Community Tourism Association (UCOTA) and Community Based Tourism Initiative (COBATI). There are about 60 community initiatives under UCOTA though not all are active.

The enterprises are located around Protected Areas and tourism routes with about 2,901 people working with the groups. Most of the enterprises (90 percent) are managed by women, earning independent income.

Product development and diversification

Among leisure tourists, wildlife safari (39 percent), gorilla viewing (26 percent), adventure tourism (25 percent), and backpacker travel (17 percent) are the most popular trip activities. Murchison Falls and Queen Elizabeth National Parks are the most popular parks and accounted for over 60 percent of total visitors to the national parks (see figure 5.4). This implies over dependency and pressure on the two national parks. The country also depends on the Mountain Gorilla as the only high-profile product to market tourism. This has long-term implications on the quality of product offer and impact on the environment in the respective tourist sites. Over dependency on a few products and sites could eventually result into increased traffic and degradation of these hotspot sites, animal stress and behavioural changes, increased waste generation from visitor facilities, introduction of alien species and vegetation changes. Moreover, any risk posed to the site and products will threaten the dependent social-economic fabric.

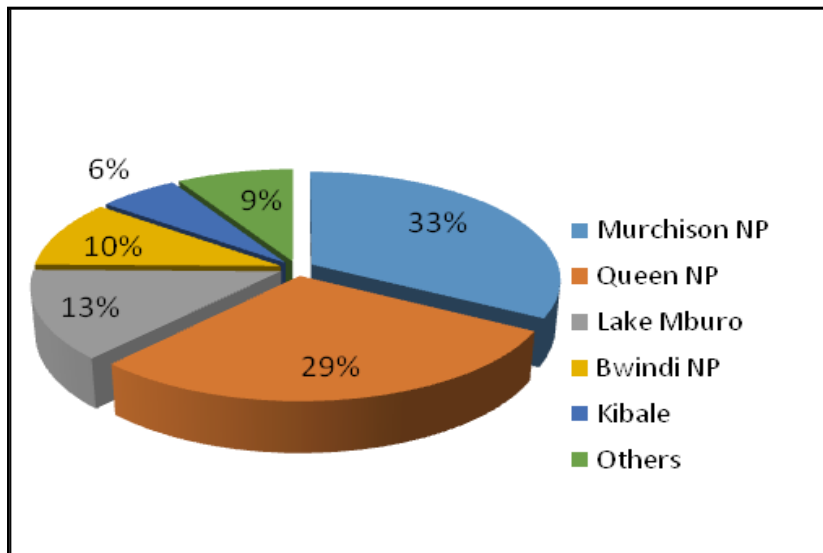


Figure 5.3: Comparison of visitor numbers to national parks for the years 2013/2014
(Source: UBOS, 2015)

The Uganda Tourism Master Plan 2014-2024 specifies product development and diversification as a priority area for intervention by MTWA, UWA, UTB and other relevant agencies. Tourism diversification aims to distribute tourism activities and benefits to other areas through a rebalancing of the tourism portfolio. This has the advantage of reducing the pressures that lead to negative environmental and social impacts, enhancing Uganda’s tourism competitiveness and increasing the direct benefits from tourism at national and local levels especially the local communities. Future areas for the sector to focus on include culture and marine tourism.

Uganda’s tourism in the global arena

Uganda has been gaining popularity as a tourist destination in the region for years now. The period 2010-2014 has seen Uganda receive several global tourism accolades: as one of 2013’s top 20 global tourism destinations by National Geographic; African bird club voted Bwindi Impenetrable NP as Africa’s top birding site in 2013; Murchison Falls and Queen Elizabeth

NPs were awarded the prestigious 2014 Certificate of Excellence by Trip Advisor; and Queen Elizabeth NP and Bwindi Impenetrable NP won the same award in 2013. In 2013 Kidepo Valley National Park was ranked third in Africa's 10 best national parks by CNN Traveller for its largest buffalo herds in Africa.

5.4 Tourism and the Environment

Negative impacts from tourism occur when the level of visitor use is greater than the environment's ability to cope with this use within the acceptable limits of change. This is particularly true of sites with mass tourism. In Uganda tourism sites are pretty much still pristine as Uganda is a niche destination though some activities are known to cause impacts on the sites. Currently, off-track driving causes soil erosion and degradation of fragile areas and has been reported around Kasenyi in Queen Elizabeth NP. Some of the measures instituted by the Wildlife Authority to address the problem include; designated game viewing tracks, enforcement of fines for off-track driving as well as regular monitoring. Nonetheless there are potential tourism impacts on the environment that the country should guard against. The impacts are in three main aspects: Resource depletion, Pollution, and Physical impacts.

High population growth rate has increased demand for resources from the protected areas for agriculture leading to encroachment on tourism areas; increased illegal activities especially poaching; and increased human-wildlife interface leading to conflicts. For example there are 13 fishing villages within Queen Elizabeth NP and although the fishing villages are outside the park boundaries, they remain enclaves of settlements within the park resulting in increased demand for fuel wood resources, land for grazing and settlement for the increasing fisher populations.

Competing economic interests may lead to the loss of some tourist attractions. For instance the Bujagali tourist site that was known for water rafting and kayaking was lost to the construction of hydropower dam (MTWA, 2014). Developments in protected areas such as hydropower, mining, oil and gas exploration and production, and road construction have potential impacts on the tourism resources through land uptake, and loss of attractions. For example, the proposed Ayago hydropower project is located entirely inside the Murchison Falls national park and will require construction of high voltage transmission lines inside the park. The Karuma Hydro power project is estimated will take up about 238.6 ha of the Karuma Wildlife Reserve (UWA, 2012).

Sustainable tourism has wider benefits such as the conservation of natural resources and the preservation and revival of cultural expression. In order to sustain this revenue stream, the habitat in which the gorillas live need to be protected thus protecting the forest ecological functions such as local climate regulation, water catchment, and natural resources for communities.

UWA and NFA have put in place a comprehensive General Management Planning process for protected areas. The planning process provides for zonation of the protected areas and forest reserves into strict conservation, tourism, and integrated resource use zones. All national parks and wildlife reserves have functional 10 year General Management Plans, which are reviewed and updated every 5 years.



A leopard and the tree-climbing lions that are much sought after in Queen Elizabeth National park



The Mountain Gorillas in Bwindi and Mgahinga National Parks are Uganda's only iconic product relied on to market Uganda's Tourism (Photo credit: UWA)

5.5 Physical Cultural Resources and the Environment

There are various types of physical cultural resources existing in Uganda. The physical cultural resources are categorized into the following: paleontological sites, ethnographic/cultural sites, prehistoric sites, faith based and historical sites (some of which are archaeological sites such as Dufile and Wedlai). A number of the sites have been modified or destroyed by human activities. For example, quarrying is taking place in some sites leading to distortions in the history as well as degradation of the environment. On the other hand, developments have taken over some sites like Bweyore, Lugard Camp in Kamwenge. Some sites like Kapir have been modified by adding paintings. However, due to government intervention on Nyero rock art site, quarrying and other types of encroachments ended in 2013. Quarrying has however, continued in sites like Kakoro and Mukongoro.



Ssezibwa Water Fall in Kayunga District, Photo credit: NEMA

The tourism industry being a high foreign exchange earner and a source of employment has led to various infrastructural developments. This has led to increased encroachment on biodiversity and natural ecosystems. For sustainability of the tourism industry, developments should take into account cleaner consumption and production practices.

5.6 Threats to Cultural and Archaeological Resources

High population growth, infrastructure development and urbanization are some of the issues facing the cultural and archaeological sites.

Infrastructure development

The activities that accompany infrastructure developments threaten physical cultural and archaeological resources through excavations of sites, extraction of construction materials like gravel and murrum-borrow pits, clearance of wayleaves for transmission lines and road reserves. Some sites may be completely destroyed such as Bweyorere (capital of Nkore Kingdom) which was one of the gazetted cultural sites was destroyed by road construction. It is important that EIAs are conducted to identify any physical cultural resources or sites that may be within the project area or are outside but could be affected by project related activities. The Bumbobi-Bubulo-Lwakhakha road development is an example of EIA responsive to culture as it pointed out areas of significance for circumcision and cultural use for mitigation against activities like gravel extraction (UNRA, 2013).

High population growth

The pace of transformation processes resulting from increasing population, urbanization, poverty and poor perceptions of the youth which tend to put down traditional knowledge systems results in cultural heritage naturally becoming weaker and more vulnerable on its own. As a result, cultural and archaeological sites gradually disappears they are encroached on for agriculture and other human activities. An example is the Nsongezi Stone Age site which is now completely cultivated and the Nyero rock art site which is under threat from quarry extraction, tree cutting and settlements.

Inadequate institutional, policy and legal framework

The Historical Monuments Act of 1967 is old and requires review to cater for cultural progression and evolution. There are numerous institutions handling culture-related mandates and this has led to duplication of responsibilities, lack of integration of programme implementation and planning and wastage of financial resources. Currently, MTWA and the Department of Museums and Monuments are responsible for physical cultural resources of archaeological, paleontological, ethnographical and traditional interest. Lead agencies for culture under the MGLSD include the Uganda National Cultural Centre, Uganda National Libraries, the Traditional and Cultural Institutions. MGLSD also implements the National Cultural Policy. In order to support sectoral growth and national development, culture needs to be integrated into long term strategies, plans and policies.

Inadequate capacity for identification and management of sites

Gazettment of sites helps to assure their protection and is a key element in the national cultural heritage policy. However, this remains a bottleneck as to date only 12 sites are fully gazetted. For instance, Kibiro Salt Village that is on the nomination or tentative list of World Heritage Sites remains exposed to destruction by oil and gas developments. The 2003, Intangible Cultural Heritage Convention (Article 11 and 12), requires Uganda to inventory and safeguard her intangible cultural heritage. Although the capacity is lacking, the Museums and Monuments Draft policy will help improve the capacity gaps identified.

5.7 Recommendations for Management of Cultural and Archaeological Resources

1. Empower Local Governments to conserve and manage cultural resources by providing adequate resources and skills.
2. Encourage Public-Private Partnerships in development and marketing of culture and creative industry products. This should be done by developing strategic and management plans to guide investors.
3. Review of the policy and legal framework to ensure incorporation of new segments of culture economic development plans. Key issues that the policy review should consider is providing for revision of the Historical Monuments Act of 1967.
4. Implement an inventorying, monitoring and safeguarding programme for all Intangible Cultural Heritage in danger using the Intangible Cultural Heritage inventorying methodology developed by MoLGSD with support from UNESCO and integrate the data into the national statistical and accounting system for economic valuation.

Chapter 6: Information and Communication Technology

6.1 Introduction

Information and Communication Technologies (ICTs), have over the last 50 years, become one of the fastest growing technologies in the world and a game changer on the international development stage. ICT is central to environmental assessments and is increasingly taking center stage in sustainable development initiatives (Tomlison, 2010). During the United Nations Conference on Environment and Development of 1992 in Rio, the global community committed to enhance scientific understanding, improve long-term scientific assessments, strengthen scientific capacities in all countries and ensure that the sciences are responsive to emerging needs.

In Uganda, the use of computers and mobile telephones has revolutionised environmental data and information systems through the use of the Internet (email and World Wide Web), social media, mobile money transfers and spatial data applications. The development of the spatial data applications for mapping, analysis and presentation has changed the way planning and decision making is done and it continues to evolve. Currently there are about 144 institutions that have the potential or the capability to apply GIS and remote sensing for mapping and monitoring different aspects in Uganda (ESIPPS International Ltd, 2014). This section highlights advances in ICT and its utility in environment management.

6.2 Environmental Information Management in Uganda

UBOS is responsible for managing integrated statistical information for all sectors in Uganda. The information is usually in form of annual Statistical Abstracts obtained from surveys, censuses and administrative records of Ministries, Departments and Agencies (MDAs). Over the years, the systems for data collection and dissemination have evolved from analogue to digital and this includes environmental data collection, dissemination and use. For example, the Ministry of Agriculture, Animal Industry and Fisheries (MAAIF), together with UBOS have tested a number of approaches to integrate mapping into the agricultural statistics system for efficiency by combining aerial systematic reconnaissance flights (SRF) techniques and Global Positioning System (GPS) with existing conventional methods of ground based agricultural statistics to improve agricultural surveys and censuses (Mayinza, 2010). The two institutions are currently exploring the use of remote sensing and high resolution imagery including use of Unmanned Aerial Vehicles (UAVs) to enhance detail.

The Environment Information Network (EIN) coordinated by NEMA is growing with most of the member institutions now applying GIS, remote sensing and GPS technologies in their various environmental surveys, assessments and reporting activities. To implement Article 18.3 of the Convention on Biological Diversity (CBD), NEMA has established a web-based National Biodiversity Clearing House (CHM) to facilitate information exchange and utilization amongst all stakeholders.

Civil society and the private sector are also embracing these applications. For example, ESIPPS International Ltd has through partners initiated a crop monitoring programme by use of remote sensing and GIS coupled with the use of Unmanned Aerial Vehicles (UAVs), essential in capturing details of crop conditions. ESIPPS is also involved in information dissemination through an Information and Technology Dissemination Centre (ITDC). The centre's core service is dissemination for various geo-information products from remote sensing and GIS and applications to ecological, energy, climate, aquatic, livestock and agriculture applications.

6.3 Usage of Information Communication Technology

Information and communication activities include; publishing activities, motion picture, video and television programme production, sound recording and music publishing activities, programming and broadcasting activities, telecommunications, computer programming, consultancy and related activities. The contribution of ICT activities to total GDP at current prices was 3.6 percent in FY 2014/15 (UBOS, 2015). By June 2014, Uganda had an internet penetration rate of 23.3 users per 100 inhabitants as shown in figure 6.1 (UCC, 2014). ICT is important in supporting development activities (environment, rural development, agriculture and health) through use of the internet, mobile telephony and social media.

ICTs supporting environment management

The advent of mobile telecommunications, particularly, the mobile phone has been immensely beneficial to developing countries by facilitating and improving communication between individuals and fostering economic growth (Maree et al., 2013). In Uganda, the number of new mobile subscribers by June 2013/14 was 2,578,710 which is a 15.5 percent increase from June 2012/13 (UCC, 2014). Total mobile subscription is now 19,244,020 (UCC, 2014).

The influx of mobile phones in rural areas represents one of the most profound changes in rural Uganda. With telephone penetration even to the most remote areas comes the potential to improve access to information. Since mobile telephone technology became available in Uganda, it has penetrated all modes of production, marketing, consumption and financial transactions. The benefits range from minimization of travel costs, saving of time and market access with options to call, send text or money instead. This also helps to improve the coordination of transportation, especially during emergencies, enhancing the effectiveness of development activities (Martin and Abbott, 2011; Maree et al, 2013). For instance, the Life Long Learning for Farmers in Uganda (L3F Uganda) project is using ICTs to facilitate learning for development in South Western Uganda. Short audio messages, SMS's and radio programmes are being used to provide farmers with information on best practice the production of potatoes, sorghum and honey, among others.

Smart phones allow even those without access to computers to use the Internet. For example, CATALYST Uganda under International Fertilizer Development Centre (IFDC) hosts farmer platforms at national level of services including increasing yields through improved seed, fertilizer application, handling practices and linkages to the market. AgriProFocus Uganda also hosts agricultural platforms for organizations to create awareness on opportunities they offer and provides networking and other support.

The number of Ugandans on social media (Facebook, Twitter, and LinkedIn) is growing steadily. It is estimated that Uganda has 25,000 active Twitter users out of a population of 38m and around 1.6m Facebook accounts (SMD, 2013). The growing number of users and how they are using it is bringing changes in civil society. Twitter is mainly the domain of middle class youth and university students, but it is also being adopted by organisations who want to have a voice, on social issues such as environment or rural development (SMD, 2013).



Farmer receives text message on climate and markets (Photo credit: Uganda Chartered Healthnet)

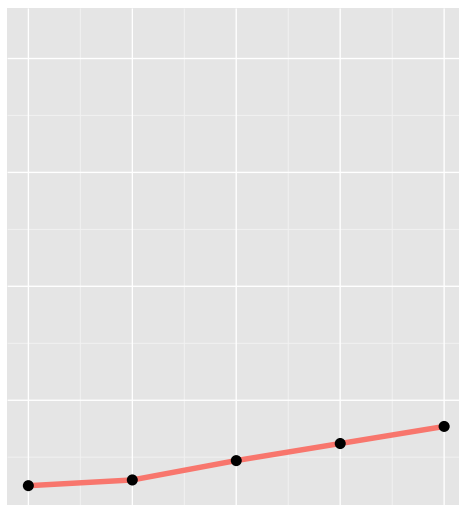


Figure 6.1: Internet and mobile cellular users (Source: UBOS, 2015)

6.4 Dealing with Big Data

Big data is seen as the next frontier for innovation, competition and productivity. It refers to the ability of society to harness information in novel ways to produce useful insights or goods and services of significant value. Although its effects are revolutionary, it has not yet made much impact in environmental management, although emerging factors such as collaborative

partnerships and business model innovations are positioning big data to become an integral part of environmental sustainability and vice versa (Keeso, 2014). The characteristics of big data are described in form of three 'Vs' of data management: volume, velocity and variety. Volume refers to the increased amount of data to be managed; Velocity refers to the increased pace of data generation as well as its use and interaction; and Variety refers to the many and often incompatible data formats, structures and semantics (Laney, 2001 in Keeso, 2014).

6.5 Coverage of Information and Communication Infrastructure

Telecommunications, radio, television and postal services

The national global system for mobile communications (GSM) coverage for the country is fairly good. The fairly good coverage ensures that there is good connectivity and relative efficiency in telephone use. Further analysis of the data shows that mobile 2G area coverage is still low standing only at 49 percent and the population coverage for 2G is over 80 percent. When disaggregated by location, only 36 percent of the Northern region and 62 percent of their population is covered. The 3G coverage for internet access is poor. only 7 percent and 27 percent for area and population coverage respectively. This renders internet communication in rural areas very difficult.

FM radio broadcasting has provided rural areas with the most reliable and accessible form of communication as well as source of information. The highest coverage both in area and population is the FM radio broadcasting with 89 percent and 90 percent respectively. The areas not covered by FM radio broadcasting are a few parts of Karamoja and some areas surrounding Lake Kyoga. FM radio broadcasting has provided rural areas with the most reliable and accessible form of communication as well as source of information. Because of its wide coverage FM radio communication is commonly used for sensitisation and popularizing government programmes including environment management interventions by NEMA.

Fibre Connection

Unlike the conventional types of cable, fibre optics have a large capacity to carry high speed signals over long distances without repeaters is huge. However, they are expensive to install and are not needed everywhere. The current coverage of long-haul fibre cables in Uganda is along major road routes with metro connections in Kampala and Wakiso districts. The total fibre length is 4,662km and route coverage is 2,081km. Countrywide 57 districts have no fibre lines implying that connectivity and access speeds in these areas might be very low. The targets of the Uganda Communications Commission include connecting each district to fibre in the short to medium term by 2020, and each sub county by 2025; and to have a national virtual cable landing station with cable routes through Kenya and Tanzania to Indian Ocean by 2020.

Challenges to ensuring national coverage

Although government aims at ensuring national coverage of all ICT infrastructures, there are number of gaps and issues that need to be addressed. The major barriers to expanding coverage include the absence of power in rural areas, cost of infrastructure especially in rural areas and the limited connection to global internet fibre cable infrastructure.

The 3G is considered as the minimum for decent internet access speed however, its coverage is very low. In addition most of the rural areas do not have fibre connections to support data backhaul implying limited access speeds, while Wi-Fi is predominantly in urban areas. The 2G mobile telephone network coverage is still far from everywhere thus marginalising a very significant part of population.

6.6 Telecommunications Infrastructure and the Environment

There are both negative and positive impacts of implementing telecommunication infrastructure projects. Positive impacts are seen in the areas of global and national development, while the negative impacts may manifest on the environment. Some of the highlighted environmental concerns include location of telecommunication towers, air and noise pollution, hazardous waste management and occupation health and safety.

The location of mobile phone towers is of concern because the lighting on mobile phone towers causes major concerns by obstructs aircrafts resulting into bird mortalities. Migratory birds that fly at night to avoid predators get attracted and disoriented by the lights resulting in high mortalities (URT, 2009). When locating these towers, Protected Areas should be avoided if possible. In addition, heavy overhead and aerial cables should avoid residential areas as they may result in unsightly visual impacts (URT, 2009). There are also health concerns arising from electromagnetic radiation especially if located close to residential areas (URT, 2009). In addition, occupational health and safety hazards may occur during construction, maintenance, and operation; for example electrical safety, electromagnetic fields (EMFs), optical fibre safety, elevated and overhead work, fall protection confined space entry and motor vehicle safety

Although the telecommunications infrastructure is relatively low impact infrastructure, at the operational level, they are known to generate considerable amount of e-waste with serious environmental health concerns. Backup power systems such as batteries and emergency generators may require the handling and storage of certain hazardous materials such as optical fibres, batteries, fuels, lubricating oils, and grease that require special management measures.

Air emissions are caused mainly by the use of diesel-fuelled emergency backup power generators, service vehicles, and cooling and fire suppression systems contribute to carbon emissions (URT, 2009). Backup power generators are the main source of noise of telecommunications towers.

The National ICT Policy for Uganda 2012 aligns itself to achievement of the NDP priorities as well as regional and international commitments such as the World Summit on the Information Society (WSIS) and the MDGs. Implementing the policy will ensure achievement of the Uganda Vision 2040 objectives. One of the priority policy objectives includes expansion of ICT infrastructure and its integration throughout the country with the following priority actions: extension of the national backbone infrastructure to cover the entire country ; integration of the communication, broadcasting and information infrastructure and systems; promotion of reliable and affordable ICT infrastructure in rural, remote and other underserved areas; and; implementing the migration roadmap from analogue to digital broadcasting.

6.7 Recommendations for Improved ICT Development

1. Increase internet coverage countrywide. Poor Internet penetration in rural areas has left many people without access to their accounts and limits access to social media.
2. Build capacity in new spatial information technologies such as Unmanned Aerial Vehicle (UAVs) and high resolution imagery as they become available for detailed assessments and monitoring of the environment system. This will reduce dependence on foreign assistance to fly and analyse the data generated by these new technologies.
3. Build open data systems to enable access and use of the available data and information and to take advantage of big data that is becoming available by global and regional initiatives. This requires that an enabling environment is in place to guide and regulate the collection, access and use of data in form of spatial data infrastructure (SDI).

4. Implement national activities to increase ICT literacy. Literacy is key in the uptake of the various ICTs. However, in some parts of the country the literacy levels among rural farmers are quite low. For instance in 2000, only about 50 percent of adults in Kabale were literate and more than 75 percent of the adult population did not advance beyond primary school. Low literacy levels makes written information useless to many farmers and although some programmes such as L3F Uganda have created a voice application for its mobile-phone information service, sharing is limited.
5. Train women and non-leaders on how to use mobile phones for specialized applications to environment management and development including access to information on production , climate change, local and international markets, and networking. The data shows that women and non-leaders are less likely to use the mobile phone to access market information (Martin and Abbott, 2011). Thus, it may be beneficial for development practitioners to train women and non-leaders on how to use mobile phones to access and compare markets for sound decision making; and coordinate with others in the area to combine resources.
6. Explore the opportunities provided by big data. Open data, information and software are becoming available but limited awareness is not enabling many individuals and institutions to access it and use it for environment management. Various institutions are continuing to collect and store data but have not recognized issues of big data and how to prepare to handle it if it manifests. Most lacking are data scientists that are able to handle large streams of data in different formats.
7. Establish innovative ways of using social media at grassroots levels for environmental advocacy



PART 3:
**ENVIRONMENTAL
RESOURCES FOR
SUSTAINABLE
LIVELIHOOD AND
DEVELOPMENT**

Chapter 7: A Synthesis

7.1 Introduction

Environment is a vital component for sustainability of livelihood and national development. Key natural resources, poverty trends and the contribution of ENR to income during the period 2012-2013 are explained. The status and trends of ENR resources, threats to these sectors' ability to create wealth sustainably and responses to address these issues and the challenges and emerging issues are addressed.

Infrastructure comprises physical components of interrelated systems providing commodities and services essential to enable, sustain, or enhance societal living condition. The environmental and the natural resources that infrastructure provides are thus included in these interrelated systems.

The country's stock of natural resources and the environment (ENR) creates a long term supply of goods and services and is thus an important part of the country's asset base. This asset base underpins and determines the speed and magnitude of economic growth and development. As such it is a major source of livelihoods for the people (FAO, 2013).

Environmentalists concern is the ability of economic systems to continue growing without undermining the natural systems which are the ultimate foundation of life. This raises the issue of sustainability that has been of major concern globally. Different scholars have come with desirable characteristics of sustainable growth and development. These include: non-declining well-being, natural capital base and production possibilities for future generations; exploitation of ENR within the limit of their sustainable yields; maintaining minimum conditions for ecosystem resilience through time and the consensus building and institutional development (Perman et al, 2011). Debates on sustainable livelihoods and the management of ENR as infrastructure are on the policy agenda. The following attributes are stressed as key sustainable livelihood goals: Improved local food; security, nutrition and health; increased sources and levels of income; resilience to stresses and shocks; improved household and community well-being; and the sustainable management of natural resources.

However, the ever increasing pressure on these resources resulting mainly from population growth, affluence, poor planning and policy failure, the state of many of the global commons is worrying. The repercussions from the deteriorating state of ENR have been evidenced in depletion and extinction of species, ecosystem destruction, pollution and climate change. The losses in wellbeing resulting from these events have been enormous. Scientists proposing methods of curbing on the rate degradation have noted that in many cases the damage emerging from ENR degradation is costly and in certain instances irreversible. This is particularly true for biodiversity loss and ecosystem destruction.

7.2 State and Trends of Environment Resources

Data and information for ENR management

Implementing a regular monitoring and assessment programme for environment and natural resources is an expensive venture. But the activities are also limited due to an absence of appropriate data collection and monitoring systems and the limited planning initiatives for data collection. As a result complete data sets on the status of these resources are missing.

It is difficult to comprehensively assess both the qualitative and quantitative changes, and the current status of the ENR resources. However, according to UBOS (2014), the composition of land area estimates was last updated from the Remote Sensing Survey carried out in 2010. It indicated that agricultural land occupies the largest proportion of land cover area (38 percent), followed by grassland (22 percent) and then water (15 percent).

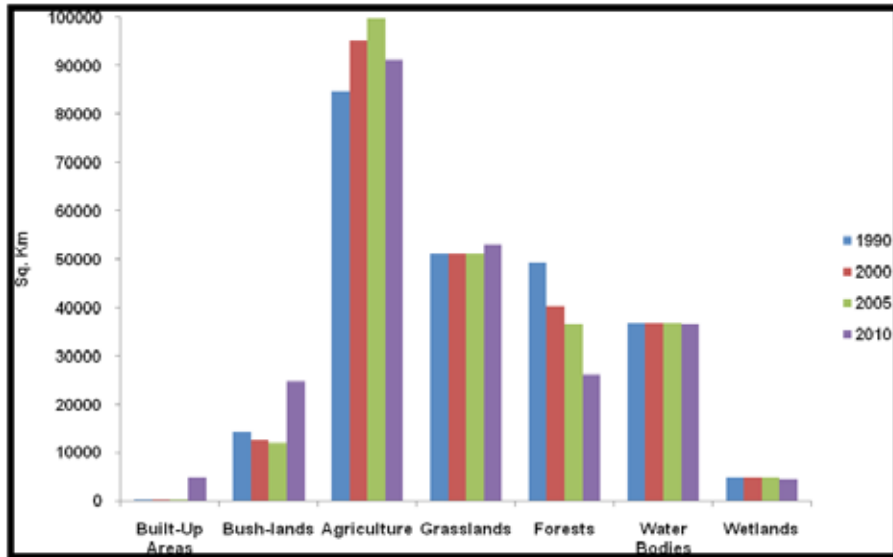


Figure 7.1: Area for Land Cover by type, 1990 -2010 (Source: UBOS, 2014)

Agriculture

The agriculture sector’s objectives include: enhancing production and productivity; control of diseases, pests and vectors; improved access to and sustainability of markets for farm produce; strengthening agriculture sector institutions to ensure that government programs are effectively implemented; building capacity for the production of improved seeds, knowledge and planting materials; building capacity for irrigation, drainage, water harvesting, soil and water conservation; and providing agricultural advisory services. The sector continues to employ more than 60 percent of the country’s rural workforce, and close to 85 percent of the population that live in the rural areas derive their entire livelihood from farming (MFPED, 2014).

The total area planted with food crops is 5,745,000 Ha (0.3 percent) (UBOS, 2014). The contribution of agriculture to total GDP has been declining in the recent past, though sector’s contribution to the economy and to household welfare remains significant. For example, MAAIF (2014) shows that the agriculture sector is still the largest earner of foreign exchange contributing to about 53 percent of Uganda’s total exports revenues and it is the largest employer. The structure of production in the sector continues to be dominated, to a large extent by subsistence farming (MFPED, 2014). This is a major bottleneck to the required growth in output. Rapid urbanisation creates high demand for agricultural produce both domestically and within the region. Thus while there is a growing market for food and cash crops, the supply side is more or less inelastic. According to MFPED (2014) the measures geared toward boosting production include developing new crop breeds with higher yields and disseminating scientific knowledge to farmers; pests and diseases; developing drought resistant crops that respond to climatic changes; building valley dams and water reservoirs for livestock and irrigation.

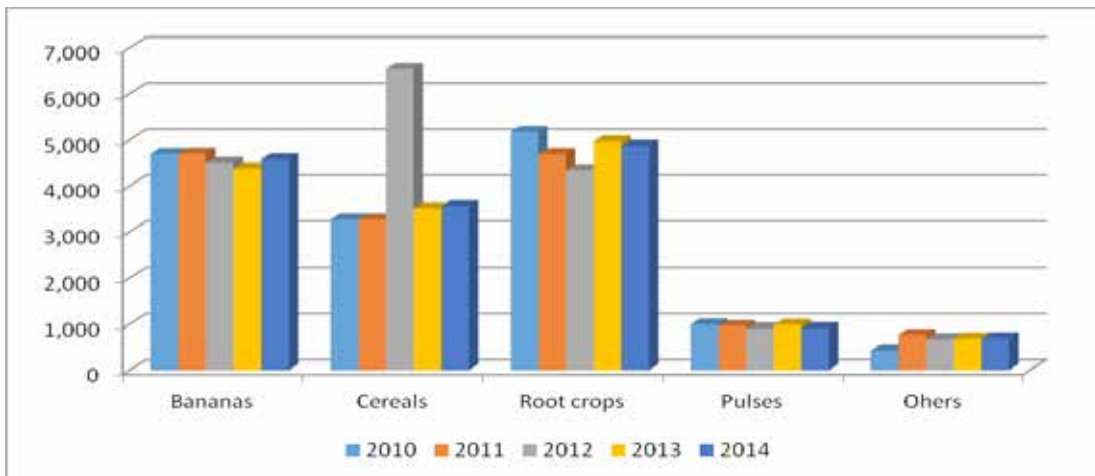


Figure 7.2: Selected crop production 2010-2014 ('000 tonnes) (Source: UBOS, 2014)

Livestock

The livestock sector is mainly dominated by cattle and poultry. The numbers of cattle, goats, sheep, pigs and poultry between 2010 and 2013, as shown in figures 7.3 and 7.4, have been increasing. Almost all cattle (93.6 percent) and poultry (87.7 percent) breeds were indigenous in 2013 (UBOS 2014). The sector contributed 1.9 percent to GDP in 2012/13. This is quite low and is constrained by the erratic climatic patterns and limited access to appropriate technology (MFPED, 2014). As a result, recent efforts have been directed towards ensuring the sustainable use of rangelands; strengthening the supportive infrastructure that include fish landing sites, livestock markets and slaughter facilities; controls livestock epidemic diseases; and ensures that high yield livestock are safely introduced in the country.

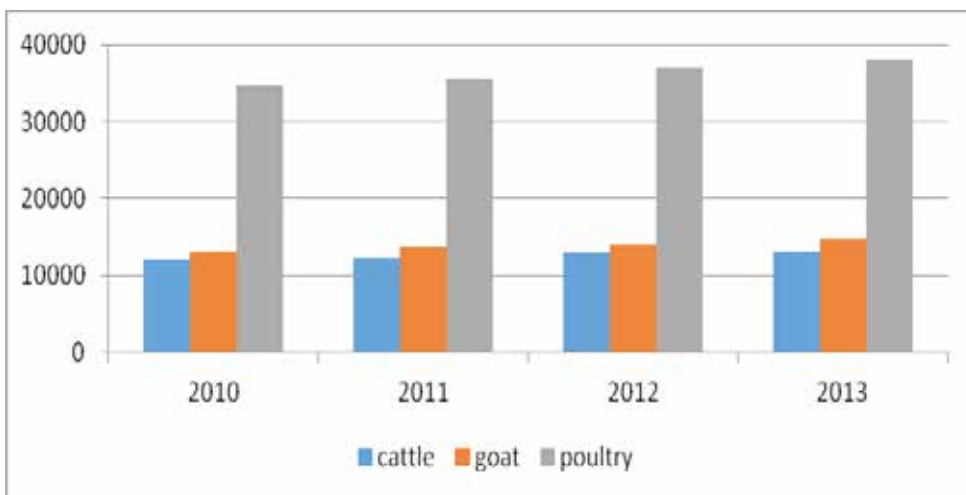


Figure 7.3: Number of Cattle, Goats and Poultry (in 000s) 2010-2014 (Source: UBOS, 2014)

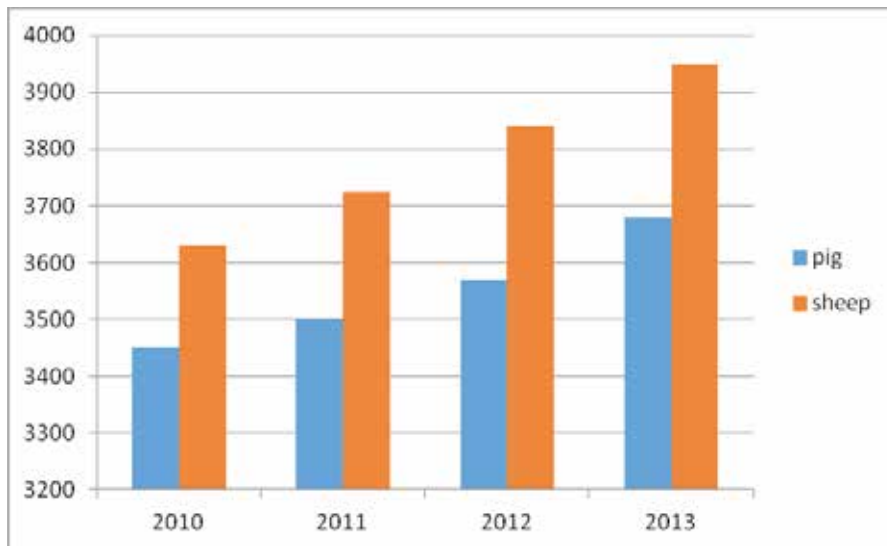


Figure 7.4: Number of sheep and pigs (in 000s) 2010-2014 (Source: UBOS, 2014)

Fisheries

The fisheries sector is an important source of food and employment in many rural areas. Exports of fish and fish products have emerged as one of the main foreign exchange earners in Uganda (MFPED, 2011). Currently the sector faces an immense overfishing problem both in qualitative and quantitative terms. Fish catches from the main water bodies have dwindled over the last 5 years leading to 300 percent increase in the average price of a kilogram of fish (UBOS, 2014). As a result most Ugandans are consuming less than adequate amounts of fish (WHO, 2014). The catches from all water bodies for the period 2006-2013 appear in figure 7.5. Aggregate catches declined between 2007 and 2010.

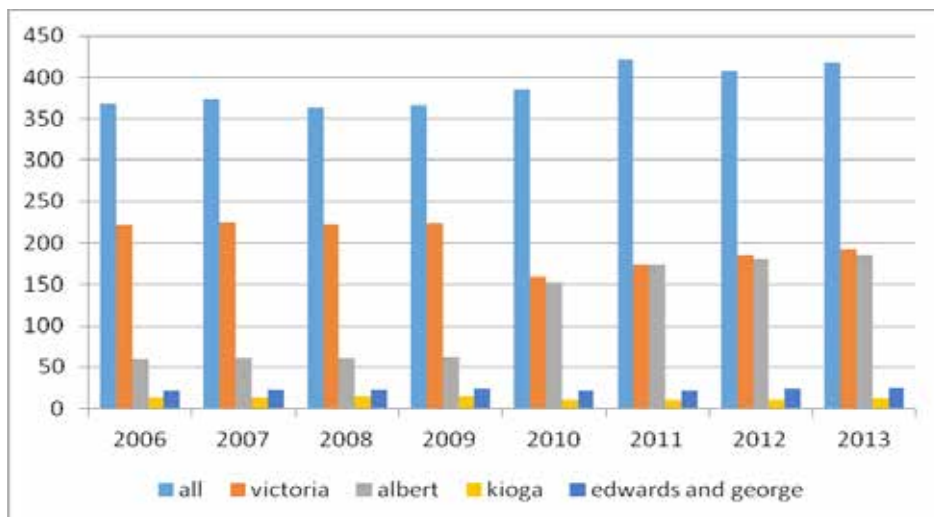


Figure 7.5: Fish catches from all water bodies (2006-2013) (Source: NaFIRRI, 2014)

Lake catches constituted the greatest percentage of total catch between 2006 and 2010. However from 2011 to 2013 catches from Lake Albert steadily increased to almost match those from Lake Victoria. The rapid rate of increase in catches from Lake Albert may be explained by the increased inflow of settlements in areas around the lake as speculators target oil.

Forestry

Forests and woodlands cover approximately 4.9 million hectares in Uganda, about 24 percent of the total land area in 2012 (UIA, 2012). The vast majority of this is woodland (19 percent), while the rest is tropical moist forest (5 percent) and forest plantations (0.2 percent). The total acreage under forests by region appears in Table 7.1.

Table 7.1: Total area under forests by region (Source: UIA, 2013)

Region	Central Forest Reserve	Local Forest Reserve	Total Forest Reserve Area
	Area (ha)		
Central	303,358	1,576	304,934
Eastern	56,479	1,531	58,010
Northern	556,825	1,447	558,272
Western	356,037	431	356,468
Uganda	1,272,699	4,985	1,277,684

Period	Forest loss (Hectares)	Deforestation rate (%)
1990-2005	1330,906	27.0
2005-2010	1288746	35.8
2010-2015	478472	20.7
1990-2015	3098124	63

Uganda has lost more than 3 million hectares of forest cover since 1990 (NFA, 2015). This is almost 30 percent of the 1990 forest coverage acreage. The main factors at play are the rapid expansion of farmlands, rapidly growing human population and increased urbanization (NEMA, 2012). In the recent past, the tendency for people to migrate out of the increasingly crowded city into the suburbs of Kampala has seen the forest coverage in the districts of Wakiso, Mukono and Mpigi reduce to 22 percent of what they were during 1990 (NFA, 2011). Forest coverage has decreased also due to weak management policies and enforcement of laws, and because over 90 percent of total energy resources used in the country are derived from fuel wood. Lately, government has intensified efforts to introduce fuel saving gadgets have been intensified at district and village levels. The importance of forest resources as sources of regulatory services including soil protection, hydrological services and sequestration of greenhouse gases is widely acknowledged (EPRC, 2010). There have thus been major efforts to curb the rapid deforestation rates. The key objective for forestry in the NDP II is to increase forest cover from 3,604,176 to 4,933,748 hectares by the end of 2015.

Water resources

Water resources are broken down into four sub-sectors: Rural water and sanitation; Urban water and sewerage; Water for production; and Water resources management. Regular supply of clean and safe water for domestic, agricultural and industrial use is key to sustainable development. Degradation of the water catchment areas, Such as wetlands can impact on the water supply levels including undermining the water filtering function.

Wildlife

Wildlife plays critical role to the country's welfare and particularly to communities living around the protected areas. The role of Uganda Wildlife Authority (UWA) is to conserve and manage the countries wildlife and biodiversity. The high encroachment of protected areas is exacerbating human wildlife conflict leading to loss of biodiversity. The continued loss and degradation of biodiversity is a serious challenge to livelihoods, economic development, culture and human wellbeing.

Land resources

Land is central to higher agricultural productivity, ecosystem stability, climate resilience and the sustained supply of both national and global environmental benefits (NEMA, 2010). . Soils lose considerable fertility through poor nutrient management. The high population growth rates and environmental degradation also pose a growing challenge to the continued productivity of the country's land resources (NEMA, 2010).

Atmospheric resources and air quality

Air pollutants in Uganda originate mainly from imported second-hand vehicles and boiler emissions from industries. Other sources include open air burning of wastes in city skips, waste dumpsites and industrial premises. Further, the rate at which the transport sector discharges greenhouse gases is increasing at an alarming rate, the sector currently accounts for about 75 percent of the greenhouse gas emissions and this is likely to increase as evidenced from the rate at which newly registered vehicles enter the transport industry. Key pollutants in the cities include particulate matter, nitrogen dioxide, sulphur dioxide, dioxins and furans, and hydrocarbons. However, accurate data on the pollution levels are limited. A recent study on the state of ambient air quality in Kampala and Jinja revealed that in both cities, source emissions include dust and soil blown by wind from unpaved roads, black smoke exhausts from cars, trucks and busses and smoke from burning household garbage. Further the study shows that the Particulate Matter (PM) concentrations (132.1 µg/m³) in these cities exceeded the mean PM concentration of 78 µg/m³ calculated for the African region and reported in the WHO 2014 publication of the global state of air quality. However, the concentration of three key gas phase pollutants (NO₂, SO₂ and O₃) in Kampala and Jinja were found to be below WHO guideline levels. Caution is, therefore, required when comparing the estimated pollution levels with the WHO standards due to differences in averaging times.

7.3 Contribution to GDP, Poverty Trends and Sector Performance

The contribution of ENR sectors to GDP steadily declined from 2008/09 to 2012/13 as shown in figure 7.6. This has been at the expense of growing value addition from the services and manufacturing sectors. The ENR sectors contributed close to 16 percent to GDP in 2012/13 (MFPED, 2013). The 2014 Poverty Status Report shows that poverty levels declined between 2009 and 2013. This has been a result of various initiatives and interventions like the Plan for the Modernisation Agriculture (PMA). However, the contribution of nature to improved standards of living cannot be under rated. Though accurate data on resources flows is lacking, indeed, a positive correlation coefficient is predicted between access to ENR goods and services and poverty levels.

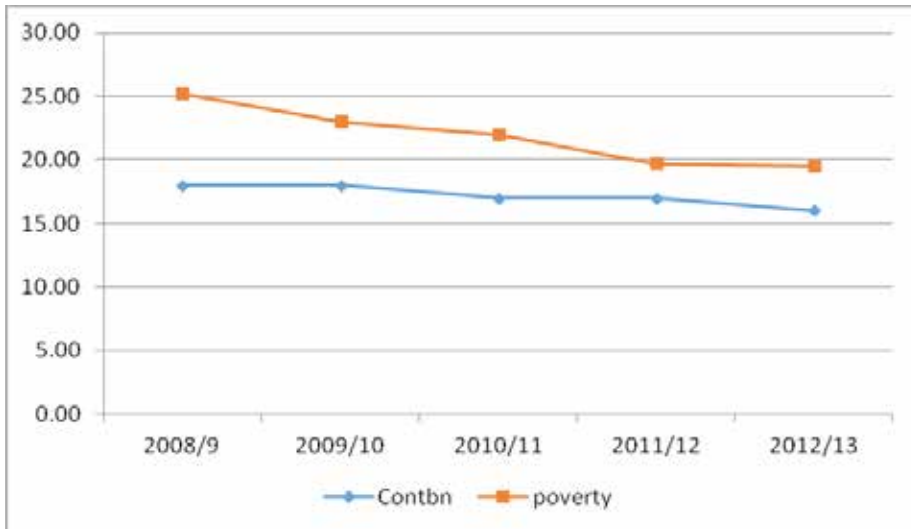


Figure 7.6: Contribution of ENR sectors to GDP and poverty 2009 -2013 (%)
(Source: MFPED (2013) and World Bank (2013))

Figure 7.7 shows the trend in the output of cash crops, food crops, livestock, forestry and fisheries. Value added from the agriculture sector, steadily increased from 2009 to 2013. Its contribution to export revenue in 2013 was estimated at 46 percent, with an overall growth rate of 1.4 percent in 2012/13. Output from the forestry sector steadily increased during the period. The value added from the water and electricity sectors increased during the period 2008-2013 (figure 7.9). On the other hand output from mining and quarrying sector remain constant during the same period.

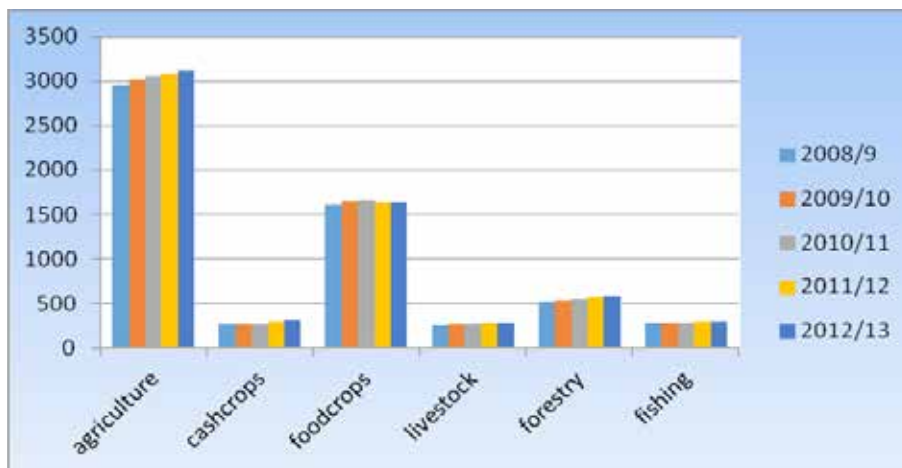


Figure 7.7: Value added – Agriculture (Billion UGX) 2008/9 – 2012/13
(Source: MFPED, 2013)

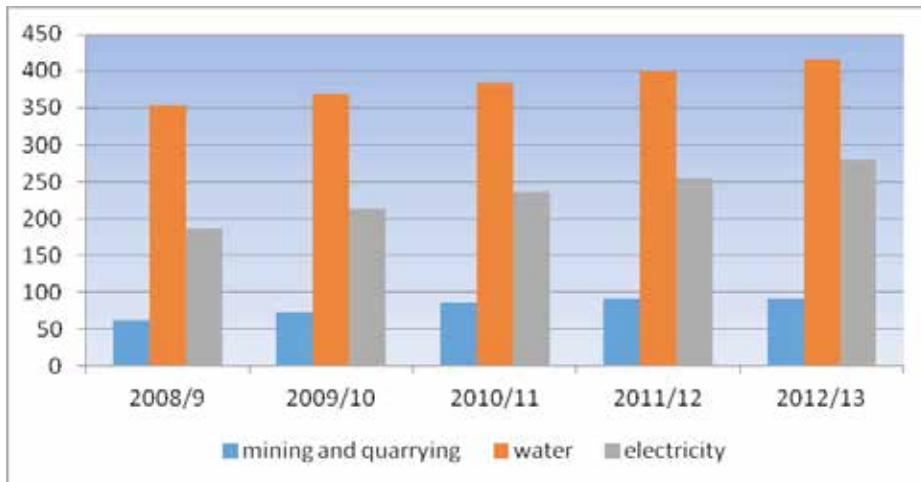


Figure 7.8: Value added - Mining, water and electricity (Billion UGX) 2008/9 – 2012/13 (Source: MFPED, 2013)

In terms of sectoral growth rates, maximum growth rates were attained in 2008 for the cash crop (9.8 percent) and forestry sectors (6.3 percent). The food crop and fishing output registered negative growth rates in 2010/11 and 2008/09 respectively (figure 7.9). The poor performance of food crop production is due to the tendency for production here to be dominated by smallholders facing a range of constraints. These include unpredictable climate with lack or poor infrastructure for irrigation; poor quality inputs, pests, diseases, lack of relevant knowledge, and the use of rudimentary technology (MFPED, 2013). The poor performance of the fisheries sector is explained by the declining stock due to the level of stress these resources have been subjected to.

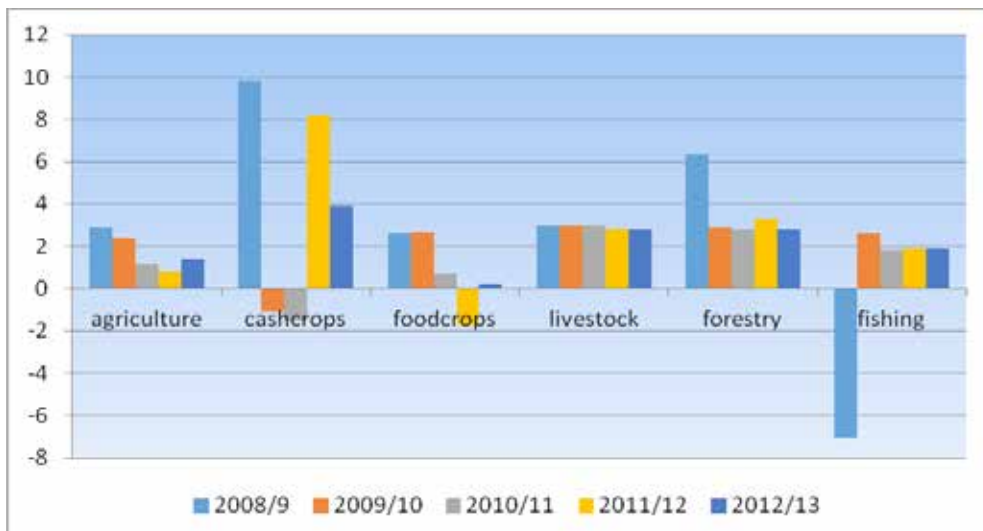


Figure 7.9: Value added Growth Rates in Selected ENR sectors 2008/9 – 2012/13 (Source: MFPED, 2013)

The growth rates of value added from the mining, water and electricity sectors for the period 2008/09 to 2012/13 appear in figure 7.10. The maximum growth rate for the mining sector output (18.6 percent) was registered in 2010/11 and the lowest; a negative one percent was recorded in 2012/13. The growth rate in output from the water has on average been 4.5 percent during this period. The maximum growth in output from the electricity sector (10.7 percent) was recorded in 2009/10. There after growth declined.

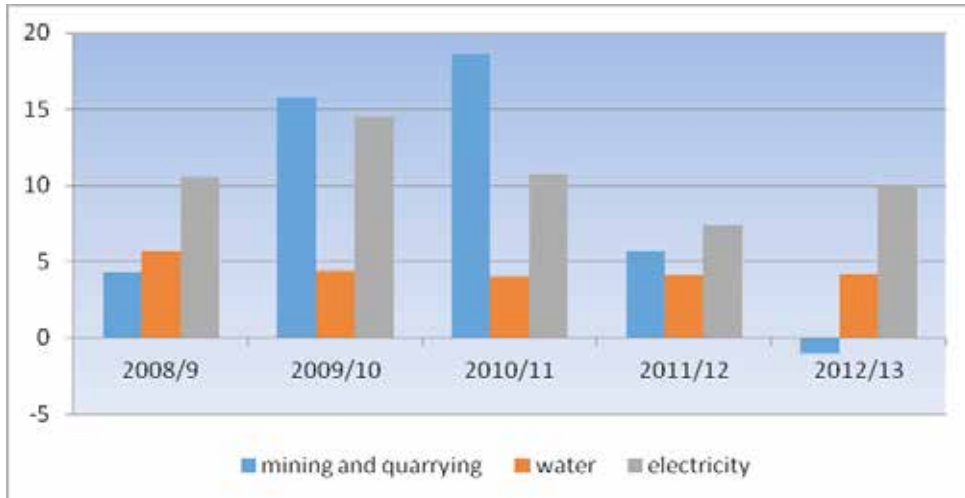


Figure 7.10: Growth in mining, water and electricity sectors 2008/9 – 2012/13 (Source: MFPED, 2013)

The discovery of oil and gas in the recent past is yet another opportunity for nature to boost economic growth and the national standards of living. Due to these resources, the projections of Uganda Vision 2040 indicate that Uganda will graduate into a lower middle income country by 2017, progress to an upper middle income category by 2032 and attaining its target of USD 9500 per capita in 2040. The sustainability of livelihoods, and basically the projected high standards of living however hinges upon the resource managers ability to identify optimal extraction plans, invest resource rent into projects or ventures that will continue to yield returns high enough to prevent incidence of declining standards as the population grows, and the ability to implement measures that can control pollution.

7.4 Threats, Responses and Opportunities

The threats, responses and opportunities for the sustainable use of ENR resources are presented by sector.

Agriculture and crop sector

Threats

According to the MFPED (2014), the crop sector continues to be vibrant amidst climatic and economic challenges as well as market shocks occasioned on the domestic, regional and International markets. The threats for the sector include:

1. Expansion of arable land through clearing of natural vegetation and deforestation adversely affecting the micro climates.
2. Weakly enforced land property rights leading to destruction of fragile ecosystems

3. Draining for wetlands for farm use leading to their degradation and total decline in size.
4. A high degree of uncertainty in production planning resulting from the change and variability in the known traditional seasons (unreliable and erratic rains, extended periods of drought or rain and so forth).
5. Low crop yield due to declining soil fertility and the limited use of fertilizers by farmers.
6. Clearing of natural vegetation from hills and hilly lands leading to massive soil erosion, water quality deterioration, land-slides, siltation of water points and soil fertility loss.
7. Floods and land-slides in the Eastern part of the country (Bududa and Teso) dislocating communities and endangering livelihoods.
8. Abuse of pesticides injuring ecosystem health.
9. Exposure to substandard agro inputs (seeds and seedlings, pesticides, machinery).
10. Alien and Invasive weed species colonizing crops.
11. Increasing incidence of pests and diseases (leading to banana wilt, coffee wilt, cassava mosaic) that have led to total destruction of plantations.
12. Inadequate soil information
13. increasing soil toxicity (salinisation of soils, particularly in the areas of Kasese)
14. Climate change effects leading to shrinking agro-ecological zones in certain districts while increasing in other areas.
15. Alien Invasive species and the springing up of new types of pests have been blamed on both the abuse of certain types of pesticides and the creation of suitable environments for these organisms to proliferate by the changes in climate.

Responses

1. Implementation of a unified single-spine agricultural extension system that is aimed at intensifying extension services; mainly to train farmers in soil erosion control, correct fertilizer use.
2. Research on increased productivity, disease control and value addition of the 10 priority commodities (coffee, tea, maize, beans, cassava, rice, bananas, citrus, fish, meat and dairy) through the Agricultural Technology and Agribusiness Advisory Services (ATAAS) project (MAAIF 2014)
3. Provision of tractors for distribution as grants to farmer groups engaged in the production of strategic commodities (maize, beans, cassava, rice, bananas, coffee and tea).
4. Establishing an agricultural mechanization resource centre aimed at provision of training of machinery operators, generation of technical information, a referral workshop, and for testing and evaluating agricultural machinery.
5. Intensification of fertilizer use through promoting the importation of fertilizers in bulk.
6. Ensuring the availability of key and quality agricultural inputs; that is, availing of inputs at farm level (seed, planting, breeding and stocking materials) (MAAIF 2014)
7. Intensification of efforts to control pests, vectors and diseases, with specific attention geared towards control the Coffee Leaf Rust (CLR), Banana Bacterial Wilt (BWW)
8. Introduction of new crops

9. Construction, rehabilitation and extension of irrigation infrastructure (Agoro, Mubuku and Doho Irrigation Schemes among others) in order promote affordable irrigation for small scale farmers.
10. Promotion and support of Public Private Partnerships (PPP) in produce value addition ventures (substantive progress in value addition PPP is acknowledged in the oil palm, oil seed, pulse seeds, Shea butter coffee, tea and fish)
11. Increased research in better methods of weed control (NAADS)
12. Research on improved seeds and farming methods (for example trials for bio-engineered breeds are on-going)
13. Introduction of agro-forestry

Opportunities

The sustainable management of farming systems and land resources, the enhancement of productivity in the crop sector provides opportunities for employment, wealth creation, food security, a healthy society, and foreign exchange earnings. This is emphasized particularly in rural areas where close to 90 percent of the population largely depend on crop farms for their livelihoods.

Fisheries

Threats

1. Declining fish stocks due to overfishing and deterioration in water quality that results from increased pollution loads in many of the water bodies
2. Disappearance of some fish species due to use of illegal fishing methods
3. Falling water levels reducing fish spawning and breeding areas
4. Alien Invasive species like the water hyacinth, and algal blooms that injure fish life
5. Eutrophication

Responses

1. Strengthening the governance of fisheries operations by providing facilities for law enforcement to 200 Beach Management Units at local levels.
2. Encouraging fishermen to engage in aquaculture.
3. Increasing surveillance on invasive weed species on water bodies and checking their growth.
4. Supporting activities to enhance the development of appropriate infrastructure for commercial fish farming (aquaculture); including the cage farming to boost fish production and productivity for improved nutrition, household incomes and exports and exports.
5. Increased regulation and enforcement in capture fisheries and promoting aquaculture (MAAIF 2014).

Opportunities

The Fisheries sector provides employment, income, proteins and in the recent period has emerged as a significant foreign exchange earner. The sustainable management of this sector is an opportunity toward the achievement of MDGs 1, 4 and 7.

Forestry

Threats

The major threat to forest resources is deforestation due to new settlements, arable land expansion and infrastructure development. The high dependency on charcoal and firewood further exacerbates deforestation and vegetation degradation. In addition the sector is negatively affected by poor governance, weak institutions and implementation failures of the policy and regulatory framework.

There have been efforts to increase forest acreage through commercial plantations. The problem however is that the species in natural forests and plantations forests are not perfect substitutes. Thus running down natural forests has come with irreversible damage due to biodiversity loss.

Responses

1. Strengthening institutional capacity for regulatory and the fiscal framework for forest management.
2. Opening up forests boundaries so as to bring out the clear demarcation of lands under the authority. The objective here was to remove people encroaching on forestry lands.
3. Stock assessments of the various forest reserve biodiversity. Stock assessments were conducted for a few reserves; Budongo, Kalinzu, and Maramagambo.
4. Zoning of forests to guide users. That is, mapping out the forest zones that are accessible and not accessible to the public and the buffer zones.
5. Restoring the bamboo plantations in northern Uganda.
6. Promoting reforestation and planting of trees in new areas by developing or growing tree seedlings easily accessed by the private investors in forests and local communities. (Carbon credit project).
7. Setting up resource centers where local communities can be trained in fuel wood energy saving practices (energy saving stoves, briquettes making).
8. Creating conditions for rural communities to get engaged in community based carbon projects. This is where small-scale farmers are introduced and encouraged to engage in agro-forestry programs that produce long-term, Plan Vivo-accredited emissions reductions while measurably improving farmer livelihoods and emphasizing sustainable land-use practices. (Eco Trust project).

Opportunities

The sustainable management of forest resources offers opportunities for sustainable supply of biomass energy, ecotourism, employment and income, research and development of new tree species, foreign exchange earnings and micro climate ameliorations. Ideally better management of the global forest resources offers opportunities to curb climate change and its consequences. Further investments in tree planting now enables those involved to reap benefits from the carbon trading program.

Livestock Sector

Threats

1. Climate change related problems: Climate change has led to decline in pasture and limited access to water sources. The result has been increased animal movements leading to aggregation of animals in areas with relatively abundant pastures and water. Often this has led to: scarce water points; over-grazing of specific micro environments; spread of animal diseases as cattle are moved in search of water and pasture; adverse impact on milk infrastructure development (milk collection and processing centres).
2. Land use change in the cattle corridor, and the privatisation of the communal rangelands has led to the over-grazing in rangelands, soil erosion and degradation as a result of cattle herders' desire to increase their stocks beyond the carrying capacity of the grounds.
3. Bush burning and the emergence of alien invasive species.
4. Weed proliferation as a result of selective feeding habits of cattle.
5. Excessive methane emissions. This is because methane is not put to any use or developments toward converting methane into energy are still at a low stage.
6. Pollution of water bodies or streams and watering points.

Responses

1. Advocacy: Farmers have been advised to embrace bio gasification. Demonstration units have been set up at district level to introduce farmers to the process of making bio gas.
2. Information on the different agro ecological zones and the respective carrying capacities has been provided to farmers and used to advise farmers in various zones on the optimal stocking rates.
3. Farmers have been advised to abandon the high cost low return breeds of livestock, and to engage in rearing high yield varieties (goats, cattle, sheep and pigs).
4. Construction of valley tanks and dams.
5. Boosting of bee keeping to enable pollination and reproduction of livestock fodder.
6. Implementation of strategic disease control programs. Disease out-breaks are usually expected during drought seasons as livestock is moved into or close to game parks.
7. To minimize disease spread, animals are vaccinated against the known common diseases (Foot and Mouth disease, and East Coast fever) before the onset of droughts.
8. The focus now is on extending water harvesting infrastructure and provision of extension services to farmers on how to grow pasture so as to reduce the nomadic behaviour.

Opportunities

The sustainable management of the livestock sector offers opportunities for employment, food security, foreign exchange earnings, and better management of the environment and natural resources.

Water resources

Threats

The major threats (MWE 2014) for the sector are:

1. Weak policy, legal and regulatory framework in the use of water resources.
2. Deterioration in water quality due to increased pollution loading from urban centres, industries and agriculture fields into water catchment areas.
3. Declining water levels in all water bodies due to increased abstraction and high evaporation rates.
4. Dried up wells and boreholes.
5. Wetland degradation resulting in higher cost of production of water for human consumption.
6. Siltation of lakes and rivers due to soil erosion, landslides and floods.
7. Alien invasive species like water hyacinth and the congress colonizing water bodies.
8. Rapidly rising water demand that cannot be easily satisfied by the existing supply infrastructure.

Responses

1. Developing policies that improve water shed management.
2. Strengthening the governance of water resources management in all districts.
3. Working with partner states to develop common abstraction policies (Lakes Victoria and Albert).
4. Controlling land use management and practices along the fringing zones of water bodies.
5. Expanding the piped water systems to a wider area; provision of boreholes and protected wells to households in rural areas.
6. Encouraging rural households to harvest and store rain water.
7. Pollution control.
8. Provision of knowledge and infrastructure for alternative water sources and ecological sanitation.

Opportunities

The water sector is crucial for sustainable economic growth as it is in charge of the provision of water for consumption, production, recreation and sanitation. The sustainable management of this sector is an opportunity toward the achievement of MDGs 1, 4 and 7.

Wildlife

Threats

1. Rampant clearance of natural vegetation, catchment and water sources disturbances.
2. Invasive species.
3. Overuse of inorganic fertilizers.
4. Poaching.

5. Competition in the regional tourism market.
6. Human wildlife conflict resulting into crop raids, killing of animals and loss of human lives (wildlife crimes).
7. Development projects in protected areas. This includes the oil and gas operations, and hydropower and roads construction in the protected areas (national parks and reserves).
8. Illegal wildlife trade within but mostly across the borders.

Responses

1. Strengthening the governance of the wildlife resources management.
2. Increased investment in the tourism sector so as to make the industry competitive in the region.
3. Increased community participation in wildlife protection.
4. Implementation of the National Land Use Policy to address issues of encroachment on forests, wetlands and other fragile but biodiversity rich ecosystems; and better management of invasive alien species (NEMA, 2010).
5. Conducting thorough EIA studies to avoid irreversible damages from oil and gas exploitation.
6. Diversifying tourism opportunities.
7. Enforcement to curb illegal wildlife trade

Opportunities

The sector offer great opportunities for future developments in the tourism sector. It also offer prospects for increased employment and foreign exchange earnings if the necessary infrastructure is well developed and the facility's services widely advertised.

Land resources

Threats

1. The lack of capacity to inventory government (public) land where continued encroachment is rampant.
2. Land degradation due to deforestation and the rapid conversion of natural vegetation into arable lands exposing big areas to sheet erosion and reducing their productivity. This problem is partly attributed to the poorly defined land ownership rights.
3. High rate of conversion of natural vegetation into arable lands and resulting land slides.
4. Declining soil fertility due to over cultivation of plots particularly in small holder agriculture and the spread of invasive alien weed species that further reduces agricultural productivity.
5. Increased pollution loads resulting from the use pesticides and fertilizers by plantation farms leading to land cover change.
6. Excessive pressure from livestock as a result of overstocking in rangelands on public land.
7. Fraudulent land transactions in the land registry.
8. Escalating land ownership conflicts (communities versus land lords).
9. Escalating district and international border disputes.

10. Extraction of oil and gas in the protected areas.

Responses

1. Increasing enforcement of laws protecting public (government) land.
2. Encouraging farmers to adopt appropriate technologies in order to reduce the rate of natural vegetation conversion.
3. Identifying areas where people leaving in land-slides prone areas can be shifted to.
4. Computerization of the land registry to control fraudulent land transactions.
5. Mapping and surveying to demarcate district and international borders.
6. Formulating physical development plans for the Albertine Graben for selected border towns.

Opportunities

There are opportunities to promote sustainable economic development and livelihood security for all through effective tenure, use and management of the land. These include interventions to promote security of land ownership so as to create conditions for improved land management and modernized agriculture.

Atmospheric resources

Air quality

The main threat to these resources is pollution resulting into human and ecosystem health concerns. Particularly ecosystem degradation and climate change effects on the human livelihoods and health status; and of the animal species that play a big role as sources of income, proteins and as recreation amenities.

Various measures to address threats to the state of atmospheric resources have been undertaken. There have been attempts to climate proof Uganda's economy, and the proposed actions aim to improve research and forecasting, water storage and disaster risk reduction (NEMA 2012).

The responses in this area include:

1. Implement better systems for weather forecasting.
2. Increasing monitoring of the known pollution sources.
3. Setting up guidelines on emission standards (with support of NORAD).
4. Establishment of Bus Rapid Transit in Kampala.
5. Phasing out of leaded fuels.
6. Construction of new roads to reduce traffic jam and improved traffic flow.
7. Introduction of mandatory vehicle inspection for at least twice a year.
8. Development of air quality standards and regulations by NEMA.

7.5 Emerging Issues and Challenges

The emerging issues and challenges in the use and management of ENR resources are presented and discussed here.

Agriculture

1. Poor crop and livestock yields resulting from the sale of substandard seeds, medicines and fertilizers by traders to farmers.
2. Livestock marketing facilities that are in a bad shape. That is the holding grounds, slaughter facilities; sanitary facilities, waste disposal area, and loading platforms in some districts require urgent rehabilitation.
3. Excessive use and misuse of pesticides injuring the ecosystems health.
4. Alien Invasive weed species colonizing crops.
5. New types of pests (leading to banana wilt, coffee wilt, cassava mosaic) that have led to total destruction of plantations.
6. Low crop yield due to declining soil fertility and the limited use of fertilizers by farmers.
7. Clearing of natural vegetation from hills and hilly lands leading to massive soil erosion, water quality deterioration, land-slides, siltation of water points and soil fertility loss.
8. Floods and land-slides in the Eastern part of the country.
9. Unreliable water sources for livestock due to changes in seasons and prolonged droughts. As a result, the pastoralists have to walk for long distance during the dry season searching for alternatives sources. This affects the quality of livestock and their market value.

Fisheries

The major threat to this sector is ever increasing demand for fish that has induced the fisher folk to intensively increase fishing effort, and to employ fishing methods that are deleterious to the fisheries health. This has reduced fish stocks to alarmingly low levels, reduced catches and sharply increased fish prices. Another challenge for this sector is the emergency of alien invasive species that have colonized significant proportions of the water bodies. The colonization of Lake Kyoga by the congress weed is really a challenge for the fisher folk and the fisheries management authority.

Forestry

The MWE (2014) report identifies the following challenges;

1. Poor state of the infrastructure such as forest stations. This makes forest conservation work difficult.
2. Increasing illegal activities such as encroachment and illegal logging due to weak monitoring of the resources.
3. Constrained capacity to supply seedlings and technical support to the increasing demand by prospective foresters.

Water resources

According to the Water and Environment Sector Report (2014), the challenges for this sector are:

1. Destruction of pipelines in towns due to on-going road works.
2. Intermittent electricity supply affecting delivery operations.

3. Insufficient funding (low disbursements) that delay implementation of planned activities.
4. Accumulation of arrears due to unpaid water services (by both government and private users).
5. Low pressure in the old network system leading to intermittent water supply as capacity is stretched by the new connections.
6. Increasing discharge of inadequately pre-treated or untreated wastewater into the receiving water bodies and the implied effects on water treatment cost.
7. Inadequate staffing and capacity to effectively manage trans-boundary water resources.
8. Depreciation of the shilling and inflation.

Mining and quarrying

According to the MEMD annual report of 2013 the challenges experienced include the following:-

1. Land Acquisition: This takes a very long time and land is very costly. This leads to project development delays and high investment costs.
2. Taxation incentives: the taxation regime has been identified as a disincentive to long term investment projects in refinery and pipeline development.
3. Management of expectations created by the petroleum discoveries: There are high expectations on the profits to be appropriated from the oil and gas industry. On the other hand local communities foresee scenarios of environmental resources degradation emerging from the expected increment in pollution levels when oil and gas extraction starts. This situation creates mistrust and discontent on side of the local society.

Atmospheric resources

The key challenges to the state of atmospheric resources are climate change and pollution. The impacts of climate change are already being felt in Uganda; especially in sectors that are critical to the economy and people's livelihoods. These include agriculture, water supply, health, transport, housing and personal safety and security. Though accurate data on pollution loads are not available, there is increasing concern on the impact of the upcoming Oil and Gas sector on current stock of pollution in the country.

1. Non-compliance of the public with the proposed standards, for example the polythene bags manufacturers and importers.
2. Enforcing emission standards for imported second-hand vehicles and others including medical and veterinary drugs and other chemicals.
3. The growth in production and use of polythene bags/packaging materials, with corresponding emissions of hazardous organic pollutants. This exacerbated by the inexistence of a plastic recycling plant.
4. Capacity constraints of NEMA in monitoring pollution levels, and limited research capability in pollution and its impacts on human, animals and ecosystems.
5. Heavy dependence on fuel wood as a cheap source of domestic energy reinforcing high deforestation rates.
6. Resource constraints. Currently, NEMA does not have the resources to single-handedly enforce air pollution regulations since most pollution takes place in homes (indoor air pollution).

7.6 Conclusion

Although the contribution of ENR sectors to welfare as measured by GDP has been fluctuating, they play a major role in providing the necessary goods and services to both firms and households. However sustainability in their use, management, and disposal of residuals will determine the degree to which they are able to confer benefits to society in the long run. There have been various concerns with regard to current practices of resource utilization from all the ENR sectors and efforts to address these concerns and threats have been expedited.

Chapter 8: Land Resources Sector

8.1 Introduction

Uganda's total area is 241,550 square kilometers, of which land covers about 200,523 square kilometers which is 83 percent of the country's total area coverage (UBOS, 2014). Land is central to higher agricultural productivity, ecosystem stability, climate resilience and the sustained supply of both national and global environmental benefits (NEMA, 2014). The land resource is fundamental in the process of achieving both national immediate and strategic objectives, and more so in transforming Ugandan society from a peasant to a modern and prosperous economy. This is premised on the understanding that the majority of Uganda's population derives their livelihood from the land resource. Land supports agriculture, human settlements and industrialization (NEMA, 2014).

However, current farming practices threaten soil fertility and prevent a significant share of the agriculture potential from being realized. The high population growth rates and environmental degradation pose a growing challenge to the continued productivity of the country's land resources (NEMA, 2014). The finite nature of land has been subjected to population pressure, coupled with inappropriate technologies of soil and water conservation, waste management, physical planning among other environmental technologies. Thus, land resource areas like forests and wetlands are being opened up for settlement and farming especially to increase cultivated land area. Over the years, cultivated land has been increasing except for 2013 when it slightly dropped from 72.1 percent in 2012 to 71.9 percent in 2013 (World Bank, 2015). Agricultural land decreased from 99,703.1 km² in 2005 to 91,151.8 km² in 2010; and built up land area increased by more than ten-fold in the same period (UBOS, 2014).

This section outlines information on land as a resource, agriculture, biodiversity, and forest and woodland resources. Trends in the state of each resource, challenges and threats to resource management, and policy recommendations have been outlined. First, the nature of administration of land in Uganda is recounted.

8.2 Land Administration

In this section, pertinent issues concerning the land resources in Uganda are discussed. These include land holding highlighting the main land tenure systems and how they affect development; land use, emphasizing physical planning and how it relates with rural and urban development; and land administration, looking into the legal, policy and regulatory frameworks pertaining to the land question. The subsection underscores current trends and the justification for the same, the impacts in relation to sustainable development, the responses to the situation at hand and proposals for policy recommendations.

Land holding basically is the ownership of land. It defines the rights to transfer the land to someone else and is a key factor for development. The type of land tenure and ownership determine the type of investment, even type of crop to be grown. It will influence one's ability to access credit for investment. Land tenure defines the rights of use and ownership over land. Uganda's legal framework (the Constitution of 1995 and the Land Act Cap 227) has classified land tenure in terms of the legal regime and the quantum of rights held. There are thus four tenure categories: customary, freehold, mailo and leasehold tenure (MoLUD 2013). To date, only 20 percent of the land is titled and the balance is under customary tenure system (NPA, 2013).

Trends in creating land tenure security

Security of tenure has been an ongoing problem with land related disputes resulting in losses of up to 11 percent of the total value of agricultural output. However significant conversion of land from customary to freehold (table 8.1) seems to have increased security of tenure for agriculture especially in areas that were predominantly under customary tenure (UBOS, 2012). The freehold system also enhances access to other factors of production such as financial credit with opportunities for wealth creation and food security.

Table 8.1: Maximum and Minimum area (hectares) converted to freehold in selected districts in 2011 (Source: UBOS, 2012)

Land use	Apac		Arua		Lira		Gulu	
	Max	Min	Max	Min	Max	Min	Max	Min
Commercial	0.87	0.04	2.06	0.04	42.18	16.00		
Residential	27.34	0.06	193.00	0.04	183.28	29.00	2.59	0.03
Farming	160.16	5.45	91.98	0.49	993.31	824.00	350.00	15.50
Institution	11.00	0.08	24.14	0.18	112.92	22.02	176.09	0.14
Residential/ farming	20.73	5.34	-	-	115.78	87.64	5.23	0.30

There is increased evidence of tenure security on mailo land. For instance in central Uganda where mailo land system dominates, the number of title transfers increased by 32.4 percent between 2007/08 and 2010/11. Further, there was an increase in the number of Mailo Special Certificates from 457 to 1,083 between 2007/08 and 2010/11, respectively, as shown in figure 8.1 (UBOS, 2012). A Mailo Special Certificates is the certificate of title that is issued at the request of the owner of the land if their copy is lost or destroyed. Increased tenure enhances good land management practices, land use planning and builds resilience in the face of disasters.

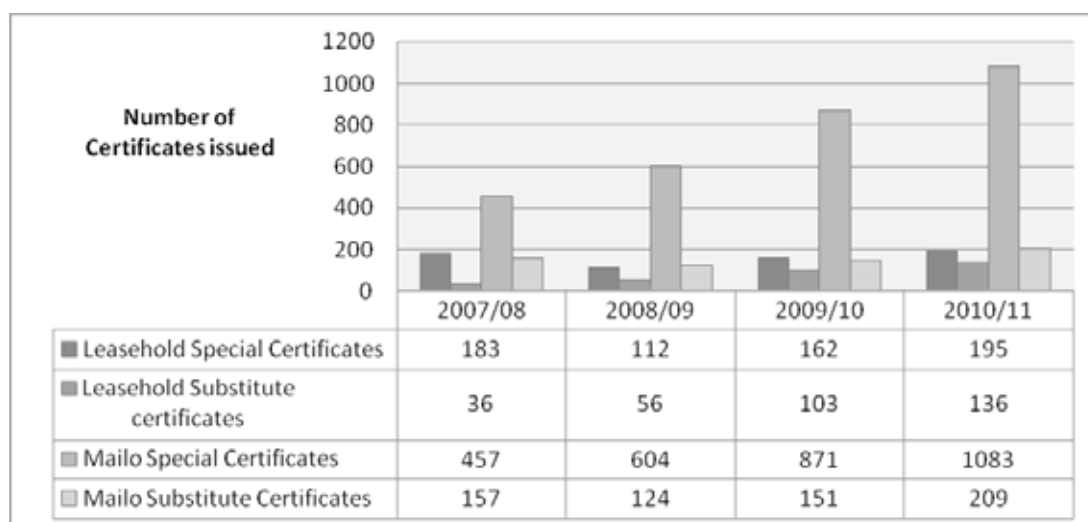


Figure 8.1: Special certificates issued between 2007/08 and 2010/11 (Source: UBOS, 2012)

Challenges in land tenure security

The main reasons causing insecurity in land tenure are weak institutions for land management administration. Although the legal framework is in place, it has not managed to address issues of land use and land rights, including gender rights in relation to ownership, and access to and control over land resources.

Women, for instance, remain largely marginalised (see chapter 2). The institutional weaknesses undermine the enforcement of the laws, especially within the fragile ecosystems like wetlands and mountains. For example, issuance of land titles in wetlands by government agencies such as land commission, local governments and urban authorities is common. Some policy recommendations to address these challenges are highlighted in box 8.1.

Box 8.1: Policy strategies to address land administration challenges

1. Implement measures to achieve improved compliance with land use laws, regulations and policies.
2. Introduce a land tax to encourage efficient land use, efficient and sustainable urbanization.
3. Ensure compliance with local development plans and regulations by strict law enforcement.
4. Extend development of the Land Information System to strengthen the coordination of land registration and physical development.
5. Strengthen institutional capacities for physical planning, including through the provision of training.

Land use

Land use information provides answers to a number of concerns including the following: the purpose of activities undertaken, for instance the specific products and services that are sought; the geographic location and extent of the spatial unit under consideration; the temporal aspects of various activities undertaken, the technologies employed, irrigation and labour; the quantitative measures such as areas and products; and the reasons underlying the current land use such as land tenure, labour costs and market conditions.

Land use processes involve both a production and a conservation component. Sustainable use and management of land is usually guided by both a land use plan and a physical development plan. Whereas implementation of a land use plan ensures that the natural potential of land is harnessed sustainably, the physical development plan, which is a design for an area or part of an area, guides placement of developments within the area. This ensures sustainable land management, planned urban and rural development and decent housing for all. These issues are discussed in detail in Section 2.

8.3 Agricultural Development

Introduction

Compared to other sectors, the agriculture sector has the highest total Gross Domestic Product (GDP) at 20.9 percent, with women and children providing about 82 percent of the labour requirement (UBOS, 2014). However, over the past years, contribution of agriculture to GDP has registered a decline. In 2010 it had reduced to 23.8 percent from 44 percent in 1999. The decline is attributed to fluctuating prices and quality of coffee and tobacco.

Agriculture employs about 80 percent of the rural population which is 81.6 percent of the national population (UBOS, 2014).

Land fragmentation, lack of land tenure security, especially for women farmers and the absence of a comprehensive national agriculture policy are major limitations facing the sector (MLHUD, 2013). Poor agricultural practices have resulted into increased land degradation as a result of soil erosion, deforestation, overgrazing and water contamination among others.

Agricultural performance

The indicators of agriculture performance include land ownership and utilization, planted area, yield and production, amounts of external input used, use of labour, agricultural prices, and livestock and poultry size and contribution to GDP. The contribution of agriculture (crop and livestock), forestry and fishing activities to total GDP current prices dropped from 25 to 24.6 percent between 2013 and 2014 respectively. The value added outputs of the agricultural activities, including cash crops, food crops, agricultural support activities, livestock, forestry and fishing, increased from 2.7 to 3.0 percent between 2013 and 2014 respectively. Over the seven years analysed, fishing showed the greatest fluctuations (figure 8.2).

The food crops subsector, which accounts for over 50 percent of the agriculture enterprises grew by 3.8 percent in 2014. Food crops growing activities contributed to 12.4 percent of GDP at current prices in 2014 compared to 12.2 percent contribution in 2013, implying that the country was food secure during 2014.

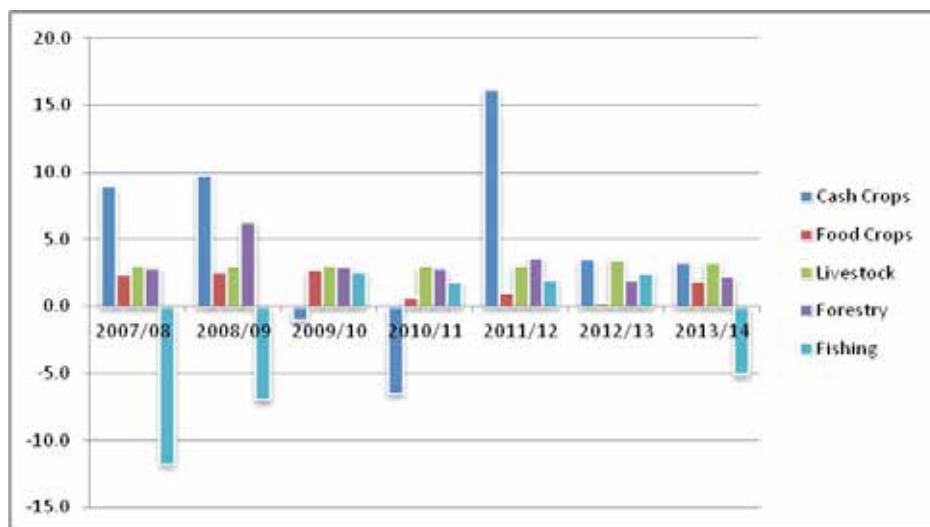


Figure 8.2: Percentage change in GDP by the Agricultural Sector
(Source: MFPED, 2012 and MFPED, 2014b)

Performance of extension services

The total amount spent on extension services increased from 62.3 to 75.3 percent between 2012/13 and 2013/14. At the institutional level, National Agricultural Advisory Services (NAADS) and the Uganda Coffee Development Authority (UCDA) increased by 69 and 183 percent respectively (Table 8.2).

Table 8.2: Financing of extension services - FY 2012/13 to FY 2013/14 (UShs. 1 000 million)
(Source: MFPED, 2014; MFPED, 2013; IFMS; Various Budget Monitoring Reports)

Institution	FY 2012/13			FY 2013/14		
	Approved	Release	Spent	Approved	Release	Spent
DDA	1.43	1.43	1.39	1.53	1.33	1.30
KCCA	1.35	1.11	0.75	1.35	1.30	1.30
LG NAADS/ General Extension	150.50	145.86	145.86	150.7	148.56	149.56
MAAIF	22.61	21.32	18.36	28.91	25.83	25.83
NAADS Secretariat	52.91	42.71	42.45	47.12	74.07	71.73
UCDA	2.75	2.75	2.72	7.75	7.75	7.75
UCDO	0.88	0.88	0.88	0.69	0.69	0.69
Total Extension (GoU)	232.43	216.06	212.41	238.05	259.53	258.16
Total GoU and donor sector budget	433.92	374.46	340.90	382.79	345.14	342.76
Percent Extension of total sector budget	53.60	57.70	62.30	62.20	75.19	75.30

Crop production

An analysis of land under crop categories in 2012 indicates that apart from the area under bananas, the acreage under all other crops increased over time. The area under cereals increased the most followed by root crops (figure 8.3). In terms of production, bananas and the root crops show the greatest variation in production over the years (figure 8.4).

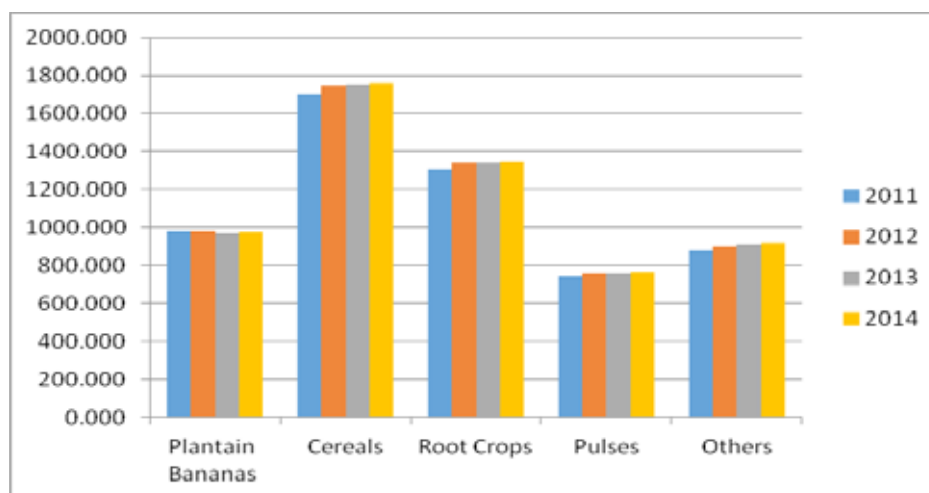


Figure 8.3: Change in area (000 Ha) planted for the period of 2011 to 2014 (Source: UBOS, 2014)

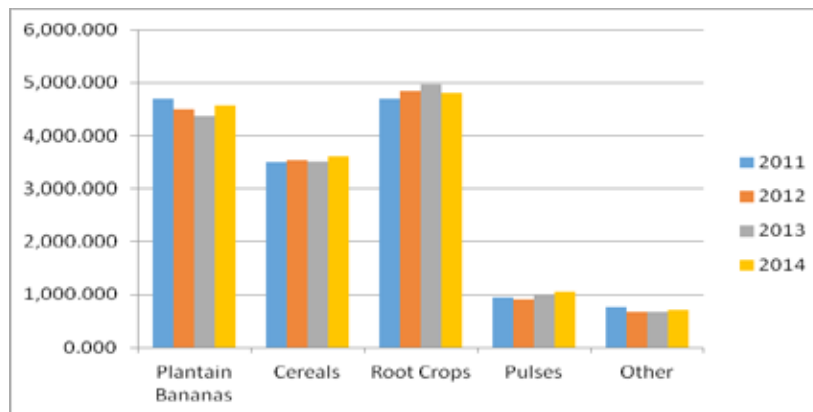


Figure 8.4: Production (Mt), Acreage (Ha) and Yield (Mt/Ha) for various crops (1000 tonnes) (Source: UBOS, 2014)

Livestock

The number of livestock has been increasing steadily since 1990. The data shows that the chicken population fluctuated greatly between 2002 and 2014 (figure 8.5). Livestock numbers are important because it is important to match the land carrying capacity to the farm size to avoid irreversible land degradation.

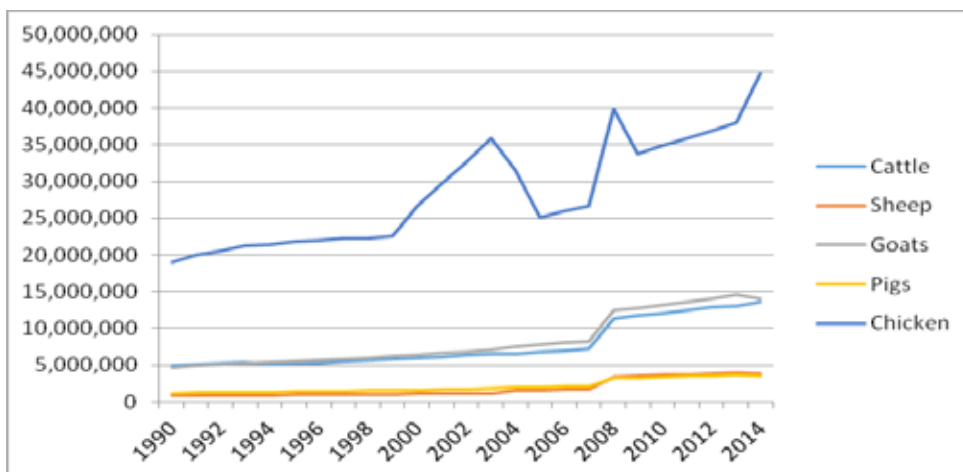


Figure 8.5: Trends in livestock population 1990 to 2014 (Source: UBOS, 2014)

Sustainable land management

Sustainable Land Management (SLM) is the use of land resources, including soils, water, animals and plants, for the production of goods to meet changing human needs, while simultaneously ensuring the long-term productive potential of these resources and the maintenance of their environmental functions (UN Earth Summit, 1992). This is aimed at promoting human coexistence with nature while ensuring that the provisioning, regulating, cultural and supporting services of ecosystems are maintained

Piloting SLM in the districts

A number of institutions have supported government to carry out SLM projects in various parts of the country. FAO (2012) supported the Kagera Transboundary Agroecosystem Management Project (Kagera TAMP) between 2010 and 2015 in Kabale, Mbarara, Ntungamo, Isingiro, Kiruhura and Rakai districts. UNDP worked in the cattle corridor districts of Sembabule, Lyantonde, Nakaseke, Nakasongola, Kamuli and Kaliro between 2010 and 2014.

The SLM project in the cattle corridor carried out under UNDP provided land users and managers with the enabling policy, institutional and operational environment for effective adoption of SLM and it led to mainstreaming and Implementation of SLM activities into the budgets and development plans for 2 districts and 2 Sub Counties. Further SLM was integrated into 210 Parish Environment Action plans (PEAPs), 30 Sub County Environment Action Plans and 4 District Environment Action Plans (DEAPs). Some of the priority actions identified and implemented included water harvesting and conservation farming, capacity of district staff was built through training, installation of equipment such as rain gauges and monitoring of natural resources (UNDP, 2014).

Impacts of SLM in the pilot districts

Some of the outcomes have included restoration of degraded lands, agro-biodiversity conservation, sustainable use of the land resource, and improved agricultural production. This has led to increased food security, improved rural livelihoods, and protection of the Kagera River water resource. One of the major approaches was the adoption of farmer field schools to share knowledge and best practice even after project end. This process also resulted in improved documentation. This generated knowledge on SLM management and led to adoption of SLM technologies and approaches at the local and national level.

There were a number of challenges faced. There was a high level of negotiation skills required by the District Environment Officers while lobbying District Council members to adopt SLM activities. The SEAP and DEAP development processes generated high expectations amongst the communities which the project could not meet. Environment issues should not be addressed in isolation, but rather integrated to the sustainable development issues that are of importance to the community. Lastly, it was a challenge to balance the interests of pastoralists with those of crop based groups.

The SLM country program

The government has now embarked on a major SLM program focusing on the South western and Eastern Highlands, Lake Victoria Crescent Region, the Cattle Corridor, Eastern and Northern Uganda. The cattle corridor was selected because livestock is a major contributor to the national GDP (7.5 percent) and the cattle corridor holds over 80 percent of the national cattle herd. The main driver of land degradation in the cattle corridor are overgrazing, which has led to soil compaction, erosion (especially gully erosion), emergence of low-value or unpalatable grasses and in some instances some areas have become bare. Tree density has also declined in parts of the cattle corridor due to extensive deforestation for charcoal production and grazing. This region is also susceptible to impacts of climate change and variability.

The northern and eastern regions were selected because the north is still recovering from civil strife and both areas have high potential of being a grain basket for the country and thus contributing to the national GDP. Low soil fertility, soil nutrient depletion, increases in floods and droughts due to climate change, wetland reclamation are some of the drivers and impacts of land degradation in eastern Uganda. In northern Uganda, the main driver is rapid ecosystem dynamics due to resettlement.

Food security

Agriculture intensification is both an advantage and a disadvantage to the rural communities in Uganda. Communities either clear forest or wetlands posing a threat to biodiversity conservation, or convert subsistence agriculture areas to commercial farming areas posing a threat to food security.

Box 8.2: Sugar cane plantations: A threat to food production in Eastern Uganda

Sugar cane plantations: A threat to food production in Eastern Uganda

Sugar cane growing is one of the most popular plantation crops in Eastern Uganda. This has led to big chunks of land being converted from subsistence agriculture for food to sugar cane growing. Although it is a viable business for those that own adequate land, it may result into food insecurity since many families use the arable areas for sugar cane and then seek out for either marginal land or degraded areas for food crop growing. The total land area in Busoga is approximately 1,9981Km² and agricultural land is 7,992km². Kakira Sugar limited being a model leading manufacturer in the region covers 97.12km² and out growers cover approximately 291.37km². With many other sugar factories coming up in the area, there is already a great impact to crop production.

Box 8.3: Rice growing: Supporting food security in Eastern Uganda

Rice growing: Supporting food security in Eastern Uganda

Uganda has, in recent years experienced increased rice growing due to existence of favourable policies and availability of good market prices. This has stimulated large private investment in the rice sector. The increase in rice production has led to a reduction in rice imports thus saving the government about US\$30 million in foreign exchange earnings (<http://irri.org/rice-today/uganda-blazing-a-trail-to-rice-success>). The area coverage of upland rice nearly doubled from about 80,000 to 150,000 ha between 2002 and 2011 respectively. Paddy rice production also increased from 120,000 to 220,000 tons from 2002 to 2011 respectively (Mohapatra 2013). The entire production chain for the rice industry in the country has grown from the production of improved seed to marketing at all levels (Sasakawa Global, 2000 in Mohapatra, 2013).

Challenges facing the sector

Crop diseases, lack of agricultural inputs, climate change, misdirected focus and negative impacts are some of the challenges facing this subsector.

Crop diseases

Production statistics are greatly affected by crop diseases. The most dominant disease for bananas was the banana bacterial wilt, recording 45.2 percent. For cassava, the most widespread disease is the cassava mosaic disease at 58.5 percent. Figures 8.6 and 8.7 show the trends in the occurrence of these two disease in the main crop growing areas. Other diseases include 16.8 percent cassava brown streak disease, maize stalk borer 26.4 percent, leaf spot and fruit fly on citrus 29 percent (MAAIF, 2015). Interventions by government are contributing to a decline in some of the diseases such as banana wilt and cassava mosaic. There are also proposals to introduce a formal cassava seed system to try and contain the spread of the cassava mosaic disease.

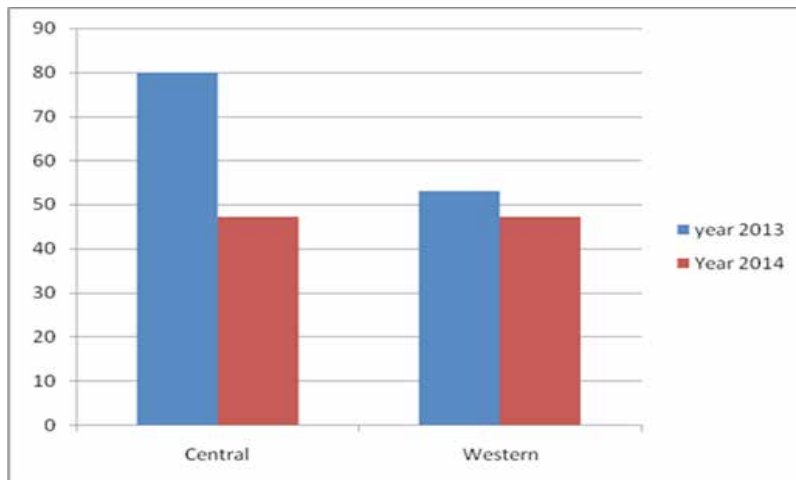


Figure 8.6: Percentage encounter of BBW in the main banana growing areas (Source: MAAIF, 2015)

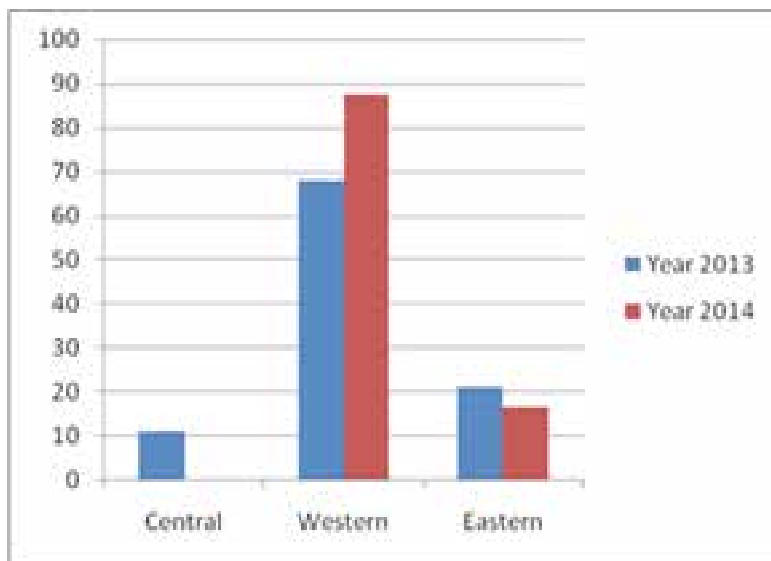


Figure 8.7: Comparison of Cassava mosaic disease (CMD) recorded in 2013 and 2014 (Source: MAAIF, 2015)

Agro inputs

Agro inputs are another constraint to crop yields is limited access to inputs like fertilizers, knowledge on application and clean planting materials, pests and disease control challenges, low and sometimes lack of advisory services, post-harvest losses, and low market for the products. Other than agro inputs reduction of agricultural production and productivity is the rural-urban migration where the men leave behind the women and the elderly to carry out agriculture production.

Opportunities to improve agriculture

Integration of climate change and gender into local government policies

The current Local Government budgets and policies include issues of climate change and gender at all levels of agricultural development. Local Governments have also tried to improve social amenities that are within the farmers' boundary in an attempt to discourage migration to urban areas. These include schools, health centres, provision of planting material through NAADS and improved access to agricultural loans. There is also an ongoing recruitment of extension workers at sub county level, and establishment of warehouses to improve storage and marketing of agriculture products.

Reversing land degradation through gender based interventions

To reduce land degradation, several initiatives have been implemented. These include the implementation of the land registration system by MHUD, which is aimed at improving access, control and right over use of land. Farmers groups have been the basis for extension services in NAADS where farmer field schools and demonstration sites have been set. Women have equal rights to gardens and to marketing of their produce. These rights of ownership are set by the farmers groups. Animal traction and mechanization have also been redistributed according to the agro-ecological zones.

Increasing productivity

Funding for research has been increased aimed at improving the technologies to counter agricultural challenges such as disease and pest, increase acceptability and use of labour saving technologies like the use of herbicides. The sustainable land management technologies for both soil and water management such as low or no till and minimum tillage farming methods have been introduced to greatly boost crop production and market driven approach have availed farmers opportunity to access loans and markets.

Policy recommendations

In addition to the National Land Use policy, a land use plan and soil information are important instruments for use in guiding agricultural planning and decisions. There is, therefore, need to expedite the soil mapping process being carried out by KARRI.

8.4 Biodiversity: Fauna

Introduction

Biological Diversity (also referred to as biodiversity) is defined by the National Environment Act Cap 153 as the variability among living organisms from all sources including, inter alia, terrestrial ecosystems and aquatic ecosystems and the ecological complexes of which they are part, this includes biodiversity within species, between species and ecosystems". The Convention on Biological Diversity (CBD) to which Uganda is a Party defines biodiversity as "the variability among living things from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems. Forests, wetlands, rangelands, wild plants and animals, domesticated animals (livestock) and crops, birds, fish are all biodiversity at ecosystem and species level.

Uganda is an exceptionally important biodiversity area Surveys report the occurrence of 18,783 species. Although the country has a surface area of just 241,551 Km² and accounts for only 0.18 percent of the worlds terrestrial and freshwater surface area,

Uganda is host to a good proportion of globally recognised species: 4.6 percent of dragonflies, 6.8 percent of the butterflies, 7.5 percent of mammals and 10.2 percent of birds. There are more primate species per area in Uganda than elsewhere on Earth (USAID, 2008). Kibale National Park (795 Km² has 12 species of primates; while Bwindi Impenetrable Forest National park and Kibale National Parks together have 173 species of polypore fungi (16 percent of the total species known in North America, Tropical Africa and Europe) (Winterbottom and Eilu, 2006).

This high level of biodiversity is a function of Uganda's location in the Eco zone between the drier East African savannahs and the more moist West African rain forests, accompanied with large differences in elevation and an extraordinary array of terrestrial and aquatic habitats (USAID, 2008).

Biodiversity at ecosystem level: terrestrial and aquatic

Uganda is a country of exceptional biological diversity, encompassing a zone of overlap between the savannahs of East Africa and the West African rain forests. Natural forests and woodlands together cover an area of nearly 50,000 km² while wildlife protected areas cover approximately 11% of Uganda's land surface. Uganda has 10 National Parks, 12 Wildlife Reserves, 10 wildlife sanctuaries, 5 community wildlife areas, 506 central forest reserves, 191 local forest reserves and 12 Ramsar Sites.

Open water resources cover up to 17% of the country's surface area comprising of five major lakes; Victoria, Albert, Kyoga, Edward and George, about 160 minor lakes and an extensive river system. Wetland ecosystems constitute those areas with impended drainage, swamp forests, papyrus and grass swamps. Wetland ecosystem coverage is estimated at approximately 10.9 % from 13 % (which was approximately 30,000 km²)¹. In 1900 Uganda's forest cover stood at 50% of the total land cover equivalent to 12.1 million ha later reducing to 4.9 million ha in 1990 and further down 3.6 million ha in 2005. It was estimated that by 2012, given the rate of loss of forest, the forest cover was 2.97 million ha. The table below summarizes this information.

Table 8.3: Trends in the rate of loss of forest cover based on the above information (Source: NEMA, 2014)

Year	1900	1990	2005	2012
Area under forests (Million Ha)	12.1	4.9	3.6	2.97
Percentage of total land area	50	24.1	17.6	14.5
Forest loss since 1900 (Million Ha)		7.2	8.5	9.1
Average Annual loss (Ha)		80,000	87,000	90,000

Despite the estimated annual rate of forest loss being 80,000ha/ha for the period 1900 and 1990, it is believed that most of the forest loss could have happened between 1970s and early 1980s during political instability and lawlessness. However the trend as can be seen from the table above between 1990 and 2012, there is consistent increase in forest loss despite the prevailing political stability mainly due to population increase and its related pressures. It is estimated that 60,000 ha over the last 10 years which is less than current rate of loss estimated to be between 87,000-90,000 ha annually.

1

Although the forest sector is facing challenges as pointed out above, there is opportunity to address the challenges both at the strategic and operational level. At the strategic level, His Excellency the President of the Republic of Uganda launched the National Vision 2040 on 18th April 2013. Under Vision 2040, the people of Uganda desire a green economy and clean environment where the ecosystem is sustainably managed

Vision 2040 provides for the following interventions for Environment and Natural Resource (ENR) sector:

- i) Expounding on the policies, laws, regulations and standards to guide the management of the environment;
- ii) Pursuing green economy as a tool for sustainable development and utilization of natural resources;
- iii) Restoration of degraded ecosystems (wetlands, forests, bare hills, rangelands among others); and
- iv) Cooperation with international institutions and CSOs in Environmental management and strengthening institutional framework for the management of ENR sector.

Biodiversity at taxa level

In this section we assess the status and trends of various taxa for which adequate data was available.

Large mammals

Large mammal counts have been carried out in protected areas for over 50 years. Table 8.5 shows the variation in animal numbers over the years. Whereas some mammals like the Burchell's zebra and the Impala have stable and viable populations, others like the Hippo and the Rothschild's giraffe are decreasing. There are also a number of animals whose population is increasing and some that are recovering. The Uganda Kob has registered continuous increase since the 2004-2006 survey period; while the Buffalo and Hartebeest registered increases in the 2011-2014 period.

Table 8.4: Abundance of large and medium mammals found in protected areas in Uganda (Source: UWA, 2014)

Species	1960s	1982-1983	1995-1996	1999-2003	2004-2006	2007-2010	2011	2011-2014	Status in Uganda
Buffalo	60,000	25,000	18,000	17,800	30,308	21,565	21,639	36953	Population increasing
Burchell's Zebra	10,000	5,500	3,200	2,800	6,062	11,814		11888	Population stable
Elephant	30,000	2,000	1,900	2,400	4,322	4,393		5346	Population increasing
Rothschild's giraffe	2,500	350	250	240	259	984		880	Population decreasing
Hartebeest	25,000	18,000	2,600	3,400	4,439	4,099	4,001	9667	Population increasing
Hippo	26,000	13,000	4,500	5,300	7,542	6,580		5838	Population decreasing
Impala	12,000	19,000	6,000	3,000	4,705	33,565		33565	Population stable
Topi	15,000	6,000	600	450	1,669	845		2222	Population increasing
Uganda kob	70,000	40,000	30,000	44,000	34,461	54,861	54,080	77759	Population increasing
Common Eland	4,500	1,500	500	450	309	1,409		1351	Population decreasing
Bright's gazelle	1,800	1,400	100	50			57	55	Population precarious but recovering
Roan	700	300	15	7		5	20	Data not available	Population precarious but recovering
Oryx	2,000	200	0	0	0	0	0	Data not available	Extinct in Uganda
Black Rhino	400	150	0	0	0	0	0	0	Extinct in Uganda
Derby's eland	300	0	0	0	0	0	0	Data not available	Extinct in Uganda
Northern White Rhino	300	20	0	0	0	0	0	0	Extinct in Uganda
Eastern Black Rhino	400	150	0	0	0	0	0	0	Extinct in Uganda
Southern White Rhino					8	11	14	17	This is a breeding population at the Rhino Sanctuary and it is increasing

Note: Data used in this section was obtained mainly from aerial surveys. For the earlier years (the 1960s) ground counts were the main means of obtaining data.

Small and medium mammals

Small mammals found in Uganda include Bats, Insectivores, Rodents, Pangolins, Mustelids, Viverids, Hyraxes and primates. The abundance of these has greatly reduced. For instance, the number of straw-coloured fruit bats has reduced drastically around Kampala. There were over 200,000 individuals in the 1960s and by 2008 there were less than 20,000. One of the main threats is habitat loss. A number of the species have been ranked as either endangered (EN) or vulnerable (VU) under the IUCN categorization. According to the IUCN categorization 12 small mammals are ranked as vulnerable and 3 small mammals are ranked as endangered at the global scale (Table 8.5).

Table 8.5: Conservation status for some threatened species of small mammals (Source: Personal communication – Dr.Kityo Robert)

Order	Genus	Species	Common name	IUCN threat level
Insectivora	Myosorex	Blarina	Ruwenzori Mouse-shrew	EN
Insectivora	Ruwenzorisorex	suncoides	Osgood's Montane Shrew	VU
Insectivora	Sylvisorex	Lunaris	Long-tailed Forest Shrew	VU
Microchiroptera	Rhinolophus	ruwenzorii	Rwenzori Horseshoe Bat	VU
Pholidota	Manis	gigantea	Giant Pangolin	VU (A4d)
Pholidota	Manis	temminckii	Ground Pangolin	VU (A4d)
Pholidota	Manis	tetradactyla	Long-tailed Pangolin	VU (A4d)
Pholidota	Manis	tricuspis	Tree Pangolin	VU (A4d)
Rodentia	Delanymys	brooksi	Delany's Mouse	VU
Rodentia	Otomys	barbouri	Barbour's Vlei Rat	EN
Rodentia	Dasymys	montanus	Montane Marsh Rat	EN
Rodentia	Hybomys	Lunaris	Ruwenzori Striped Mouse	VU
Rodentia	Praomys	degraaffi	De Graaff's Praomys	VU
Rodentia	Thamnomys	Kempi	Kemp's Forest Rat	VU
Rodentia	Thamnomys	venustus	Montane Forest Rat	VU

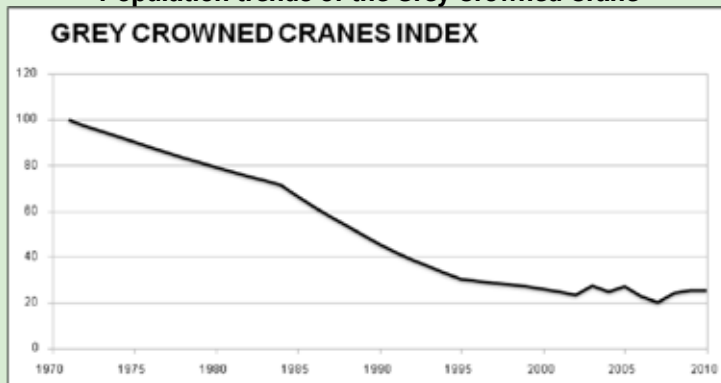
Birds



The population of Uganda’s national bird, the Grey-crowned Crane *Balearica regulorum*, has plummeted by 80% since the 1970s. Its population has reduced from more than 35,000 birds in the 1990s to less than 13,000 individuals by 2010. The Grey Crowned Crane is also on the decline globally and is listed as Endangered on the IUCN Red List.

In Uganda, its habitat (seasonally flooded wetlands) is seriously degraded and quickly disappearing. However, they are also under threat from illegal trade, use in witchcraft and domestication. Although records since 2000 show signs of recovery due to increased public awareness, there is need to develop a national species action plan that will protect the species.

Population trends of the Grey Crowned Crane



Source: Nature Uganda 2014



Grey Crowned Crane (Photo credit: Achilles Byaruhanga, Nature Uganda)

Wetlands as habitat for birds

Wetlands are by far the most critical habitat for migratory birds in Uganda, although they are also found in non-wetland sites. However, despite the importance of wetlands as vital habitats for migratory species, they are amongst Uganda’s most threatened ecosystems mainly due to conversion for agriculture, livestock and settlements. The reduction in wetland habitats is correlated with the sharp declines in many migratory species. It is thus critical to maintain the countrywide network of critical wetland sites in order to safeguard the migratory birds.

Transformed wetlands, such as Doho and Kibimba rice schemes, have become good opportunistic feeding grounds for birds and if the changes are permanent, may become important sites for water birds. The Kibimba Rice Scheme was identified as an Important Bird Area (IBA) in 2012 and is an important habitat for species including herons, egrets, Ibises, cranes and many waders. Over the last decade, the number of species and individuals has been increasing especially the Palearctic migrants such as Eurasian Curlew.

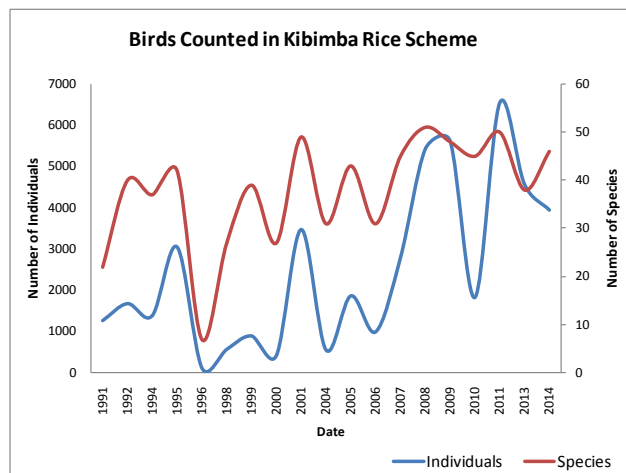


Figure 8.8: Trends in the number of species and number of individuals recorded in Kibimba Rice Scheme during the period 1991 – 2014 (Source: Nature Uganda, 2014)

8.5 Impacts of Urbanization on Bird Populations

Urbanization is a growing phenomenon in the country and this is affecting the bird population of urban areas. The birds found in urban areas are predominantly exotic and ever-present species such as Rock Pigeons and House Sparrows, but increasingly a number of indigenous species have adapted to life in urban centres. Species that were once common in towns are retreating as roads, factories and houses are built over swamps and hillsides reducing available habitat. Many small passerines such as waxbills, buntings and canaries which rely on scrub cover for nesting have been negatively impacted with numbers in sharp decline. Similarly, birds which require undisturbed habitats such as papyrus swamps have all disappeared as their papyrus homes have been converted. Such species include the Papyrus Gonolek and the White-winged Warbler.

Other species have adapted and benefited from new feeding opportunities. Birds such as the Marabou stork, pied crows and Black kites thrive on the increasing amount of food found in rubbish skips in town centres. Kampala is said to have the biggest breeding population of Marabou storks in the world. The Marabou's are an indicator of environmental quality as they thrive in urban areas where waste management is poor.

8.6 Status of Bird Populations in Protected Areas

More bird species occur outside protected areas than inside the protected area networks. In Uganda, this is especially true with water birds because the protected area network does not contain many wetland areas. Even in circumstances where water bodies appear to be in a National Park, they may not fully be under the jurisdiction of the protected area management. For instance, although Lake Mburo is within Lake Mburo National Park (LMNP), its waters are open access except for a small strip of shoreline. The same applies to Kazinga Channel in the Queen Elizabeth National Park (QENP). Despite this, analysis of key indicator species (Pied kingfishers and Fish eagles) in Lake Mburo (LMNP), Queen Elizabeth (QENP) and Murchison Falls (MFNP) National Parks and Kyambura Wildlife Reserve show that the status of populations of water birds in protected areas is comparable to the populations of same species outside protected areas. For example, 88 percent of the total numbers of all pied kingfisher individuals recorded during water bird counts were from PAs while with the Fish eagles it was 83 percent (Nature Uganda, 2014). This is an indication that human activities have a very big impact on the status of species even where there is no direct competition. However, these results highlight the critical importance of PAs and impact of human activities on biodiversity loss.

8.7 Conservation Action for Protection of Birds

Collaborative Forest Management (CFM)

Collaborative Forest Management or co-management of forests by the National Forest Authority (NFA) involves local communities in forests monitoring and management and encourages income-generating activities such as ecotourism both in and around the forest. Interventions such as soil and water conservation are also promoted to support livelihood activities such as increased agricultural production. For instance, Bakiga, Bafumbira and Batwa community members adjacent to Echuya Forest Reserve have been supported by Nature Uganda to conserve the reserve; and similar activities have been employed in Kasyoha-Kitomi Forest Reserve and other critical forests. This has resulted in more regulated access to forest products under established CFM agreements, improved community attitude towards the forest and a better sense of community ownership.

Site Support Groups (SSGs)

Another approach that has been employed is that of Site Support Groups (SSGs) or Local Conservation Groups. These are alternative entry points for community conservation. SSGs are active at Echuya FR, Lake Opeta, Lake Bisina, and Lake Katwe, Lutembe Bay, Mabamba Bay and Musambwa Island. They play different roles depending on the local context and available natural resources. Some of the interventions include natural resources management training, tourism development and alternative livelihoods promotion.



One of the rare frogs' species encountered in the Albertine Graben
(Photo credit: WCS)

Woody plants

Actual numbers of woody plant species abundance countrywide has not been recently estimated. So the change in 'natural' vegetation cover, especially forest cover (tropical high forest and woodlands), will be used as a proxy for the change in woody plants. Forests are the main stores of biodiversity. Forest cover has been consistently declining with the forests outside protected areas declining more than forests within protected areas. The rate of decline of forest cover has been at 1.8 percent per year (NEMA, 2012), equivalent to 2.2 percent in private forests and 0.9 percent in Protected Areas.

The drivers of forest loss (and indirectly biodiversity decline) include agricultural expansion (subsistence and commercial), charcoal burning, illegal timber and wildlife harvesting, urbanisation, industrialization and infrastructure development. Although additional forest cover has been realized over the years through increased tree planting efforts, the mainly monoculture planted forests are less diverse than the natural cover vegetation they replace. Tree diversity, as well as biodiversity including mammals, birds and butterflies, has in turn been lost over time. Forest loss outside protected areas has been mainly attributed to conversion of forests to agriculture and over-harvesting of wood for fuel wood and charcoal (NFA, 2011).

Valuation of biological resources

One of the challenges of conservation and accessing funding for biodiversity conservation is the lack of information on the economic value of the biological resources. However there are efforts to value some of the biological resources as highlighted below.

Wetlands

A recent assessment of the total economic contribution of wetlands in three agro-ecological zones in Uganda produced updated results on the per hectare net benefit of wetlands. For the three agro-ecological zones of the south western farmlands, Lake Victoria crescent and the Kyoga plains, the net economic benefits of wetlands was valued at \$11,358, \$10,388 and \$10,948 per hectare per year, respectively (Kakuru, et al, 2013). Although wetland degradation is taking place, there is inadequate quantitative data to back it up. Wetland assessment has been carried out in piece-meals and so the national inventory has not been fully updated. Rates and type of degradation differ between urban and rural wetlands. This has over time resulted in reporting different figures over the same years.

Forestry

Forest contribution to biodiversity conservation services takes into account both stocks and flows of biodiversity from Uganda's forestry resources. The total annual contribution of forest biodiversity to the national economy was estimated at \$154.8 million (NEMA, 2012; Masiga et al, 2013).

Threats to biodiversity

Habitat destruction and degradation

Habitat destruction and degradation is one of the greatest threats to biodiversity. It occurs due to a range of actions including clearing of forests for other activities like agriculture, infrastructure development and industrialization. Degradation is due to pollution of natural resources and selective extraction of resources.

Invasive and exotic species

Invasive species are species of plants, animals or other organisms introduced to areas outside their natural distribution. They are believed to be the second most significant cause of species loss after habitat destruction. Many of them are quick colonizers and if not managed, increase in distribution and density, and eventually cause greater impacts and require more resources to control their spread. They threaten the natural environment, economic development and biodiversity by alteration of ecological structures and functions, including reduction of overall habitats and species abundance, and richness. The invasive species also reduce the recreational and community values of the protected area systems consequently impacting economic and social values. The invasive species that currently pose a threat to biodiversity include *Acacia hockii* in Lake Mburo National Park. Other species include *Cassia senna*, *Lantana camara*, *Dichrostachys cinerea* and *Imperata cylindrica*.

Human wildlife conflict

Human-wildlife conflicts mainly occur due to crop raiding and killing of livestock. For example, a total of 90 problem animal cases were reported to UWA between 2014 and 2015. Out of these, 83 (92 percent) were attended to while seven 7 were not.

Strategies to improve biodiversity management

Although there exists IUCN conservation status categorization of species, there has not been a comprehensive list of this categorization at the national level. Efforts are now under way to develop these lists for woody plants, birds, mammals (large, medium and small), amphibians, reptiles, dragonflies and butterflies. Also a partial list for fish species is being developed. Other initiatives are both at ecosystem and species level.

Specific taxa/ecosystem programmes

Birds

Various actions to ensure conservation of bird species have been established. These include development and implementation of action plans including monitoring programs. Details of species under each activity are shown in Table 8.6.

Table 8.6: Activities set up to support conservation of some of the species of conservation concern

Species with International action plans	Blue Swallow
	Grey-crowned Crane
	Grauer's Swamp Warbler
	Lappet-faced Vulture
	Shoebill
	Lesser Flamingo
	Madagascar Squacco Heron
Species with National Action plans	Blue Swallow
	Grey-crowned Crane (soon)
Species with projects implemented	Grauer's Swamp Warbler (Current)
	Shoebill (Current)
	Grey-crowned Crane
	Fox's Weaver (Current)
	Lesser Flamingo
	Blue Swallow
Bird Monitoring Programmes by Nature Uganda	Land birds Population Monitoring (BPM)
	Water birds Monitoring
	Provisional Carcass Vulture Counts
	Kampala Vulture Counts
	Raptor Counts

Wetlands

Conscious effort is being made to conserve wetland biodiversity. Since 2008, 2.4 percent of wetlands in Uganda have been rehabilitated. Sites or sections of 56 wetland systems have been restored including Nakivubo, Nyaruzinga, Namatala, Kirinya, Bushenyi, Kyetinda, Kasanga, Walukuba and Lubijji wetland systems. About 0.7 percent of wetlands are under community management-planning spearheaded by community efforts, Local Governments and the Wetlands Management Department. Table 8.7 highlights some of the efforts being carried out. The Department of Wetland Management has also developed plans to enhance biodiversity in wetland areas.

Table 8.7: Two examples of effort being carried out to conserve wetlands in areas managed by UWA (modified from park’s management plan)

Site of the wetland	Year	Management objective	Actions
L.Mburo & Nakivale in Mbarara, Isingiro and Kiruhura districts	2003-2013	To promote and conserve the biodiversity habitat, aesthetic, cultural and economic values of the LMNP ecosystem and its unique wildlife, in particular Uganda’s only surviving Impala population, for the benefit of the present and future generations	<ul style="list-style-type: none"> • Obtaining and verification with local communities the gazetted LMNP boundary description • Preparation of a fire management plan and establishment and maintenance of fire breaks • Work with the Directorate of Water Development and district authorities to provide permanent sources of water for cattle outside the park.
Rwenzori mountains	2004-2014	To protect and conserve for posterity, the Rwenzori mountains ecosystem as a National Park and a World Heritage Site with its water catchment values, unique natural and scenic beauty & its fragile mountain ecosystem which supports threatened, endemic & rare species of fauna & flora for the local & the international community.	<ul style="list-style-type: none"> • Sensitization of communities & Local Governments on boundary alignment • Planting of trees along the boundary • Sensitization of Community Protection Area institutions and communities on laws, policies, and impacts of poaching & uncontrolled resource off take. • Negotiate an MOU for resource use • Carrying out environmental assessment for any new developments in the park. • Negotiate a protocol for transboundary collaboration. • Sharing monitoring and research information including carrying out joint monitoring & research activities. • Continuously liaising with relevant stakeholders on natural resource management issues in and around RMNP • Organization of regular meetings for stakeholders to address natural resource management issues and concerns in around RMNP

Invasive species eradication program

Uganda Wildlife Authority (UWA) has developed a strategy to manage the spread of invasive species in protected areas (UWA, 2013). This includes eradication of some species, active management of others and setting up control treatment research trials. Strategies put in place are: to implement a comprehensive management programme; prevent the introduction of and eradicate new invasive species; contain and control the spread of established invasive species; and ensure programme sustainability since invasive species can re-occur and even when cleared, the seed bank may still exist.

Wildlife enterprises

Wildlife enterprises such as crocodile ranching in Buwama has reactivated its activities and is now producing crocodile skins for export and crocodile meat for both local and international consumption. Sport hunting permits have also been granted to several companies, which in turn have supported protected area management.

Revenue sharing

Protected areas share revenue with communities around the protected areas. Under this program, Murchison falls National Park alone disbursed a total of Ug.shs. 2,082,700,000 to the six districts around the park (UWA, 2013b).

Reduction of human-wildlife conflicts

Local communities around Protected Areas were empowered to implement community based mitigation measures. In the Murchison Conservation Area, 170 youth were trained and equipped as community wildlife scouts in 12 districts. There was also prompt response to problem animal cases which has resulted into improved community-Protected Area relations. These were also trained in chilli growing as livelihood alternatives. A total of 26.5km of new problem animal control trenches were excavated in areas of QENP, KNP and Murchison Falls National Park (MFNP) and 16km were maintained. A 7 km stretch of the buffalo wall was reconstructed in Mgahinga Gorilla National Park to prevent buffaloes and other antelopes from leaving the park to destroy community crops. In addition 5km of Mauritius thorn hedge were planted in five parishes around Bwindi Impenetrable National Park (BINP) to control problem animals (UWA, 2013c).

Translocation of animals

Translocation of animals can help to control numbers where populations are high and to boost numbers where they are low. The government has a programme to translocate zebras and impalas from Lake Mburo National Park to Katonga Wildlife Reserve to boost the numbers and improve tourism. In the 1960s, Katonga Wildlife Reserve supported a significant population of elephants, hippopotamus, zebra, Topi, waterbuck, eland, oribi and roan antelope (Allan, 1995). However, intensive poaching reduced the large mammal population drastically. Zebra, Topi, Eland and roan antelope got locally extinct in Katonga, while elephants and buffaloes are now restricted to a small forested area in the western part of the reserve and are occasionally seen (UWA, 2013b).

UWA has entered into a collaborative management agreement with Game Trails (U) Ltd to among others actively manage and restore the integrity of Katonga Wildlife Reserve to undertake community sensitisation programs, ecotourism and community benefit sharing through sport hunting program. Another co-funded agreement was also reached in 2011/2012 between the two to translocate 50 zebras, 50 impalas, 10 topis and 10 elands from Lake Mburo Conservation Area to Katonga Wildlife Reserve. In 2013, 96 Impalas and 11 zebras were translocated from

Lake Mburo National Park to Katonga Wildlife Reserve. Some of these animals did, however, not survive the exercise. A total of 90 Impalas and 6 zebras were successfully translocated to Katonga Wildlife Reserve (UWA, 2013b).

Biodiversity outside protected areas

There is declining abundance of both fauna and flora outside protected areas. Although the mandate for its protection is vested in UWA, they mainly have their focus on the protected areas. The questions of who is in reality taking stock of their statistics and coverage arise. Observation was made of dwindling numbers of bats, with reference bat valley, and a reduction of woody cover, which is a critical habitat for birds around the city.

A system where national specialists in these taxa can be supported to regularly collect the data and also work with the mandated institutions should be set up to ensure their conservation.

8.8 Biodiversity: Flora

Status of forest and woodland resources

Any vegetation type covering an area of at least 1 hectare, dominated by trees that grow above the height of 4 meters with at least 30 percent crown, is regarded as a forest (NFA, 2008). The 30 percent crown cover was adopted in 2015. In 1990, forests were estimated to cover 4.9 million hectares or 24 percent of Uganda's land area. Forest area has since declined to 3.6 million (18 percent of land the land area) in 2005 and was projected to decline further to about 2 million or 10 percent of the land area in 2010 (NFA, 2015). Most of the deforestation is taking place on private land outside protected areas such that forests on private land have declined from 68 percent in 1990 to less than 40 percent (NFA Database)

Trends in forest coverage

Uganda is estimated to be losing its forest cover at a rate of 80,000 hectares per year. Between 1890 and 1990, the area of forest and woodland has declined from 45 percent to 20 percent of total land surface (NFA, 2011 in NEMA, 2015). The majority of forest loss has occurred outside of PAs and is largely due to conversion of forest lands to agriculture and over-harvesting of wood for firewood and charcoal (NFA, 2011, in NEMA, 2015). The rate of decline of forest cover is 1.8 percent per year, equivalent to 2.2 percent in private forests and 0.9 percent in PAs (NEMA, 2012). Figure 8.9 shows the trend in loss of forest cover since 1990. At the current rate of forest loss, Uganda could lose all its forest by 2040, resulting in serious economic and ecological consequences.

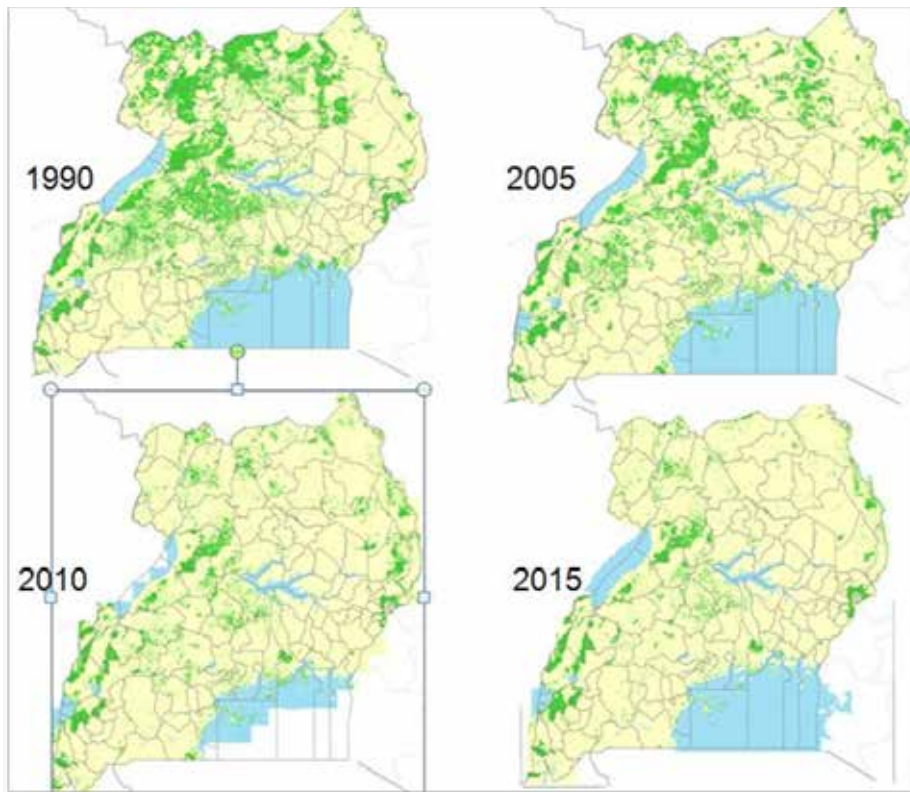


Figure 8.9: Change in Uganda Forest Cover, 1990–2015 (Source: NFA, 2015)

Primary threats to Uganda’s forests

The primary threats below are discussed in order of importance of the threat to biodiversity and forest conservation.

Agricultural expansion into forest ecosystems

Agricultural expansion remains a major deforestation driver in Uganda. According to the National Biodiversity Strategy and Action Plan, the key agents of agricultural expansion are small-scale farmers who make up more than 70 percent of the population, migrants and private, large-scale monoculture farming such as for palm oil and sugar cane (NFA, 2011, in NEMA, 2015). Between 1990 and 2005, agricultural land area expanded by 2 percent (from 8,400,789 ha to 8,847,591 ha, mostly in the form of small-scale agriculture (NFA, 2011, in NEMA, 2015). Large-scale agriculture covers less land area than small-scale farms; it increased from 68,446 to 106,630 ha between 1990 and 2005 (NFA, 2011, in NEMA, 2015).

About 72 percent of the working population (aged 14–64), approximately 25.2 million people, is directly employed in subsistence agriculture, which is characterized by very low input use and widespread use of poor farming practices (UBOS, 2014; MWE, 2011). The low use of inputs increases the pressure to convert forests to cropland in search of land that is more fertile. Private forest owners find agriculture more profitable than forestry (MWE, 2013) and, therefore, barring incentives to retain forest, readily convert forest to crop production.

Uganda's Uganda Vision 2040 and the NDP II identify agriculture as a key sector for growth. Oil palm has been identified as a crop that can enhance economic returns from agriculture (MAAIF, 2010), and in support of this, the government has 4,120 ha and plans to acquire an additional 2,000 ha for a palm oil estate on the Buvuma Islands; of the area acquired, 1,000 ha had been public land, and 3,120 ha was purchased from mailo land owners. Some of the land was forested and some had already been converted to agriculture. By 2017, the GOU aims to have planted 6,500 ha of oil palm there (GOU, 2014). Other districts (Kibaale, Kabarole, Hoima, Masindi, Bundibugyo, Bugiri, Jinja, Iganga, and Masaka) have also been targeted to grow oil palm (Carerre, 2013); these plans have yet to be implemented. The promotion of commercial crops such as oil palm reduces available arable land for the rural poor, which may force them to encroach on forests and other natural ecosystems.

Charcoal and firewood collection

About 92 percent of Uganda's energy needs are met from woody biomass (NEMA 2014a) Fuel wood currently contributes more than 96 percent of energy for cooking in Uganda (NEMA, 2014b). Charcoal is used mainly by the urban households for cooking. It is preferred since it is reliable, convenient, accessible and available at a stable price. Uncertainties surrounding the availability and high cost of liquefied petroleum gas have resulted in many urban households depending on charcoal (GIZ, 2011). As a result, charcoal trade is very lucrative and is threatening natural forest cover in the country. The number of trees that can be converted into charcoal has reduced and a much bigger area is now needed to produce the same amount of charcoal. The charcoal producers have tried to cope with the above situation by going much deeper into the woodlands. This also partly explains why charcoal is being transported over longer distances for instance from Gulu (and beyond) to Kampala.

Charcoal burning involves the irreversible thermochemical decomposition of organic material, especially wood at elevated temperatures in a very limited supply of oxygen (Cuna and others, 2010). The currently used technology for charcoal production is traditional and causes between 80-90 percent energy loss (Knopfle 2004). In addition, about 15-20 percent of the produced charcoal is lost during transportation and storage respectively (Knopfle, 2004; Cuna and others, 2010) thus accelerating the rate of deforestation. Charcoal produced on a small scale is typically packed in sacks and sold by the roadside. That produced on a large scale is usually packed and transported for sale to urban centres.

Indiscriminate cutting of trees for commercial wood fuel (firewood and charcoal) has contributed to the reduction of the total area covered by natural forests and woodlands. Most of the rural biomass sources on private and communal land have already been depleted to fulfil the needs of the increasing population. Biomass is the dominant energy resource for households as well as for small- and medium-scale industries such as lime, brick, and tile making and a number of agro-based industries in Uganda. Woody biomass meets 92 percent of the country's energy needs (NEMA, 2014a).

Uganda's available wood stock is estimated at 284.1 million tons with a potential sustainable biomass supply of 45 million tons. Accessible sustainable wood biomass supply stands at 26 million tons, and this amount meets only 59 percent of the total demand of 44 million tons per year (MEMD, 2014). If this situation is not addressed, the continued loss of forest cover will lead to an energy crisis (NEMA, 2014b).

Charcoal production has increased from 7,975,000 tons in 2009 to 10,449,000 tons in 2013; during the same period, fuel wood for household use increased from 21,905,000 to 25,196,000 tons (UBOS, 2014). Most of this was collected from natural forests (MWE, 2011). Collection for charcoal and firewood is threatening the existence of some of the most highly sought after trees species of *Combretum*, *Terminalia*, *Albizia* and more recently *Vitellaria* (Shea tree) (MWE, 2011).

Charcoal producers prefer old-growth hardwood species and are second to agricultural expansion in degrading and deforesting natural forests (especially woodlands). Charcoal in Uganda may be extracted from public, communal, and privately owned land, CFRs, and LFRs (Mapesa et al, 2013). The impact of charcoal production is exacerbated by a license system that undervalues natural forests and rewards rapid harvests across large areas. Woodlands have been the most affected by charcoal production, especially in central Uganda (MWE, 2011), and more recently exploitation has spread to northern Uganda and northeastern Uganda, including the Karamoja sub-region. There is no clear mechanism to regulate charcoal production to ensure that the industry does not result in degradation of forests and woodlands. The rate at which wood is harvested for charcoal is unsustainable, and if not addressed, may lead to total degradation of woodlands. Outside of PAs, the Shea tree is under serious threat due to the high demand for charcoal. This is the case in all districts where Shea trees are found. The high demand is threatening the species as well as degrading the fragile savannah ecosystems where it is found. For instance in Nakasongola district, nearly all Shea trees have been cut for charcoal production (NEMA, 2014a). Figure 8.10 shows some of the routes for illegal products out of forests.

The strategy has yet to be implemented. In addition, the MEMD has been developing and implementing strategies for biomass energy conservation and produced a biomass strategy. To this end, the MEMD has promoted energy-saving cook stoves. The impact of these interventions on households, charcoal producers, industrial consumers, and forests is not yet known. The MEMD and Deutsche Gesellschaft fur Internationale (GIZ) are promoting two types of energy-

To promote sustainable use of fuel wood in Uganda, the Ministry of Energy and Mineral Development (MEMD) developed a strategy for sustainable charcoal production and licensing targeting 14 charcoal-producing districts.

saving cook stoves: improved household cook stoves and improved institutional cook stoves. Various types of briquettes that minimize or require no charcoal or fuel wood use have been promoted, mainly by donor projects, but they have yet to be widely taken up.

A major gap exists in establishing frameworks to reduce high taxes on alternative but affordable energy sources like solar and cooking gas. Taxes on charcoal are inconsistent, not regularized, and determined by the district local governments. They are categorized as levies for transporting charcoal from one district to another and not taxes on charcoal per se. They are relatively low compared to taxes on other energy sources. The current common levies range between Ug.sh 1,000–1,500 per 100 kilogram of charcoal compared to Ug.sh 100,000 of the equivalent of cooking gas.



Figure 8.10 :Major routes for illegal timber, charcoal and other products from forests (Source: Mapesa et al, 2013)

Impacts of charcoal burning

Deforestation

There is a growing concern in Uganda about the ever-shrinking forest cover. Estimates indicate that 7,000 ha of protected forests are destroyed every year for timber and charcoal while 73,000 ha of forests on private land are cleared annually (IRIN, 2012). Forests in central Uganda and those near urban centres suffer the greatest pressure because charcoal consumption is much higher in the urban areas, especially Kampala.

Charcoal burning, in many cases, is encouraged by private landowners to allow for conversion of forests into 'more productive' farming land at a relatively low cost (GIZ, 2011). Agriculture is considered to provide more long term returns and thus is a major driver for deforestation. Charcoal has a high income generating potential for the rural population and creates significant revenue for the districts through taxation. So even outside private land, the pressure on forests and woodlands for charcoal and wood fuel is high.

Although charcoal producers prefer old-growth hardwood species and are responsible for the greatest loss of natural forest, the practice is indiscriminate with charcoal from preferred tree species selling at a higher price than that from the less preferred species. Private forested land, constituting about 70 percent of total forest land cover in Uganda, is at a higher pressure for raw materials for charcoal production (Mapesa et al, 2013); leading to intense deforestation around heavily populated areas. The data shows that the total production of round wood timber for charcoal and fuel wood both for commercial and household use in monetary terms increased from 11,337,000 tonnes in 2009 to 14,687,000 tonnes in 2013 (UBOS, 2014).

Domestic consumers use a variety of species for fuel wood. As a result their consumption is likely to be sustainable because they generally harvest fast-growing species from fallows on their own or their neighbour's land.

Opportunities to reduce charcoal burning

Use of energy efficient cooking stoves

Price is one of the major factors influencing the decision by a household to acquire an Improved Cook Stove (ICS). Keeping the price of the improved cook-stoves low and affordable is still a challenge because of high production costs. The price of a small charcoal based ICS is about Ug.sh. 15,000 while the traditional metal stove of the same size is Ug.sh. 5,000. The medium sized ICS range between Ug.sh. 20,000 and 30,000, while the traditional ones of the same size range between Ug.sh. 6,000 and 8,000. It follows that the decision for a household to purchase an improved stove can only be made after a thorough assessment of the benefits of the ICS.

Increase access to electricity

Uganda's approach to controlling charcoal use is through increasing access to alternative energy sources. Vision 2040 commits to expand and promote a countrywide rural electrification program and alternative energy sources such as solar, liquefied natural gas and biogas. The Uganda Vision 2040 target is to increase access to electricity from 11 to 80 percent between 2010 and 2040 (NPA, 2013a). However, there are limited frameworks to reduce high taxes on alternative but affordable energy sources and thus reduce pressure on natural resources for fuel. The available hydro-electricity is expensive and is largely used for household lighting and not cooking. Renewable electricity options such as solar and wind will need to be explored.

Although solar provides cheap, clean and sustainable energy, the capacity to tap this energy source is still limited (AfDB, 2014). Many rural areas in Uganda are isolated, and this increases the cost of infrastructure for power distribution. Consequentially, photovoltaic (PV) systems are a perfect solution for areas where there is no grid connection (Alpert and others, 2005; Cook & Vizy, 2012). The options of wind are also available although it has not been a priority source largely due to technological and funding challenges that compete with other pressing issues such as poverty, health and security (AfDB, 2014).

Along with current initiatives in the solar and wind sector, the on-going investment in development of clean renewable energy sources such as hydropower and geothermal is a big opportunity to enhance Uganda's economic development in a sustainable manner.

Strategy for sustainable charcoal production and licensing

In order to minimize environmental degradation the MEMD developed a strategy for sustainable charcoal production and licensing, targeting 14 charcoal producing districts (GIZ, 2011). The Ministry has also promoted energy saving cook stoves although the impact of these interventions on households, institutions, charcoal producers and industrial consumers is not yet evident (NPA, 2013a).

The proposed interventions are in line with the 12th African Union Summit whose theme was infrastructure and energy. It committed African governments to devise means of meeting energy demands for industrial, domestic and commercial activities while at the same time ensuring, efficient use, and sustainability as part of the global (MDGs) and Continental (NEPAD) commitments.

Box 8.5: Green energy initiatives

Charcoal provides a stable source of energy to the majority of Uganda's population. However, a lot of energy is lost in throughout the charcoal supply chain, during production, transportation and storage. Efforts by government to reduce dependence on charcoal for fuel are still in their infancy and further need an integrated approach that considers all stakeholders to ensure a stable transition to better and affordable green energy. It is therefore important to put more emphasis on providing a stable, assured and higher financial return to the producers of green energy solutions. In addition, private forest owners need to be sensitised on the livelihood and economic opportunities providing by retaining the forests as opposed to clearing them for agriculture.

Infrastructure development: urban expansion, energy development and mining

Urbanization and industrialization have exerted pressure mainly on peri-urban Forest Reserves (FRs) for expansion of urban and industrial centres. Pressures come from infrastructure developments, in particular urbanization, the oil and gas mineral industry, development of hydropower and geothermal energy. The development of additional secondary cities such as Arua, Gulu, Jinja, Mbarara and strategic towns, including Hoima planned under Uganda Vision 2040, presents a potential threat to forests. Conservation of green areas needs to be considered for sustainable urbanization (GOU, 2012).

Hydropower projects are considered a key ingredient for the development of Uganda's economy. Unfortunately, they come with a cost to forests, especially if not well managed. In the quest to harness hydropower for development, waterfalls located in pristine areas have become targets. Figure 8.11 shows the location proposed and ongoing hydropower projects in and outside of PAs. Hydropower and the ancillary development will contribute to further fragmentation of the PA system which harbour most of the forest cover. A good example is the Ayago hydropower project which is located entirely inside the Murchison Falls Conservation Area (MFCA). The power plant requires high-voltage transmission lines inside the park, which will require land clearing and a permanent easement. Under the proposed Karuma hydropower project, approximately 238.6 ha of Karuma Wildlife Reserve which is mainly a forest will be lost (UWA, 2012a).

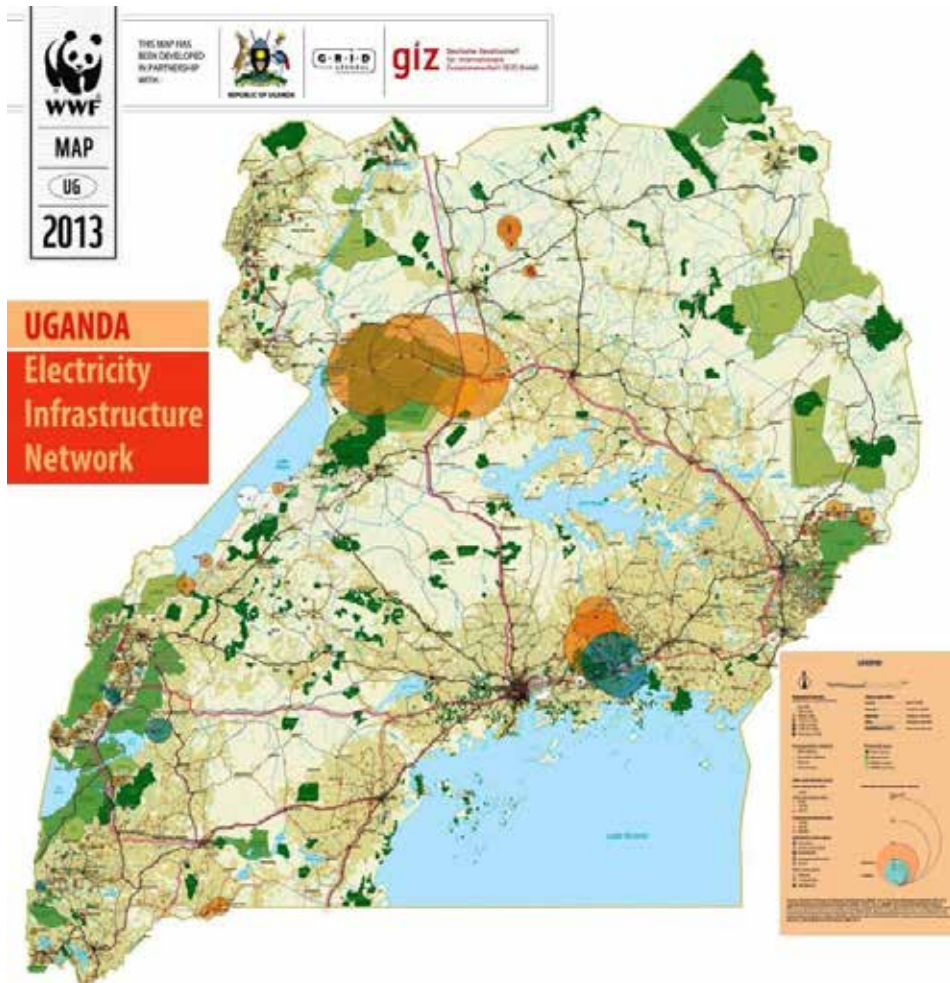


Figure 8.11: Proposed and ongoing hydropower projects outside and within Protected areas (Source: WWF, 2013)

Both large-scale commercial mining and artisanal or small-scale mining are affecting forests. In Kidepo Critical Landscape, gold mining, sand and stone extraction is largely not monitored, as most of it is done illegally (UWA, 2012b). This poses a serious threat to the area’s network of forests. Outside PAs, development could be undertaken in a sustainable manner and mitigation could more successfully minimize impacts. The main issues for development outside PAs are the limited capacity of environmental agencies to evaluate impacts, develop mitigation measures, and monitor impacts, and political interference by local politicians where development takes prominence over forest protection.

Illegal activities

Although the ban on timber harvesting in Uganda is still in force, there is plenty of evidence of continued illegal pit sawing in CFRs such as Budongo, Kasyoha-Kitomi, Kalinzu, and others. Several other illegal activities continue in protected forests. Figure 8.12 and Figure 8.13 show illegal activities in Budongo and Kalinzu CFRs. Timber is logged from Local Forest Reserves and private land mainly for local consumption. For instance, in Kalinzu there is illegal harvesting of the threatened species *Parinari excels* and *Funtumia elastica* (GVTC, 2013).

There have been some successes in curbing illegal activities. For instance Uganda has been successful in reducing illegal trade in *Prunus africana*. It was recently removed from review at the 22nd meeting of the Plants Committee of the Convention on International Trade in Threatened and Endangered Species (CITES).

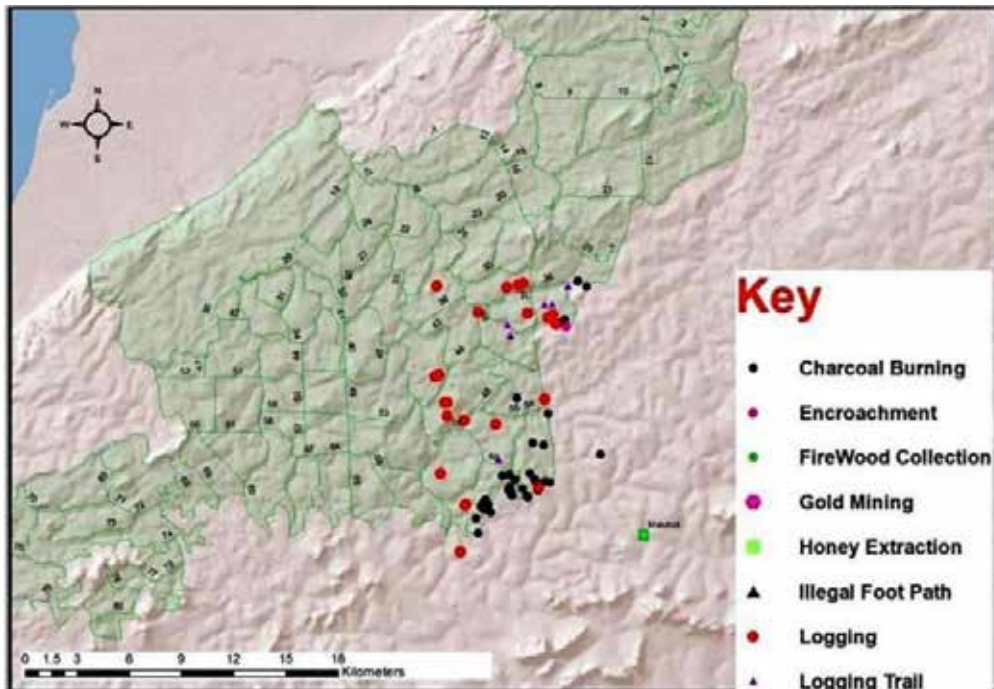


Figure 8.12: Illegal activities in Budongo CFR, Source: African Wildlife Foundation (USAID/ Uganda Biodiversity Program, 2014)

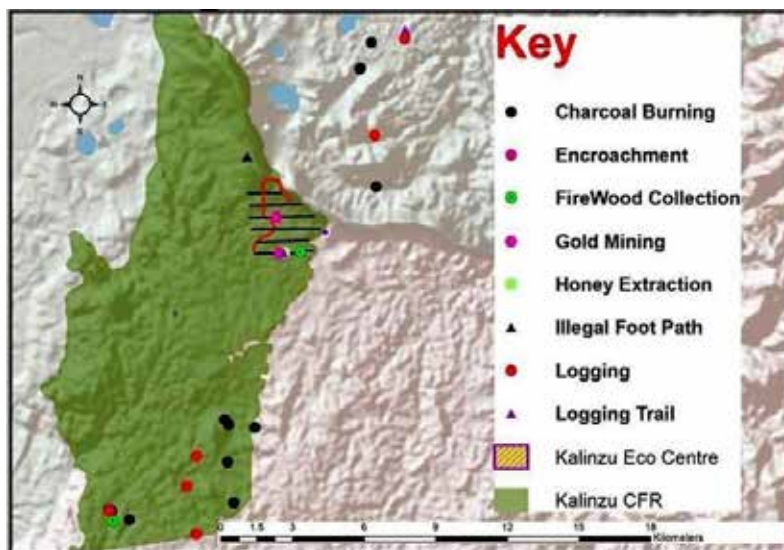








Figure 8.13: Examples of illegal activities in Kalinzu CFR (Source: African Wildlife Foundation (USAID/Uganda Biodiversity Program, 2014)

		
A local valley dam in Kalagala forest reserve	Fresh charcoal burning in Alwi forest reserve (Nebbi)	Dam excavated in Kapinpina forest reserve (Luwero).
		
Fresh land clearing for cultivation in Bujawe forest reserve	Tobacco garden in the Bujawe forest reserve (Hoima)	Construction materials in the forest reserve. Permanent buildings not within the terms of the plantation licences.

A selection of illegal activities in protected forests Source: Auditor General's Report 2010

Over-exploitation of forests

Most logging for timber and fuel wood is currently taking place on private land (MWE, 2011). Roundwood production for monetary and non-monetary uses in Uganda increased by 4.2 percent from 2009 to 2013 (UBOS, 2014). This is despite the fact that forest cover has been declining and therefore most likely harvesting is beyond the natural rate of forest replenishment. About 80 percent of the timber on the market is illegal because very few harvesters go through the required procedures, making it difficult to monitor exploitation; this eventually results in overharvesting (WWF, 2012).

Causes of forest degradation

The following are the causes of the threats to forests in Uganda;

Population growth

One of the major causes of encroachment on forest ecosystems is high population growth and increasing demand for resources. The highest tree loss in Uganda has been registered in private lands mainly for plantation agricultural production at 8,000 hectares per year (NFA, 2014). As more people open land for agriculture, gardens are extended up to PA boundaries, which lack buffer zones to limit community access to forest resources.

In towns such as Kabale and Kisoro, located within the Albertine Rift region, the increased demand for agricultural land has led to land fragmentation, which is a generalized pattern observed across all of Uganda. In the eastern region, population density is highest in the highlands. For example, Bududa district has a population density of 952 persons/km² compared to the national average of 124 people/km². This high human population density has put the forests and woodlands at risk.

Migration in particular, population movements from densely populated to sparsely populated areas is directly contributing to forest loss. For example, Kibaale district is the third most populated district in Uganda and has one of the highest rates of forest loss, approximately 2.2 percent annually as compared to the loss at national level of 2.5 percent per annum. This is mainly attributed to high population movement in recent years and subsequent forest clearing for agriculture. The influx of people to Masindi district from districts such as Iganga, Sironko, and Mbale because of the scarcity of arable land is a driver of deforestation, especially in areas adjacent to Budongo CFR (Shepherd, 2013). The war in northern Uganda and South Sudan led to displacement of populations, some of which were settled in Kiryandongo district. These have been a threat to forests adjacent to MFNP because of unsustainable exploitation, especially of wood for charcoal and firewood and draining of wetlands.

Governance and institutional mandates

Implementation of Uganda's policy and regulatory framework covering forests is weak. This is primarily due to lack of resources. Budgetary allocations for natural resources agencies are insufficient to implement their mandates (MFPED, 2013). Most agencies involved in natural resources management are understaffed, and poorly facilitated. For example, limited staff capacity to effectively patrol all CFRs is a challenge that NFA has grappled with over time.

In addition to limited resources, overlapping and conflicting mandates of MDAs involved in forest management. For example, forest resources are managed by agencies anchored in different ministries and results in poor coordination and discourages collaboration. About 15 percent of the forests are under UWA, whose mandate is different from NFA's. UWA and NFA are anchored in different ministries, yet they manage relatively similar forests. This results in duplication of roles between UWA and NFA, especially in CFRs that are managed for biodiversity conservation. Dealers in forest produce take advantage of the poor coordination among the responsible agencies to illegally exploit the resource.

Limited opportunities for off-farm employment

Limited alternative livelihood options can lead to over-exploitation of forest and woodland resources both inside and outside PAs. Most of the settlements around woodland areas in Uganda have low employment opportunities driving people to harvest trees for charcoal production as a source of income. This situation is currently most severe in north and north eastern Uganda because civil strife has only recently ended there, and the communities have few, if any other income generation options besides charcoal production and subsistence agricultural production. Throughout rural Uganda, local communities' continued dependence on forest resources is in part attributed to lack of alternative income generation options (Obua et al, 2010).

Poverty

Studies have found a positive correlation between poverty and degradation of forests and other natural ecosystems in western and central Uganda (Nakakaawa et al, 2010; Aggrey et al, 2010). Poor communities cut trees for timber, firewood, and poles to obtain income for their household needs (Tabuti et al, 2003; Harrison, 2013). Lack of reliable health care (a facet of poverty) has also led to excessive use of certain medicinal plants around PAs in south western Uganda, especially *Prunus africana*, whose bark is used for making medicine to treat prostate cancer and other ailments (NEMA, 2012). Poor communities around PAs depend largely on resources from within the PAs, such as fuel wood, timber and non-timber forest products. Poverty limits a community's capacity to develop alternatives to resources found within PAs.

Insecurity of land tenure

More than 70 percent of the land in Uganda is customarily owned with no formal registration of tenure rights. Communities in areas that have development prospects such as the Albertine Region, where oil and gas reserves are being developed, are losing communal land to speculators, sometimes through illegal means (CRED, 2014).

Government policies

Some government policies outside the conservation sector affect forests and other natural ecosystems. Uganda has a very ambitious infrastructure development plan in its quest to become a middle-income country by 2040. The theme for the budget speech 2014/2015 was, 'maintaining the Momentum: Infrastructure for Growth and Socio-Economic Transformation.' Among the notable infrastructure projects that the country intends to pursue are: the construction of an inland container depot at Mukono, the redevelopment and upgrading of facilities at Port Bell and Jinja piers, a standard gauge railway, construction of major hydropower plants at Karuma and Isimba, oil refinery development in Hoima; and construction of 650 km of the following roadway nationwide (MFPED, 2014). The processes for implementing these projects are underway. They will need large expanses of land, which will likely lead to destruction of natural ecosystems including forests. The government is increasing its tax base to become self-reliant, including taxing alternative energy sources such as liquefied petroleum gas (LPG). Alternative energy sources could reduce pressure on forests and woodlands that are currently the main energy source for most people in Uganda.

The value of natural ecosystems

In general, there is little appreciation of the value of the goods and services provided by forests and other ecosystems. Consequently, natural capital mainly forests are undervalued and not prioritized in resource allocation and national accounting systems. In some situations, they are perceived as land available for other 'productive' uses. Some Local Governments have applied for the degazettment of FRs in their jurisdiction to pave way for urban growth. This is exacerbated by the fact that most of the ecological functions of forests do not have an immediate market, which is an incentive for proponents of conversion to other land uses. This is in spite of the fact that Uganda's economy relies on sectors such as agriculture, fishing, and tourism, all of which depend on the state of natural ecosystems.

8.9 Recommendations for Sustainable Management of the Forest Resource

1. Promote and support research programs on biofuels.
2. Establish programs on alternative clean energy sources and promote use of efficient energy technologies.

3. Promote alternative rural livelihood programmes which integrate environmental concerns.
4. Promote taxation reforms to reduce tax on alternative clean energy sources such as electricity, cooking gas, and solar equipment to promote conservation of wood fuel sources.
5. Support local communities to through payment for ecosystem services (PES) to secure conservation of forests on private land.

Chapter 9: Atmospheric Resources

9.1 Introduction

This chapter presents the state of climate in Uganda, its impact on economy and environment; and, interventions by government in relation to institutional and policy framework, opportunities for harnessing atmospheric resources for improved livelihood and sustainability and recommendations for addressing climate change. The health and livelihoods of many Ugandans are greatly dependant on atmospheric resources that are critical for human development.

9.2 Atmospheric Resources

Rainfall

Uganda received between 855 -1703 mm/year in 2013 and 2014. The rain falls during two seasons in the south of the country, progressively merging into one rainy season in the north. The seasonality of rainfall is linked to the seasonal migration of primary humid air masses and convergence zones over Africa that shifts towards a northerly location in August and during January, into the south.

Rain days

Rain days are important in keeping track of the distribution of number of days on which it rained in the different months of the year. In 2013, the four selected centres had total rain-days as follows: Lira (133 rain-days), Mbarara (92 rain-days), Tororo (133 rain-days) and Kampala (106 rain-days). Monthly distribution of rain-days indicate that Tororo had the highest number of rain-days in the months of January, March, April and May; Mbarara had the highest in February, November and December while Lira had the highest number in the months of June, July, August and October.

During 2014, the four centres had total rain-days as follows; Lira received 121 rain-days, Mbarara received 103 rain-days, Tororo received 150 rain-days and Kampala received 132 rain-days. Monthly distribution of rain-days indicate that Tororo had the highest number in the months of May, June, September and October. Kampala had the highest number of rain-days only in January and April as shown in Figures 9.1 and 9.2.

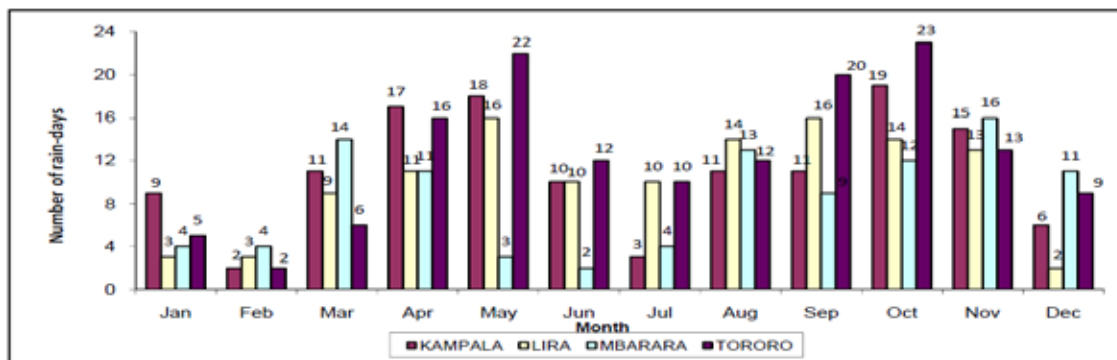


Figure 9.1: Monthly distribution of rain-days in 2013 (Source: UBOS, 2014)

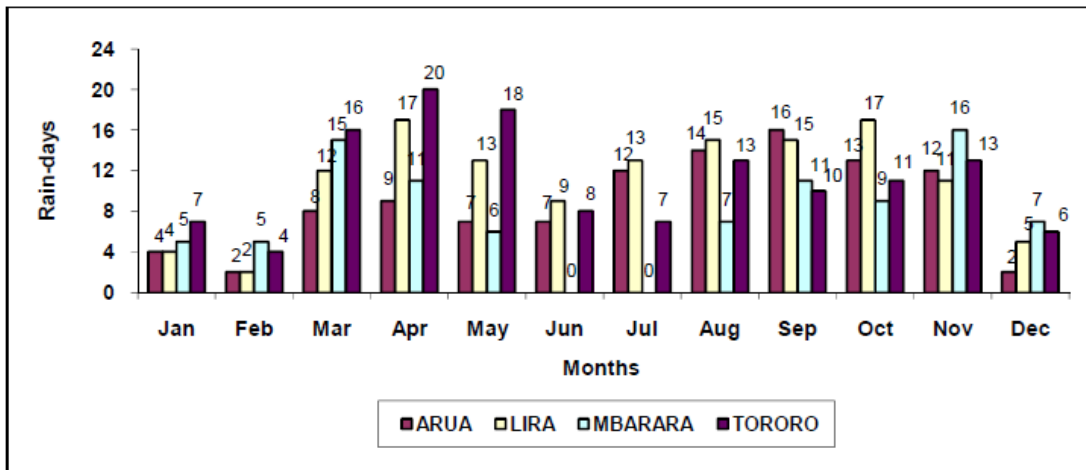


Figure 9.2: Monthly distribution of rain-days in 2014 (Source: UBOS, 2015)

Increasing rainwater harvesting is an opportunity to take advantage of the rainfall we receive in the country. The Lake Victoria Crescent region receives between 1200-2000 mm of rainfall annually. Energy supports livelihoods and economic development, there is potential for use of renewable energy source from wind and solar. Efforts have to be geared towards, research, dissemination, capacity building and supporting people on adaptation of renewable energy technologies.

Temperature

According to UBOS (2014), temperatures in the country ranged between 14-31°C. Entebbe and Kampala continued to experience the lowest mean maximum temperature while Gulu and Kasese had the highest mean maximum temperature in the same year. It should be noted that the long term mean maximum temperatures for Kasese remained high (above 28.5°C) throughout the year as seen in Figure 9.3 below.

The long-term minimum temperature (2009-2013) for selected centres showed that Jinja had the lowest minimum temperature in the last five years while Gulu had the highest mean minimum temperature. Entebbe and Jinja had generally high mean relative humidity at 06:00 hrs throughout 2013 ranging between 77 and 86 percent.

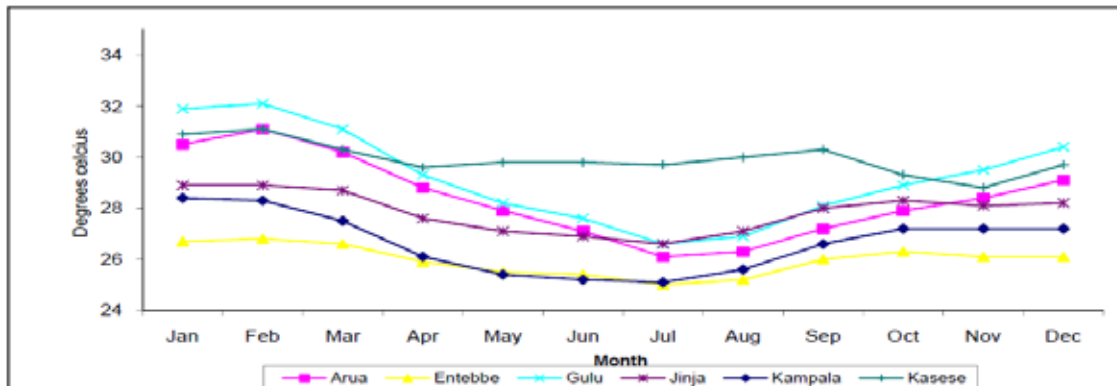


Figure 9.3: Long-term Mean minimum temperature for selected centres 2014 Sunshine

The average annual sum of solar radiation in the country is presented in Figure 9.4.

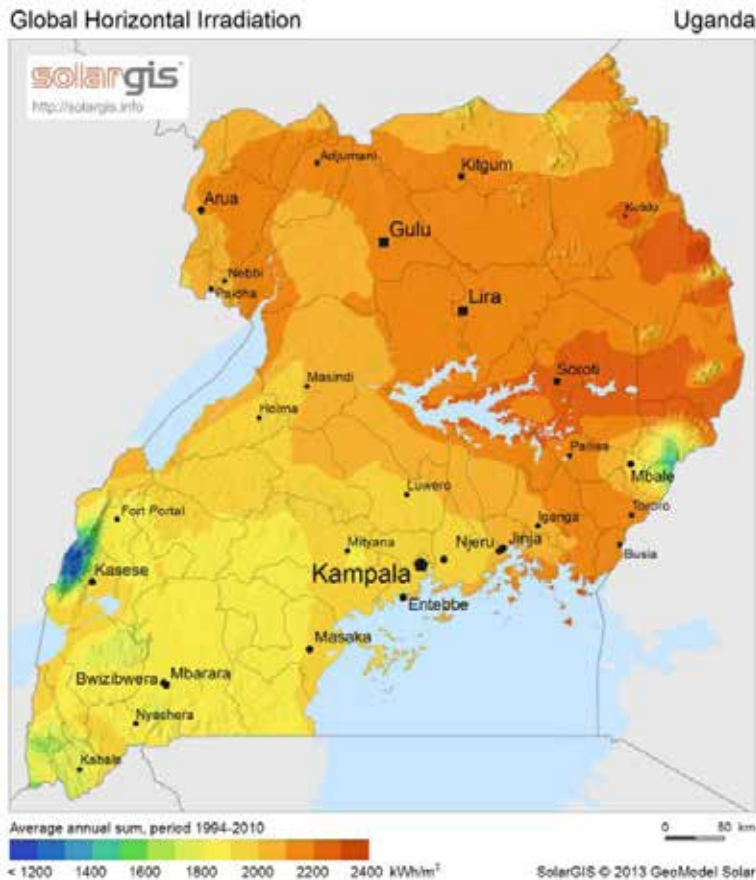


Figure 9.4: Average annual sum period of 1994-2010 of solar energy (Source: Solar GIS 2013)

Wind energy resource

The location of the country in the continental interior and the highly contrasting local relief features obstruct the development of high wind speeds. Average annual wind speeds of at least 4.0-4.5 m/s are needed for a small wind turbine to produce enough electricity that is cost-effective. In Uganda, the highest recorded averages are just below 4m/s. The greatest potential for wind energy in Uganda is in Karamoja, Gulu, Nebbi and Tororo.

Despite having wind speeds lower than the required level for wind energy generation, there are still some areas where the wind resource can be harvested to support livelihoods. Wind pumping is a viable and useful option for improving water supply to rural areas where wind speeds are above 3 m/s. Even where wind is intermittent, there are options of using hybrid systems (wind and diesel). Wind energy is already being used for water pumping in Karamoja region.

9.3 Implications of Climate Change

Climate change

Uganda is vulnerable to climate change impacts, for example, increasing temperature, increased frequency and intensity of rainfall, heat waves, landslides, droughts, floods and storms. The regions and ecosystems across the country: mountains, lowlands and the cattle corridor differ in vulnerability and capacity to adapt to climate change. The most vulnerable sectors to climate change impacts are agriculture, water supply, health, transport, housing and personal safety and security (MWE, 2015).

Evidence shows that climate change due to global warming is a function of anthropogenic factors with the main drivers in Uganda being land use change motorised transport and industry. The impacts include changes in the rainfall patterns, and variability in temperatures thus increase in pests and diseases, flooding and landslides in parts of the country. The overall consequence is increasing poverty, famine and food insecurity. The National Adaptation Plan of Action estimates that up to 90 percent of the country's natural disasters are weather- and climate-related. The magnitude, frequency and severity of these hazards, especially drought, have increased over the past decades. Some of the extreme events that have been reported include the Teso floods of 2007 and 2010, the Kasese floods of 2013 and 2014, the Bududa landslides of 2010 and 2013 and Bulambuli in 2014 (NEMA, 2012).

Agriculture

Over 80 percent of Uganda's population is rural and depends on rain-fed agriculture, which is prone to impacts of climate variability; therefore, the economy as well as the wellbeing of the people in Uganda is dependent on climate. Drought and floods present a big challenge to food security and agriculture because of the impact on basic elements of food production, soil, water and biodiversity. Rampant siltation of the valley dams and tanks have contributed to increased water stress in the livestock sector, increasing travel distances to and overgrazing around the few water sources in the districts concerned.

Health

Climate change has also resulted in the proliferation of diseases in some areas that were initially disease free. For example, the traditionally cooler Rwenzori region now suffers from malaria because the increases in temperature have resulted in the mosquitoes extending their habitat range. Other highland areas that malaria has recently spread to include Kabale, Kapchorwa and Zeu hills (in Zombo district). There are also emerging diseases such as Ebola and Marburg fever that have been linked to environmental changes and climate change (NEMA, 2012). Melting snowcaps, along with higher than normal rainfall, has increased the frequency of flooding and mudslides. Flooding coupled with poorly maintained sanitation infrastructure has led to increases in water borne and water related diseases. For instance, outbreaks of cholera in Kampala, have been attributed to too much rainfall and poor disposal of fecal material within some areas in the city.

Infrastructure and hydrology

Droughts, flooding and landslides among others have caused loss of property, life and other livelihoods over the years. The amount of rainfall has a direct input to the hydrology of the water bodies. The annual renewable water resources have declined from 66,000 million km³ in 2002 to 43,300 million km³ in 2012 mainly due to climatic and environmental factors. In 2005, Lake Victoria had its lowest water levels at 1,133.66 a.m.s.l (Okungu et al, 2011) since 1961, which greatly affected the generation of hydropower at Kiira Dam and led to load shedding.

Catchment degradation

Degradation of the catchment areas such as Mt. Elgon water shed, Mount Rwenzori have increased due to numerous human activities. These include human settlements, agriculture, gravity flow water scheme thus affecting the ecosystems functionality.

The rapidly increasing population are highly dependent on natural resources for livelihoods encroaching ever further into critical ecosystems such as forests, wetlands and mountainous areas. These ecosystems play a role in micro-climate moderation emphasizing the need for their conservation.

9.4 Initiatives to Combat Climate Change

Climate change policy

The government has made progress in bolstering national institutions working to address climate change. A National Climate Change Policy 2013 was developed as well as a funded Climate Change Implementation Strategy. The policy has three thematic areas identified for implementation. These include; develop institutional capacities for climate change management in Uganda, establish the knowledge base for climate change mitigation and adaptation and operationalise the Climate Change Policy.

Opportunities

Information and communication

Climate change challenges require reliable information. The National Climate Change Resource Centre in the Ministry of Water and Environment is part of the broader 'Global Change Alliance-Uganda: Agriculture Adaptation to Climate Change' project, to provide science-based information and tools on climate change. The Resource Centre will address adaptation and mitigation issues for resource managers, government institutions and the public to manage and respond to climate challenges, and accordingly contribute towards a more progressive and sustainable climate change response for Uganda.

Climate monitoring and early warning systems

UNDP is helping to strengthen climate monitoring and early warning systems in Uganda, largely through improving national capacities to generate and use climate information in planning for, and management of, climate hazards and long-term strategic planning. This is through transferring appropriate technology, infrastructure and skills to hydro-meteorological services (UNMA and DWRM), user-agencies (MAAIF, DRDPM, CCU and MLG) and end-users (local communities) in the country.

Clean Development mechanism (CDM) projects

CDM Capacity Building Project supported by the Belgian Government is already running and trained 6 Ugandans as CDM consultants. The project has supported 8 projects from registration to certification by the UN CDM Executive Board.

A number of CDM projects have been implemented in the country in various sectors such as renewable energy, afforestation, energy efficiency, water purification and municipal solid wastes. Many of the Projects issued with the Letters of Approval have been registered by the UN CDM Executive Board. A CDM Register has also been established. Due to proactive work of the CCU which is also the Secretariat for the Designated National Authority (DNA) for Uganda under the Kyoto Protocol, Uganda is ranked the 3rd best country in Africa in terms of CDM performance.

Through these carbon trading efforts, Uganda has registered modest carbon investments in the country (over USD 250 million) which continue to contribute to the country's poverty reduction and food security efforts as well as economic growth while at the same time contributing to the global efforts of tackling the rising greenhouse gas emissions (NEMA 2014).

Green investments

To counter emissions by developed countries, investments should be encouraged in areas that increase carbon sinks. These include afforestation, re-afforestation, climate smart agriculture, green procurements and payment for ecosystem services among others.

Modest progress has been made on REDD+ (Reducing Emissions from Deforestation and Forest Degradation plus). Some carbon projects under the REDD+ pilot initiatives and voluntary carbon schemes are being promoted in the country as part of enhancing mobilization of carbon finance by catalysing innovative carbon financing schemes.

9.5 Recommendations for Policy Action

1. Support the mandate and the ability of research institutions to develop innovative and applied solutions.
2. Build the capacity of the Climate Change Department and other supporting agencies.
3. Strengthen early warning systems and meteorological services.
4. Improve Municipal Solid Waste management practices in urban areas.
5. Strengthen compliance monitoring and enforcement of environmental laws and regulations across the board.

Chapter 10: Water and Wetland Resources

10.1 Water Resources

Introduction

This chapter presents the status of water and wetlands resources. The water section addresses the state of surface and ground water resources, governance of water resources in Uganda, issues for sustainable development of water resources, opportunities for use of water to create wealth and alleviate poverty and, recommendations for the management of water resources.

Uganda's water resources

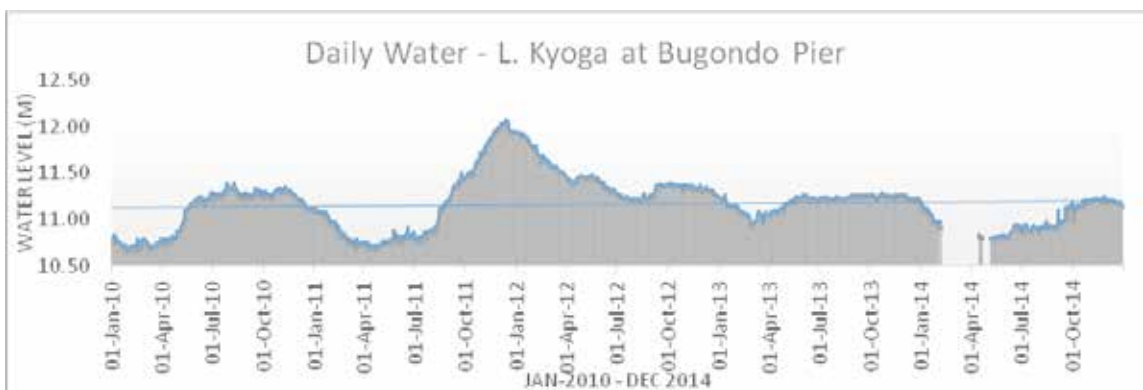
Surface and ground water resources cover an area of 36,280 km² (15 percent) of the 241,500 km² total area of the country.

Surface water resources

Surface water resources are relatively abundant in Uganda with the flow of the Nile exceeding 25 km³ per year, and large volumes of water stored in the various lakes in the country. Water levels are primarily replenished by rain and vary over time (figure 10.1).



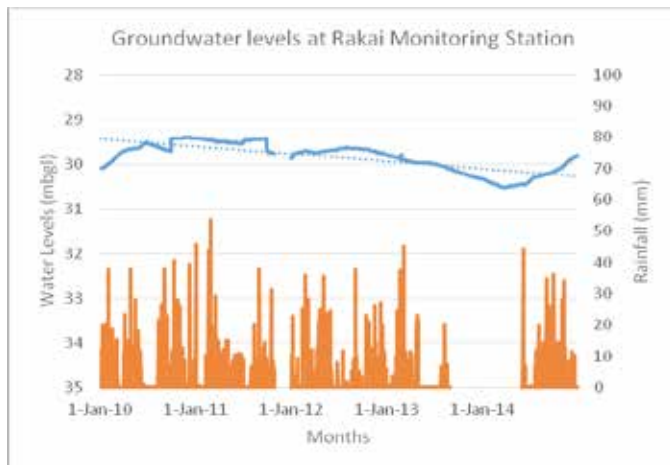
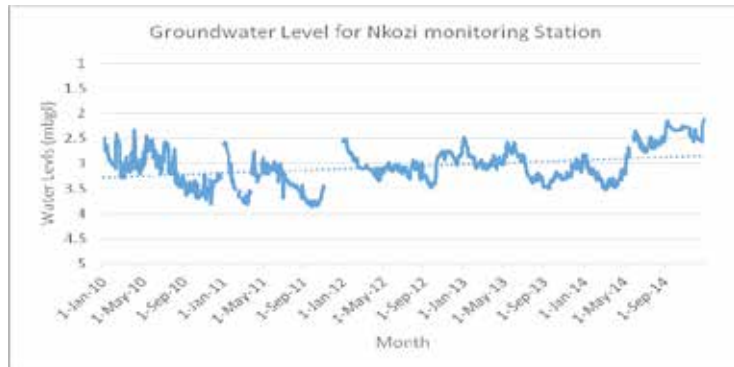
Figure 10.1: Water levels are different major surface water bodies
(Source: MWE, 2014)





Groundwater resources

DWRM has been carrying out groundwater mapping since the year 2001, and so far, 78 districts in the country have been mapped. In addition to district groundwater maps, regional groundwater maps following a Water Management Zones boundary have been prepared. Samples of the groundwater maps and reports are on the website of MWE (MWE, 2014). Figure 10.2 shows groundwater levels at different water monitoring stations of Nkozi, Rakai and Soroti.



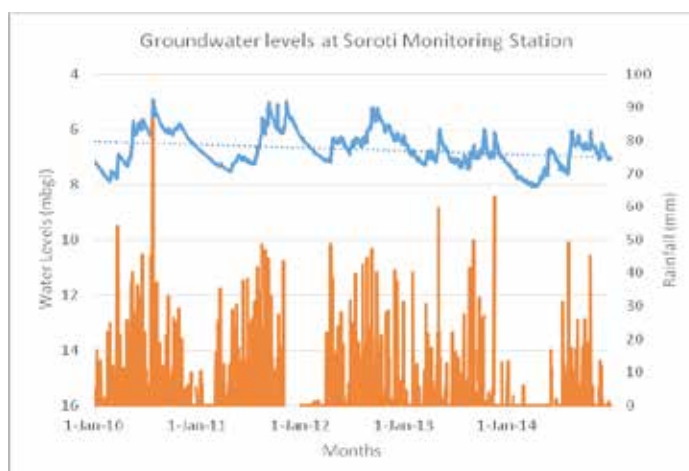


Figure 10.2: Groundwater levels at Nkozi, Rakai and Soroti monitoring stations
(Source: MWE, 2015)

Access to water

Sixty one percent of the country's water is from a ground water source, accessed from springs and boreholes. By June 2014, the national safe water coverage for rural area was 64 percent (MWE, 2014). There are approximately 20,000 deep boreholes, 3000 shallow wells and 12,000 protected springs in the country constructed mainly for rural domestic water supply.

Uganda had 198 urban councils (1 city, 22 municipalities and 175 town councils). The urban councils comprise large and small towns of which 66 urban councils are managed by NWSC and 132 urban councils are managed by Ministry of Water and Environment through the Urban Water and Sewerage Department (UWSD) of the Directorate of Water Development. Table 10.2 shows summaries access to safe water; of the 198 urban councils, 143 have operational piped water supply schemes, only 16 are connected to sewerage services while 55 still rely on point water sources such as boreholes, wells, and springs. Considerable investments in urban infrastructure and services are required to improve the access of water services at the current rate of urbanisation. Figure 10.1 shows national access to safe water.

Table 10.1: Water supply and sewerage in urban councils (Source: MWE, 2014)

Category	Urban council	Number	With water supply	Without water supply	With sewerage services
Urban councils (under NWSC)	City	1	1	0	1
	Municipalities	19	19	0	14
	Town Councils	35	35	2	1
	Town boards	11	11	0	0
Urban councils (under DWD)	Municipalities	3	3	0	0
	Town councils/ Boards	128	84	53	0
	Kakira Town Council which is privately owned	1	1	0	0
		198			

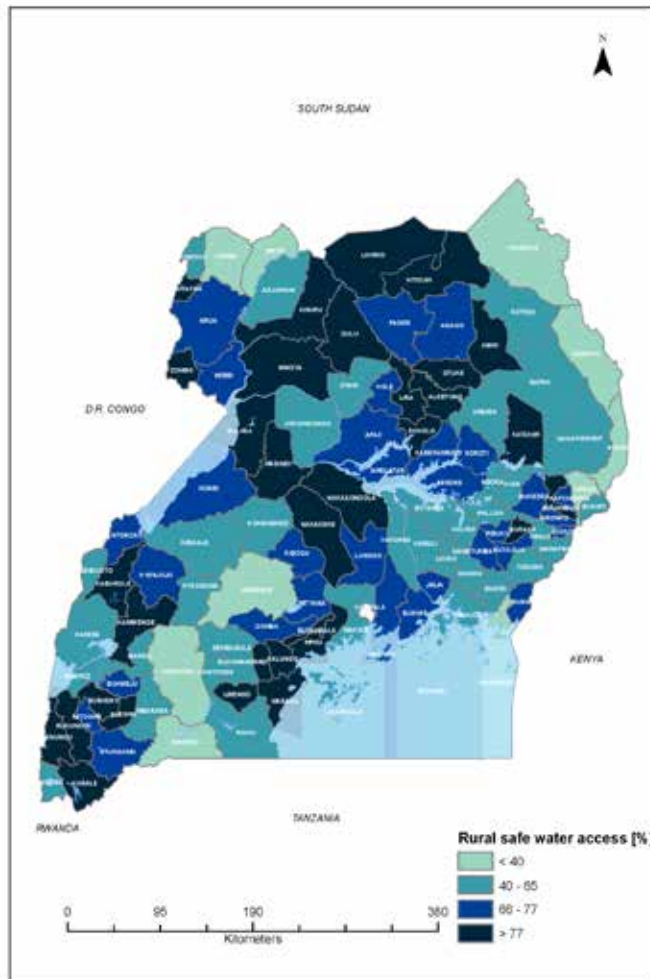


Figure 10.3: Access to safe water by district (June 2013)
(Source: MWE 2014)

To incorporate water as an issue in sustainable development, we need a long-term perspective in order to account for the slow unfolding interaction of hydrologic and social processes and the necessary time for a new water infrastructure to yield its fruits. Whereas forecasts may be reliable over the short term, they incorporate a fundamental uncertainty if used to predict long-term water use because of our limited understanding of human and ecological processes (Alcamo and Gallopín 2009). The future of water resources needs also depends at least partly on human decisions that are yet to be made (Gallopín, 2012). One of the approaches to address such challenges is to use scenarios.

Some of the major clusters of potential driving forces of the future water situation, as modified from Alcamo and Gallopín, 2009, are:

- i. Demographic forces that include population growth, migration pressures and urbanization;
- ii. Economic forces that include trade and increasing prosperity;
- iii. Water infrastructure especially water works investment;

- iv. Technological forces that include water use efficiency, water pollution, adoption of new crops;
- v. Climate change;
- vi. Water resources quality and distribution;
- vii. Environmental forces including agriculture, water-related diseases, ground water, ecosystem health;
- viii. Social, cultural and ethnical forces including personal lifestyles, poverty and inequity; and
- ix. Political, institutional or governance forces including power structure, level of conflict and globalization.

Current rate of water utilization

Water availability was based on the modeling time period of 1953-1978 (DWRM, 2013). The present utilization rate is generally very low throughout the country, with an average value of 2.8 percent and the highest being 9.3 percent (DWRM, 2013). The highest utilization occurred in the Lake Victoria Basin, and was mainly caused by the water demand in the Kampala metropolitan area. In contrast, the current rates of water utilization in the Aswa, Lake Edward, and Lake Albert basins are particularly low and effectively negligible. The principal reason for the overall low utilization rate, compared to rates in other countries, is the very small area currently under irrigation in Uganda.

Demand for metered water, on the other hand, has been consistently increasing (Figure 10.4). With the continued population growth, this demand will continue to increase over the years.

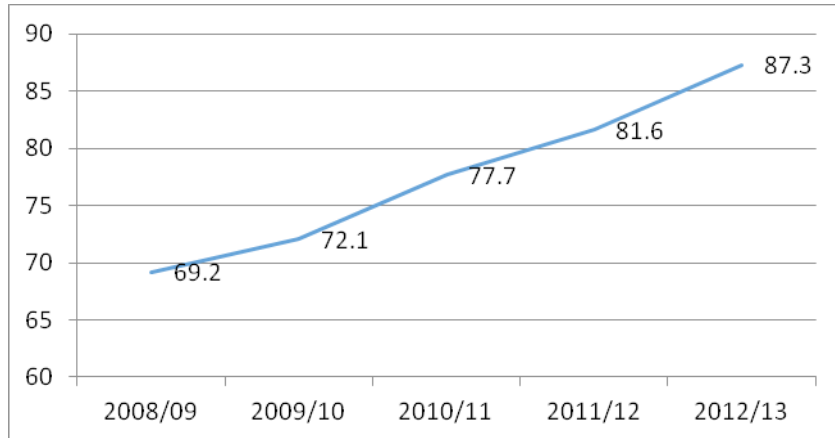


Figure 10.4: Water produced by NWSC, 2008/09 – 2012/13 (million cubic meters) (Source: DWRM, 2013)

Projected rate of water utilization in 2030

It is projected that by 2030, the water demand will have increased by over 400 percent, primarily because of irrigation potential will be fully developed while the share of the irrigation water demand will rise to 60 percent, compared to just 6 percent in 2009 (DWRM, 2013). The overall water utilization rate will stand at 14.1 percent, compared to only 2.8 percent in 2009. The changes will be more dramatic for a number of basins, such as the Albert Nile (62 percent), Lake Kyoga (40.3 percent), and Lake Victoria (30.7 percent).

With an overall expected utilization rate of 14.1 percent in 2030, Uganda will have to exercise some caution in developing its water resources because shortages can be experienced at local levels at some points in time. Each medium to large scale water development project will require detailed scrutiny of the local conditions and impacts. This applies in particular to the proposed irrigation projects in wetland areas in the Lake Victoria, Lake Kyoga, and Albert Nile basins. In addition to the projected water utilization, the emerging oil and gas developments will also place an added environmental stresses on the Lake Albert basin.

Access to sanitation

Access to sanitation increased to 74.6 percent in 2013/14 from 71 percent in 2012/13 in rural communities). The national target of 77 percent by 2015. This was largely attributed to increase financing, improved support supervision, improved use of the implementation guidelines as well as increased follow up by the district and sub county level extension workers. Rural latrine coverage is shown in figure 10.5.

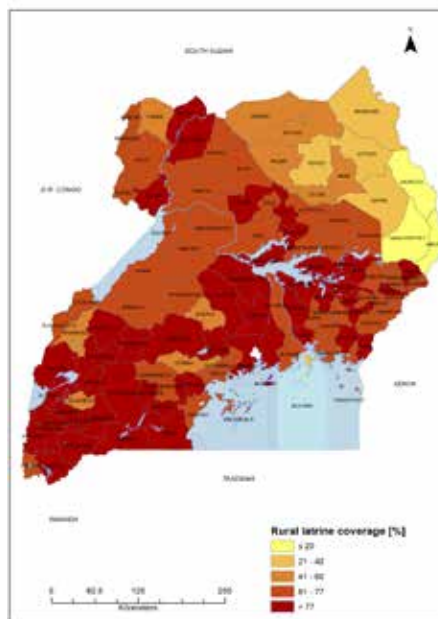


Figure 10.5: Status of rural latrine coverage in Uganda
(Source: MWE, 2014)

Water for production

The percentage of WfP facilities with actively functioning water user committees is 78 percent (MWE, 2014). This was based on spot checks of 278 facilities under community management with established water user committees, for 711 facilities constructed from 2000 to 2014 in the 54 districts so far covered in the WfP database. The total storage capacity added through investments by MWE in the FY 2012/2013 was 152,000 m³.

Opportunities for use of water to enhance livelihoods and development

A number of opportunities exist that the country can tap in to exploit its water resources sustainably to enhance livelihoods and alleviate poverty. The following activities are on the rise in the country and all need water including small hydropower dams for rural electrification; quarrying and mining; road construction; irrigation systems; fish farming; tourism; water supply systems; and jetty construction and landing sites.

Irrigation potential

The importance of irrigation becomes relevant as a technology to mitigate the impacts of climate change. The government has to date commissioned four irrigation schemes: Agoro, Mubuku, Doho and Olweny irrigation schemes.

Strategies to improve water resources management

Catchment approach to water resources management

There have been lessons learned from implementation. For instance a pilot study on River Rwizi catchment area located in Victoria water management zone has revealed that IWRM is better embraced in an area that is experiencing serious water resources problems. Secondly, because the process requires involvement of multiple stakeholders for its success, it involves a great deal of consultations and consequently substantial amounts of funds are required. Involving political, administrative and technical representatives in catchment management structures was found to be a viable aspect, thus it is highly encouraged.

Rainwater harvesting

The updated Water Policy and Water Act has among others, a regulation on rainwater harvesting. Rainwater harvesting is integrated in the implementation of the catchment management plans (implemented so far in Lokok, Mpanga and Rwambu). In FY 2013/2014, the investment on rainwater harvesting was 12 percent (UGX 2.595bn) of the total water supply investment. Part of this investment catered for the 812-rain water harvesting tanks installations by CSOs and the acquisition of 1120 rainwater harvesting jars in the same period (MWE, 2014).

Challenges facing fresh water resources

Water pollution

One of the most serious threats to water resources is the degradation of ecosystems, which often takes place through changes to landscapes such as the clearance of forests, the conversion of natural landscapes to farmland, the growth of cities, the building of roads, and surface mining. These activities deplete and degrade the water resources thereby reducing the amount of water available for use. In urban and industrial centres water bodies face contamination threats from industrial effluent, solid waste such as plastic bottles and plastic bags. The contamination of water bodies is referred to as water pollution.

Water pollution is driven mainly by the rapidly growing population, poor land use and management, growing urbanization, growing industrialization, poor environmental sanitation, and poor solid and liquid waste management. Emerging economic activities such as floriculture, horticulture, fish farming and oil exploration are exerting extra strain on the country's water resources. Uganda's economy is predominantly agricultural, and as such, organic matter and nutrients are the major pollutants of the aquatic environment. In addition, there is a growing demand for water of adequate quantity and suitable quality for social-economic activities such as drinking, agriculture, industry, recreation and ecotourism.

Risks associated with water pollution

Access to water

Risks associated with water pollution are largely related to lack of available water supply for domestic and industrial use. Unsafe handling and storage of water at household level coupled with sanitation challenges compound the problem of supplying water of good quality to the population.

The DWRM established that concentrations of fecal coliform bacteria at monitoring stations in the national network generally exceeded the WHO standard for drinking water (MWE, 2013). Furthermore, contamination of water resources by pathogens increases the incidence of water-borne diseases such as cholera, dysentery and typhoid.

Poor water quality also leads to water scarcity for communities living nearby open water sources who are often very poor and cannot afford sufficient water treatment, or are forced to use large quantities of fuel wood to boil water, further increasing pressure on forest resources. Polluted water, spent or used water from farms, communities, villages, homes, urban areas or industry may contain harmful dissolved or suspended matter.

Water demand

Water demand is increasing exponentially from the agriculture, industrial and domestic sectors. This is fueled by population growth and increased water use from the development sectors. A combination of increased water use, competition and inefficient water supply and purification practices can lead to water pollution.

Water pollution control could be enhanced through proper water use allocation (abstraction and wastewater discharge), water service regulation (drilling, construction, dam safety, and easement), compliance monitoring and enforcement of water and environmental laws including the requirement for Environmental Impacts Assessment.

Increased nutrient loading

Unregulated discharge of wastewater causes changes to the nutrient balance in water. Excessive nutrient loading results into eutrophication and the challenges of excessive plant growth that can disrupt water supplies and fisheries. Key sources of nutrients include the agriculture, industry and domestic sectors. Unsustainable agricultural practices, in particular, lead to siltation problems, wetland encroachment and wetland reclamation (MWE, 2013) which further reduces the water quality. Runoff from farms that contain pesticides and other farm related effluent may contaminate the surrounding soils and water. Some of the data is shown in tables 10.2 and 10.3.

Table 10.2: The pollutant loads (t/year) from various industries in Uganda (Source: DWRM, 2013)

Industry	BOD ₅	TN	TP
Breweries	507	11	1
Cardboard production	1	0	0
Cement manufacturing	0	0	0
Dairy processing	4	0	0
Distilleries	32	3	1
Fish processing	40	8	0
Flower farms	0	0	0
Food and Beverage processing	100	45	4
Institutions/offices	441	220	58
Integrated Steel Mills	7	1	0
Meat processing	28	3	1
Metal workshop	0	0	0
Metal, plastic, and rubber products manufacturing	6	1	0
Mining	0	0	0
Paint industry	2	0	0
Poultry production	1	0	0
Pulp and Paper Mills	10	1	0
Sugar manufacturing	595	15	7
Tanning and Leather finishing	7	1	0
Tea estate	8	2	1
Textile manufacturing	5	1	0
Vegetable Oil processing	8	2	0
Waste Management facilities	0	0	0
Unspecified, small industries, small offices	295	147	39

Table 10.3: Total Pollution in Uganda by 2013 (Source: DWRM, 2013)

Parameter	Monitoring Location	Industrial Effluents	Aquaculture	Estates	Rural Population	Urban Population	Livestock	Land Runoff	Total
BOD	Lake Albert	11			4,309	471			4,791
	Lake Kyoga	891			6,956	716			8,563
	Upper Nile	0			2,974	579			3,553
	Lake Victoria	1,193			4,826	1,438			7,457
	Total	2,095			19,064	3,204			24,364
TN	Lake Albert	2	70	518	1,616	169	7,704	8,023	18,102
	Lake Kyoga	98	139	333	2,608	293	16,739	12,420	32,630
	Upper Nile	0	51	0	1,115	207	8,165	9,660	19,199
	Lake Victoria	361	163	468	1,810	863	8,651	7,482	19,797
	Total	462	423	1,319	7,149	1,531	41,260	37,580	89,727
TP	Lake Albert	1	11	295	1,077	139	1,615	1,719	4,857
	Lake Kyoga	28	22	135	1,739	241	3,480	2,661	8,305
	Upper Nile	0	8	0	743	172	1,677	2,070	4,670
	Lake Victoria	84	25	214	1,206	770	1,872	1,603	5,775
	Total	113	66	644	4,766	1,321	8,644	8,054	23,608

Trans-boundary pollution

Uganda occupies a central location in the Nile basin and is obliged to participate fully and actively in trans-boundary issues including pollution management. Coordinated and regular measurements of water flow and pollutant concentrations will be required to actually determine how much pollution is transported across borders, and this is not yet in place.

Initiatives to control water pollution

There are opportunities to reduce and prevent pollution of water resources. Successful approaches target the main causes of water pollution which are mainly human induced. Interventions may include proper management of solid and chemical waste to prevent contamination of surface and underground water resources. Activities such as farming, clearing forests, building roads, and mining can put too much soil and particulate matter in rivers; and solid waste has the potential to damage natural water system.

The treatment of effluent from industries, sewer systems, farmland and urban centre's is fundamental in preventing surface water pollution. The enabling legal framework such as the Water Act, Cap 152, and the accompanying regulations such as Water Resources Regulations (1998) and the Waste Discharge Regulations (1998) are in place to control water depletion and pollution. Under this legal framework, permit holders are monitored for compliance to water abstraction and waste discharge conditions. For instance, in 2013, there were 369 permit holders being monitored (MWE, 2013).

Government is implementing an approach that involves water protection zones to prevent or control potentially harmful activities. The development of water conservation regulations to ensure sustainability of water resources in Uganda is also recommended.

Conclusion

Uganda's water resources face immense pollution from industrial effluent, mining and agriculture among others. The government has made strides to ensure conservation of this important resource, but there are growing challenges especially resulting from the changes in land use, the growing human population, climate change and the need for economic growth.

The quality of water is important for the well-being of the environment, society and the economy. Improving water and sanitation services and managing water resources requires investment. However, this investment should not be one-off nor short term. It requires a multi-sectorial approach and should be based on scientific data so as to be scale-appropriate and location-relevant (UN-Habitat, 2010).

Opportunities and policy recommendations for improved water resources management

A number of opportunities exist that the country can tap in to exploit its water resources sustainably to create wealth and alleviate poverty. These include hydropower and irrigation potential (basin wide), water catchment and trans-boundary approach to water resources management and the existing legal and policy framework. The following are the proposed strategies for management of water resources

1. Improved management of groundwater resources
2. Improved water storage capabilities
3. Enhancing information and knowledge management

Key messages for policy actions on sustainable development of water include:

1. Strengthen institutional set up for water catchment management zones and trans boundary area at local levels.
2. Strengthen enforcement of the existing legal frameworks.
3. Expand the Integrated Water Resources Management (IWRM) framework to include other aspects like poverty eradication and disaster preparedness in addition to provisioning of drinking water and sanitation.
4. Support DWRM to fill the data gaps and also ensure they have up-to-date data to carry out better informed analysis of the status of water quality and quantity
5. Propel the country onto a Great transitions trajectory as this offers the most optimal scenario given the existing water utilization projections and Uganda's population growth. Yet even with the most optimal scenario, varied levels of monitoring effort and caution will have to be exercised in the different catchments

10.2 Wetlands Resources

Introduction

This section on wetlands resources presents the status of wetland resources, the importance of wetlands for improved livelihoods and development. include, The section further presents the governance of wetlands in Uganda, impacts of wetlands encroachment, action and response and strategic interventions and recommendations.

Status of wetlands in Uganda

Wetlands coverage is currently about 10 percent of land area and has been declining steadily since 1994 when it was roughly 15 percent of land area (Table 10.4) (MWE, 2014). Wetlands loss is attributed to conversion for agriculture, human settlement and industrial development. About 0.7% of wetlands are under management planning spearheaded by community efforts, Local Governments and the Wetlands Management Department in the Ministry of Water and Environment.

Table 10.4: Area of wetlands from 1994- 2015 (Source: MWE 2014)

Year		Wetland coverage %	Comments
1994		15.6	Reduction rate of wetlands between 1994 to 2008 was 2.1%
2008		10.9	This was estimated to reduce by 3% between 2008 to 2014
2015		10.3	Due to the conservation efforts and natural factors, wetland coverage reduced at a reducing rate of 0.6% compared to the projected reduction of 3%

Challenges facing wetlands management

Inadequate knowledge and information base

The last national inventory, though satisfactory, has not been updated and there is limited information on the extent and actual loss annually. This has implications for policy or management decision making.

Catchment and wetlands degradation

There are numerous examples of wetlands degradation around the country, but there is much pressure in the urban areas. For instance, the catchment around the 1.5 km² Kinawataka wetland (6.5 km east of Kampala city center along Kampala-Jinja highway) has been degraded as a result of industrialization and urbanization. Urban agriculture and the construction of unplanned settlements, factories and warehouses are common. Effluent from industry and municipalities is discharged directly into streams that flow into Kinawataka wetland before entering Murchison bay in Lake Victoria. The direct discharge of volumes of wastewater escalates the pollution load beyond levels that the wetlands can realistically address. This has led to eutrophication in Lake Victoria. Figures 10.6 and 10.7 highlight some of these changes.



Figure 10.6: Major land use and land cover change in Kinawataka wetland Analyzed from Digital globe 0.90 meters which is 90cm 2005-2014



A satellite image view of unplanned section of Kinawataka area in Kampala

Urban wetlands such as Nakivubo, Lubigi and Kyetinda also face many of the same challenges due to pressures from the surrounding urban areas. These affect the quality of water that drains into Lake Victoria thereby increasing cost for water treatment and supply plants.

Land tenure

The management of natural resources can only be sustainable if the tenure systems within wetlands, property ownership and national goals for poverty reduction and social transformation are well matched. Land in Uganda is privately owned and wetlands are held in public trust, however there has been an increase in acquisition of land titles in wetlands.

Valuation of wetlands

The economic contribution of wetlands is appreciated in Uganda with a focus on the market and non-market values. Environment economists have undertaken valuation in a bid to present the actual economic value of wetlands to guide decision making (Kakuru et al, 2013).

Demarcation of wetland boundaries.

Efforts are ongoing to demarcate the boundaries of key wetlands around the country. In addition, public awareness of stakeholders has been held in the districts of Lira, Bushenyi, Gulu, Mbale, Masaka and Jinja. The Wetlands department disseminated the wetland boundary demarcation strategy to selected stakeholders for pre-testing. The strategy has been used as a reference tool for the wetland demarcation exercise and has been very useful in the pilot wetland demarcation process of five urban and five municipal wetlands. An Action Plan was also developed and the demarcation strategy operationalized.

Coordinating and implementing wetland management plans

Framework management plans for wetlands systems in Lira (Arocha-Okole), Mbale (Namatala-Doho), Kumi Awoja), Mukono (Ssezibwa) and Mbarara (Ruwizi-Rufuha) have been prepared in consultation with Local Governments and are being implemented. These Framework Management Plans have provided a mechanism for collaboration between the local governments, which shares these wetland systems.

In addition, 12 Management plans for RAMSAR sites and 66 management plans for critical wetlands in Gulu, Lira, Mbale, Bushenyi, Jinja, Kasese, Kamwenge, Kabarole, Lwengo, Kumi and Masaka have been prepared. These are wetlands of international importance or those important as a source of water for urban areas or sinks for urban waste water purification. The plans are meant to ensure equitable use of wetland resource by the stakeholders for livelihoods enhancement. Furthermore, 8 District Wetland Action Plans (DWAPs) out of the planned 32 have been developed and integrated into the District Development Plans in a number of districts (MWE, 2014).



Local community in resource analysis in Lutembbe and singing of Awoja Framework plan (Photo credit: MWE, 2014)

Addressing the land administration issue

In order to reverse the degradation of wetlands, the government made a decision in 2014 to cancel all land titles issued in wetlands. In order to implement this decision, MWE and NEMA are in the process of demarcating all the wetlands boundaries before eviction and eventual restoration.

A total of 276.1Kms wetland boundaries in Kampala, Bushenyi, Wakiso, Mukono, Masindi, Otuke, Gulu, Arua ,Iganga Lira, Mbale, Kaliro, Bulambuli, Kamwenge, Jinja, Kasese, Rakai, Isingiro were demarcated in between 2012 to 2014. There are plans to demarcate a further 150 Kms of wetland in FY2014/15 in Dokolo, Kisoro, Hoima, Luwero and Pallisa.



Wetland demarcation for Masese-Budumbuli wetland in Jinja (Photo credit: MWE, 2014)

Restoration of degraded wetlands

A total of 735.5ha of degraded wetland sections were restored in Kampala, Masaka, Jinja, Wakiso, Bushenyi, Isingiro, Sheema, Buhweju, Mukono, Masindi, Rakai, Gulu, Lira, Mbale, Arua, Iganga, Kaliro, Mbarara districts. This restoration contributed to increased catchment water retention. This output has gone a long way in reclaiming the ecological and hydrological functions of the wetlands for water quality and availability as well as mitigating the impact of climatic change.

Recommendations for policy

Increase biodiversity financing to lead agencies to ensure wetland conservation Scale up the biodiversity offsets option for wetlands that are in the city especially Kampala.

10.3 Fisheries Resources

Introduction

The fisheries sector is a priority area in the NDP II as it supports livelihoods and the economy through employment, income generation and food security. Fisheries contribute 2.4 percent of the national economy (DFR, 2012). In total, the subsector contributes to the livelihood of approximately 5.3 million people, of which 1.5 million are employed in fishery activities directly or indirectly; and 5,000 in commercial fish industrial processing plants (DFR, 2012). Fish contributes to food security as a source of protein. Fish per capita consumption is 5.7 kilograms, below the WHO recommended level of 12.5 kilograms (DFR, 2014).

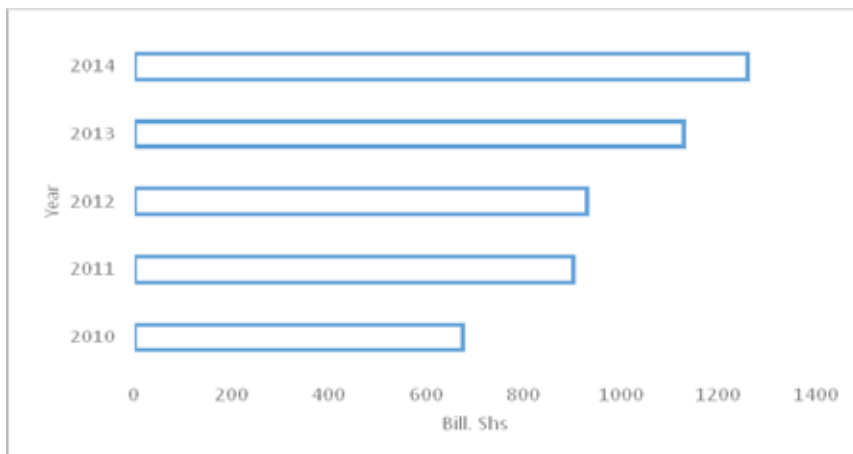


Figure 10.7: Fish contribution to the GDP by Economic Activity at Current prices (Bill. Shs) (Source: MAAIF, 2014)

State of fisheries resources in Uganda

The fisheries sector is largely dependent on capture fisheries although aquaculture is also being promoted. Fishing activities are growing at 1.4 percent after a decline in 2013/14 thereby contributing 1.8 percent of the total GDP which indicates slight improvement over the previous year though far lower than the growth rates realized in the early 2000s. Figure 8.14 shows the contribution of the sector to GDP. Below is a presentation of the state of the fisheries sector under capture fisheries production, fish export trends and aquaculture.

Capture fisheries

The fisheries landscape includes the five large lakes of Victoria, Kyoga, Albert, Edward, George and Kazinga Channel, 160 minor lakes, rivers (Albert Nile), swamps and floodplains all of which are critical habitats, breeding and nursery grounds for fish and suitable sites for fish farming. Uganda's fisheries resources are not only diverse in aquatic ecosystems but also in fish species biodiversity (MAAIF, 2011; and FAO, 2004).

Lake Victoria continues to be the most important water body in Uganda, both in size and contribution to the fish catch. Its share of catch was 41.4 percent in 2011 rising to 45.7 percent in 2012, 45.9 percent in 2013 and 53 percent in 2014. This was followed by Lake Albert, and then Lake Kyoga.

Overall, the annual fish production from capture fisheries decreased from 419,000 in the year 2013 to 390,000 tonnes in 2014 (Table 10.5). The decrease in fish production between 2013 and 2014 could be a combination of

- a) Increased illegal, un-reported and un-regulated (IUU) fishing activities
- b) Increased fishing effort due to open access regime resulting into over fishing
- c) Inadequacies in fish catch data collection
- d) Emergence of new weed (Kariba weed –*Salvinia molesta*.) on Lake Kyoga-Lake Albert and Albert Nile systems

Table 10.5: Fish production by water body ('000 tonnes) for the period 2009 to 2014 (Source: DFR, MAAIF)

Water body	Year					
	2009	2010	2011	2012	2013	2014
Lake Victoria	221.30	162.93	175.82	185.52	193.00	183
Lake Albert	56.50	154.15	163.60	152.56	160.00	152
Lake Kyoga	60.00	49.06	61.58	44.05	40.00	38
Lakes Edward, George and Kazinga Channel	8.80	4.50	5.30	5.21	6.25	6
Other water bodies	20.00	15.30	14.80	20.30	20.00	11
Total	366.60	385.94	421.10	407.60	419.00	390.0

Aquaculture

Aquaculture (fish farming) is a non-traditional technology that has been adopted by smallholder farmers. Over the last 5 years, the Department of Fisheries Resources has taken deliberate efforts to revitalize aquaculture production in the country. Currently there are 8,000 subsistence fish farmers, 3,500 small-scale commercial farmers and 500 emergent commercial fish farmers (MAAIF, 2013).

The aquaculture subsector is growing at a high rate and production increased from 46,000 tonnes in 2008 to almost 100,000 tonnes in 2013. To combat the decline in capture fisheries there have been government effort to promote aquaculture throughout the country.



Aquaculture practices on Lake Bunyonyi in Kabale (Photo credit: NEMA)

The Aquaculture Unit drives fish farming activities in Uganda in collaboration with the NAFIRRI Kajjansi and development partners. NaFIRRI has designed an Aquaculture (fish farming) policy brief which outlines the new innovative practice of cage culture. It outlines what the practice requires and how the average fish farmer can take up profitable commercial fish farming.

Challenges facing the fisheries sector

There are a number of issues affecting the fisheries sector and key among these include the open access fisheries regime, declining fish stock, increasing fishing effort, use of destructive fishing equipment, underfunding and alien invasive species.

Open access fisheries management regime

In an open access fishery, fishermen feel the urge to catch as many fish as they can before their competitors do, no person or group holds exclusive rights over the resource. There is limited control to open access fishing that has led to indiscriminate fishing and a decline in the fish catch.

Declining fish stocks

The total production from capture fisheries has declined with increased catch effort in the recent years which is an indicator of declining fish stock. The main driver of dwindling fish stocks is the increasing demand from the growing population pressure for food and incomes; and from regional markets. Inadequate alternatives to capture fisheries, forces people to remain in the industry. Other causes of declining fish stock include infestation of shoreline habitats by invasive species like the water hyacinth and Giant Salvinia; climate change which affects water levels exposing traditional fish breeding grounds; and pollution from industrialisation

and increased urbanisation reduces water quality. Declining fish stock have resulted in reduced revenue to government; reduction in livelihood incomes for households dependent on the fisheries industry in Uganda; increased food insecurity; and the decline in fish resources is encouraging overfishing.

Use of destructive fishing gears and methods

One of the most damaging effects on the capture fisheries is the use of destructive fishing gears and technologies especially when they are used in fish breeding and nursery grounds resulting in harvesting of young fish.

Under funding

Underfunding of the subsector severely undermines effective and sustainable fisheries management. Aquaculture, in particular, depending on the systems and species may require improved technologies. In such cases, access to capital will be a key factor for development.

Invasive aquatic weeds

Invasive aquatic weeds are a problem that is continuing to spread on traditionally open water bodies. By 2014, a new aquatic weed *Salvinia molesta* had appeared on Lake Kyoga and spread along River Nile to Lake Albert and Albert Nile. Aquatic weeds make fishing difficult by hindering the navigation of fishing boats, entangling gears and altering micro-aquatic ecological conditions necessary for fish survival. Box 8.2 describes some of the impacts of the weed and recommendations for control.



Water hyacinth, Kariba weed (*Salvinia molesta*) and other floating weeds on Lake Kyoga- better (Photo Credit: Bob Nuwagira, NEMA 2014)

Availability of fish feeds

The availability and costs of feed is a limiting factor to aquaculture. The sub sector experiences irregularity or shortages of feed supplies which poses a risk to operations.

Availability of quality seed (fingerlings)

Fingerlings collected from the wild are of poor genetic material, which results into stunted growth. Efforts by government to support private hatcheries is yet to register the desired outcomes and they are still operating below capacity.

Box 10.1: *Salvinia molesta*: Impacts and recommendations for control (Source: NaFFIRI 2014)

Salvinia is a free floating weed found on Lakes Kyoga and Albert and the River Nile with environmental and social impacts. It grows rapidly and doubles its mass in about four days. It forms thick extensive mats that result into the destruction of habitat of fish and other aquatic biota. When it dies and rots it creates an oxygen deficient environment that negatively impacts other aquatic biodiversity. It also impairs the water quality for domestic use. It is well established along much of the central and western shorelines of Lake Kyoga. Activities that are commonly done in the near-shore areas such as water abstraction by lakeside communities, watering domestic animals, docking and boat take-off, bathing and swimming are negatively affected by the thick mats.

This weed endangers fishers and livestock who can become entangled in heavy infestations. The weed also creates microhabitats that are ideal for disease vectors such as the malaria-carrying mosquitoes and bilharzia snails, and alters the natural beauty of open water, such as dams, rivers and lakes.

Recommendations:

- 1) Urgent interventions to control this weed are required
- 2) Collect baseline data and information on the extent of *Salvinia* infestation in the Kyoga Basin lakes and other associated water bodies such as Lake Albert and the Albert Nile.
- 3) Select control options that are environmentally friendly. For instance since *Salvinia* easily breaks under the influence of even slight winds, waves and water currents, mechanical control may not be the best option. It might be necessary to explore biological control options.
- 4) Explore best management practices for *Salvinia* from those countries like Zimbabwe and Kenya where the weed is non-native but has apparently not led to major disruptions to use of water resources.

Strategies for better management of the fisheries resource

Promoting fish farming

The Government has constructed four regional fish fry production (hatcheries) and demonstration centres in Mbale, Gulu, Kaggansi and Bushenyi under the Fisheries Development Project. These are expected to boost aquaculture development with provision of quality fish seed to farmers. Five hundred emergent commercial fish farmers and subsistence fish farmers have already received direct support to boost their production. Permits have also been issued to 100 farmers to engage in cage culture in small water bodies.

Improving fish management regimes

Government is addressing the issues of open access fisheries through a management regime that includes Fishing licensing is also being streamlined to control effort and enhance efficiency; and the issuance of Vessel Identification Plates to license fishing vessels for easy monitoring. There are also efforts to introduce closed fishing seasons and no fishing areas and increase monitoring, control and surveillance over the fisheries resources.

10.4 Recommendations for implementation of Fisheries Resources Management

The following are recommended:

1. The fisheries sector should identify and establish a sustainable funding mechanism to address the challenges. Provide viable alternative sources of livelihoods among fisher folk to relieve pressure on capture fisheries.
2. Restock minor lakes and dams with native fish species to replenish the stocks and increase production
3. Promote and support aquaculture.
4. Streamline fishing vessel licensing to limit open access regime
5. Regulate gear size by species by water body and slot size for all major fish species rather than commercial fish species only.
6. Identify, map and gazette and protect ecologically sensitive areas (fish breeding and nursery areas) as no fishing zones to allow natural biological recruitment
7. Introduce closed fishing seasons for some fish species and non-shared lakes.

Chapter 11: Energy and Mineral Resources

11.1 Renewable Energy

The overall renewable energy power generation potential is estimated at 5,300 MW. This includes 2,000 MW of hydropower, 450 MW of geothermal, 285 million tons of biomass standing stock with a sustainable annual yield of 46 million tons, 1,650 MW electricity of biomass cogeneration, an average of 5.1 kWh/m² of solar energy, and 800 MW of peat (MEMD, 2014).

Biomass

Biomass is the predominant type of energy used in Uganda, accounting for over 94 percent of the total energy consumption in the country (MEMD, 2014). Charcoal is mainly used in the urban areas while firewood, agro-residues and wood shavings are widely used in the rural areas. Firewood is used mainly on three-stone fires in rural households and in urban areas occupied by the poor. Firewood is also commonly used in institutions and by low-end food vendors in urban areas. Only about 10 percent of all households use efficient stoves (UBOS, 2014). Biomass occurs in a wide range of forms in natural woody formations, as a byproduct of agricultural processes and from dedicated energy plantations.

Biogas

Biogas is used at a small scale for lighting and cooking, and there are no large-scale bio-ethanol or bio-diesel production facilities (MEMD, 2012a). The potential of large-scale sugar plantations is yet to be exploited.

Geothermal Energy

Geothermal energy resources are estimated at 450 MW (MEMD, 2014). The three potential areas of Katwe-Kikorongo, Buranga and Kibiro have been assessed and marked as potential targets for geothermal development. More active and inactive geothermal features have been discovered in several districts across the country. In 2014, reconnaissance surveys were done at several locations including Kanangaroki in Kaboong, Elegu and Amuru in Adjuman, Panyimur in Nebbi and Kaberebere in Mbarara. Geological studies revealed thermal springs, which are possibly fracture controlled, and most likely low temperature resources. These thermal springs are in non-volcanic terrain and are possibly related to deep circulation of meteoric waters along permeable fractures. Figure 11.1 shows some thermal springs in the country.

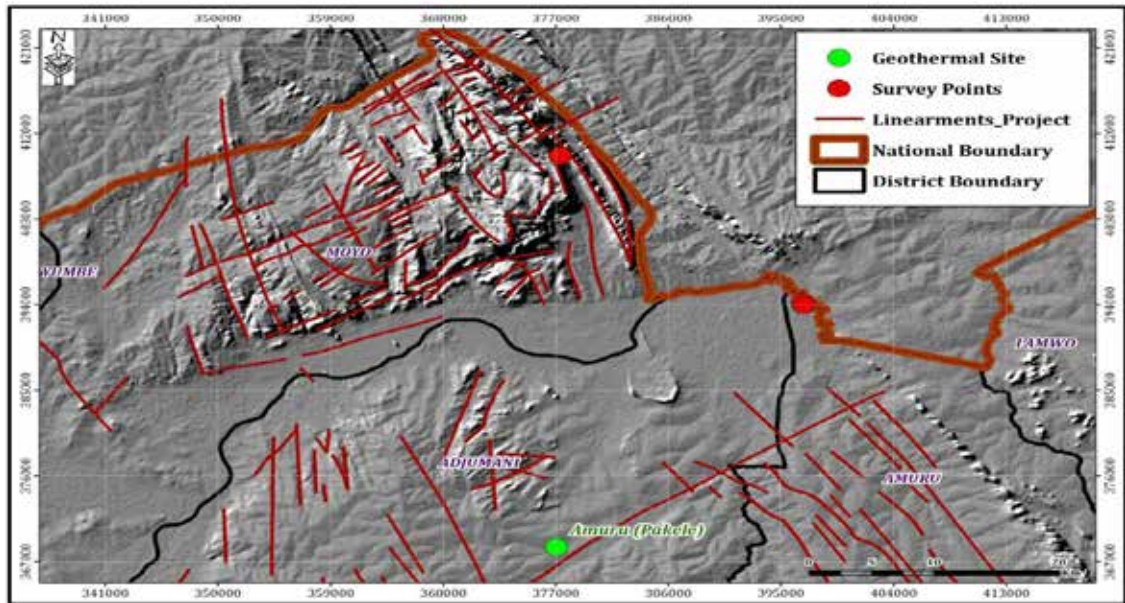


Figure 11.1: Digital Elevation Model showing Amuru Geothermal site
(Source: MEMD, 2014)

Hydropower

Uganda's hydropower potential is estimated at over 2,000 MW most of which is located along the Nile. The current generation capacity stands at 852 megawatts, with peak demand of 540 megawatts.

Government is investing in infrastructure to meet the increasing demand for energy thereby lowering production costs, improve on the country's competitiveness and increase access to electricity. This will be done in tandem with the extension of the transmission networks into a national grid in line with the regional agreements.

Development of hydropower

Electricity access is a major requirement for development, and electricity demand in Uganda is high for industrial and domestic use. New hydropower stations expected to be operational by 2018 include Isimba-183 MW and Karuma-600MW. Studies for Ayago 600 MW are ongoing. Several mini hydropower sites with a potential of about 210 MW have been identified through different studies (NPA, 2015). A schematic diagram illustrating some of the sites under development is presented in Figure 11.2.

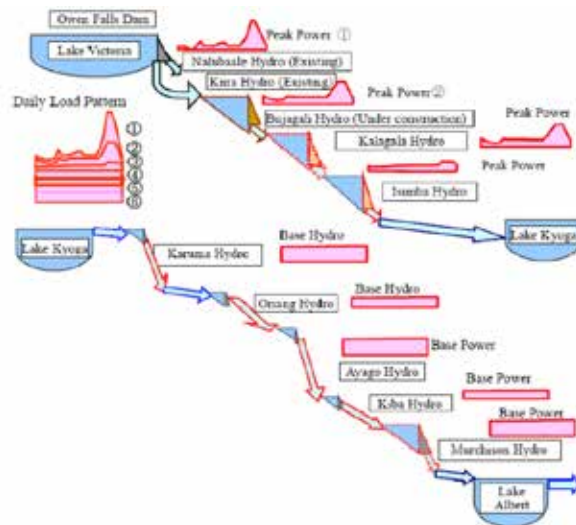


Figure 11.2: Schematic drawing illustrating development of hydropower dams along the R. Nile in Uganda (Source: MEMD, 2014)

Solar energy

Existing solar data clearly indicate that the solar energy resource in Uganda is high throughout the year. The insolation is highest in the dryer area in the northeast and lower in the more hilly and mountainous areas in the east and south-west. A mean solar radiation 5.1 kWh/m² per day (on a horizontal surface) is quite favorable for the application of a number of solar technologies. Solar energy is currently used primarily for off-grid electrification for rural communities, as well as for solar cooking, and providing water heating and power to public buildings (GIZ, undated).



Solar panel installation at Bumadu Seed S.S. in Bundibugyo (right), and a home in Kibiito with an installed solar system under REA's PVTMA (left) (Photo credit: MEMD 2014)

In 2014, the MEMD undertook projects to promote the development and adoption of solar energy and sustainable use of various renewable energy technologies. In the same period, with support from Energizing Development (EnDev) through GIZ-PREEEP (Promotion of Renewable Energy and Energy Efficiency Program), the Ministry implemented various activities in line with solar power and rural electrification with the aim of improving access to and efficient utilization of renewable energy by both households and industries (MEMD, 2014). Some of the achievements registered include:

- i. Provision of solar PV systems for 30 Social Institutions, such as health centers, schools and government offices.
- ii. Distribution of more than 1,000 solar systems to provide lighting and support small scale businesses like phone charging
- iii. Setting up of two rural outlets to provide 400 households with Sales Agents selling pico PV lanterns for Small Solutions, solar systems and solid after-sale services.
- iv. Supporting Village Power [local solar company] in opening a Rural Service Center in Gomba district to increase service quality and access to Solar Home Systems. In addition, EnDev collaborated with the company to pilot their Mobile Money Enabled Solar Home Systems, allowing for easier financing for the end-user and remote control of the system (MEMD, 2014).

Wind energy

Wind speeds in most areas of Uganda are moderate with average speed not exceeding 3 m/s. This implies that electricity generation potential is low since cut in wind speed for electricity generation from wind is 3 to 4 m/s (MEMD, 2012b). The cut in wind speed is the minimum wind velocity below which no useful power output can be produced from wind turbine. This ranges between 3 and 4 m/s. Areas such as along the shores of Lake Victoria and in Karamoja that have slightly higher wind speeds have potential for production of electricity on a medium scale.

Nuclear energy

A Nuclear Energy Unit was established with working groups to assist in the development of a strategy and implementation plan for establishment of nuclear power plants in the country. A Siting Working Group will determine where the nuclear installations are located. The Technology Deployment Working Group (TDWG) will inform on issues of physical infrastructure, financing, local industrial involvement, plans for sustainable supply of nuclear fuel and radioactive waste management. In 2014, TDWG and AF-Consult Switzerland Ltd undertook a study to integrate nuclear power into the generation capacity plan 2015-2040 (MEMD, 2014). In the same year, the Siting Working Group also embarked on siting studies taking into account Population, Topography, sites of ecological importance, geological and structural data such as faults, infrastructure such as the Standard Gauge Railway and existing and future Power Grid lines. A Nuclear Laboratory has been set up to support pre-feasibility studies for establishing the first nuclear power plant in the country.

Challenges in the sector

Some of the challenges facing the sector include;

Over dependence on biomass energy

The high inefficient and unregulated use of solid biomass energy is a key limitation to sustainability in the sector. Over dependence on tree biomass energy has led to deforestation and land degradation.

Climate change

Uganda's total installed capacity is 822 MW, which is mainly along the river Nile. However, during drought periods, only about half of the installed capacity can be generated because of the low water levels. The Government procured emergency thermal generators to counter the challenge. In addition, two dams in Uganda are equipped with desilting gates and have proper plans for the management of upstream water and land use issues.

Opportunities to bolster use of renewable energy resources

To meet the sector targets and respond to increasing demand for energy, the key areas of focus in the sector include; increasing power generation capacity to drive economic development; expanding the electricity transmission grid network; increasing energy efficiency; promoting the use of alternative sources of energy; and strengthening the policy, legal and institutional framework. The planned interventions are summarized in table 11.1.

Table 11.1: Planned interventions for promoting renewable energy (Source: NPA 2015)

Objective	Interventions
1. Increase power generation capacity to drive economic development.	<ul style="list-style-type: none"> • Develop large and small hydropower energy plants • Develop geothermal power sources. • Build thermal power plants.
2. Expand the electricity transmission grid network.	<ul style="list-style-type: none"> • Complete the on-going power line upgrade and associated substations. • Build new transmission lines to evacuate power from generation plants. • Extend the transmission grid to service previously unreached peri-urban and rural areas.
3. Improve energy Efficiency	<ul style="list-style-type: none"> • Revamp the transmission networks to reduce technical power losses • Install reactive power compensation devices. • Introduce prepaid meters and increase monitoring to reduce • Commercial power losses. • Develop and enforce standards for promoting energy efficiency
4. Promote use of alternative sources of energy	<ul style="list-style-type: none"> • Develop nuclear energy for power generation and other peaceful purposes. • Promote and facilitate the use of renewable energy technologies like bio-fuels, wind, solar, improved cook stoves and LPG at household and institutional levels
5. Improve the policy, legal and institutional framework	<ul style="list-style-type: none"> • Develop policies to address gaps (atomic energy, thermal power from locally produced petroleum products, biomass, and energy efficiency) • Review the existing policies and Acts (Energy Policy, Renewable Energy Policy, and Electricity Act). • Formulate a PPP framework to allow more private investment in the energy sector.
6. Build capacity in the energy sector	<ul style="list-style-type: none"> • Strengthen the institutional and human capacity. • Train staff in specialized fields like nuclear science, geophysics, geology, hydropower and geothermal technology.

Development of the National Biomass Energy Strategy (NBEST)

The National Biomass Energy Strategy 2014 aims at balancing supply and demand of biomass energy by proposing interventions that will allow for biomass use with minimal environmental impacts. It makes a comprehensive analysis of the current supply and demand for biomass energy resources and makes forecasts of up to 2040. The six pillars of the strategy are; awareness creation; establishment of a biomass resource information system; capacity building; biomass demand interventions; biomass supply interventions and cross cutting issues such as innovative financing.

11.2 Minerals

Introduction

This subsection presents the state of mineral resources in Uganda and their contributions towards sustainable livelihoods. The indicators selected for this theme have their foundation on the baseline of indicators used in the SOER 2012. These indicators include: Variety and type of minerals, the production volumes, Investments in the mineral subsector, contribution of the mineral subsector to the GDP of Uganda, contribution to the mineral subsector to sustainable livelihoods, environmental issues and governance, gender issues, status of artisan and small-scale mining activities.

Status of the minerals sector

Mining is fast becoming a key a livelihood subsector in Uganda, with majority of people earning a livelihood from the mining value chain through artisanal and small-scale mining. There is also great increase in both foreign and local investment in the mining subsector, with increases in exploration and mining licenses from just 50 in 1990 to 873 by the end of 2013. This alone has offered employment for many Ugandans and created other livelihood opportunities along the mining value chain.

The distribution of minerals in Uganda is uneven with the south-western, north-eastern and central regions having the bulk of mineral deposits (figure 11.3). These possess massive potential to improve livelihoods of people if the right checks and balances are put in place.

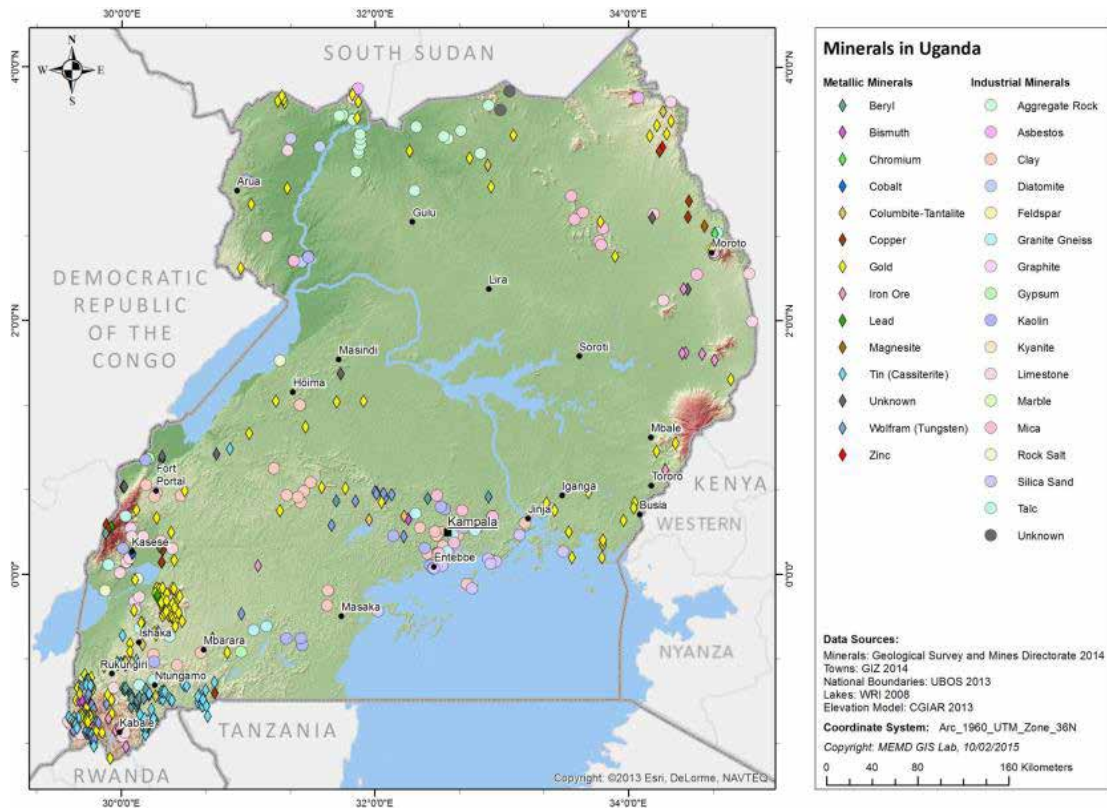


Figure 11.3: Geographical distribution of minerals in Uganda (Source: MEMD, 2014)

Mineral production, import and export

The value of mineral production decreased by 29 percent from 207.8 billion in 2012 to 148.2 billion in 2013 and mineral imports decreased by 33 percent from 31.6 billion in 2012 to 21.2 billion in 2013 (MEMD, 2014) as shown in Tables 11.2 and 11.3. This was attributed to the limited trade in tin, tungsten, tantalum (3Ts) and gold following the cross border restrictions in the trade of the 3Ts and gold due to the Regional Certification Mechanism coupled with fluctuating market rates for minerals. However, the value of mineral exports increased by 20 percent from 69.9 billion in 2012 to 83.7 billion in 2013 (MEMD, 2014). Gold was the most exported mineral in 2013, most of the gold is mined by artisanal miners and this has the potential to improve the livelihoods of people involved in the gold value chain.

Table 11.2: Total value of mineral production 2012 to 2014 (value in 103 in UGX) Source MEMD 2014

Mineral	2012	2013	2014
Limestone	112,351,639.20	110,684,618.00	130,828,831.00
Pozollana	13,656,798.96	13,092,882.00	15,590,886.00
Gold (kg)	507.90	620,190.00	2,860.00
Vermiculite	30,085,882.20	1,329,731.00	1,540,574.00
Cobalt**	44,702,412.63	24,227,994.00	0.00
Crude cobalt carbonate	1,500,555.00	797,914.00	0.00
Wolfram	30,708.24	2,503,230.00	2,753,034.00
Syenitic Aggregate	4,288,646.00	164,859.00	96,906.00
Kaolin	1,202,146.52	4,387,527.00	4,628,602.00
Iron Ore	0.00	619,217.00	11,383,168.00
Gypsum	0.00	0.00	0.00
Lead	0.00	0.00	0.00
Coltan (30 percent Purity)	0.00	0.00	0.00
Tin (75 percent Purity)	0.00	872,087.00	11,383,168.00
Beryl (1 percent Beryllium)	0.00	0.00	0.00
Manganese (Above 46 percent Mn)	0.00	0.00	0.00
Total	207,849,667.00	159,300,249.40	168,339,533.80

Table 11.3: Annual Mineral Exports by value 2012-2015 (Source: MEMD, 2014)

Mineral commodity	2013	2014	2015
Beryl Ore	30,761,065	-	-
Cobalt	27,974,413,300	-	-
Coltan	40,497,198	275,185,535	275,185,535
Columbite/Tantalite	55,458,278	-	-
Copper	-	3,485,030	-
Crude Cobalt Carbonate	1,014,182,028	-	-
Gold	21,598,627,677	1,587,064,796	1,444,742,006

Iron Ore	-	485,500,000	675,000,000
Lead	227,030,351	-	-
Marble	-	-	4,000,000
Nickel	1,185,561,000	-	-
Quartz	26,813,188,470	-	-
Ruby	11,565,000	-	-
Tantalite	-	191,003,414	20,068,246
Tin	873,259,953	916,379,776	472,808,669
Tourmaline	-	18,426,800	18,426,800
Tungsten ore	3,462,188,087	-	-
Tungsten tailings	394,034,746	-	-
Wolfram	-	5,214,220,622	3,026,425,569
Total	83,680,767,153	8,691,265,973	5,932,656,825

Contribution of the mineral sector to economic development

Since 2010 there has been an improvement in the mining subsector with a total contribution of GDP averaging 1 percent over the last 4 years (UBOS, 2015). The sector grew by 13 percent in 2014, contributing 719 billion shillings from 636 billion shillings in 2013 (UBOS, 2015), this is in comparison to a growth rate of 12.6 percent and 12 percent respectively in 2011 and 2010. Currently in Uganda, it is estimated that an average miner contributes almost 20 times more to GDP than the average woman or man in farming, forestry or fishing (Hilson et al, 2007 in Villegas et al, 2012).

The mining sector currently employs directly more than 300,000 Ugandans, with more than three quarters working as artisans and small scale miners (NPA 2010, UIA undated; UNEP, 2012). At least 20,000 of these miners are engaged in gold mining via artisan and small scale mining, which has become a relatively important economic activity, mostly in the regions of Busia and Karamoja in the east and northeast respectively as well as in the southwest in Kigezi and Buhweju goldfields. Indirectly, an estimated 700,000 Ugandans benefit from livelihood opportunities associated with mining including those involved in transport, food vending and equipment supply. Almost 50 percent of Ugandans obtaining a livelihood from mining are women (NPA, 2010). It is envisaged with more government effort being made to improve the mining subsector it will continue to grow and consequently improve the livelihoods of many Ugandans.

In 1990, there were under 50 explorations and mining licensees issued. By the year 2000, 136 Exclusive Prospecting Licenses, 95 Location Licenses, 15 Mining Leases and 817 licenses had been issued by the end of 2013 (MEMD, 2013). Total investment in mineral sector since the Sustainable Management of Mineral Resources Project (SMMRP) started in 2004 increased from US\$5 million to a cumulative US\$340 million by end of 2011. The investment in the mineral sector is projected to increase by about US\$ 130 million by the end of the financial year 2014/2015 (UIA, 2015)

Emerging issues in the mineral sector

Gender is increasingly taking a key role in the shaping of the mining sector as a livelihood strategy, over 50 percent of Ugandans obtaining a livelihood from mining are women (NPA, 2010). However in the formal mining sector there are less than 5 percent of women employed while women's participation in the artisanal and small-scale mining (informal mining sector) ranges between 25 percent to up to 90 percent at some sites (UNEP, 2012). The Mineral Policy (2001) explicitly seeks: 'to remove restrictive practices on women's participation in the minerals sector and protect children against mining hazards'.

Numerous entry points where explicit legal reforms to promote gender equity could be introduced include: licensing requirements, extension service delivery (and its decentralization), consultation, compensation, and distribution of benefits among others. Even with increased participation of women in artisanal and small-scale mining, women are still marginalized either being paid less or having their earnings taken by their husbands. For example in Karamoja women often turn over gold earnings to their husbands (Houdet et al, 2014).



Young women working in a stone quarry in Kabale, Photo credit: NEMA 2014

Safety and Health are very critical components in the mining industry as some of the worst accidents in the world have happened in mines. Some of safety and health issues that have been documented in Uganda include: Inhalation of mercury vapour, fatalities and serious injuries due to collapse of pit walls and contamination of water holes leading to easy spread of water borne diseases. With the increasing participation of the population in the mining sector, there is much needed effort to avoid unsafe working conditions to ensure that livelihoods are made better and not wrecked in the process.

Future developments in the mineral sector

Karamoja region

There are both foreign and domestic companies with exploratory and mining rights in the region and these numbers are expected to rise with growing demand for metals and minerals. Preliminary results of the geological mapping, geochemical surveys and mineral resources assessment of Karamoja that was done between 2012 and 2013 showed great mineral potential for gold, wolfram, and columbite-tantalite and tin (MEMD, 2013). This presents huge opportunities that can help the locals realize sustainable livelihoods from mining if properly managed. Mining also has the potential to offset the missed livelihood opportunities from the indigenous activities like agriculture that may be affected by climate change.

Kigezi region

Aerial geological surveys conducted by the Geological Surveys and Mines Directorate (GSMD) in Kigezi sub-region in south-western Uganda in 2014 reveal that there are about 200 million metric tonnes of iron ore deposits. Preliminary results from the GSMD show that iron ore discoveries have been made at Buhara, Muyebe and Nyamiringa in Kabale District, Nyamiyaga and Kazogo in Kisoro district and Kinamiro and Butogota in Kanungu district. The gross value is estimated at US \$ 15.6 (MEMD, 2014). Feasibility studies are ongoing to establish an iron ore processing plant using natural gas or coking coal from Mozambique and South Africa. Uganda has no iron smelting plant and all extracted iron ore is exported. Iron ore has great potential to promote sustainable development and livelihood improvement if harnessed properly. The development of an iron ore reduction and processing plant in Uganda would provide employment and many other indirect benefits associated with the iron ore value chain.



Iron ore collection point along the Kabale- Kisoro highway (Photo credit: NEMA 2014)

Eastern Uganda

The Uganda Sukulu Phosphate and Multi Metal project in Tororo District is a mining and manufacturing plan with an investment of over \$240 million. Guangzhou DongSong Energy Group Company Ltd and the Government of Uganda are implementing this project. The plan is to invest and establish a mine and a beneficiation plant with annual capacity of two million tons, a phosphate fertilizer plant of annual production of 300,000 tons, a sulphuric acid plant of annual production of 400,000, a 12MW waste heat- based power generation plant and a steel mill of annual production of 300,000 tons. It is estimated that the venture will hire more than 1,200 local people and will invest in schools, hospitals and other public welfare projects.

The Sukulu Phosphate Multi Metal Project has the potential to boost agriculture production through the provision of fertilizers, support to infrastructure development through the iron and steel production, jobs, support other industries and boost Uganda's export earnings through value addition of the primary commodities.

Other projects

Other mining projects include: gold exploration under Roraima Ltd in Busia Eastern Uganda, Nickel, copper, cobalt exploration in Kitgum under Sipa exploration Company Ltd, Graphite exploration in ROM Mountains Kitgum District under Consolidated African Resources Ltd, Limestone exploration in moroto under Hima Cement Ltd, among others. The Kilembe copper cobalt project under Tibet Hima Mining Co. Ltd is projected at an investment of about US \$170 million and is revamping copper and cobalt mining under the Kilembe mine concession together with detailed exploration to confirm more reserves.

Environmental and social impacts of mining in Uganda

There is an enormous potential for mining to contribute greatly to sustainable livelihoods and development in Uganda, however this poses threats to the environment.

Unsustainable mining results into environmental degradation. Some of the major potential environment impacts are presented in Table 11.4

Table 11.4: Some of the negative environment impacts that result from mining Adapted from Villegas et al, 2012

Mining activity	Observed and expected environmental impact
<p>Clearing vegetation, and harvesting timber and non-timber forest products:</p> <ul style="list-style-type: none"> • Gathering wood for camp or mineshaft construction • Clearing vegetation to expose substrate for mining. • Firewood collection for warmth and cooking in camps • Bark removal to make pans for washing minerals 	<p>Food sources are diminished. E.g., in the case of apes, this includes fruit trees and terrestrial herbaceous vegetation</p> <ul style="list-style-type: none"> • Habitat and migration paths are blocked by mining camps • Habitat loss due to deforestation • Increased vulnerability of forest ecosystems to invasive plant and animal species • Erosion of unsecured soil during rains, sometimes resulting in landslides • Secondary impacts from erosion, including sedimentation and siltation (see below) • Extensive use of tracks both on foot and by cars lead to additional habitat loss, migration range disruption and increased vulnerability to commercial bush meat trade
<p>Use of toxic chemicals in gold processing:</p> <ul style="list-style-type: none"> • Use of cyanide • Use of mercury, especially vaporization and release into waterways 	<ul style="list-style-type: none"> • Risk of 'dead zones' and localized death of animals (including birds and fish) exposed to unmanaged cyanide releases • Exposure of humans and animal species to mercury emissions into air or water • Bioaccumulation of Hg up the food chain, especially in carnivorous fish consumed by local and distant populations • Pollution of drinking water for humans and animal species

<p>Mining in or near rivers and streams:</p> <ul style="list-style-type: none"> • Increased release of silt during the washing and planning process • Diversion of waterways to access mineralized deposits on the riverbed or to obtain water needed for washing • Use of pumps to remove water when digging below the water table • Direct dumping of waste, tailings and effluents in waterways 	<ul style="list-style-type: none"> • Siltation reduces light penetration into water bodies, causing reduced photosynthesis in aquatic plants, depleting oxygen levels in the water and clogging of the gills of fish; all consequences kill aquatic life • Increased turbidity due to siltation can reduce water quality by creating favourable conditions for harmful microbes Direct (tailing, diesel from pumps) and indirect (turbidity) pollution of human and animal drinking water sources • Sedimentation can lead to loss of refuges and spawning grounds for fish
<p>Physical removal of soil and rock to access the deposit:</p> <ul style="list-style-type: none"> • Use of high power hoses or medium and large-size backhoes and dredges to remove topsoil or the top layer of sand and clay • Use of spades and other manual tools to remove soil 	<ul style="list-style-type: none"> • Increased vulnerability of affected areas to erosion • Reduced capacity of the area for recovery of the native ecosystem • Creation of ecologic niches for non-native vegetation • Release and dispersal of corrosive dusts • Exposure of mineralized rocks, soils and tailings leading to • Oxidization of sulphide minerals and the subsequent release of toxic metal ions (known as ARD - 'acid rock drainage'). ARD can impact groundwater and surface water quality.

Socio-economic impacts of mining in Uganda include HIV/AIDs and stimulation of the sex trade through the cash based economy. There is also a slight modification of culture compared to other countries, which sometimes causes cultural conflict. There are also a few cases of land conflict and tenure.

1. Strengthen the Department of Geological Surveys and Mines. Investment in staffing capacity, technology and data and information acquisition and management are important. More highly trained staff will allow the government to carry out more surveys and exploration activities using local capacity other than expensive expatriates.

11.3 Oil and Gas

Introduction

This chapter explores the status of the oil and gas industry in Uganda, highlighting potential environmental and social issues during the development and production phases. It also presents the opportunities for the sector in enhancing sustainable livelihoods.

Status of the oil and gas sector in Uganda

Exploration for oil and gas resources has only covered 40 percent of the Albertine Graben. There were no exploration licenses granted during the period 2012-2014. The status of licensing in the Albertine graben as of February 2013 is shown in Figure 11.7. One production license was granted in September 2013 to CNOOC Uganda limited for the Kingfisher Development Area in Hoima and one well drilled in the Kingfisher field. This milestone marked the onset of the development phase in the petroleum value chain (MEMD, 2013; MEMD, 2014a).

There is no direct revenue collected from oil and gas production since Uganda has not started production. Nonetheless the government collected non-tax revenues amounting to US\$ 2,863,000 during 2013. An accumulated amount of US\$ 8,828,000 had been received from 2002 to the end of 2013 (MEMD 2014a).

Investment in the Oil and Gas Sector

By the end of 2013, a total of US\$ 2,419 million had been invested in the sector, the year 2013 recorded the highest capital investment into the sector of approximately US\$ 600 million.

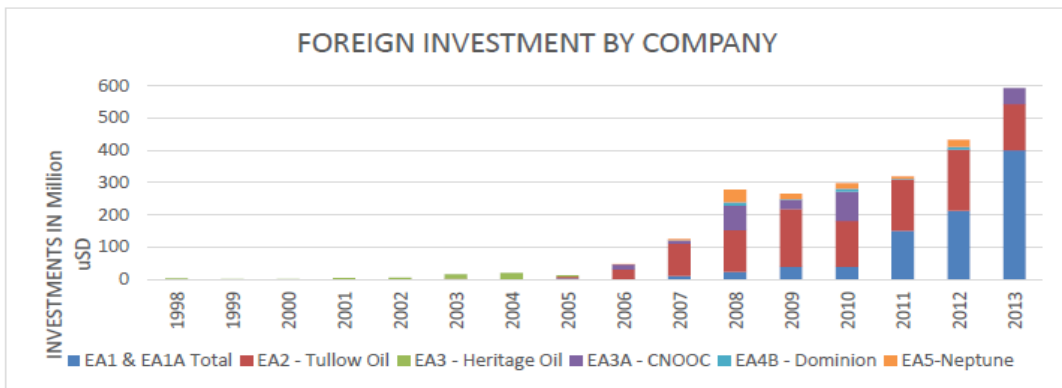


Figure 11.7: Investment by different foreign companies in the Oil and Gas sector
(Source: MEMD, 2014a)

Employment in the Oil and Gas Sector

The sector employs 1,028 people of which 52 percent are Ugandans (MEMD 2014a). However this percentage employment does not take into consideration the total number of people employed by the local service companies and the subsidiary employment that comes with the sector. Table 11.5 shows a conservative estimate of the indirect and induced employment in the sector, based on the research coefficients in other countries. In reference to the estimation below, it can be deduced that the oil and gas sector in Uganda has employed 10,177 people to date. The petroleum industry has a lot of employment opportunities for skilled and semi-skilled workers, unfortunately because of low literacy levels and limited vocational training most local people have not been able to get jobs and this problem could persist if affirmative interventions are not put in place.

Table 11.5: Conservative estimate of employment in the sector (Source: PEPD, 2014a)

Category	Direct Employment	Indirect	Induced	Total
Coefficient	1	2.3	6.6	0
Total	1,028	2,364	6,784	10,177

Planned developments in the oil and gas sector

The country is transiting exploration into the development and production phase. Under the development phase, more wells will be drilled, pipelines laid, a refinery developed and exploration will continue concurrently. In addition, contingent infrastructure including waste management facilities, roads, settlements are planned. Figure 11.8 highlights the planned infrastructure in place in the Albertine Graben.

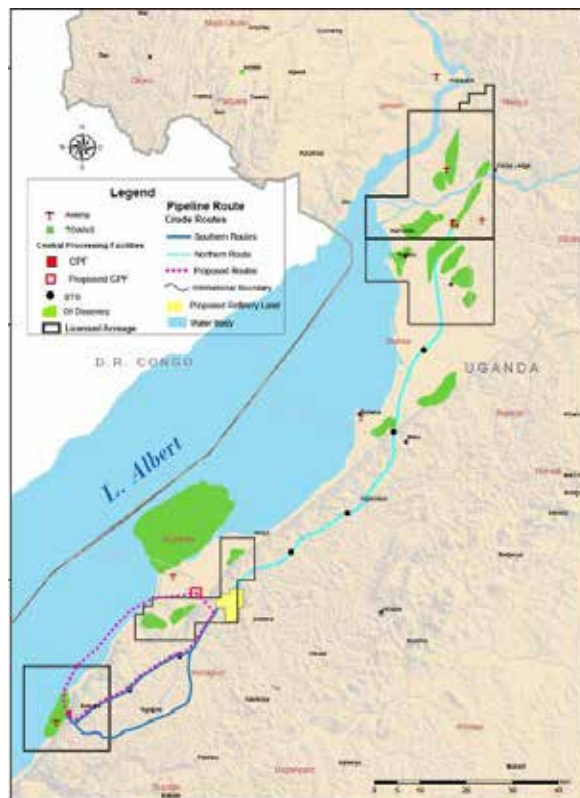


Figure 11.8: Oil and Gas Infrastructure for the discoveries of Albertine Graben (Source: Petroleum Exploration and Production Department, 2014)

The Kingfisher field is estimated to contain 635 million barrels of oil, of which 196 million barrels are estimated to be recoverable. The field is estimated to produce between 30,000-40,000 barrels of oil per day (bopd). This planned production is expected to be achieved by drilling 40 development wells (MEMD 2014a).



The new Hoima- Kaiso Tonya Road (Photo credit: John Diisi, NFA)

Refinery development in Hoima district

The refinery is to be established in Kabaale Parish, Buseruka Sub County in Hoima district. The refinery is estimated to provide employment to approximately 10,000 people countrywide. It was envisaged that the refinery would have an initial capacity of 30,000 barrels per day that will subsequently be expanded to 60,000 bbls/d and finally 120,000 bbls/d (MEMD 2013b).

Oil Pipeline and storage facilities

A 205 km pipeline to transport refined petroleum from the refinery in Kabaale, Hoima to a distribution center in Buloba, west of Kampala is to be developed as part of the refinery project. A study was commissioned on distribution and storage facilities for petroleum products from the refinery to the respective demand centers; and evaluating the pipeline and storage facilities for crude oil and gas. The objective of the study was to assess environmental issues that can be integrated in the early planning stages of the project and also serve as a basis against which future impacts can be measured or monitored. These developments will increase the demand of construction materials and land which may put pressure on natural resources such as forests and water resources.

Environmental impacts and mitigation measures

Environment and Social Impact Assessments (ESIA) undertaken for the activities done during the exploration period identified potential impacts to the environment and mitigation measures were recommended.

Waste management

Waste generated during exploration phase included drill cuttings and domestic waste (solid and liquid). Some wastes from petroleum activities are categorized as hazardous requiring special treatment and disposal. NEMA authorized six firms to set up petroleum waste treatment and

disposal facilities in the country, with only Enviroserv Uganda Ltd located in Hoima district was operational by the end of 2014. Prior to the establishment of treatment plants, drilling waste was contained in designated sites which were regularly monitored.



Construction of hazardous waste landfill in Hoima (Photo credit: NEMA, 2014)

Ecological disturbance

A study by (SEA et al 2011) in Murchison Falls National Park showed that elephants, buffalos and giraffes were most negatively affected by the exploration activities. The avoidance distance of these animals from these activities ranged from 750-1000 meters.

The following environmental and biodiversity tools have been developed as part of the efforts to ensure appropriate environment management for the oil and gas sector in the country:

- i. An Environment Sensitivity Atlas (ESA) for the Albertine Graben was developed in 2009 and updated in 2011. The ESA describes the different levels of sensitivity in the different parts of the Graben with a view to guiding the oil and gas activities in the area.
- ii. An Environment Monitoring Plan (2012 to 2017) for the Albertine Graben that defines the key monitoring indicators together with an enforcement and compliance monitoring strategy have been put in place and are being implemented.
- iii. Guidelines for operation of Oil Companies in Protected Areas have also been developed.
- iv. A Strategic Environment Assessment (SEA) for Oil and Gas Activities in the entire Albertine Graben was concluded in 2014. . The SEA will be used to ensure that environmental concerns are captured in Government's PPPs (plans, programmes & policies).
- v. A National Oil Spill Contingency Plan is under development for use in the (unlikely) event of an oil spill.

- vi. Management plans for the protected areas within the Albertine Graben such as Murchison Falls National Park, Queen Elizabeth National Park and Budongo Forest have been updated to provide for the ongoing and planned oil and gas activities within these areas of highly sensitive biodiversity.

Social and economic impacts

There are several potential negative impacts that can occur in the oil and gas sector. Increase in population and urbanization, easy spread of diseases and infections, increased costs of living, disruption of existing livelihoods, displacement, cultural disruption and land tenure conflicts (NEMA, 2014a).

Resettlement Action Plan and Compensation of communities affected by development of the refinery

The Resettlement Action Plan (RAP) conducted showed that the total population of affected persons and households will be 7,118 and 1,221 respectively (MEMD 2014b). Implementation of the Resettlement Action Plan (RAP) for the 29 square kilometers of land that will host the refinery and its attendant infrastructure commenced during July 2013 with disclosure of compensation amounts for the land, crops and other property including a disturbance allowance of 30 percent to the Project Affected Persons (PAPs). In 2013, the PAPs received training in livelihood restoration interventions. (MEMD 2013).

Opportunities for enhancing the oil and gas resources

Refinery development

The refinery in Uganda will boost the region's refining capacity and ensure security of supply of petroleum products in the country and neighbouring states which will turn boost Uganda's revenue. The development of attendant industries such as the petrochemical and manufacturing industries will also create jobs for Ugandans and ensure the transfer of technology in the refining and associated industries.

Other benefits include contribution to the country's growing energy requirements by providing heavy Fuel Oils (HFO), which can be used for power generation, and Liquefied Petroleum Gas (LPG) that will help offset use of firewood and charcoal for domestic cooking.

Training and job creation

One of the major expectations of Ugandans, especially of the youth, is related to employment opportunities. The government is developing comprehensive and evidence-based programme to strengthen the vocational skills training at Kigumba Petroleum Institute, Makerere University and also supporting other private universities. The youth skills programme is being tailor-made to enable young people to tap into the potential opportunities that are likely to result from oil and gas sector. The opportunity to create employment can be achieved by a public-private partnership with the National Oil Company taking the lead.

Improved infrastructure for social service delivery

The supporting infrastructure for the oil and gas industry will attract government and private sector investments in social services such as education institutions, health centres, housing infrastructure, airfields, and markets.

Use of oil revenues to develop other sectors

The nascent oil sector has a high potential to contribute to Uganda's economic transformation because of the significant revenue expected in the near future. The revenues will contribute to infrastructure development, especially roads, renewable energy and railway. The planned investment in development of transport infrastructure such as railway and water transport systems as well as on-going efforts to expand the road network and introduce mass transport systems will improve traffic flow and reduce greenhouse gas emissions.

Recommendations for policy action

Expedite the completion of the on-going policy and legislative frameworks for environmental management.

PART 4:
**FUTURE
OUTLOOK**

Chapter 12: Environmental Governance

12.1 Introduction

The current environmental governance regime was shaped by the National Environment Management Policy of 1994, which sets out the overall policy goals, objectives, principles, laws and institutions for environmental management in Uganda. The Policy is currently under review.

The National Environment Act (NEA) Cap. 153 is under review to accommodate emerging issues. The attendant regulations under the act are also under review, these include:

- i. National Environmental Act Cap. 153
- ii. National Environment (EIA) Regulations, Statutory Instrument No. 153-1
- iii. National Environment (Waste Management) Regulations, Statutory Instrument No. 153-2
- iv. National Environment (Standards for Discharge of Effluent into Water or on Land) Regulations, Statutory Instrument No. 153-3
- v. National Environment (Audit) Regulations, Statutory Instrument No. 12 of 2006
- vi. National Environment (Noise Standard and Control) Regulations, Statutory Instrument No. 30 of 2003, to incorporate regulation on vibrations
- vii. National Air Quality standards (NAQS)
- viii. Oil Spills Regulations and Guidelines

The Environment Act works in tandem with other laws and policies. Some of the newly developed policies include the:

- i. National Land Policy 2013
- ii. National Agriculture Policy 2013
- iii. Uganda Wildlife Policy 2014

Wildlife and Tourism

There are many policies and laws that guide implementation of activities in the tourism sector. These are summarised in table 12.1 which also shows how they link to tourism. The newly revised Wildlife Policy 2014 focuses on wildlife sector to effectively contribute to sustainable national development and transformation of the well-being of the people; the Tourism Policy 2014 promotes enhanced competitiveness of Uganda's tourism sector through effective marketing, promotion, research and infrastructure development.

Culture and Archaeology

Legal framework

The Museums and monuments policy 2015 aims at promoting culture and enhancing its contribution to community empowerment. The recognition of the role of culture in promoting environmental protection and the dependency of culture on the environment is among the core principles underlying the policy. The policy therefore puts emphasis on involving the Indigenous People and Local Communities (IPLCs) in decision-making and environmental protection.

Regional integration

The EAC Development Strategy 2011-2016 provides for the strengthening of this co-operation to enhance social cohesion and foster economic development and regional integration through culture and sports. The East African Cultural Festival, dubbed Jumuiya ya Afrika Mashariki Utamaduni Festival (Jamafest), with the first edition held in Kigali in 2013 is one of those initiatives aimed at implementing Article 119 as well as changing the perception of the people towards cultural heritage to foster cultural creativity.

Oil and gas sector

The oil and gas activities are guided by the existing legal framework in the Environment and Natural Resources (ENR) sector. The National Oil and Gas Policy 2008 laid the foundation for developing necessary specific legislation and regulations, as well as the institutional framework for development of the oil and gas sector. It is within this context that the Petroleum (Exploration, Development and Production) and Petroleum (Refining, Conversion, Transmission and Midstream Storage) Acts 2013 were developed.

These two laws take special consideration for Health, Safety and Environment aspects for both the Upstream and Midstream Subsectors (MEMD, 2014). Production sharing agreements (PSAs) and licenses also form part of the regulatory framework.

The seventh objective of Uganda Wildlife Policy, 2014 stresses the need to ensure positive impact of exploration and development of extractive industries in wildlife conservation area. It is under this objective that UWA developed is makes special considerations for the oil and gas sector. It is under this objective that UWA developed the 'Operational guidelines for oil and gas exploration and production in wildlife protected areas, 2014.

12.2 Strategies for Improved Environmental Governance

Coordination

Efforts should be made to have a platform for regular engagement within agencies involved in the management of environment and with CSOs in the Environment sub-sector and this should be regularly monitored and performance appraised.

Strengthening District and Local Environment Committees

This requires the active participation of local actors at the district level. Functional environmental committees at parish, sub-county and district level can perform the function of raising environmental consciousness within the population.

Establish financing mechanisms for the Environment and natural resources sector

The allocation of conditional grants to Lead Agencies at National and Local level will address the issue of limited budgetary allocation to the environment and natural resource sector. There is need to have structured and well-regulated capacity building for agencies and stakeholders within the sector.

Promote education for sustainable development (ESD)

The efforts to have environmental literacy will require consistent engagement with the formal, non-formal and informal education sector.

12.2 Progress on Implementation of Key Global and Regional Policies

The Government of Uganda has committed to upholding the principles of the United Nations Charter and the subsidiary UN agenda by ratifying various treaties. International and regional policies are set at a strategic level but implementation and realization is expected at local level through national programmes. Together with regional treaties, Uganda has about 30 multilateral agreements whose ideals are reflected in national policies and laws. The policies that Uganda has ratified and is obliged to implement are discussed outlining progress, made in Uganda on implementation of key global and regional policies, with a special focus on the Millennium Development Goals (MDGs) and on the country's efforts towards implementation of MDGs (refer to annex).

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PART 5:
ANNEX

KEY GLOBAL AND REGIONAL POLICIES

Progress on implementation of key global and regional policies

POLICY/TREATY AIM/DESCRIPTION	DATE: ACCEPTANCE/ ACCESSION / RATIFICATION	KEY ACHIEVEMENTS	CHALLENGES	RECOMMENDATIONS
Millennium Declaration, 2000				
<p>World leaders committed their nations to a new global partnership to reduce extreme poverty and set out a series of time-bound targets, with a deadline of 2015, that have become known as the Millennium Development Goals addressing extreme poverty in its many dimensions- income poverty, hunger, disease, lack of adequate shelter, and exclusion-while promoting gender equality, education, and environmental sustainability.</p>	<p>2000</p>	<p>(In reference to Millennium Development Goals Report for Uganda, 2015)</p> <ul style="list-style-type: none"> Uganda achieved 33% of the MDG targets. MDG 1 target of halving the proportion of people below the national poverty line achieved more than five years ahead of the 2015 deadline. 	<ul style="list-style-type: none"> There was no full ownership of the MDGs at both National and local levels. Resource constraints limited the implementation of interventions that were to support achievement of MDG targets 	<ul style="list-style-type: none"> Enhance the efforts to address the unfinished business of the MDGs. These will further support the achievement of SDGs

<p>Convention on Biological Diversity (CBD), 1992</p>	<p>The Convention on Biological Diversity (CBD) was ratified on 8th September 1993, the Conventions; three objectives are the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of benefits arising from the utilization of genetic resources. The main recent event within the CBD has been the entry into force of the Nagoya Protocol on access to genetic resources and the fair and equitable sharing of benefits (ABS) in October 2014. Uganda acceded to both the Nagoya protocol on ABS and the Nagoya Kuala-Lumpur Supplementary Protocol on liability and redress to the Cartagena on Biosafety on 25th June 2014. The supplementary protocol is yet to enter into force.</p> <p>Main objectives include;</p> <ul style="list-style-type: none"> Promote the conservation and sustainable use of bio-diversity Promote the fair sharing of benefits arising from the use of biological resources. 	<p>Sept. 1993</p>	<ul style="list-style-type: none"> (In reference to NEMA, 2014): Preparation of National Biodiversity Strategy and Action Plans (NBSAPs) in response to Article 6 of the convention Initiatives/projects on regional and international levels: the Lake Victoria Environment Management Programme and Reducing Biodiversity loss at cross-border sites Project involving Kenya, Uganda and Tanzania UNDP/GoU Project on the Conservation and Sustainable Use of the Threatened Savanna Woodland in the Kidepo Critical Landscape in North Eastern Uganda launched on 11th December 2013. Project on Testing the Effectiveness of Payment for Ecosystem Services (PES) for financing biodiversity conservation outside protected areas. sustainability of the PES scheme when the GEF support ends in April 2014 A national Cleaning House Mechanism (CHM) developed and launched in 2012 with website to promote sharing of information on biodiversity nationally and globally (See Chapter on ICTs under Part 2) Guidelines for sustainable biofuel production and for financing biodiversity Regulatory frameworks: Revision of Uganda Wildlife policy in 2012 to align with emerging sectors (e.g., oil and gas) and the country's transformation; Approval by Cabinet of the National Biotechnology and Biosafety Bill 2012 aiming to regulate biotechnology and use of GMOs in the country; Uganda National Wildlife Act, cap. 200 in 2013; Uganda Wildlife Training and Research Institute Bill 2013 and Uganda Wildlife Education Centre Bill 2013; and Revision of national regulations to align to the Nagoya Protocol on Access and Benefit-sharing (ABS) Studies: A study on governance and valuation of protected areas to address governance issues in ENR and a study to illustrate the economic importance of PAs to national development and livelihood improvement, respectively; taxonomy capacity needs assessment; the role of indigenous knowledge in the conservation of medical plants; and Building a Foundation for Sustainable Wildlife Trade in Uganda in support of CITES 	<ul style="list-style-type: none"> Promote the use of the tools that have been developed to monitor and manage environment and biodiversity resources in the oil and gas areas : The Monitoring plan , the strategic environment assessment, sensitivity atlases a, EIA and environmental audit reports Adopt modern and innovative ways of undertaking biodiversity inventories such as high resolution satellite images , advanced modelling techniques to extract spectral data and use of Unmanned Aerial Vehicles (UAVs) or drones which can capture detailed data at desired frequency for large areas, thus saving on costs and time in the long run Work with agencies responsible for population / family planning and land use planning to ensure that biodiversity resources on land have less pressure from high population and that land use planning that is ecologically oriented is implemented on public land
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<p>Aichi Biodiversity Targets 2015 – 2020.</p>	<p>The Aichi Biodiversity Targets were formulated as part of the CBD Strategic Plan including 20 targets for 2015 or 2020. The targets are organized under five goals as follows:</p> <ul style="list-style-type: none"> • Strategic Goal A: Address the underlying causes of biodiversity loss by mainstreaming biodiversity across government and society • Strategic Goal B: Reduce the direct pressures on biodiversity and promote sustainable use • Strategic Goal C: To improve the status of biodiversity by safeguarding ecosystems, species and genetic diversity • Strategic Goal D: Enhance the benefits to all from biodiversity and ecosystem services • Strategic Goal E: Enhance implementation through participatory planning, knowledge management and capacity building 	<p>(In reference to NEMA, 2014):</p> <ul style="list-style-type: none"> • Developed national biodiversity targets within the framework of the global Aichi Targets • Awareness and education among various stakeholders on biodiversity values • Sharing of information through the national CHM (See above for CBD) • Policy and regulatory framework . (see above for CBD) • Established National Green (Biodiversity) accounting system • Developing Green Procurement policy • National REDD+ Program- pilot phase • Revising regulations on National Environment (Access to Genetic Resources and Equitable Sharing of Benefits) • Reduction in fishing effort ; 30% reduction in fishing effort; Prepared and implemented a number of fisheries management plans; and amending fisheries laws and regulations • Other measures include, ecosystem management and wetlands restoration plans, invasive species sustainable management of agriculture and forests, pollution standards , accession to the Nagoya Protocol on ABS, study on financing biodiversity and increasing sharing ad use of taxonomic information 	<p>(In reference to NEMA, 2014):</p> <ul style="list-style-type: none"> • Slow Progress on target 7A (reverse loss of environmental resources on the account of declining forest cover due to conversion to other land uses and as a result of rapid population growth and reliance on fuel-wood • Slow progress on Target 7B: Reduce biodiversity loss achieving by 2010 a significant reduction in the rate of loss. Poverty and high population growth are the main causes of biodiversity loss (decline in forest cover and fish species), therefore, threatening species , ecosystems and ecoregions 	<p>(In reference to NEMA, 2014):</p> <ul style="list-style-type: none"> • Increase coordination of agencies involved in rural electrification to reduce forestry loss and improve efficiency • Adoption of renewable energy through efficient stoves and briquettes 	
<p>UNESCO Convention on Cultural and Natural Heritage, 1972</p>	<ul style="list-style-type: none"> • The Convention defines the kind of natural or cultural sites which can be considered for inscription on the World Heritage List. It sets out the duties of States Parties in identifying potential sites and their role in protecting and preserving them. The States Parties are obliged to conserve not only the World Heritage sites situated on their territory, but also to protect the national heritage, are encouraged to integrate the protection of the cultural and natural heritage into regional planning programmes, set up staff and services at their sites, undertake scientific and technical conservation research and adopt measures which give this heritage a function in the day-to-day life of the community. 	<p>November 20, 1987</p>	<p>(With reference from Department of Museums and Monuments; and</p> <p>UWA-http://www.ugandawildlife.org/wildlife-a-conservation-2/conservation/unesco-world-heritage-sites</p> <ul style="list-style-type: none"> • Reconstructing Kasubi Tombs • Submitted six (6) rock art sites (Nyero and other hunter gathering sites)to UNESCO world heritage for listing in January 2014 • Maintained the status of the World Heritage sites: Bwindi Impenetrable and Rwenzori National Parks ensuring that the integrity – EIAs prior to all developments near the sites. • Two of Uganda's national parks are recognized by UNESCO as World Heritage Sites: Bwindi Impenetrable National Park and Rwenzori Mountains National Park. 	<ul style="list-style-type: none"> • Lack of funding leading to destruction of some sites, e.g., one of the rock art sites known as Mukongoro in Kumi District have been quarried by local people with license from the Sub-County. Burning the rocks weakens the major rock some of which have rock paintings. There is also a risk to visitors as the weakened rocks can easy collapse. 	<ul style="list-style-type: none"> • Geology and Mines Department to streamline rock mining licenses • Ensure that sites under conventions are gazetted. The ministry in the last 2 years has been trying to survey, title and gazette some sites but the ministry of lands procedures are cumbersome.

<p>The United Nations Convention to Combat Desertification (UNCCD), 1994</p>	<ul style="list-style-type: none"> To combat desertification and mitigate the effects of drought in countries experiencing serious drought, particularly in Africa to achieve sustainable development. Focuses on improving productivity of land, and the rehabilitation, conservation and sustainable management of land and water resources leading to improved living conditions, particularly at the community level. 	<p>25th June 1997</p>	<p>(in reference to NEMA, 2002)</p> <ul style="list-style-type: none"> Public awareness activities and media programmes targeted at high level policy and decision makers, NGOs, Members of Parliament, Local Governments and Local communities and the general public. (Article 19). Established a National Co-ordination mechanism for UNCCD activities consisting of a National steering committee, National Secretariat, District Steering Committees and a National NGO Coordinating Committee to combat desertification. (Article 14). Established a framework for the National Action Programme (NAP) to combat desertification Establishment of a Uganda National Fund to Combat Desertification 	<p>(in reference to NEMA, 2002)</p> <ul style="list-style-type: none"> Environmental degradation : productivity of Uganda's soils declining and susceptible to soil erosion, Vegetation loss due to overgrazing and deforestation for timber, charcoal and fuel wood leading to extinction of many plant and animal species; floods and water silting, etc. 	<ul style="list-style-type: none"> Promote sustainable land management to reduce environmental degradation and increase production Establish grazing carrying capacity and set grazing stocking rates for different regions in the country Introduce sustainable production/research on introduction of drought resistant pasture species including control of bush burning to enhance rangelands vegetation cover and productivity
<p>The United Nations Framework Convention on Climate Change (UNFCCC), 1992 with its Kyoto Protocol</p>	<ul style="list-style-type: none"> To stabilise the concentration of greenhouse gases in the atmosphere at a level that does not affect food production, allows ecosystems to adapt naturally to climate change and enables economic 	<p>Sept 1993</p>	<p>(With reference to CCD: http://ccd.go.ug/; NEMA, 2002; Banana et al 2014):</p> <ul style="list-style-type: none"> Formulation of the Uganda National Climate Change Policy 2015 Preparation of the Intended Nationally Determined Contribution (INDC) Establishment of a database of the Actors Landscape Clean Development Mechanism (CDM) Capacity Development and Projects Support Project A significant number of private forest owners are following the principles of CDM in managing their forest in anticipation of registering them for CDM markets Low Emission Capacity Building (LECB) Project for Uganda Climate Change Adaptation and ICT (CHA) project to strengthen the adaptive capacity of individuals and communities in the cattle-corridor to water-related impacts of climate change and variability Economic assessments of the impacts of climate change under CDKN program The Global Climate Change Alliance- Uganda: Agriculture Adaptation to Climate Change project Inventory of greenhouse gas emissions by the various sectors Vulnerability and Adaptation Assessment was undertaken to identify vulnerable sectors and intervention measures 		

Hyogo Framework for Action (HFA)(2005-2015) and its successor, the Sendai Framework for Disaster Risk Reduction 2015-2030			
<p>Main goal is to build resilience of nations and communities to disasters, by achieving substantive reduction of disaster losses by 2015 – in lives, and in the social, economic, and environmental assets of communities and countries.</p> <p>The Sendai Framework is the successor instrument to the HFA. It ensures continuity with the work done by States and other stakeholders under the HFA and introduces a number of innovations with stronger emphasis on disaster risk management as opposed to disaster management.</p>	<ul style="list-style-type: none"> Preparation, adoption and implementation of National Policy for Disaster Preparedness and Management Disaster risk reduction strategy Establishment of a National Platform for Disaster Risk Reduction hosted by the Department of Disaster Preparedness and Management. It is a multi-stakeholder national mechanism that serves as an advocate of DRR at different levels. It provides coordination, analysis and advice on areas of priority requiring concerted action. The platform draws membership from key government ministries, UN agencies, international NGOs and academia. Participation in the review of the Hyogo Framework and adoption of the Sendai Framework for Disaster Risk Reduction 2015-2030 		
The Convention on Wetlands of International Importance (Ramsar Convention) 1971			
<ul style="list-style-type: none"> The Convention's mission is "the conservation and wise use of all wetlands through local and national actions and international cooperation, as a contribution towards achieving sustainable development throughout the world". Under the "three pillars" of the Convention, the Contracting Parties commit to: <ul style="list-style-type: none"> work towards the wise use of all their wetlands; designate suitable wetlands for the list of Wetlands of International Importance (the "Ramsar List") and ensure their effective management; Cooperate internationally on trans-boundary wetlands, shared wetland systems and shared species. 	<p>1988</p> <ul style="list-style-type: none"> The data collected is stored in the National Wetlands Information System (NWIS) at the Wetland Management Department A Wetlands monitoring Programme to ensure that the health and social values of wetlands are maintained Wetlands boundary demarcation Training activities involving government and non-governmental organisations, and Training manuals and other resource materials developed Communication of the values of wetlands to the public to increase public awareness Development of management plans for specific wetlands conservation and utilisation of the natural resources of wetlands Designation of Ramsar sites :Lake George, Nile Delta, Lake Nabugabo, etc. Formulation of the Uganda Wetlands Management Policy 1995 	<ul style="list-style-type: none"> Wetland inventories in 53 of the 56 districts of Uganda by 2006 and continued aiming to cover the whole country. The data is compiled into District Wetland Inventory Reports (DWIRs) to be disseminated through the Ministry of Water and Environment website The data collected is stored in the National Wetlands Information System (NWIS) at the Wetland Management Department A Wetlands monitoring Programme to ensure that the health and social values of wetlands are maintained Wetlands boundary demarcation Training activities involving government and non-governmental organisations, and Training manuals and other resource materials developed Communication of the values of wetlands to the public to increase public awareness Development of management plans for specific wetlands conservation and utilisation of the natural resources of wetlands Designation of Ramsar sites :Lake George, Nile Delta, Lake Nabugabo, etc. Formulation of the Uganda Wetlands Management Policy 1995 	<ul style="list-style-type: none"> Establish a swamp restoration program where encroachers have been evicted and boundaries marked. The program should include surveys and management planning Create Riparian Associations to ensure concerted stewardship amongst the wetland users
		<p>With reference to NEMA, 2002; and Wetlands Management Department (WMD); http://www.mwe.go.ug/index.php?option=com_content&view=article&id=40&Itemid=201</p> <ul style="list-style-type: none"> Declining wetland resources : reduced from 15% in 1994 to 10.9% of Uganda's area by 2008 Pressure from conversion for industrial development, settlements, agriculture, sand and clay mining Need to update the district wetland inventories for better use in current planning and decision making failures in the policy, legal, regulatory and institutional arrangements; poor governance and attendant political interference, and poor participation of stakeholders in management issues 	

Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)				
<p>CITES aims to ensure that international trade in wild animals and plants does not threaten their survival. This is envisaged to be achieved through appropriate trade control measures and monitoring of the status of endangered species .Uganda represents the EA region on the standing committee, a position that further galvanizes its obligations to ensure that trade in endangered species of wild fauna and flora is regulated.</p>	<p>July 18, 1991</p>	<ul style="list-style-type: none"> UWA and other agencies are enhancing intelligence gathering Review of the Wildlife Act, will contain deterrent sanctions for offenders involved in illegal wildlife trade Uganda signed the Lusaka agreement (see next treaty below) 	<ul style="list-style-type: none"> Persistent trade in restricted species, such as elephant parts – Uganda is mainly a conduit 	<ul style="list-style-type: none"> Establish regional collaboration mechanisms on intelligence since Uganda is mainly conduit to rub the trade from the sources in the region, e.g., through the Arusha Declaration on Regional Conservation and Combating wildlife/ Environmental Crime
Lusaka Agreement on Cooperative Enforcement Operations Directed at Illegal Trade in Wild Fauna and Flora				
<p>This agreement was signed by countries in Eastern, Central and Southern Africa, who agreed to work together to stop the illegal trade in wild flora and fauna.</p> <p>It aims to reduce and gradually eliminate this illegal trade by creating a task force responsible for implementing it. It is derived from the CBD and CITES</p>	<p>1994</p>	<ul style="list-style-type: none"> Capacity building: The Lusaka Agreement Task Force (LATF) delivered in February 2015 a specialized training in intelligence and investigations to Uganda Wildlife Authority law enforcement officers. Uganda Wildlife and Forestry officials participated in another LATF / UNEP Regional Training on Forestry and Wildlife Law Enforcement and Governance held from 21st to 25th May 2012 Kenya and Uganda efforts on formalizing their Cross-Border Wildlife Security Cooperation Adoption of the Regional Approach to Strengthening Africa's Wildlife Enforcement Framework Participating in establishing the Eastern Africa Wildlife Directors Forum. 	<ul style="list-style-type: none"> The international nature of illegal wildlife trade and deployment of sophisticated techniques of smuggling. This makes tracking costly and dangerous Participation of destination /receiving countries is limited Limited innovation of alternative sources of wildlife trophies and industrial materials 	<ul style="list-style-type: none"> Strengthen collaboration with international agencies such as Interpol to cope with the wide network of illegal wildlife traffickers Increase capacity in hi-tech and ICT means of tracking culprits Undertake awareness at all levels on the illegal trade and implications to development and human livelihoods Lobby destination/receiving countries to strengthen surveillance and control of the trade Promote innovation of alternative sources of wildlife trophies and industrial materials

<p>IUCN Red List of Threatened Species, 1994 (first version was 1991)</p>	<p>The IUCN Red List is intended to be an easily and widely understood system for classifying species at high risk of global extinction. The main aim is to provide an explicit, objective framework for the classification of the broadest range of species according to their extinction risk.</p>	<ul style="list-style-type: none"> • Sustainable management of the Mt. Elgon ecosystem and Karamoja region project focused on biodiversity and water conservation • Supporting the REDD+ programme in partnership with the Ministry of Water and Environment 	<ul style="list-style-type: none"> • Fast-growing populations and extension of inappropriate land uses on areas of high biodiversity value • Inadequate monitoring and assessment of endangered species 	<ul style="list-style-type: none"> • Employ ecological land use planning to enable identification of area and species of high biodiversity value and those that are threatens to be preserved • Establish a system for mapping and monitoring of the endangered species to secure reliable information for planning and management
<p>UNESCO Convention on safeguarding intangible heritage, 2003</p>	<p>Purposes: (a) to safeguard the intangible cultural heritage; (b) to ensure respect for the intangible cultural heritage of the communities, groups and individuals concerned; (c) to raise awareness at the local, national and international levels of the importance of the intangible cultural heritage, and of ensuring mutual appreciation thereof; (d) to provide for international cooperation and assistance.</p> <p>Each State Party shall: (a) take the necessary measures to ensure the safeguarding of the intangible cultural heritage present in its territory; (b) among the safeguarding measures referred to in Article 2, paragraph 3, identify and define the various elements of the intangible cultural heritage present in its territory, with the participation of communities, groups and relevant non-governmental organizations.</p>	<p>(In reference to the Department of Museums and Monuments):</p> <ul style="list-style-type: none"> • Documenting some languages and cultures that are at risk of instinct such as the Inki in Karamoja 		

UNESCO Convention on the protection and promotion of the diversity of cultural expressions, 2005				
<p>The convention complements the previously established provisions of UNESCO including the Universal Declaration on Cultural Diversity of 2001. "The Convention recognises the rights of Parties to take measures to protect and promote the diversity of cultural expressions, and impose obligations at both domestic and international levels on Parties.</p> <p>The Convention is a precursor for seven UNESCO conventions which deal with the four core areas of creative diversity; cultural and natural heritage, movable cultural property, intangible cultural heritage and contemporary creativity.</p>				
Stockholm Convention on Persistent Organic Pollutants (POPs), 22 May, 2001				
<p>To protect human health and the environment from chemicals that remain intact in the environment for long periods, become widely distributed geographically and accumulate in the fatty tissue of humans and wildlife. The Convention requires Parties to take measures to eliminate or reduce the release of POPs into the environment. As a Party to the Convention, Uganda is obligated to produce a National Implementation Plan (NIP) describing how a Party will meet its obligations under the Convention (Articles 3, 5, 6 and 7)</p>	<p>20 July, 2004</p>	<ul style="list-style-type: none"> • (With reference to NEMA, 2008); • Inventory studies to establish the kinds of POPs that occur in the country and their status • Developed a National Implementation Plan (NIP) for managing the POPs. 	<ul style="list-style-type: none"> • Studies show that POPs occur and are proliferated due to inadequate and inappropriate management practices 	

<p>Johannesburg Declaration on Sustainable Development, 4 September 2002</p>	<p>Builds on earlier declarations made at the United Nations Conference on the Human Environment[3] at Stockholm in 1972, and the Earth Summit[4] in Rio de Janeiro in 1992. While committing the nations of the world to sustainable development, it also emphasizes multilateralism as the path forward and focuses 'the worldwide conditions that pose severe threats to the sustainable development of our people, which include: chronic hunger; malnutrition; foreign occupation; armed conflict; illicit drug problems; organized crime; corruption; natural disasters; illicit arms trafficking; trafficking in persons; terrorism; intolerance and incitement to racial, ethnic, religious and other hatreds; xenophobia; and endemic, communicable and chronic diseases, in particular HIV/AIDS, malaria and tuberculosis."</p>	<p>Agreement for the Establishment of the Global Crop Diversity Trust, 4 October 2003</p>	<p>14 Sept. 2005</p>
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<p>Montreal Protocol on Substances that Deplete the Ozone Layer</p>	<p>The Montreal Protocol on Substances that Deplete the Ozone Layer (a protocol to the Vienna Convention for the Protection of the Ozone Layer) is an international treaty designed to protect the ozone layer by phasing out the production of numerous substances that are responsible for ozone depletion.</p>	<p>15 Sept. 1988</p>	<ul style="list-style-type: none"> Developed the country programme that was approved by the Executive Committee in 1994. The Executive Committee subsequently approved \$547,896 from the Multilateral Fund to enable compliance in accordance with Article 10 of the Protocol Uganda has achieved more than 95% phase-out of the ODSs with technical and financial support from the Multilateral Fund Secretariat to implement project activities for phasing out of the ODSs. 	<p>Uganda has concessionary been found to be non-complaint: failed to report data for either of the control periods 1 July 2000-30 June 2001 and 1 July 2001-31 December 2002, and has reported annual data for 2001 which is above its baseline. In the absence of further clarification, Uganda was presumed to be in non-compliance with its obligations under Article 2A Article 2H of the Montreal Protocol of the Montreal Protocol having reported consumption of 30 ODP-tonnes for the controlled substance in Annex E in 2002.</p> <p>(i) availability of viable alternatives to HCFCs and HFCs and other ODSs that are local in nature, accessible and address realities faced by the grassroot communities; (ii) affordability of the recommended alternatives; (iii) how to determine cost-effectiveness and energy efficiency relating to use of recommended alternatives; (v) lack of alternatives that are suited to regions with very high ambient temperatures; and, (vi) how to address and meet the needs of the Article-5 Parties centred around institutional strengthening and the inherent capacity-building needs to enable Parties handle the different challenges. Development of alternatives should be viewed as an opportunity for initiatives that protect our environment, yet address development needs of the communities of least developed countries.</p>	<p>(Hon. Flavia Munaba Nabugere, 2014)</p> <ul style="list-style-type: none"> Mobilize funding for institutional strengthening funding; Increase capacity-building and funding to enable research and monitoring of the behaviour or status of the ozone layer across geographical regions, so that A-5 countries can actively participate in monitoring the status of the ozone layers; otherwise the is a glaring knowledge gap linked to research on the ozone layer; Address the challenges of small and medium enterprise with reference to Article-5 in coping with a fast pace of ever changing direction in science and industry in terms of research and furnishing of new technologies on the world market, amongst other factors.
<p>Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer 3 December 1999</p>			<p>27 Jul 2007</p>		

Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade, 10 September 1998				
To promote shared responsibilities in relation to importation of hazardous chemicals. The convention promotes open exchange of information and calls on exporters of hazardous chemicals to use proper labeling, include directions on safe handling, and inform purchasers of any known restrictions or bans. Signatory nations can decide whether to allow or ban the importation of chemicals listed in the treaty, and exporting countries are obliged to make sure that producers within their jurisdiction comply.	18 Aug 2008			
Convention on the International Maritime Organization, 6 March 1948				
The purposes of the Organization, as summarized by Article 1(a) of the Convention, are "to provide machinery for cooperation among Governments in the field of governmental regulation and practices relating to technical matters of all kinds affecting shipping engaged in international trade; to encourage and facilitate the general adoption of the highest practicable standards in matters concerning maritime safety, efficiency of navigation and prevention and control of marine pollution from ships". The Organization is also empowered to deal with administrative and legal matters related to these purposes.	30 Jun 2009			
Statute of the International Renewable Energy Agency (IRENA) 26 January 2009				
	30 Jun 2009			<ul style="list-style-type: none"> • Preparation of the National Biomass Energy Strategy 2014

<p>Cartagena Protocol on Biosafety, 2003</p>	<p>The Cartagena Protocol is a subsidiary agreement to the UN Convention on Biological Diversity (CBD). The Protocol is an international treaty governing the movements of living modified organisms (LMOs) resulting from modern biotechnology from one country to another.</p>	<p>September 11, 2003</p>	<p>UNCST: ;UNEP&GEF (2002), Project Document Section 1 - Project Identification;(Hon. Fiava Munaba Nabugere, 2014);</p> <p>National Biotechnology and Biosafety Policy, 2008; and Law Formation of the National Biosafety Committee (NBC), Institutional Biosafety Committees</p> <p>Project on implementation of the Uganda National Biosafety Framework (NBF) within the context of the Cartagena Protocol. The objective was to provide support to strengthen capacity building for the implementation of the National Biosafety Framework in Uganda, compliance with the obligations of the Cartagena Protocol.</p> <p>Specific objectives:</p> <p>Set up a regulatory and administrative system to enable an adequate level of protection in the field of the safe transfer, handling and use of living modified organisms (LMOs) resulting from modern biotechnology, with a specific focus on trans-boundary movements in Uganda, and meet the obligations foreseen under the Cartagena Protocol;</p> <p>Strengthening, and when needed building, effective scientific human capacity in risk assessment/risk management and monitoring capabilities through training.</p> <p>C) Strengthening national infrastructure for LMOs testing;</p> <p>Strengthening the information system to be linked to the Biosafety Clearing House Mechanism; and</p> <p>Enhance public awareness and promote dissemination among the relevant stakeholders;</p>	
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East African Community Protocol on Environment and Natural Resources/EAC Memorandum of Understanding on the Environment?			
<p>Provides for the development of harmonized national and sectorial mechanisms for the management of the shared resources of trans-boundary resources and ecosystems, especially forests, wildlife and water. Various joint management initiatives have been implemented.</p>	<p>January 8, 2010</p>	<ul style="list-style-type: none"> Implementation of Article 19 : partner states to protect mountain ecosystems, such as critical water catchments, conservation and heritage areas, and other areas of common strategic interest at local, national, regional, and international level through Mount Elgon Regional Conservation Program (MERECP) initiated to address the conservation and development needs of the Mount Elgon ecosystem with a focus on clean water provision through a Payment for Environmental Services (PES) approach Collaboration between implementing institutions, especially through sharing information, joint planning and patrolling of protected areas. 	
The River Nile Cooperative Framework Agreement (CFA)			
<p>Under the auspices of the Nile Basin Initiative (NBI), whose mission is to achieve sustainable socio-economic development through the equitable utilization of and benefit from the common Nile Basin water resources</p> <p>Principle 7 of the agreement states that "Nile Basin States will take all appropriate, jointly, for the protection of and conservation of the Nile River Basin and its ecosystems". Article 6 requires States that are party to this agreement "to protect, conserve and, where necessary rehabilitate the Nile river Basin and its ecosystem, in particular, by protecting and improving water quality, protecting and conserving biological diversity, protecting and conserving wetlands and restoring and rehabilitating the degraded natural resources base.</p> <p>Article 3. Section 7 calls on member states to take all appropriate measures, individually and, where appropriate, jointly, for the protection and conservation of the Nile River Basin and its ecosystems.</p> <p>Article 5 of the agreement requires Nile Basin States to take all appropriate measures to prevent significant harm to other Basin States.</p>	<p>May 14, 2010, MWE</p>	<p>(With reference to NEMA 2002)</p> <ul style="list-style-type: none"> Application of Environmental Impact Assessment (EIA) regulations on projects within the River Nile landscape; 	<p>(With reference to NEMA 2002)</p> <ul style="list-style-type: none"> Capacity to conduct EIAs and monitor implementation, especially on highly technical projects, is limited Initiatives that directly enhance sustainability of natural ecosystems within the Nile River Basin are scarce. Riparian resources such as wetlands and forests around Lake Victoria continue to be threatened due to urban expansion and other activities, mainly related to population increase.

Common Market for Eastern and Southern Africa (COMESA) Treaty			
<p>Signatories commit to ensuring prudent and rational use of natural resources.</p> <p>Chapter 16 provides for cooperation in the development of natural resources, environment, and wildlife.</p> <p>Article 123 requires countries to cooperate and harmonize their policies and laws in the utilization of natural resources for the preservation of ecosystems and to address environmental degradation. In Uganda, this has not been fully implemented, especially for timber and other forest products.</p>	<p>December 8, 1994</p>	<ul style="list-style-type: none"> To foster the goal of the COMESA Customs Union established in 2009 to promote economic integration through unrestricted movement of goods, services, and people, a regional biotechnology and biosafety policy [COMESA (Common Market for Eastern and Southern Africa) (2014a)] was designed to provide guidance and facilitate decision-making on how to manage transboundary movement of GMOs across the porous borders safely and responsibly. It was envisaged that a centralized regional risk-assessment policy would allow COMESA countries to apply a harmonized approach to planting, trade, and handling of emergency aid of GM crops and mitigate the anticipated threat of disruption in intra-regional trade on products containing GMOs. A biosafety roadmap and a communication strategy developed Developing a Tripartite Free Trade Area Agreement that will bring together 26 Member States in collaboration with the East African Community and the Southern Africa Development Community to expand the market and realize benefits of economies of scale and complementarities. 	<ul style="list-style-type: none"> Concerns over safety and long-term impacts of GM technologies still persist
Greater Virunga Transboundary Collaboration (GVTC) October 30, 2015			
<p>GVTC is a mechanism for strategic, trans-boundary, collaborative management of the Greater Virunga Landscape set up in 1991 by state institutions in charge of PAs in the Republic of Rwanda, the Republic of Uganda, and the DRC.</p> <p>Governing institutions are the Rwanda Development Board (RDB), UWA, and the Institut Congolais pour la Conservation de la Nature (ICCN). It initially aimed to protect mountain gorillas in Mgahinga, Bwindi, Virunga, and Volcanoes NP's but later expanded to tourism, community conservation, research and monitoring and has also extended to include more PAs.</p>	<p>October 30, 2015</p>		
The Arusha Declaration on Regional Conservation and Combating Wildlife/Environmental Crime			
<p>Calls for a coordinated response to combat illegal wildlife trafficking</p>	<p>November 8, 2014</p>	<ul style="list-style-type: none"> Bringing greater awareness to the wildlife trafficking issue inside and outside of Africa Resource mobilization for national, bilateral, and multilateral activities 	



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