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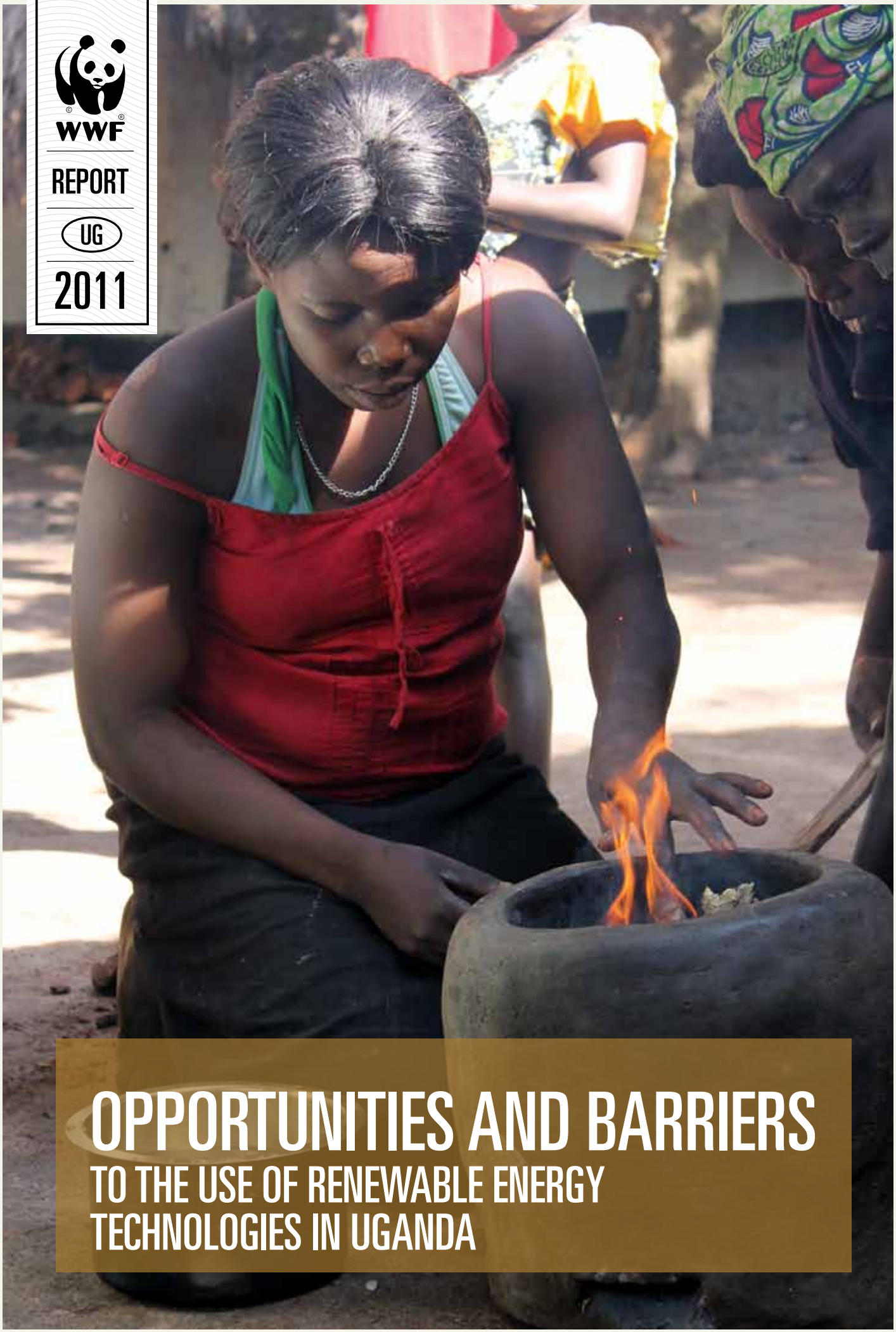

OPPORTUNITIES AND BARRIERS

TO THE USE OF RENEWABLE ENERGY TECHNOLOGIES IN UGANDA

Cover photo: A woman lights an improved cookstove

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ACRONYMS AND ABBREVIATIONS

BAT	Best available technology
BAU	Business as usual
BP	Bank procedures
BUDS	Business Uganda Development Scheme
CBD	Convention on Biological Diversity
CDM	Clean development mechanism
CERs	Corporate environmental reports
CSO	Civil society organization
DFID	Department for International Development
DWD	Directorate of Water Development
DWRM	Directorate of Water Resources Management
EAC	East African Community
EDT	Electricity dispute tribunal
EIA	Environment impact assessment
ENSO	El-Niño southern oscillation
ERA	Electricity Regulatory Authority
ERT	Energy for rural transformation
ESIA	Environment and social impact assessment
GHG	Greenhouse gas
GoU	Government of Uganda
GWh	Gigawatt hours
HDR 2007/2008	Human Development Report 2007/2008
HV	High voltage
ICSEA	Improved Cook stoves for East Africa
IGAD	Intergovernmental Authority on Development
KP	Kyoto Protocol

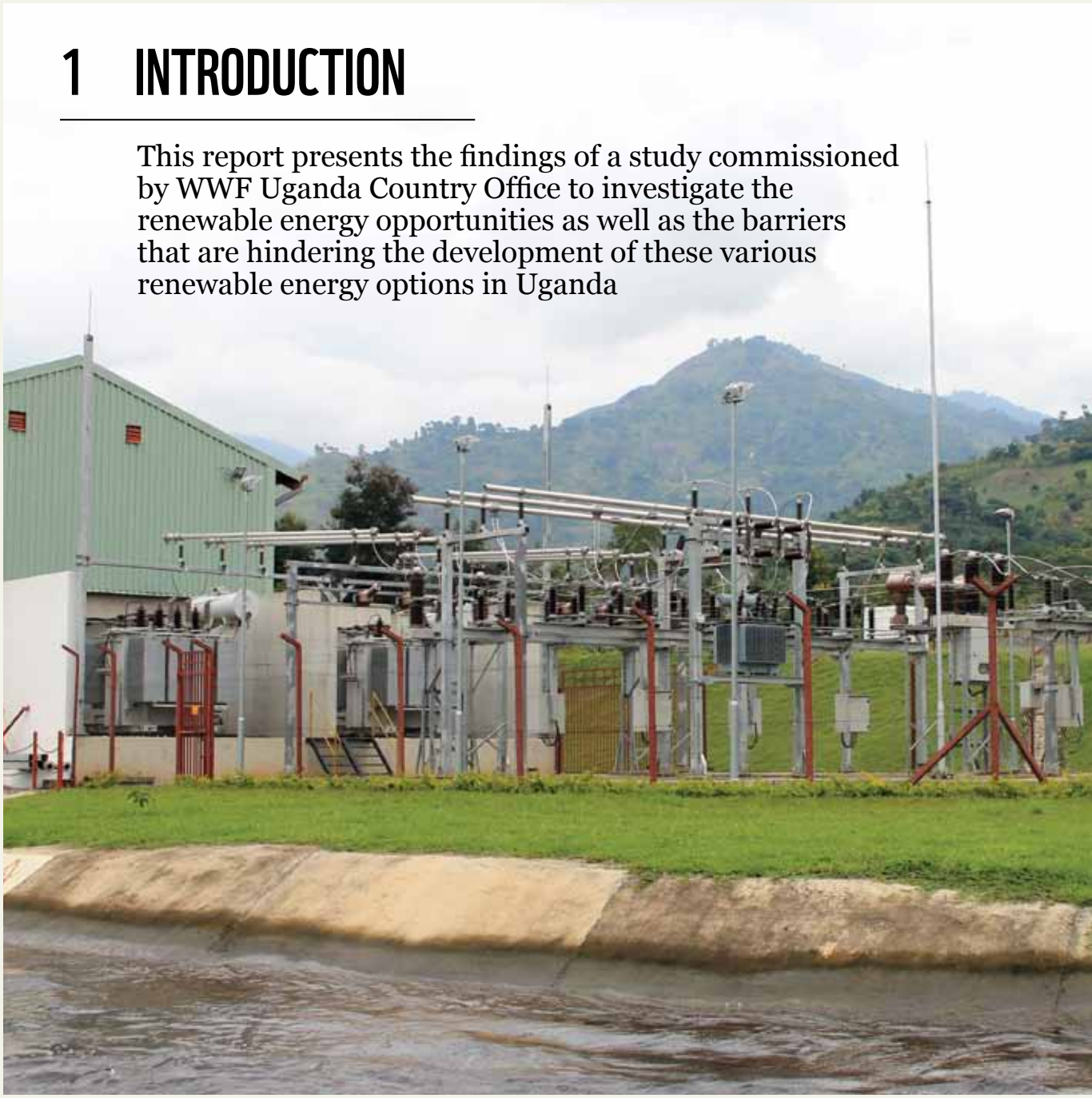
kVA	Kilo Volt Amperes
kW	Kilowatt
kWh	Kilowatt hour
LPG	Liquefied petroleum gas
LV	Low voltage
MAAIF	Ministry of Agriculture, Animal Industry and Fisheries
MDG	Millennium Development Goal
MEMD	Ministry of Energy and Mineral Development
MLHUD	Ministry of Lands, Housing and Urban Development
MT	Mega tonnes
MW	Megawatt
MWE	Ministry of Water and Environment
NAPA	National Adaptation Programme of Action
NDP	National Development Plan
NEMA	National Environmental Management Authority
NFA	National Forestry Authority
NGO	Non-government organization
NPA	National Planning Authority
ODF	Operational directives
OECD	Organisation for Economic Cooperation and Development
OP	Operational policies
PDCA	Plan – do – check – act
PSF	Private Sector Foundation
PSIP	Power Sector Investment Plan
REA	Rural Electrification Agency
REB	Rural Electrification Board
REF	Rural Electrification Fund
REP	Renewable energy policy
RES	Renewable electricity standard
RESP	Rural Electrification Strategy and Plan
SDC	Sustainable development criterion
SPEAR	Small-scale Programme-of-activities in East Africa covering renewable energies
TWG	Technical working group
UCB	Uganda Carbon Bureau
UBoS	Uganda Bureau of Statistics
UCC	Uganda Communications Commission
UEB	Uganda Electricity Board
UEDCL	Uganda Electricity Distribution Company Ltd
UEGCL	Uganda Electricity Generation Company Ltd
UETCL	Uganda Electricity Transmission Company Ltd
UIA	Uganda Investment Authority
UNFCCC	United Nations Framework Convention on Climate Change
WB	World Bank
WENRECO	West Nile Rural Electrification Company Ltd
WMO	World Meteorological Organization
WPC	Water Policy Committee

FOREWORD

EXECUTIVE SUMMARY

1 INTRODUCTION

This report presents the findings of a study commissioned by WWF Uganda Country Office to investigate the renewable energy opportunities as well as the barriers that are hindering the development of these various renewable energy options in Uganda



1.1 Background

There is an emerging general consensus in both scientific and political circles that climate change is a reality. As a result, governments and private entities all over the world are making efforts to establish measures for the mitigation of climate change. Wider use of renewable energy resources, improved energy-efficiency and the use of clean(er) fossil fuels are just some of the proposed mitigation measures.

The Human Development Report 2007/2008, (2007: 133) asserts that power generation is the main source of carbon dioxide emissions, accounting for four in every ten tonnes of CO_2 dispatched into the earth's atmosphere. CO_2 is a main greenhouse gas and is thus seen as a major contributor to the climate change phenomenon. How countries generate electricity and how much CO_2 is emitted per unit of produced energy are therefore critical issues for determining the type and scope of climate change mitigation in the future.

According to the Renewable Energy Network for the 21st Century, (2010: 10) many recent trends reflect the increasing significance of developing countries in advancing renewable energy. Collectively, developing countries have more than half of the global capacity for renewable power. It is therefore imperative that the various opportunities for the use of these 'clean energy' initiatives are assessed, along with their potential problems. This study aims to address these issues in the context of Uganda.

1.2 Overall Goal

The purpose of this particular study is to assess the opportunities for the use of renewable energy and energy efficiency technologies in Uganda and produce recommendations on how to accelerate their uptake during the period up to 2030. The study has also explored the recommendations of the Technical Working Group (TWG) regarding the Climate Registry (CR) approach and how this could act as a clearing house mechanism to facilitate the coordination and efficient use of multiple sources of financing including private sector investors, multilateral, bilateral and national development banks as well as carbon market instruments.

The study covers the following major aspects:

- Issues affecting available and foreseeable renewable energy development in Uganda
- Uganda's current official low-carbon and renewable energy strategies
- Required pre-requisites for increasing the use of renewable energy and improving energy efficiency before 2030
- Interlinked dimensions of opportunities and problems relating to proposed energy solutions
- The Climate Registry approach as proposed by the Global Financial Mechanism and the Technical Working Group (GFM/TWG) project
- Recommendations to accelerate the use of renewable energy technologies in Uganda

These issues are elaborated in the subsequent chapters of this report.

1.3 Research Method

The consultant has had several interactions with the client; guidance and study materials have been obtained regarding the execution of the consultancy. We were also able to obtain additional literature and data as well as hold discussions with a number of persons; in this we received much useful guidance from the Climate Change Unit (CCU), Uganda Carbon Bureau (UCB), Centre for Research in Energy and Energy Conservation (CREEC), Ministry of Energy and Mineral Development (MEMD), Electricity Regulatory Authority (ERA), Uganda Electricity Transmission Company

Ltd. (UETCL), Rural Electrification Agency (REA) and others.

1.4 Inter-linkages of the Different Sectors

The Energy Policy for Uganda (2002: 10) recognizes linkages between the energy sector and other sectors. It notes in particular that policies on the economy, environment, water resources, agriculture, forestry, industry, health, transport, education, de-centralization and land use have to be taken into consideration. In order to develop a sustainable energy policy, it is important to integrate economic, social and environmental objectives in a way that improves the well-being of the current generation whilst safeguarding the welfare of future generations. This makes the National Adaptation Programme of Action (NAPA) as formulated by the Climate Change Unit relevant.

An Institutional underground biogas plant at Uganda Rural Development Training Centre (URDT) in Kibale. Biogas is a clean alternative fuel that has not been well done.

1.5 National Adaptation Programme of Action (NAPA)

According to Uganda's National Development Plan (2010: 315), NAPA was launched with support from the Global Environment Fund (GEF). NAPA includes nine priority projects at a cost of approximately US$ 40 million. Limited progress has been made in implementing NAPA due to lack of funds and inadequate capacity to prepare detailed proposals and mobilize funding.

1.6 Carbon Trading through the Clean Development Mechanism (CDM)

Despite financial and capacity constraints, the Climate Change Unit (CCU) under the Ministry of Water and Environment has charted the way forward for the country towards addressing the issues pertaining to climate change phenomena. This has been advantageous in that some funding through CDM has been made available through carbon trading. There is enormous potential to exploit opportunities under CDM in Uganda and possible projects are, but not limited to energy, forestry and waste management (Carbon Trading through the Clean Development Mechanism CDM, 2010).

1.6.1 Forestry sector

Investments in CDM projects in afforestation and reforestation can arrest forest depletion and improve carbon sequestration. Through this, Uganda has a potential to sink considerable amounts of CO_2 per year and thus earn carbon credits from the world carbon market.

1.6.2 Waste management

Uganda generates enormous amounts of waste. There is a high potential for developing CDM projects by utilizing this waste for a number of uses such as making biomass fuel briquettes, organic fertilizer and utilizing methane from landfills to generate electricity. The Uganda Municipal Waste Compost Programme coordinated by NEMA has been planned for several districts.

1.6.3 Energy sector

Uganda also has a high potential for using renewable energy sources including biomass supplies, hydropower, solar energy, wind energy and geothermal energy. Agricultural waste might also be used to generate electricity (The Renewable Energy Policy for Uganda, 2007: 33).

Government will need to address issues relating to

1. Power generation
2. Residential/institutional buildings
3. Vehicle emission standards
4. Research, development and the use of low-carbon technologies (Human Development Report 2007/2008, 2007: 133)

1.7 Interdependency of Opportunities and Barriers

When all the above issues are considered holistically, it becomes evident, for example, that sustainable forest management will result in dependable rain patterns which will in turn be beneficial for hydropower generation; moreover, properly managed forests will support the construction of power lines as well as the sustainable supply of wood fuel. Using proper waste management, it will be possible to utilize methane from landfills to generate electricity. In the field of agriculture, certain types of crops, e.g. sugar cane, are planted to support investments in the production and use of ethanol, biodiesel, methanol and biogas; in the transport sector, there is currently a worldwide drive towards cheaper and more efficient electric and hybrid motor vehicles. The thrust towards renewable energy and energy-efficient technologies is therefore a joint effort; however, while there are many opportunities, there are also barriers which need to be overcome in order to achieve the desired goal. This will become even more evident in the following chapters.

2 OPPORTUNITIES AND BARRIERS AFFECTING AVAILABLE AND FORESEEABLE RENEWABLE ENERGY DEVELOPMENT IN UGANDA

2.1 Introduction

In this chapter we will discuss opportunities and barriers affecting available and foreseeable renewable energy development in Uganda (wind, hydro, biomass, solar, geothermal, etc), using a general approach. To fulfil the TORs, we will provide a more detailed analysis for issues affecting solar, wind, biomass and hydro energy technologies.

2.2 Availability of an Abundant Renewable Energy Resource Base

Uganda's renewable energy resource base is quite substantial; however, renewable energy sources (including large hydropower stations but excluding biomass) contribute only about 5% to the country's total energy consumption. Much of the renewable energy resource base remains unexploited, largely due to the perceived technical and financial risks. These resources include biomass, geothermal, large-scale hydropower, mini/micro/pico hydropower, wind and solar energy. This limits the scope and productivity of economic activities that can be undertaken in any part of the country. Thus it is imperative that the use of these abundant resources should be increased. Recently completed studies indicate the potential of renewable energy sources in Uganda (see Table 1-1). However, more site-specific data is available for the actual development of the resources (The Renewable Energy Policy for Uganda, 2007: 33).

Total energy sales in the Ugandan domestic market are projected to grow by 7.1% on average per year...

Energy source	Estimated electrical potential (MW)
Hydropower	2,000
Mini-hydropower	200
Solar	200
Biomass	1,650
Geothermal	450
Wind	
Total	5,300

Table 1: The renewable energy potential *(The Renewable Energy Policy for Uganda, 2007)*

The availability of such a renewable energy resource base and the attendant demand for energy therefore provide opportunities for investment.

2.3 The Need to Satisfy the Rising Energy and Electricity Demand

The Power Sector Investment Plan for Uganda (2009: 10) provides a forecast for the energy and electricity demand in Uganda, as follows:

- Total energy sales in the Ugandan domestic market are projected to grow by 7.1% on average per year, from 1,593 GWh in 2008 to 7,156 GWh in 2030. Peak demand is forecasted to grow an average of 5.8% per year from 479 MW in 2008 to 1,657 MW in 2030. These growth forecasts reflect the general positive outlook for Uganda's economic growth. The demand forecast is somewhat higher than previous forecasts.
- Total energy sales, which include the Ugandan domestic market and the export to neighbouring countries, are projected to grow on average by 8.5% per year from 1,593GWh in 2008 to 9,775GWh in 2030. Peak demand is forecast to grow an average of 7.1% per year from 479MW in 2008 to 2,162MW in 2030 (The Power Sector Investment Plan for Uganda, 2009: 10).

The ever increasing demand for energy opens up opportunities for investing in the power sector.

2.4 The Obligation to Address Climate Change issues

It is evident from the above that a major increase in the supply of electricity in Uganda is required, but it is equally evident that this increase should be developed in a sustainable manner: also it needs to be realized in an environmentally responsible manner and be affordable at the same time. There is need for direct Government involvement as climate change will lead to rising poverty in poor countries followed by catastrophic risks for humanity as a whole: already, climate change is considered a global and national security priority. As a party to the United Nations Framework Convention on

Climate Change (UNFCCC, adopted in 1993) and the Kyoto Protocol (KP) that came into force in February 2006, Uganda is obliged to put in place appropriate mitigation and adaptation measures to address the cause and effects of climate change as well as undertake education and awareness programmes to sensitize Ugandan citizens to climate change issues (National Development Plan, 2010: 315). Uganda's international obligations to address climate change issues provide opportunities for renewable energy exploitation and development.

2.5 Opportunities for Renewable Energy Exploitation

2.5.1 Opportunities for the exploitation of biomass

The Renewable Energy Policy for Uganda (2007: 34) describes biomass as any organic matter that is available on a renewable basis mainly through photosynthesis. In the energy context, biomass means vegetable matter from agriculture or forestry and animal waste, which can be used as fuel. Biomass includes firewood, shrubs, grasses, forest wastes and agro-industrial residues. Examples are bagasse, husks, trash from sugar, oil milling, grain milling, etc. Biomass also includes organic municipal and industrial wastes like paper waste, old clothes, polythene, spent grains in breweries, animal waste, abattoir waste and sewage sludge, which can be used as sources of energy. Sometimes these are used as energy sources, but often inefficiently (Biogas Technology, 2002: 3).

There is a large potential for improving the use of bio waste in the agro-industry. It could be used for electricity generation, fuel for vehicles and as a substitute for furnace oil.

Crop residues and agro-industrial residues including husks, bagasse and oil residues play a very significant role in Uganda's energy supply. Biomass contributes over 90% of the total energy consumed in the country and provides almost all the energy used to meet basic energy needs for cooking and the heating of water in rural areas, most urban households, institutions, and commercial buildings. Biomass is the main source of energy for rural industries. Limited availability of electricity and high prices of petroleum products constitute barriers to a reduction in the demand for biomass. Trading in biomass - especially charcoal - contributes to the rural economy in terms of rural incomes, tax revenue and employment. Fuel wood requirements have contributed to the degradation of forests as wood reserves are being depleted rapidly in many regions. Charcoal consumption increases at a rate close to the urban growth rate of 6% per annum according to The Renewable Energy Policy for Uganda, 2007: 34). Most of the traditional biomass energy technologies used in Uganda, including wood and charcoal stoves, ovens and kilns, are inefficient. Several initiatives to conserve biomass resources undertaken by Government and the private sector, including international NGOs like GIZ, have started to have a significant impact and should be further supported. Some pilot projects (households and/or institutions) to produce biogas from waste (animal dung and human waste) or gas and electricity from gasification also offer good opportunities.

The Renewable Energy Policy for Uganda (2007: 34) gives the per capita consumption of firewood as 680 kg and 240 kg per year in rural and urban areas, respectively, and 4 kg and 120 kg for charcoal. The total biomass (firewood and wood for charcoal) demand for households was 32.8 million tons per year (National Development Plan, 2010: 93). Cottage industries account for about 20% of total biomass use, adding a further 6.6 million tons and bringing the total biomass demand to about 39.4 million tons countrywide.

Although biomass is traditionally used in its solid mass (charcoal, wood, agricultural residues), its energy content can also be exploited in non-traditional forms using various technologies or improved versions of existing technologies designed for better

energy efficiency. Some of these are mentioned below.

- There are still many households which use traditional versions of highly inefficient charcoal and/or wood stoves. There is a need to disseminate improved cook stoves and for people to be trained in their use. Additionally, efficient wood-burning cook stoves can be made for individual households or for institutions and factories.
- Artisans who make traditional charcoal stoves can be trained in the production and marketing of improved charcoal stoves.
- There now exist improved ways of producing charcoal; charcoal producers need to be trained in these improved production methods.
- Efficient wood-fired boilers need to be introduced in those cases where the old type of boiler is still used for industrial processes. The new efficient boilers can greatly reduce fuel wood consumption.
- Factories still use the older type of kilns which are very energy inefficient (lime, bricks, etc.). Improved kilns are now available which are far more efficient.

2.5.2 Opportunities for converting waste to energy

Municipal waste in Uganda is generally composed of wet materials rich in carbon and nitrogen including organic household waste, agro-industrial waste (slaughter houses, food industry) and agricultural waste such as manure and straw. There is a vast amount of municipal waste - both solid and sewage effluents - that is currently not being utilized for energy production. The capital city, Kampala, alone produces an estimated 430,000 tons of solid waste annually. Other municipalities and towns also generate considerable amounts of waste without having proper waste management plans in place. Over 70% of municipal solid waste is vegetable matter (mainly food residues). The current practice is either to burn this waste in the open air or dump it in landfills with no extraction of its energy contents. This does not only result in a waste of energy, but also causes environmental risks, as the burning is not controlled and the landfills are poorly managed.

Wastes from the biogas pant is used as manure in vegetable gardens

This combustible waste matter can be used for electricity generation. The non-combustible organic matter can be used to produce biogas. The large quantity of sewage can also be effectively used to generate biogas. Biogas can be used as domestic fuel, fuel for vehicles and power generation.

The Renewable Energy Policy for Uganda (2007: 64, 76) sets a target of 100,000 household biogas plants which would save 200,000 tons of wood fuel 2017.

The slurry that comes out of the digester is rich in nitrogen,

phosphorous, potassium and humus and can be used to replace imported fertilizers and increase agricultural productivity. The Uganda Fertiliser Strategy 2006 Draft Report estimates that, between 1996 and 2000, 0.37 kg of fertiliser was used per hectare; the official import of fertiliser was estimated to be 25,000-30,000 metric tons annually. Without doubt, there is an opportunity for making locally produced fertilizers as this would result in saving foreign exchange.

In addition to municipal waste, there are vast quantities of industrial waste such as used grain in breweries and used boxes, which can all be used for power generation. In most developed countries like the UK, China and Japan the methane gas produced by landfills is put to further use, for instance for the generation of electricity.

2.5.3 Opportunities for the exploitation of solar energy

The existing data show that solar energy in Uganda is at high levels throughout the year. The mean solar radiation on a horizontal surface is 5.1 kWh/m² per day. This level of radiation is appropriate for the application of a number of solar technologies including

i) Solar water heating

ii) Solar photovoltaic systems for supplying basic electricity to rural institutions and households, especially in areas not connected to the grid.

The total annual photovoltaic capacity is estimated at 200kWp for households, institutions and commercial use. Solar thermal energy has a great potential in the form of solar water heaters in electrified areas. However, the installation of solar energy equipment has a high capital costs. For this reason, electricity is most often used for water heating, although, in the longer term, it would be cheaper for the consumer to use solar energy.

According to the Ugandan Ministry of Energy and Mineral Development, 1,200MW is expected to be generated with solar power by 2017. This would need installation of 700kWpk solar home systems plus 30,000m² solar panels supplying water heaters. A total of 21,322MW would be saved through increased energy efficiency (The Renewable Energy Policy for Uganda, 2007: 64, 76).

Furthermore, small solar water heaters are relevant for remote areas where hot water is needed in rural clinics and tourism areas to provide a cheap, reliable and environmentally friendly source of energy. Solar technology can also be used for power generation; however, the prohibitive costs make it less favourable than other sources of power generation. The Electricity Regulatory Authority (ERA), has set the following feed-in tariffs in recognition of this factor: whereas the feed-in tariff for solar PV is US$ 0.362 per kWh, that for hydropower is US$ 0.109 (500kW >< 1MW) while others are as follows (per kWh): bagasse US$ 0.081; biomass US$ 0.103; biogas US$ 0.115; landfill gas US$ 0.089; geothermal US$ 0.077; wind US$ 0.124 (Uganda Renewable Energy Feed-in Tariff (REFIT) Phase 2 Approved Guidelines for 2011-2012, 2010: 12). The relatively high feed-in tariff for solar is meant to be an incentive and encouragement to would-be investors.

Solar thermal energy has a great potential in the form of solar water heaters in electrified areas. However, the installation of solar energy equipment has a high capital costs.

Of late, the Ugandan Government has started giving tax incentives as well as subsidies for solar equipment. Globally, manufacturing processes for solar equipment are also becoming cheaper. The efficiency with which photovoltaic cells convert sunlight into electricity has increased from 6% in the early 1990s to the current 15%, while their cost has fallen by 80% (Human Development Report 2007/2008, 2007: 135). Solar power is therefore turning into a much more lucrative business than ever before, thus providing opportunities for investment.

2.5.4 Opportunities for the exploitation of wind energy

In most areas of Uganda, wind speed is moderate. At less than 10m above ground, average wind speeds generally range from 2-4m/s. In some areas with a complex

terrain, the wind may speed up due to slopes, escarpments and tunnelling effects. Based on wind data collected by the Meteorology Department, it was concluded that the wind energy resource in Uganda is sufficient for small-scale electricity generation and for special applications such as the pumping of water mainly in the Karamoja region. More recently, low speed wind turbines have been developed and they have proved effective for power generation at low wind speeds.

Recent studies also confirm that electricity can be generated from wind, especially for small industries or in rural areas where targets for a windmill range from 2.5 - 10 kVA.

2.5.5 Opportunities for large-scale hydropower

Uganda's low kWh per capita, currently at 65.9 kWh is an important indicator for the country's need to increase its generation capacity. Africa's average stands at 578 kWh while the world's average is 2,752 kWh. The current power deficit averages at 105 MW, forecast to increase to 2,162 MW by 2030.

The potential for large-scale hydropower along the River Nile has been estimated at about 2,000 MW. Bujagali and Karuma sites have been studied in detail; initially, both were to be developed in a Public Private Partnership (PPP) to generate electricity in the medium term (The Renewable Energy Policy, 2007: 41). More recently, however, the Government of Uganda decided to develop Karuma as a public (Government) venture.

Government also intends to create a favourable investment climate and attract large investments in the industry sector to ensure that sufficient capacity for electricity generation is created. It is intended to increase generation from the current levels to 674 kWh by 2015, and subsequently to 3,670 kWh per capita by 2040 (National Development Plan 2010/11 – 2014/15, 2010: 151). This provides opportunities for hydropower.

2.5.6 Opportunities for mini hydropower

More than 50 potential sites for small-scale hydropower plants have so far been identified in Uganda by various studies. They would have a combined potential of 210 MW. Currently, small-scale hydropower accounts for only 18MW of electricity generation. Some of the identified sites could be developed for isolated grids and others to sell their electric energy to the national grid.

The Electricity Regulatory Authority gives a comprehensive list of these sites (Small Hydropower Development in Uganda, 2007:6). They include sites where power plants are already operating; sites that are currently not operating and require major rehabilitation; sites for which developers have valid exclusive permits and sites for which no exclusive permits are in force. The potential of other sites still needs to be assessed.

2.6 Barriers to Renewable Energy and Energy Efficiency Development

The National Development Plan (2009: 152), among others, gives the constraints that need to be addressed for Government to meet its commitment of promoting the development and utilization of renewable energy sources as follows. Key areas to consider are as follows.

2.6.1 Barriers resulting from low water levels in lakes

At Jinja, the total hydropower capacity is 380 MW (Nalubaale 180 MW and Kiira 200 MW). However, due to poor management of the catchment areas and the low level of regional cooperation in the management of shared water resources, the level of Lake Victoria has fallen, hampering the generation of hydropower as a result. The situation was aggravated a long drought. In addition, there were indications of uncontrolled water discharge for hydropower generation at Owen Falls Dam in Jinja that went beyond sustainable discharge volumes. However, increased vigilance has started to yield results: the lake level has started to show a marked improvement.

2.6.2 Barriers resulting from limited institutional capacity

The situation described under 2.6.1 happened as a consequence of the prevailing circumstances. Proper management of water resources requires strong institutional capacity. In this case, the Ministry of Water and Environment lacked the capacity to monitor and enforce compliance. This implies that there is still a need for collaboration between public and private sector institutions and coordination of planning, infrastructural development and financing. If well coordinated, such collaboration will go a long way towards alleviating the shortcomings.

..poor management of the catchment areas and the low level of regional cooperation in the management of shared water resources, the level of Lake Victoria has fallen, hampering the generation of hydropower

2.6.3 Barriers due to human resources with limited skills

Hand in hand with institutional capacity goes the requirement for adequately trained personnel. Users also need to be adequately sensitized on issues pertaining to proper water management. Currently, communities are characterized by a lack of knowledge of water resource management, indicating a need to train a pool of competent and functional community committees in the management of water for production facilities.

2.6.4 Barriers due to weak regulations and enforcement

More often than not, one will find that regulations are wanting in certain areas. Where they do exist, there are no means to ensure that they are being followed. There is therefore still a need to improve regulations and enforcement within certain sectors, for instance by setting up a framework for the operation and maintenance of water resources for production facilities. In addition, policy, legal and institutional frameworks should be reviewed to attract more private investment to these sectors. This will improve the coordination of institutional planning to incorporate the key sectors and those that play a contributory role.

2.6.5 Barriers due to short-sighted and uncoordinated institutional planning

A major constraint is the lack of data and information on the concerned sectors. This makes it more difficult to plan, formulate policy and make decisions on investment. For example, many stakeholders are involved in the planning of a hydropower plant, each with their own specific mandates - it is not easy to find a common denominator. There is the ERA for the issuance of permits and licenses for the generation of power; MEMD/REA for support agreements and subsidies in relation to rural electrification schemes; the Directorate of Water Development for the utilization of water resources; NEMA for EIAs; Uganda Investment Authority (UIA) for investment licenses; the local governments of the areas where the project is planned, etc. Also, given the bureaucratic processes involved, the developer may feel that the entire process is quite intimidating. There is also a tendency for each organization to simply refer the developer to the relevant organisation without providing adequate guidance as to which particular office/officer the developer needs to contact. One consequence of this is decision-making which may be based on a short-term outlook.

2.6.6 Barriers due to a weak private sector

The private sector has an increasingly important role in the energy sector, especially since the 1999 Electricity Act. There is a need for the development of comprehensive policies to address gaps (nuclear energy, thermal power from locally produced petroleum products, biomass and energy efficiency). There is also a need to review existing policies and acts (Energy Policy, Renewable Policy and Electricity Act) and to formulate a PPP framework to allow more private investment in the energy sector.

2.6.7 Barriers due to high investment capital and limited financing options

Prior to obtaining a license for the construction of a power generating facility, a feasibility study (FS) and an environment impact assessment (EIA) need to be carried out. For this, consultants need to be employed, but local developers have limited funds for the employment of consultants. The PSF (Private Sector Foundation) gives some limited funding to project developers (loans of US$50,000, to be increased to US$100,000) on presentation of a business plan, but this is hardly adequate even for a pre-feasibility study. A number of developers have obtained this amount, but they found it to be very small. There is also the problem of long-term financing of hydropower projects, which is not normally taken on by local banks. This is a problem which GoU is trying to solve.

2.6.8 Barriers due to poor regulation of public-private partnerships

International experience suggests that co-operation between the public and private sectors in form of public-private sector partnerships (PPP) can be a powerful incentive for improving the quality and efficiency of public services, and a means of public infrastructure financing. PPP describes a Government service or private business venture which is funded and operated through a partnership between Government and one or more private sector entities. It involves a contract between a Government authority and a private sector party. However, a policy framework to guide Public-Private Sector Partnerships is yet to be formulated.

Attention needs to be paid to implementing community schemes as well as the provision of subsidies to independent power producers operating the mini grids.

2.6.9 Barriers due to high power tariffs

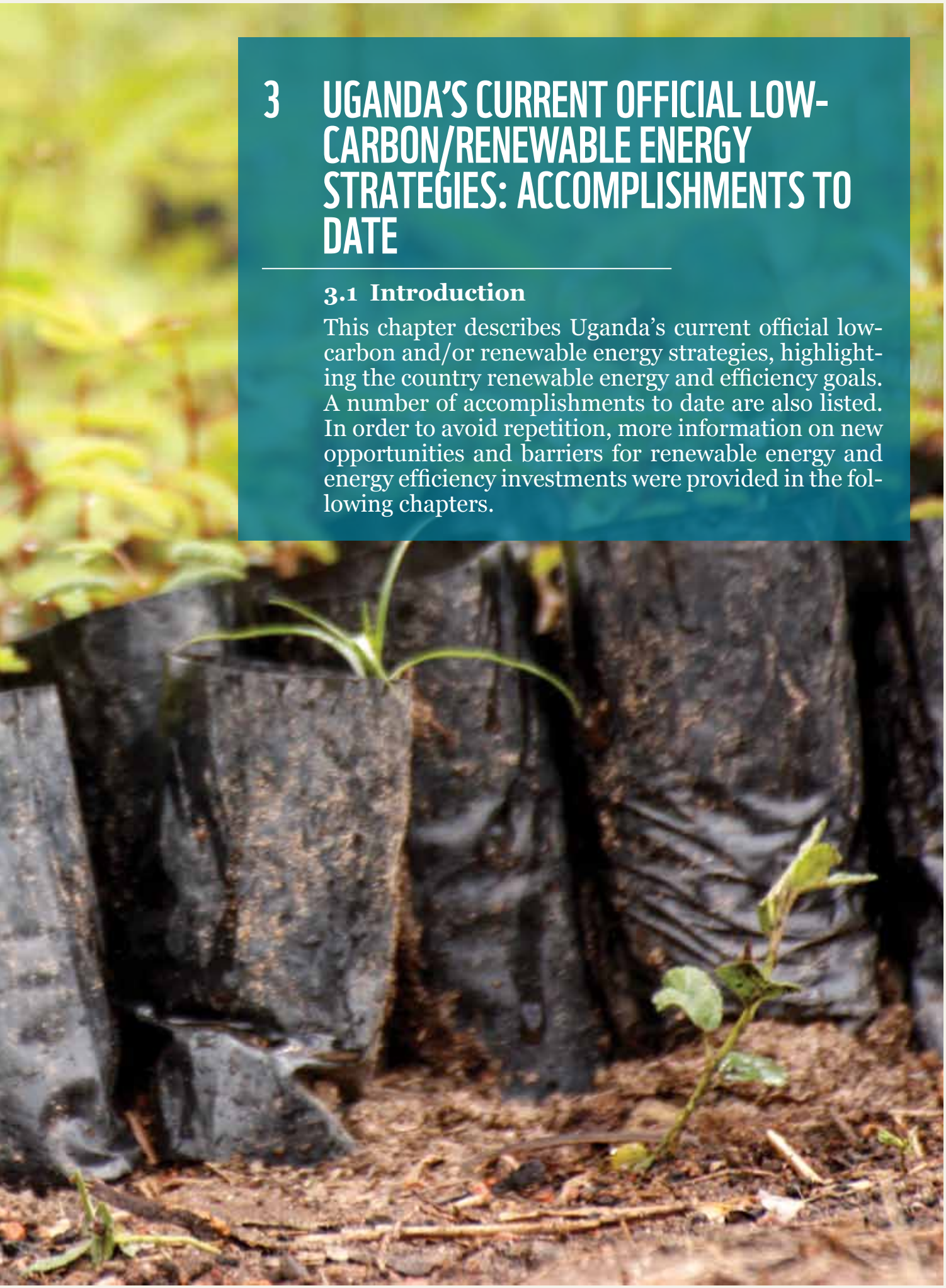
Due to low generation capacity and the limited cover of the national power grid, grid access remains very low. There is a clear rural – urban divide: only 6% of rural households has access to grid power as compared to 40% of urban households. Even in urban areas a significant proportion of households still rely on non-renewable energy sources. This is partly due to the prevailing high power tariffs (National Development Plan, 2010: 15).

2.6.10 Barriers due to limited power transmission and distribution network

There is a need to build new transmission lines to distribute power from new plants and to extend the network to improve the delivery of power to different areas of the country. In particular, there is a need to extend the grid to district headquarters and maximize the connection of major economic centres and social service facilities. Attention needs to be paid to implementing community schemes as well as the provision of subsidies to independent power producers operating the mini grids. Investment needs to be made in energy transmission to rural and urban areas as well as to individual households.

2.7 Concluding Remarks

We have illustrated that Uganda has much potential for renewable energy sources and that much of this still remains unexploited. These resources include: biomass, geothermal energy, large-scale hydropower, mini/micro/pico hydropower, wind and solar energy. The reasons for the inadequate exploitation have also been given. The National Development Plan lists strategic interventions hinging largely upon sector reforms, capacity and financial issues. The next chapters will give some ideas and suggestions for steps which could be taken to address these strategic interventions and to accelerate the drive towards renewable energy technologies.



3 UGANDA'S CURRENT OFFICIAL LOW-CARBON/RENEWABLE ENERGY STRATEGIES: ACCOMPLISHMENTS TO DATE

3.1 Introduction

This chapter describes Uganda's current official low-carbon and/or renewable energy strategies, highlighting the country renewable energy and efficiency goals. A number of accomplishments to date are also listed. In order to avoid repetition, more information on new opportunities and barriers for renewable energy and energy efficiency investments were provided in the following chapters.

3.2 The Drive for a Low-Carbon/Renewable Energy Strategy

The National Development Plan lays down objectives, strategies and interventions regarding climate change issues for Uganda for the 2010/11 – 2014/15 period National Development Plan (2010: 316), while the Renewable Energy Policy 2007 has set the overall target to increase the use of renewable energy from the current 4% to 61% of the total energy consumption by 2017 (The Renewable Energy Policy, 2007: 7). The Climate Change Unit under the Ministry of Water and Environment (MWE) is the lead agency for the country's drive towards a cleaner and more sustainable and environmentally responsible utilization of energy (National Development Plan 2010:316). It also has the responsibility of setting up climate change policies and efficiency goals for the country using a sector-wide approach such that all the measures taken by the various ministries and other concerned stakeholders are well coordinated. Current restructuring will strengthen the Climate Change Unit (CCU) and upgrade it to a full secretariat. This has not prevented the CCU from carrying out activities in line with the country's international obligation although the overall policies and efficiency standards are yet to be formulated.

Individual ministries are also making their contributions. However, once the fully fledged CCU secretariat is up and running as envisaged in the National Development Plan, all policy and efficiency issues are expected to be handled in a more coordinated manner. If properly handled, current constraints could become opportunities for the development of clean energy in the country.

3.3 International Obligations

Uganda is a party to the United Nations Framework Convention on Climate Change (UNFCCC, adopted in 1993) and the Kyoto Protocol (KP), which came into force in February 2006. This obliges Uganda to put in place appropriate mitigation and adaptation measures to address the cause and effects of climate change, and undertake education and awareness programmes. These treaties have been ratified but not yet domesticated. The Climate Change Screening of Danish Development Cooperation with Uganda (2008: 12) study recommends that a statutory order is used to fast-track the insertion of these treaties into local legislation.

3.4 National Adaptation Programme of Action (NAPA)

The Climate Change Unit under the Ministry of Water and Environment (MWE) formulated the National Adaptation Programmes of Action, which was launched in 2007 with support from the Global Environment Fund (GEF). NAPA includes nine priority projects at a cost of approximately US$ 40 million. Limited progress has been made in implementing NAPA due to lack of funds and inadequate capacity to prepare detailed proposals and mobilize funding.

3.5 Barriers / Constraints to the Performance of the Climate Change Sector

A number of constraints currently hinder the performance of the climate change sector. These include:

i. A shortage of expertise

The Climate Change Unit is currently constrained by a critical shortage of requisite expertise. However, this is one of the issues which are being handled by the Government in the current restructuring exercise.

ii. A lack of awareness

At all levels, there is limited awareness of the causes of climate change and/or climate variability and their devastating impacts on socioeconomic development plans and activities.

iii. Inadequate legislation

There is lack of policy, legislation, regulations and guidelines for mainstreaming climate change into development plans at all levels.

iv. Role of strategic planners

There is inadequate conceptualization of the importance of weather and climate information by strategic planners. A lack of knowledge in strategic planners results in additional setbacks.

v. Unreliable data

Weather forecasting depends on available data. Currently, the scientific data are insufficient and unreliable, especially the climate data required for forecasting various phenomena. Therefore forecasts are not reliable.

vi. Resources

Institutional and financial resources are currently inadequate; this poses a very serious setback to the sector.

vii. Coordination

Liaison between the various ministries and other relevant institutions is crucial when expecting uniformity and well-coordinated efforts. Currently, coordination mechanisms are still weak: they need to be strengthened.

3.6 Government's Objectives, Strategies and Interventions for Low-Carbon / Renewable Energies

3.6.1 Objective 1 - Develop the national capacity for coordination and implementation

The first objective as laid down in the NDP is to develop the national capacity for coordination and implementation of climate change adaptation and mitigation activities in the country in support of social welfare and national development.

Strategy: Address the legal and institutional frameworks necessary for the implementation of UNFCCC.

The following interventions will be needed:

a. UNFCCC and related protocols need to be domesticated and enforced to make them fully applicable in the Ugandan context.
b. The capacity and mandate of the Climate Change Unit needs to be strengthened to allow for effective sector coordination and to streamline roles and linkages with other stakeholders.
c. Sector studies need to be undertaken to identify each sector's role in climate change action.
d. From the above it follows that a national climate change policy will need to be developed to provide a conducive policy and regulatory framework.
e. Sectoral risk assessment and management options will be some of the issues to be kept in mind when dealing with the above.

3.6.2 Objective 2 – Ensure climate-proof development planning

The second objective is to ensure that all development planning is tailored towards the achievement of the climate change goals and objectives.

Strategy: Re-define climate change as a development issue.

The following interventions will be needed:

a. Interventions to increase climate change awareness, training and education at all levels.
b. Implement NAPA with a focus on building community and ecosystems' resilience to adverse impacts of climate change.
c. Build capacity through institutional and manpower development.
d. Strengthen weather and climate monitoring for improved data generation.
e. Conduct climate change research (adaptation and mitigation) and technology development.
f. Develop mainstreaming guidelines, with a strategy to climate-proof development initiatives for use at all levels of Government.

3.6.3 Objective 3 – Promote a low-carbon economic development path.

The third objective is to promote a low-carbon development path in all contributing sectors.

Strategy: Provide and promote incentives for clean development.

The following interventions will be needed:

a. Intensify public education on the role of emissions in global warming.
b. Develop and implement incentive mechanisms to reduce or avoid emissions.
c. Build private sector capacity to participate effectively in clean energy development initiatives.
d. Reduce overheads for CDM project formulation and development.

Both Government and the private sector have important roles to play in the above. This will become even more evident in the next Chapter which lists some achievements.

3.6.4 Objective 4 – Meet Uganda's international obligations.

The fourth objective is for Uganda to meet its international obligations.

Strategy: Implement climate change conventions.

The following interventions will be needed:

a. Interventions to follow up the commitments and obligations defined in the conventions.
b. Implement decisions made by the Conference of the Parties to the Convention (COP).
c. Participate in climate change fora.

3.6.5 Objective 5 - Promote renewable energy.

The National Development Plan sets out a number of objectives for the Energy Sector. One of these aims at the promotion of renewable energy. For more details, please see Section 3.7.

3.7 Role of the Climate Change Unit within the Ministry of Water and Environment

The Ministry of Water and Environment (MWE) is the focal institution for UNFCCC and the Kyoto Protocol is. In 2007, the MWE coordinated the preparation of the National Adaptation Programmes of Action (NAPA). The MWE, recognizing the crosscutting nature of climate change and the need for broad participation, has established an institutional framework to coordinate the implementation of UNFCCC and the Kyoto Protocol. It consists of a multi-sectoral and multi-disciplinary National Climate Change Steering Committee; a Secretariat advises the Minister of Water and Environment on the approval of CDM projects and climate change policy issues. The National Climate Change Steering Committee will provide an overall oversight for the implementation of NAPA.

Under the guidance of the National Climate Change Steering Committee, the National Climate Change Steering Committee Secretariat coordinates the implementation of NAPA and liaises with the UNFCCC Secretariat. It also reports to the Conference of the Parties on the implementation of the NAPA. The National Climate Change Steering Committee Secretariat also assists with identification of additional funding sources.

3.7.1 Opportunities inherent in the 2007 NAPA projects

These projects were designed to mitigate the effects of climate change. They include the following:

i. Community Tree Growing Project - estimated total project cost of US$ 5.5 million

This project opens up opportunities for the exploitation of forests for poverty alleviation, economic development and environmental improvement.

ii. Land Degradation Management Project - estimated total project cost of US$ 4.7 million

This project will help to halt and reverse land degradation in resource constrained communities that are vulnerable to climate change. As a result, soil degradation, the clearing of bush, encroachment of forest reserves, reduced production of food and livestock, desertification, migration to towns to look for employment, loss of biodiversity and erosion of gene pools in agro-ecosystems will be halted as well.

iii. Climate Change and Development Planning Project - estimated total project cost of US$ 1.2 million and a time frame of 3 to 5 years

This project will support the development, dissemination and application of mainstreaming guidelines at various levels to climate-proof development activities with a view of integrating climate change issues into development planning and implementation at all levels. Generation of climate change scenarios and their explanation will be required to support the dissemination of key messages to improve

understanding of climate, its variability and change. With successful implementation of the project it is hoped that in future, climate change issues will be taken into consideration in the development of sectoral and investment plans.

3.7.2 Opportunities in carbon trading through the clean development mechanism (CDM)

The national and international institutional framework has been established to facilitate the implementation of the climate change convention on CDM. At the international level, the environmental objective of CDM is regulated by the CDM Executive Board (CDM-EB). As a party to both UNFCCC and KP, Uganda has established an institutional framework to issue letters of approval and thus participate in the international emissions trading. The institutional framework consists of the following:

- Minister responsible for Environment. Serving as the DNA (designated national authority), s/he facilitates projects that can earn saleable/tradable units which can be used for compliance with KP targets.
- Climate Change Policy Committee (CCPC): provides the Minister with technical advice on climate change policy issues and CDM projects
- Climate Change Unit providing secretariat support to the CCPC

Current activities include

1 Activities relating to the CDM process and projects

2 Promotion of clean technologies at the national level, e.g. in the biomass sector.

The Climate Change Unit (2010: 2) has provided information on projects that have been submitted to the secretariat. Of these, two CDM projects and one programme of activities have been registered by the CDM executive board. Eight projects have been issued with letters of approval (LoA) and are at various stages of the CDM regulatory process. Please refer to Appendix 4 for a more comprehensive list.

CDM registered projects:

1. Nyagak mini hydro project in West Nile
2. Uganda Nile Basin Reforestation Project (NFA)

3. Uganda Municipal Waste Compost Programme in several districts, coordinated by NEMA

Projects that have been issued with letters of approval:

1. Kakira Bagasse Co-generation Project in Jinja
2. Bugoye Run-of-River Mini Hydropower Project in Kasese
3. Kikagati Mini Hydropower Project in Mbarara District
4. Georg Loeding Enterprises Forestry Project in Kasese
5. Kinyara Bagasse Co-generation Project in Masindi
6. lshasha Mini Hydropower Project in Kanungu
7. Mpererwe Landfill Gas Project
8. Kachung Forest Project in Dokolo District

Projects pending approval:

1. Buseruka Mini Hydropower Project in Hoima District
2. Bujagali Hydropower Project in Jinja

If the respective project reduces or avoids GHG emissions, then the developed country party can claim a portion of the certified emission reduction units (CERUs). CERUs can be used by northern companies to 'redeem' emissions against their national commitments or trade them on the open market. Further information regarding applicable regulations and verification processes is provided in Chapter 6.

Uganda's Climate Change Unit remarks that:

- A lot remains to be done by the Ugandan business community and Government to encourage international investment under CDM.
- Delays in implementing CDM will mostly hurt poorer countries such as Uganda.
- CDM implementation costs can be reduced through good policies, a positive investment climate, a welcoming attitude and transparency.

3.8 Role of the Ministry of Energy and Mineral Development (MEMD) in the drive towards implementation of low-carbon development paths

Since the enactment of the 1999 Electricity Act, the Ministry of Energy and Mineral Development (MEMD), in conjunction with the Rural Electrification Agency (REA) and the Electricity Regulatory Authority (ERA) has been addressing a number of issues in certain key areas.

3.8.1 Energy and development

Energy services such as lighting, heating, cooking, mechanical transport and telecommunication are essential for socio-economic development, since they yield social benefits, create employment and generate income. These issues are at the core of poverty eradication and national development. For renewable energy to remain relevant, the policies adopted must propel it to a level where it provides services that will facilitate the achievement of national development goals. MEMD, REA and ERA and other development partners have been carrying out programmes and activities to address the issues of insufficient generation capacity and network coverage.

3.8.2 Reliability, efficiency and sustainability

Renewable energy technologies (RETs) should be used more, and used in such a way that they provide reliable and efficient services to consumers. This will give consumers confidence in RETs, thus improving the sustainability of the RET market. For this purpose, MEMD is working with other development partners to address the pertinent

issues through programmes and activities such as Energy for Rural Transformation (ERT).

3.8.3 Legal and institutional framework

To maintain and improve the responsiveness of the legal and institutional framework to facilitate renewable energy investments, Government, through MEMD, is doing the following:

1. A standardized power purchase agreement on feed-in tariffs for renewable energy generation projects of up to 20 MW capacity was publicized.
2. Putting legislation and regulations in place to promote the use of renewable energy and renewable energy technologies in all sectors. In particular, urban authorities will be obligated to incorporate solar water heating in building plans, and local authorities will be encouraged to secure agricultural land for energy farming to produce biofuels.
3. Regulations for grid connections and the incorporation of electricity generated from renewable energy has already been put into place.
4. Introduce a sector-wide approach (SWAP) in energy planning and implementation. This will be largely in conjunction with the Climate Change Unit once it is strengthened.
5. Establish a national energy committee with representatives from stakeholders to provide strategic policy guidance to the sector.
6. Establish a decentralized coordination at district local government levels to support the promotion of renewable energy investments at the lowest level.
7. Create Renewable Energy and Energy Efficiency and Conservation Departments at the Ministry of Energy and Mineral Development.
8. Attract qualified personnel into the sector so as to support renewable energy investments.
9. Integrate energy issues into non-energy sector policies and planning for the sustainable provision of energy services.

3.8.4 Power generation programme

The Power Generation Programme is part of the drive for increased power generation. It includes two approaches of project realization. The first deals with large hydropower schemes and the second deals with small power schemes.

Large-scale hydropower projects

These sites are normally tendered out to prospective developers. After the selection, the prospective developer will acquire a license from the Electricity Regulatory Authority to carry out feasibility studies and designs. Once these are approved, the developer will arrange an appropriate financing package that will facilitate the implementation of the scheme. Public private partnerships will be encouraged and the tariffs will be negotiated on a case by case basis.

- *Kiira and Nalubaale Complex:* two hydropower stations at the Nile outlet from Lake Victoria with 200 MW and 180 MW, respectively
- *Bujagali:* a 250 MW project expected to be commissioned during 2011 (Investment Guide for Rural Electrification, 2001: 13).
- *Karuma:* Government has decided to develop a single project which utilizes the available head giving an estimated power output of about 700 MW (National Development Plan, 2010: 149)
- *Isimba Hydropower Project:* this site is planned to be developed as a complementary project to Bujagali and Karuma. It has an estimated potential of 130 MW (Na-

tional Development Plan, 2010: 149).

- Other possible sites: Kalagala (350 MW); Ayago South (234 MW); Murchison (642 MW); Bugumira (109 MW) (National Development Plan, 2010: 149)

Small-scale power projects

These include small hydropower plants (less than 20 MW), biomass, co-generation, geothermal energy, wind power, solar power and other sources. Projects in a number of these renewable energy areas are already underway.

3.9 Some Programmes and/or Institutions participating in Low-Carbon and/or Renewable Energy Activities

3.9.1 Energy for Rural Transformation (ERT)

The ERT Programme is a 10-year multi-sectoral programme meant to eradicate poverty and achieve development. The cumulative effect has been an increase of electricity access from approximately 1% in the beginning of 2001 to 3% at the end of 2005, which is a positive step towards achieving the 10% target by 2012. The main stakeholders in the programme include the Ministry of Energy and Mineral Development, the Rural Electrification Agency, the Ministry of Local Government, Ministry of Health, Ministry of Finance Planning and Economic Development, Ministry of Education and Sports and the Bank of Uganda whose role it is to manage the Energy for Rural Transformation Refinance Fund (ERTRF).

Other stakeholders include the Ministry of Agriculture, Animal Industry and Fisheries, the Private Sector Foundation, the Directorate of Water Development and the Uganda Communications Commission.

In the second phase, the Energy for Rural Transformation Project aims to increase access to energy and information and communication technology (ICTs) in rural Uganda.

Among the ERT projects are the Kisiizi Power Project, the Kakira Cogeneration Project, the West Nile Project, biomass gasification pilot projects, traditional fuel efficiency improvement for SMEs, compact fluorescent lamps (CFLs), Hydromax hydropower generation at Buseruka in Hoima district, and Kilembe Investment Ltd investment power distribution in Kasese and north western Bushenyi districts.

3.9.2 Business Uganda Development Scheme (BUDS) Energy for Rural Transformation (ERT) – Government of Uganda/World Bank Project and Private Sector Foundation (PSF) (BUDS ERT – GoU/ WB Project and PSF)

The BUDS ERT is a project component managed by the Private Sector Foundation Uganda: it is the private sector component of Uganda's 10-year Energy for Rural Transformation Project (ERT). The objective of BUDS-ERT is to develop private sector capacities to start, operate and improve rural electrification-related businesses and to increase their application of efficient productive uses of electricity and traditional fuels in rural electrification areas.

3.9.3 Uganda Cleaner Production Centre (UCPC)

The Uganda Cleaner Production Centre (UCPC), hosted by the Uganda Industrial Research Institute (UIRI) at Nakawa, is a joint project of the Government of Uganda and the United Nations Industrial Development Organisation (UNIDO). The main objective of UCPC is to introduce cleaner production practices to enterprises in Uganda in order to help companies reduce operating costs through increased overall efficiency, especially in the use of materials and energy.

3.9.4 Centre for Research in Energy and Energy Conservation (CREEC)

This is an organization based within the Faculty of Technology at Makerere University in Kampala, Uganda. CREEC's mission is to enhance access to modern types of energy through research, training and consultancy in East Africa. CREEC focuses on a number of areas which include biofuels, gasification, solar power, pico-hydropower and energy management. To build capacity, CREEC operates on the principle of knowledge sharing and open source information. For this purpose, they work with many other relevant bodies and organizations for project implementation and the sharing of knowledge and experience.

To date, these have included market development for improved cooking technologies, technology standardization for cooking, heating and ventilation, indoor air pollution exposure and health monitoring.

CREEC has also been involved in the distribution of solar LED technology to various communities in Uganda. CREEC works in close cooperation with the private sector and the Government. The organization is also knowledgeable regarding market requirements and market trends. One of the NGOs they are involved with, Barefoot Power (Uganda) Ltd. has set itself the goal of reaching one million Ugandans by 2013.

...there has been progress: many programmes and activities have been initiated by Government and the private sector. Much has also been done in the industrial, forestry and agricultural sectors. However, there is still a need for speeding up the process, but this will depend largely on the pace at which the requisite Government reforms and restructuring can be implemented.

3.9.5 Electricity Regulatory Authority: renewable energy feed-in tariffs (REFIT)

Under the 1999 Electricity Act Renewable Energy Policy (2007), the Electricity Regulatory Authority, established a set of feed-in tariffs, in addition to a standardized Power Purchase Agreement to run initially from 2007 to 2009. Due to limited uptake by project developers, the renewable energy feed-in tariffs (REFIT) were reviewed in 2010 and a new tariff was developed based on updated levelled costs of production and accompanied by guidelines. These guidelines are meant to provide clarity and guidance to project developers, investors and key institutional stakeholders on the key components and operational structure of REFIT (Uganda Renewable Energy Feed-in Tariff (REFIT) Phase 2 Approved Guidelines. 2010:2).

3.9.6 Credit support facility: Uganda Energy Credit Capitalization Company

As part of the Energy for Transformation (ERT) Programme, a credit support facility (CSF) was created to address the lack of long-term commercial debt finance for small renewable energy projects. In a first phase, the CSF offered a credit refinancing facility (refinancing up to 90% of debt) through which two small renewable energy projects were supported. Building on the experience of the CSF, the Government of Uganda launched the Uganda Energy Credit Capitalization Company (UECCC) in 2009. It is supposed to offer a standby refinancing facility as well as partial risk guarantees in order to improve access to long-term commercial debt finance for private developers. Renewable energy investments include solar energy, biofuels, and biomass. Energy products will take the form of hydropower plants, geothermal plants, cook stoves and ovens for baking. Project funds are expected to be managed by a trust fund, the Uganda Energy Capitalisation Trust.

3.9.7 National Forestry Authority: the Nile Basin Reforestation Project in Uganda

The Nile Basin Reforestation Project in Uganda is being implemented by Uganda's National Forestry Authority (NFA) in association with local community organizations. Growing trees absorb carbon dioxide from the atmosphere in exchange for revenues from the World Bank BioCarbon Fund paid to NFA and the communities (Press Release - World Bank, 2011).

The BioCarbon Fund is an initiative with public and private contributions. It purchases

emission reductions from afforestation and reforestation projects under the CDM, as well as from land-use sector projects outside the CDM, such as projects that reduce emissions from deforestation and forest degradation (REDD) and increase carbon sequestration in soil through improved agriculture practices.

The project will establish a plantation of pine and mixed native species in the Rwoho Central Forest Reserve, which deforestation and erosion has degraded to grasslands. This is the first of five small-scale projects developed through the Clean Development Mechanism (CDM). Each will be registered separately, with the total size of the plantation ultimately reaching 2,137 hectares.

3.9.8 Uganda Carbon Bureau

The Uganda Carbon Bureau is a privately owned company. It was created with a view to provide practical advice and support to project developers, carbon credit buyers, development agencies, financiers and others wanting a better understanding of climate change, global warming and the carbon emissions trading markets. The Bureau has special knowledge of carbon project activities in Uganda and works closely with the private sector and public agencies. The Bureau has been and is currently involved in a wide range of projects and programmes across the energy, forestry and related fields involving either emissions reductions or carbon sequestration.

Small-scale Programme of Activities in East Africa covering Renewable Energies (SPEAR)

A PoA is a new and efficient way of accessing the carbon market. SPEAR is a carbon finance support 'umbrella' for small-scale, grid connected, renewable energy projects of up to 15 MW in the five countries of the East African Community (Kenya, Uganda, Tanzania, Rwanda and Burundi) plus Sudan.

Improved Cook Stoves for East Africa (ICSEA) Programme of Activities

ICSEA is a carbon finance support 'umbrella' for projects that disseminate improved cook stoves using wood or charcoal in the five countries of the East African Community (Kenya, Uganda, Tanzania, Rwanda and Burundi) plus Sudan.

3.9.9 Sustainable Energy Use in Households and Industry (SEUHI)

MEMD has been implementing the Sustainable Energy Use in Households and Industry (SEUHI), a three-year project supported by the Netherlands Government. The objective of this project was to improve efficiency in energy conversion and use in households and small-scale industry. The project addresses rural and urban household stoves in Kampala, Soroti, Adjumani, Kabale and Tororo; charcoal production in Luwero, Nakasongola and Masindi; and lime production in Kasese, Kisoro and Tororo (National Biomass Energy Demand Strategy, 2001: 19).

3.9.10 Integrated Rural Development Initiatives (IRDI)

Integrated Rural Development Initiatives (IRDI) aim to reduce environmental degradation, promote sustainable utilization of natural resources and improve the social economic status of communities in general and marginalised groups in particular. IRDI promotes the use of renewable energy technologies with emphasis on training trainers the construction and use of mud stoves, the use of hay baskets and the construction of biogas plants.

3.9.11 German Technical Cooperation - Promotion of Renewable Energy and Energy Efficiency Programme (GIZ-PREEEP)

The German Technical Cooperation, GIZ has been supporting a number of projects in Uganda. These include the Promotion of Renewable Energy and Energy Efficiency Programme (PREEEP). Other participating organisations include the Uganda

Industrial Research Institute and the Centre for Research in Energy and Energy Conservation (CREEC). To date, progress has been made in the fields of energy conservation for households and institutional cooking. Brochures have been published for rocket baking ovens, household rocket stoves and the institutional rocket stove. Construction manuals for firewood saving household and institutional stoves have also been published (Promotion of Renewable Energy and Energy Efficiency Programme. July 2008 to June 2011). According to the Ministry of Energy and Mineral Development, during 2008/2009 ten engineers and managers were trained in energy auditing and management, 100,000 household and 150 institutional cook stoves were distributed; and 250 solar home systems and 30 solar institutional systems were distributed (Power Sector Development Operation, 2009:2). Similar figures were expected to be attained in the year 2009/2010.

3.9.12 National Environment Management Authority (NEMA)

The National Environment Management Authority supports CBOs and NGOs involved in environment-related activities in Mbarara, Kabale, Kasese, Arua, Tororo, Busia and Mbale Districts. Trees were planted in agro-forestry farming systems mainly for soil conservation. Tree nurseries are well stocked at sub-county levels. NEMA also provides assistance in the construction of energy-saving stoves.

3.9.13 The Rural Electrification Agency (REA)

To give rural populations and the urban poor access to electricity requires special packages to make the connections and services affordable. Under the Rural and Urban Poor Electricity Access Programme, procedures for on-going community schemes will be improved, and the cost of connecting the community will be subsidized. The Programme will also support the development of independent grids supplied by micro and pico hydropower and biomass gasifiers to be managed by communities. Solar systems will also be installed in dispersed remote settlements. The Programme will prioritize the electrification for productive uses and key social services. All this will be carried out in addition to the rural electrification and extension schemes which the

Conclusion

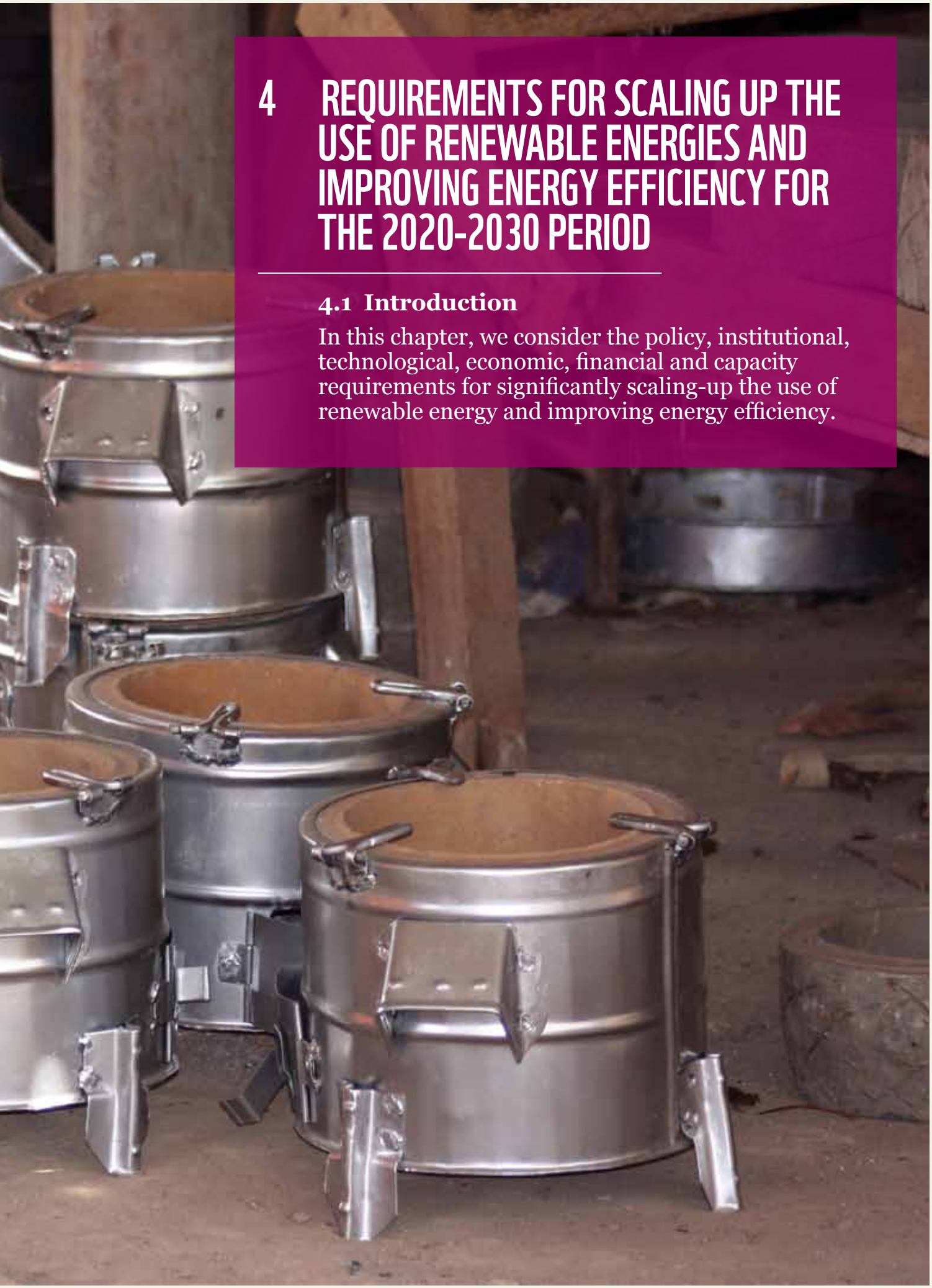
Much has also been done in the industrial, forestry and agricultural sectors. However, there is still a need for speeding up the process, but this will depend largely on the pace at which the requisite Government reforms and restructuring can be implemented.

Rural Electrification Agency is already executing countrywide.

Further encouragement will be achieved through the disbursement of consumer subsidies through financial institutions and PV companies to provide financing for installing solar electricity. Using the Photo Voltaic Targeted Market approach (PVTMA), solar loans will be given to individuals to acquire solar PV systems with loans from financial institutions. Participating financial institutions at the moment include Post Bank Uganda, FINCA and selected savings and credit cooperatives (SACCOs). It is expected that other institutions will soon join the scheme. There is also a standing arrangement where the Rural Electrification Agency (REA) works in partnership with the Private Sector foundation (PSFU), which in turn provides additional funding to the participating firms or companies.

3.10 Concluding Remarks

Uganda has a low carbon/renewable energy strategy in place. The National Development Plan lists the constraints of the Climate Change Unit (CCU); it also gives objectives and the strategic interventions required. Government has gone ahead to launch National Adaptation Programme of Action (NAPA) which has remained a challenge to full implementation due to lack of funds and the inadequate capacity to prepare detailed proposals and mobilize funding. MEMD has an elaborate Renewable Energy Policy including strategies; although much has been put in place, a lot still remains to be implemented. As illustrated in the above chapter, there has been progress: many programmes and activities have been initiated by Government and the private sector. Much has also been done in the industrial, forestry and agricultural sectors. However, there is still a need for speeding up the process, but this will depend largely on the pace at which the requisite Government reforms and restructuring can be implemented.



4 REQUIREMENTS FOR SCALING UP THE USE OF RENEWABLE ENERGIES AND IMPROVING ENERGY EFFICIENCY FOR THE 2020-2030 PERIOD

4.1 Introduction

In this chapter, we consider the policy, institutional, technological, economic, financial and capacity requirements for significantly scaling-up the use of renewable energy and improving energy efficiency.

We start by considering various aspects of renewable energy and energy efficiency; next, we consider Uganda's international obligations and the international legislation already in place but not yet fully implemented.

In Uganda, some policy, legal and institutional frameworks are already in place; however, more needs to be done both by the country itself and by international cooperation; this will be illustrated later in the chapter. In addition, we will point out that not only does the Government of Uganda provide incentives and guarantees, but international funding is available, and the prudent use of this funding can be channelled towards the scaling up of renewable energy and energy efficiency technologies. Although some activities are already undertaken (see Chapter 3), scaling up is necessary despite existing barriers and constraints.

With the right policies, institutional, technological, financial and other frameworks in place, Uganda can significantly upscale the use of renewable energy and improve energy efficiency for the 2020-2030 period.

4.2 Uganda's Obligation under International Treaties

As a party to UNFCCC, adopted in 1993, and the Kyoto Protocol (KP) that came into force in February 2006, Uganda is obliged to put appropriate mitigation and adaptation measures in place to address the cause and effects of climate change and undertake education and awareness programmes. These treaties have been ratified but they are not yet domesticated. A 2008 study recommends that a statutory order is used to fast track the insertion of these treaties into local legislation.

While work is under way towards achieving this, some policy, legal and institutional frameworks already exist. Collectively, they aim at sustainable energy use and the use of renewable energy and energy-efficient technologies in Uganda.

4.3 Need to Make Full Use of the CDM Regulatory Framework

The environmental objective of the CDM is regulated by an international institution – the CDM Executive Board. This provides for an elaborate international regulatory framework to approve methodologies for the checking and auditing of greenhouse gas emission reductions. Renewable energy projects are the main candidates for this programme. In Uganda, the sustainability objective of the CDM is regulated through the Sustainable Development Criteria developed for that purpose.

4.4 Need to Make Full Use of Institutional Frameworks already in place

Relevant ministries in Uganda already have in place institutional frameworks which contribute towards the eventual goals. However, it has been observed that there is still a need for harmonization and coordination. This role is taken on by the Ministry of Water and Environment (MWE), particularly by the Climate Change Unit (CCU). This is one of the issues to be addressed when the ongoing re-structuring and strengthening of the CCU has been fully implemented.

4.5 Need for Full Participation of the Key Energy Sector Participants

The overall responsibility for the power sector within Government lies with MEMD. MEMD oversees and coordinates the implementation of all power projects. The following institutions – subordinate to MEMD - were established under the reform brought about by the 1999 Electricity Act.

4.5.1 Electricity Regulatory Authority

The functions of ERA include the regulation of the power sector activities, issuing of generation, transmission and distribution licences, regulation of electricity tariffs, development and enforcement of performance standards within the sector, and enforcement of adherence to the National Grid Code.

4.5.2 Uganda Electricity Generation Company Limited (UEGCL)

UEGCL is the state-owned generation company. UEGCL currently owns Nalubaale and Kiira power stations. The two stations are currently operated under a concession agreement by Eskom (U) Ltd.

4.5.3 Uganda Electricity Transmission Company Limited (UETCL)

UETCL is the state-owned transmission company. UETCL builds, owns and operates the high voltage network of more than 33 kV. UETCL has the licences for bulk power supply and purchase, operation of high voltage transmission grids, system operator and power import and export.

4.5.4 Uganda Electricity Distribution Company Limited (UEDCL)

UEDCL is the state-owned distribution company. UEDCL builds, owns and operates distribution networks of up to 33 kV in the areas where UEB used to operate with a few additions made by REA and UMEME. UMEME is operating UEDCL's distribution network under a concession agreement.

4.5.5 Rural Electrification Agency (REA)

REA is a Government institution that promotes, enables and realizes rural electrification schemes within and outside of UMEME's designated supply area. REA is the secretariat of the Rural Electrification Board (REB), which manages the Rural Electrification Fund. This fund provides subsidies to support rural electrification projects.

Other major stakeholders in the power sector include concessionaires like UMEME, Eskom (U) Ltd., Ferdsult Engineering Services and WENRECo who distribute and help to meet energy needs. Recently, the Government of Uganda has been encouraging cooperatives to take on the responsibility of running distribution supply systems within their own communities. Examples of these are PACMECS (Pader and Abim Community Multi-purpose Electricity Cooperative Society) and BECS (Bundibugyo Energy Cooperative Society).

Licensed oil companies must take responsibility for protecting the environment of their sites or any areas in the country impacted by their operations while Government will legislate, regulate and monitor compliance (National Oil and Gas Policy for Uganda, 2008: 38).

4.6 Need to Make Full Use of Existing Policy Framework

The existing policy frameworks include clauses which support the required renewable energies and energy efficiency goals. Once fully implemented and well coordinated, they will provide a boost to the scaling up process. As already indicated above, the overall responsibility for the power sector within Government lies with MEMD

4.6.1 Policy framework for the Ugandan energy sector

Over the past ten years, the Government of Uganda has embarked on a power sector reform programme which has seen the implementation of significant structural changes within the sector. The reform programme was aimed at providing adequate, reliable and least-cost power to meet the country's demand, promoting the efficient operation of the power sector and scaling up rural and peri-urban access to maximize impact on poverty reduction. Despite the implementation of these reforms, the country continues to experience significant power supply shortages, low rates of access to electricity and high levels of power losses, all impacting negatively on the country's economic growth (Power Sector Investment Plan, 2009: 4).

4.6.2 The 2002 National Energy Policy

The goal of the policy is to meet the energy needs of Uganda's population for social and economic development in an environmentally sustainable manner. The 2002 National Energy Policy seeks to meet the following broad objectives:

- To establish the availability and potential of the various energy resources and the demand the country has for them.

- To increase access to modern affordable and reliable energy services as a contribution to poverty eradication
- To improve energy governance and administration
- To stimulate economic development
- To manage energy-related environmental impacts

4.6.3 The 2007 Renewable Energy Policy for Uganda

The overall goal of the Renewable Energy Policy (REP) is to increase the use of renewable energy such that its proportionate use increases from the current 4% to 61% of the total energy consumption by 2017 (Renewable Energy Policy for Uganda, 2007: 7).

The key objectives include:

- Maintain and improve the responsiveness of the legal and institutional framework to promote renewable energy investments
- Establish an appropriate financing and fiscal policy framework for investments in renewable energy technologies
- Promote research and development, international cooperation, technology transfer and adoption of standards in renewable energy technologies;
- Utilize biomass energy efficiently so as to achieve sustainable resource management
- Promote the sustainable production and utilization of biofuels
- Promote the conversion of municipal and industrial waste to energy.

As part of the power generation programme, REP promotes power generation from mini hydrology, biomass, co-generation, wind, solar, geothermal and peat. The consideration of nuclear power generation is also planned.

4.6.4 The Oil and Gas Policy

Among other objectives, the Oil and Gas Policy seeks to uphold the delicate balance of the environment, human development and biodiversity required for mutual benefit and survival, thus ensuring sustainable development. Many stakeholders engage in development initiatives and interventions focusing on expected benefits and often end up by doing harm. Licensed oil companies must take responsibility for protecting the environment of their sites or any areas in the country impacted by their operations while Government will legislate, regulate and monitor compliance (National Oil and Gas Policy for Uganda, 2008: 38).

4.6.5 The National Environment Policy

The National Environment Management Policy for Uganda seeks to meet the following objectives:

- Improve the health and quality of life of all people in Uganda and promote long-term, sustainable socio-economic development through sound environmental and natural resource management
- Integrate environmental concerns in all development policies, planning and activities at national, district and local levels, with full participation of the people
- Conserve and restore ecosystems and maintain ecological processes and life support systems, especially of national biological diversity
- Optimize resource use and achieve a sustainable level of resource consumption
- Raise public awareness to understand and appreciate linkages between environment and development
- Ensure individual and community participation in environmental improvement activities.

4.6.6 The National Water Policy

The National Water Policy was prepared in 1999 with the aim to manage and develop Uganda's water resources in an integrated and sustainable manner; so as to ensure adequate quantity and quality of water for the social and economic needs of present and future generations. The water policy is influenced by the current economic liberalisation / privatisation and decentralization reforms. The water sector's goal and strategy include systems sustainability enhanced by community participation, capacity-building and a demand-driven approach.

4.6.7 The 1999 Wildlife Policy

The Uganda Wildlife Authority (UWA) was establishment by the Wildlife Act, Cap 200 with the mandate to manage all matters of wildlife in Uganda.The Uganda Wildlife Policy is to conserve, for all time, the rich biological diversity and natural habitats of Uganda while accommodating the development needs of the nation and the well-being of its people and the global community. Natural habitats include forests, so these goals can only be attained when forest conservation measures are in place.

4.6.8 The 2001 Uganda Forest Policy

This policy deals directly with forest conservation. Among other objectives, the Forest Policy aims to set up an integrated forest sector that achieves sustainable increases in the economic, social and environmental benefits from forests and trees for all the people of Uganda, especially the poor and vulnerable (The Uganda Forestry Policy, 2001: 13).

4.6.9 The 2008 National Industrial Policy

The National Industrial Policy aims at an industrial transformation which will be pursued in a manner that ensures efficient resource utilization and environmental sustainability (National Industrial Policy, 2008: 17). Environmental sustainability implies utilizing renewable energies and energy-efficient production methods.

4.6.10 Agriculture: policy principles of the National Agricultural Advisory Services (NAADS)

NAADS aim to transform agricultural production and productivity without degrading the environment by supporting farmers to manage agricultural activities while maintaining natural resources' productivity for both the present and future generations. If the policy is properly implemented, it should be possible to halt and reverse land degradation. As a result, it should also be possible to halt soil degradation, bush clearing, encroachment into forest reserves, reduced production of food and livestock, desertification, loss of biodiversity and erosion of gene pools in agro-ecosystems.

4.6.11 Investments: The Uganda Investment Authority

The Uganda Investment Authority (UIA) is the statutory agency responsible for promoting and facilitating investment in Uganda. The law governing investment in Uganda is the Investment Code Act Chapter 92. The Act established UIA to promote investments in Uganda, advise the Government on policies conducive to investment and provide information on investment issues. One of the core functions of UIA is to attract foreign direct investment (FDI) into the country in addition to promoting domestic investment. UIA also plays a crucial role in attracting investment to the renewable energy sector.

4.7 Need to Make Full Use of Available Incentives and Guarantees

Various incentives for investors are available in Uganda, ranging from tax incentives such as waivers and double taxation agreements (applicable to nationals of particular countries) to investment guarantees.

Specific incentives are accorded to investors in rural electrification: Section 64 of the Electricity Act CAP 145 decrees that the Minister (of Energy) shall set up a rural electrification fund to support rural electrification. The Minister is also supposed to develop eligibility criteria for financial support and subsidy levels.

In addition, the Government has evolved other financial support mechanisms to support investors in rural electrification. These include the following (Investment Guide for Rural Electrification, 2001: 22):

- The Energy For Rural Transformation Refinancing Fund (ERTRF) is currently managed by the Bank of Uganda's Development Finance Department. However, only accredited financial institutions are eligible for financing arrangements through ERTRF. Currently these include Barclays Bank, Bank of Baroda, DFCU Ltd, East African Development Bank, Orient Bank, Stanbic and Standard Chartered Bank (U) Ltd.
- As part of the Energy for Transformation (ERT) Programme, a credit support facility (CSF) was created to address the lack of long-term commercial debt finance for small renewable energy projects. In a first phase, the CSF offered a credit refinancing facility (refinancing up to 90% of debt) through which two small renewable energy projects were supported. Building on the experience of the CSF, the Government of Uganda launched the Uganda Energy Credit Capitalization Company (UECCC) in 2009. It is supposed to offer a standby refinancing facility as well as partial risk guarantees in order to improve access to long-term commercial debt finance for private developers.
- The Government of Uganda has also set up a mechanism for accessing support to the carbon credit fund (e.g. CDM) for renewable energy projects under the Kyoto Protocol. The Climate Change Unit within the Ministry of Water and Environment is responsible for CDM in Uganda.
- The BUDS-ERT support facility of up to US$ 100,000

The Electricity Act, Section 45 (4) also provides that plants with a capacity of up to 10 MW may be owned on a basis of 'build, own and operate' (BOO).

4.8 Need for Funding the 2007 NAPA Projects

In 2007, a National Adaptation Programme of Action (NAPA) was launched with support from GEF. NAPA includes nine priority projects at a cost of approximately US$ 40 million (National Development Plan, (2010:315). Limited progress was made in implementing the NAPAs due to lack of funds and inadequate capacity to prepare detailed proposals and mobilize funding. Information on NAPA projects was provided in Chapter 3 (Uganda National Plans of Action, 2007:15).

4.9 Requirements for Financing Investments in the Energy Sector

The Power Investment Plan gives the scale of costs for the planned/real investments for the entire sector (generation, transmission and distribution) up to 2025 - and it is big. These plans will also address issues pertaining to renewable energy production as the bulk of added power will be hydropower and from other renewable energy sources (Power Sector Investment Plan, 2009: 10). In brief:

- The total capital investment cost required between 2010 and 2030 is estimated to be US$ 9.1 billion.
- Based on the stated assumptions, it is estimated that Government and the utility companies need to source some US$ 2.1 billion of investment in electricity supply infrastructure from 2010-2030.
- The total financial repayments required from 2010 to 2030 is estimated at US$ 8.4 billion.
- Between 2010 and 2018, the opportunity exists for the to reduce subsidies or lower tariffs.

- It is likely that there will be deficits between 2021 and 2024 due to large investments in new generation projects
- After 2024, there is a definite opportunity for Government to reduce subsidies and capital investment in the sector.

4.10 Need for Increased International Co-operation

As has been pointed out, limited progress has been made in implementing NAPA due to lack of funds and an inadequate capacity to prepare detailed proposals and mobilize funding. A similar scenario exists in the energy sector, where funding gaps and capacity constraints have resulted in curtailed investment and thus to limited access to the electricity grid. These are areas where the international community could come in as they have a direct link with climate change mitigation measures.

Some funding could be made available from international cooperation (for details see Chapter 5) through:

a. The Forest Carbon Partnership Facility (FCPF)
b. The United Nations Collaborative Programme on Reducing Emissions from Deforestation and Forest Degradation in Developing Countries (UNREDD)
c. The Forest Investment Programme (FIP) that operates under the Climate Investment Fund (CIF).
d. Other financing sources for emission reduction

(A Registry Approach for REDD+/Technical Working Group, 2010).

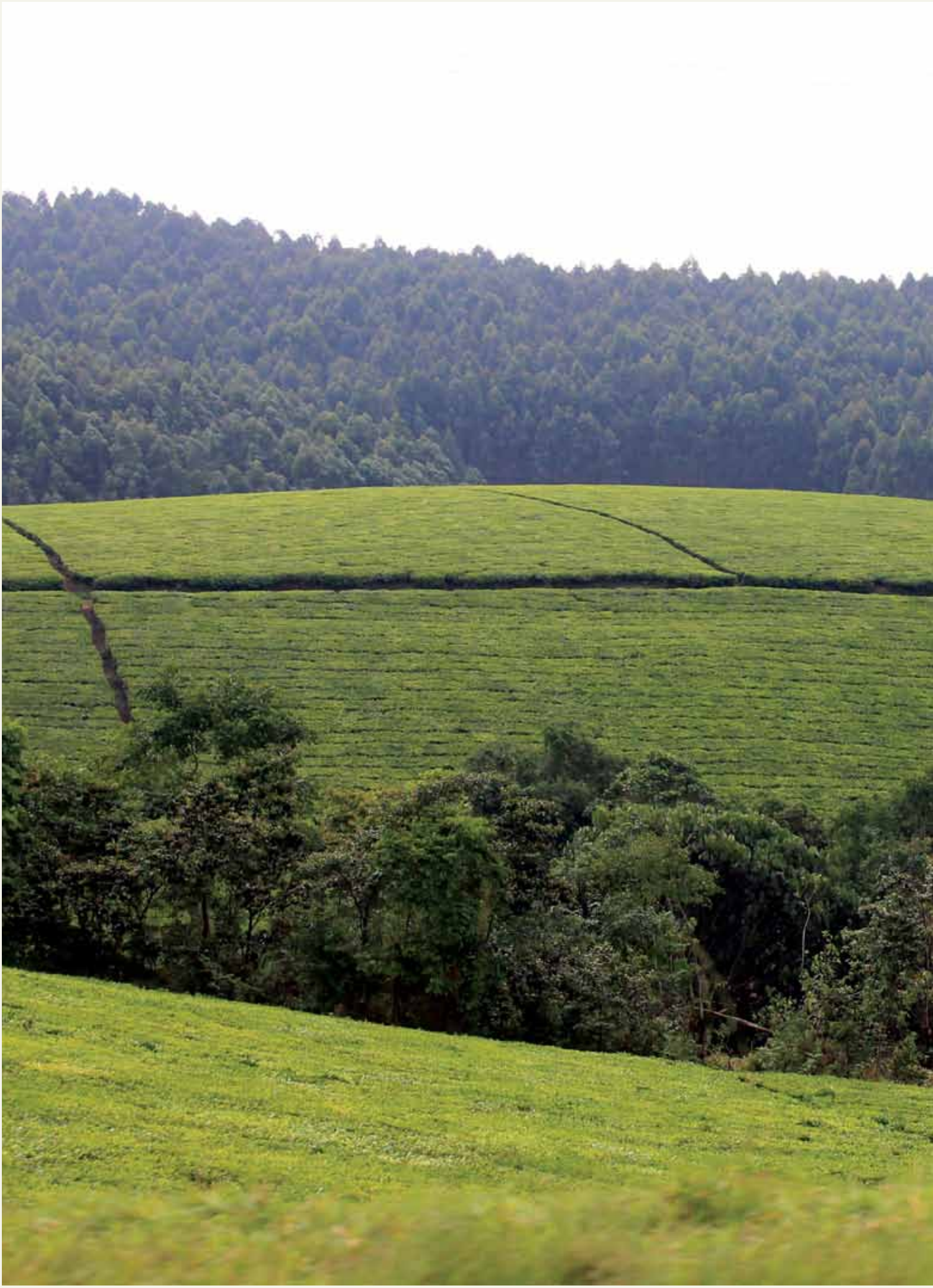
A number of pilot countries, including Uganda, are already participating in the above arrangements. In additionally, various contributing countries have pledged substantial resources for an emerging emission reduction partnership through their own bilateral agencies.

4.11 Concluding Remarks

In this chapter we have presented the policy, legal and institutional frameworks which are pertinent for the attainment of the desired goals. There are still gaps in some areas; this especially the case where the relevant sector policies have not integrated climate change. These need to be addressed fast to achieve upscaling of the use of renewable energies. In addition to Uganda's international obligations, the obligations for action are enshrined within the 1995 Constitution of the Republic of Uganda, which is the governing law of the country. Also, the Uganda Investment Authority plays a crucial role in attracting investment to the energy sector by issuing investment licenses and setting out procedures for investing in Uganda.

There is the Electricity Act and other laws and regulations such as the National Environment Act, the national environment (wetlands, river banks and lake shores management) regulations, the national environment (waste management) regulations, all of which have an impact on renewable energy and NAPA. They have sections relating to the sustainable use of natural resources. While this is a very good first step, these laws and regulations need to be fully implemented to achieve progress at a faster pace. Some of this will be addressed by the CCU: it will be required to formulate an overall policy in addition to guidelines for the relevant renewable energy standards.

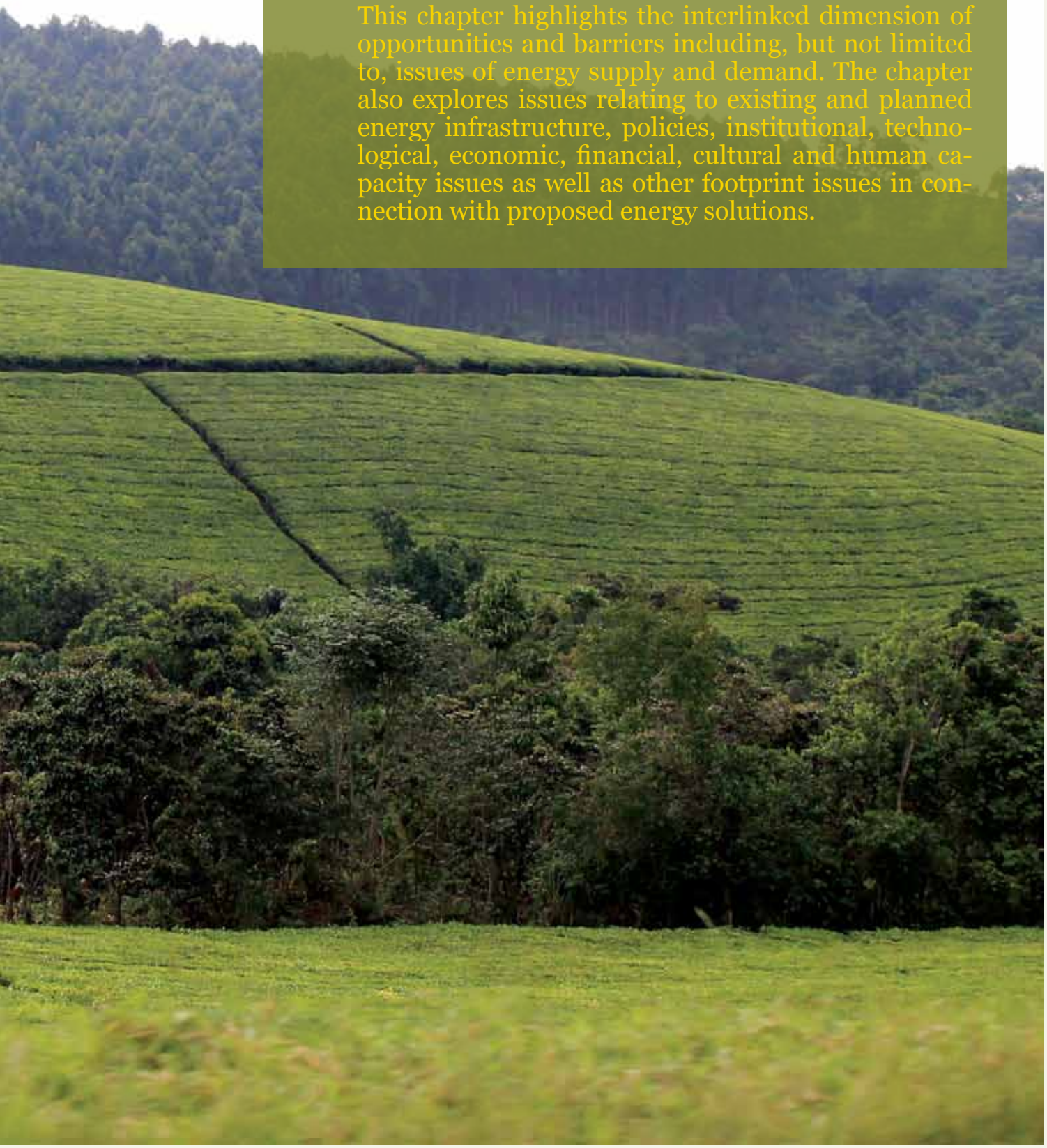
The Chapter also indicated future costs derived from studies relating to NAPA and investment costs in the energy sector. The international community would be instrumental in bridging the funding gaps. It was shown that there are incentives by the Government of Uganda and that international funding is available. Its prudent use could achieve the acceleration of the uptake of renewable energy and improve energy efficiency during the period between 2020 and 2030.



5 INTERLINKED DIMENSIONS OF THE OPPORTUNITIES AND BARRIERS IN UGANDA

5.1 Introduction

This chapter highlights the interlinked dimension of opportunities and barriers including, but not limited to, issues of energy supply and demand. The chapter also explores issues relating to existing and planned energy infrastructure, policies, institutional, technological, economic, financial, cultural and human capacity issues as well as other footprint issues in connection with proposed energy solutions.



It has now been acknowledged that carbon pricing alone, be it either through taxation or cap-and-trade schemes, will not be sufficient to drive investment and change behaviour at the scale or speed required to mitigate the effects of climate change (Human Development Report, 2007: 132). It has now been realized that governments need to become fully involved in the formulation and implementation of policies pertaining to regulations, energy subsidies and information dissemination.

5.1.1 Opportunities in the forestry sector

The forestry sector also presents much potential for CDM as it is of high economic importance. The clearing of forests for agricultural cultivation, livestock grazing and to obtaining raw materials for construction, in addition to the high demand for wood fuel, is the main cause for forest depletion.

By 1990, Uganda was harvesting forests at 17% above the sustainable rate. Investment in CDM projects in afforestation and reforestation can arrest forests depletion and improve carbon sequestration. Uganda has 4.9 million hectares of natural forests and woodlands, covering 24% of the country's area of 241,000 km^2.

The CCU has indicated that overall, Uganda has the potential to sink 162 Mega tons of CO_2 per year at a value of at least $ 1.6 million on the world carbon market.

5.1.2 Opportunities in waste management

CCU lists waste management as another area that presents much potential for CDM. Uganda is endowed with a lot of natural resources from which a lot of organic waste is generated in different use processes, ranging from agriculture, agro-processing industry and wood-processing industries to household waste which is generated on a daily basis.

Uganda has a high potential of developing CDM projects by utilizing this waste, for example for making biomass fuel briquettes, organic fertilizers and utilizing methane from landfills to generate electricity. Waste management can therefore provide alternative means of renewable energy, substituting for the traditional forms of energy use like firewood and charcoal. The Renewable Energy Policy for Uganda (2007: 64, 76) indicates savings of 200,000 tons of biomass (i.e. wood fuel), if 100,000 units of household and institutional biogas plants are built.

5.1.3 Opportunities in the energy sector

The energy sector presents much potential for CDM. Uganda's energy sector predominantly depends on biomass, which provides 93% of the country's total energy needs. Wood fuel is the main source of energy for households, small-scale industries such as manufacturers of bricks and tiles, tea and tobacco and fishing. Replacing or complementing this with hydropower presents an opportunity for the exploitation of renewable energy.

...the distribution and use of 500,000 improved wood stoves would translate into a cumulative saving of 9,520,000 tons of biomass.

5.1.4 Small-scale Programme of Activities in East Africa covering Renewable Energies (SPEAR)

A Programme of Activities (PoA) is a new and efficient way of accessing the carbon market. SPEAR is a carbon finance support 'umbrella' for small-scale, grid connected, renewable energy projects of up to 15 MW in the five countries of the East African Community (Kenya, Uganda, Tanzania, Rwanda and Burundi) plus Sudan.

The Uganda Carbon Bureau is the coordinating/managing entity of a PoA under the rules of CDM. The aim of the PoA is to help energy projects to earn the maximum amount of carbon finance from their clean energy activities in the quickest and cheapest way. SPEAR is not a broker, and will not purchase projects' carbon credits, but will support projects with their sales contracts.

Clean energy projects are part of the solution to reduce greenhouse gas emissions and

to mitigating the impact of climate change. These projects will provide reliable power to villages, businesses and industries to help stimulate local development and to replace energy sources with high greenhouse gas emissions.

5.1.5 Improved Cook Stoves for East Africa (ICSEA)

ICSEA, another PoA, is a carbon finance support 'umbrella' for projects that disseminate improved cook stoves using wood or charcoal in five countries of the East African Community (Kenya, Uganda, Tanzania, Rwanda and Burundi), plus Sudan. The aim of the PoA is to help improved cook stoves projects to earn the maximum amount of carbon finance from their energy saving-activities in the quickest and cheapest way. These projects will provide much cheaper energy-efficient cooking facilities across the region, and will improve indoor air quality and provide a safer cooking environment. Their manufacture, distribution and maintenance will help to stimulate local development, to lower the pressure on dwindling forest resources and reduce the amount of non-renewable biomass currently used as energy source, which create major greenhouse gas emissions. According to The Renewable Energy Policy for Uganda. (2007: 64, 76), the distribution and use of 500,000 improved wood stoves would translate into a cumulative saving of 9,520,000 tons of biomass.

5.1.6 The need to be guided by already established international processes and mechanisms

The Government needs to address issues relating to:

1. Power generation
2. Residential/institutional buildings
3. Vehicle emission standards
4. Research, development and the use of low-carbon technologies.

In the international arena, focus is usually placed on

1. In the field of power generation, the energy mix can be changed in favour of low-carbon energy. This requires large up-front investments and long-term planning; there is also a need to set up regulatory mechanisms interlinked with subsidies and/or incentives.
2. The formulation or enactment of energy efficiency standards for buildings, electrical appliances and motor vehicles.
3. Policies which support research and development programmes, as research will most likely lead to increased efficiency.

Opportunities in power generation

The Power Sector Investment Plan (2009: 10) forecasts the peak demand for Uganda to grow an average of 7.1% per year from 479 MW in 2008 to 2,162 MW in 2030 with investment topping an estimated US$ 9.1 billion. The National Development Plan, (2010:149) sets out the future of energy development in Uganda. In the electricity sector,

it calls for the improvement of the country's competitiveness and the acceleration of socio-economic transformation. The per capita electricity consumption must be raised to the levels of other middle income countries – which calls for an addition of 3,500 MW to the existing capacity. According to the Human Development Report (2007: 132), the main source of CO_2 emissions worldwide is the generation of electricity. The way to mitigate this trend is to change the energy mix in favour of low-carbon energy. In part, this is the purpose of Uganda's Renewable Energy Policy, the implementation of which should go a long way towards achieving cuts in CO_2 emissions.

Opportunities in the building sector (commercial/institutional/ residential)

In OECD countries, one-third of produced electricity usually goes into heating and cooling systems, domestic refrigerators, ovens, lamps and other household appliances and equipment. The residential sector accounts for around 35–40% of national emissions from all fossil fuels, with appliances alone producing around 12% (Human Development Report 2007: 136). This means that there is a huge untapped potential for saving energy in the residential sector. Falling CO^2 would boost international climate change mitigation efforts and the public would save money.

There seems to be a growing trend in the construction industry in Uganda to put up buildings that rely on air conditioning rather than on the natural circulation of air. In addition, the use of re-conditioned refrigerators and other second-hand household appliances is widespread - all these trends only serve to increase CO_2 emissions. Adherence to energy efficiency and conservation measures will save Uganda a total of 92 MW by 2017 (Renewable Energy Policy for Uganda, 2007: 76)

There are a wide range of policies on building standards, procurement regulations, appliance standards and energy efficiency obligations which can be used to assess the potential costs and benefits of achieving a reduction in emissions.

- Efficiency gains in the building and residential sectors can be achieved with regulations and information. Consumer awareness can be increased through public actions: policy can also be instrumental in creating strong disincentives for practices that decrease efficiency and thus increase carbon emissions – or prohibit them altogether.
- Very large reductions in CO_2 emissions can be achieved with regulations of building standards and their enforcement.

Opportunities in the improvement of vehicle emission standards

Motor vehicles in general and personal transportation in particular are the world's largest oil consumers. At the same time, motor vehicles are also the source of CO_2 emissions that increases most rapidly. The transport sector is a major consumer of petroleum products (75%) and the forecast demand for petroleum products indicates an average growth rate of 7.5% per year with the demand for diesel growing at 8.4% and petrol at 6.5% per year (Carbon Trading through the Clean Development Mechanism (CDM) 2010: 4). It is further estimated that there are approximately 217,622 vehicles (2001/2002) in the country with an additional 10,000 vehicles potentially added every year. A study of GHGs in the transport sector estimated that the transport sector is responsible for 708.61 Giga grams of CO_2 emissions. With the transport sector being a major contributor to GHG emissions in Uganda, there are investment opportunities for CDM projects dealing with the reduction of GHG emission.

Mileage travelled per litre of fuel: A primary driver of the upsurge in emissions is the lessening fuel efficiency of vehicles. Increasing numbers of low-efficiency sports utility vehicles (SUVs) contribute hugely to a lowering of the standard, although an increase in the use of light duty trucks makes a positive impact. This standard should gradually

be increased over the years as is the trend in most developed countries.

Car taxation: an additional powerful instrument to complement regulatory measures is car taxation. This could take the form of a tax increasing with the level of CO_2 emissions.

Biofuels: The development and use of biofuels has a double advantage over petroleum products. Biofuels such as ethanol are far less polluting as they do not produce CO_2 emissions to the same degree as petroleum products; in addition, they reduce dependency on oil imports.

Opportunities in research and development and the use of low-carbon technology

Traditionally, power plants exploiting non-renewable resources have a commercial advantage because their prices do not reflect the costs of their contribution to climate change. This poses a problem to the accelerated development of improved technologies - for this reason they are currently not widely available. With the imposition of a carbon tax or the introduction of a cap-and-trade scheme, the incentive structures in the coal industries would be transformed, putting more polluting power generators at a disadvantage. Such a measure would create appropriate market conditions for a low-carbon transition energy policy.

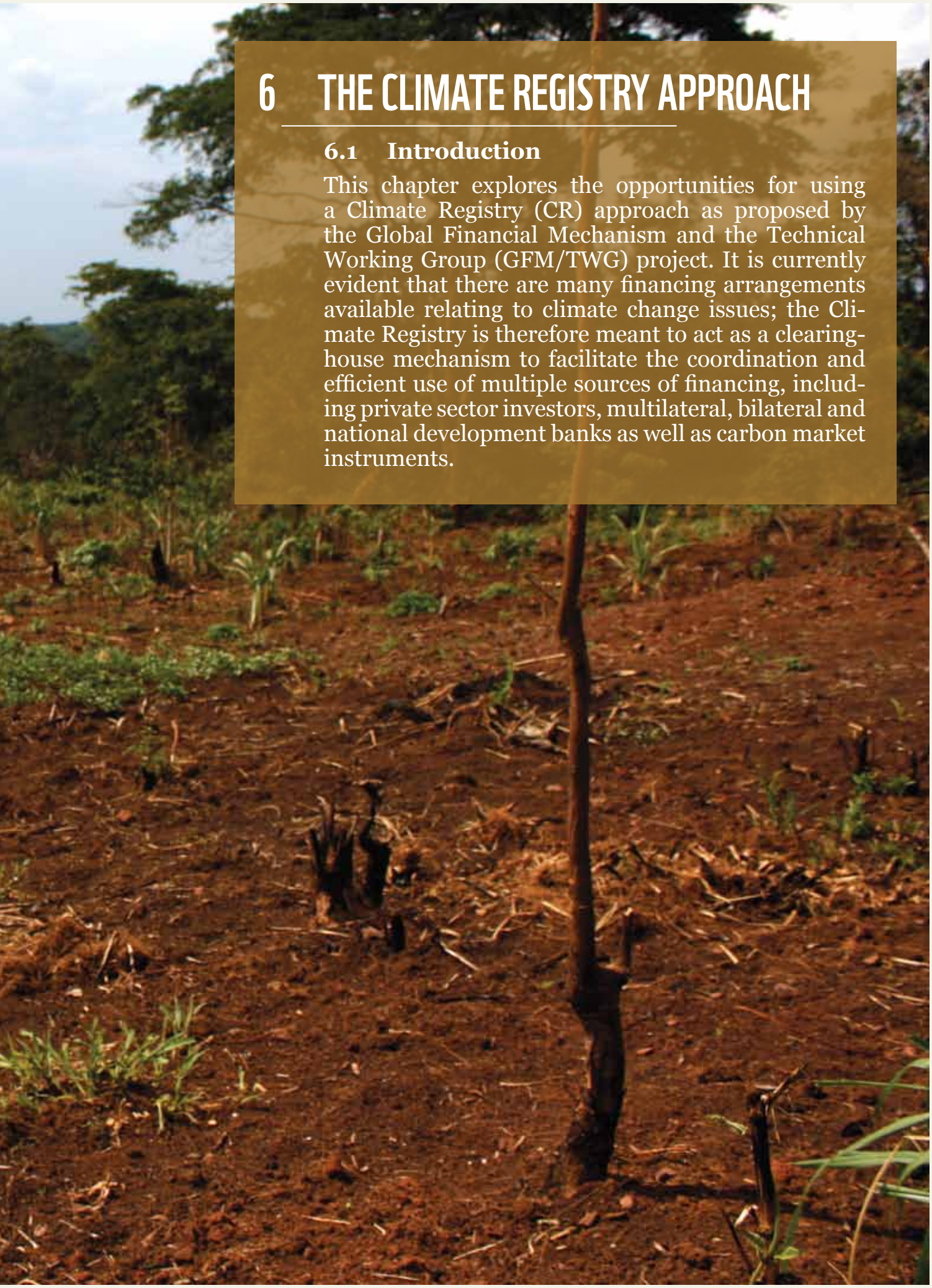
Improved technology - integrated biomass gasification combined cycle (IBGCC): Plant types that use integrated gasification combined cycle technology are an example of improved technology: they burn synthetic gas produced from coal or another fuel to clean the emissions. Supported by public funding in the US and the EU, these new technical developments have attained levels of thermal efficiency which compare very well with conventional plants – and with high levels of environmental performance.

Uganda is currently involved with improved charcoal stoves with the objective to improve the efficiency of energy conversion and use the improved stoves in households and small-scale industry (National Biomass Energy Demand Strategy, 2001: 19).

Research efforts - carbon capture and storage (CCS): Carbon capture and storage (CCS) is an example of progress being made in the area of research and development. Internationally, there is a move in the direction of CCS. With this technology, the gas that is emitted during the burning of a fossil fuel is separated and processed into a liquefied or solid form and transported to a safe location for storage. Storage sites might be below the sea bed, in disused coal mines or depleted oil wells. In theory, CCS technology could be fitted into a conventional plant; it therefore offers the potential for zero CO_2 emissions, taking the carbon out of electricity generation and any other carbon-intensive production sites such as cement factories and petrochemical facilities.

5.2 Concluding Remarks

As already indicated, the use of renewable and energy efficiency technologies will go a long way towards mitigating the impacts of climate change. Promoting the use of energy-efficient wood or charcoal cook stoves in rural villages can have a positive impact on the pattern of biomass usage. Furthermore, a programme of activities like ICSEA will be a further boost in that the programme has been formulated to provide assistance to individual energy-efficient cook stove projects to earn the maximum amount of carbon finance from their energy-saving activities in the quickest and cheapest way. This in turn will greatly help to reduce forest degradation and hence climate change. Other areas mentioned above relate to power generation, residential/institutional buildings and vehicle emission standards in addition to research, development and the use of low-carbon technologies. It is the combined efforts made in all these areas which will result in the mitigation of climate change impacts.



6 THE CLIMATE REGISTRY APPROACH

6.1 Introduction

This chapter explores the opportunities for using a Climate Registry (CR) approach as proposed by the Global Financial Mechanism and the Technical Working Group (GFM/TWG) project. It is currently evident that there are many financing arrangements available relating to climate change issues; the Climate Registry is therefore meant to act as a clearing-house mechanism to facilitate the coordination and efficient use of multiple sources of financing, including private sector investors, multilateral, bilateral and national development banks as well as carbon market instruments.

It has however been noted by the TWG that most contributing countries have announced that the majority of the pledges will be implemented through their own bilateral agencies - this also needs to be considered.

6.2 Climate Registry: The North American Approach

North America has a climate registry (Benefits of Joining the Registry, 2010). A Board of Directors represents the members (U.S. and Mexican states, Canadian provinces and territories and other Native Sovereign Nations) and have committed themselves to a set of principles and goals as part of the CR approach. These principles and goals were formulated to support common greenhouse gas measurement and reporting standards.

The North American Climate Registry's publicity material indicates that the Climate Registry is a non-profit organization that provides meaningful information with the purpose to reduce greenhouse gas emissions. It establishes consistent and transparent standards throughout North America for businesses and governments to calculate, verify and publicly report their carbon footprints in a single, unified registry.

6.2.1 Advantage of commitment of participating parties

The Registry is committed to:

- Using best practices in the reporting of greenhouse gas emissions
- Establishing a common data infrastructure for voluntary and mandatory reporting and emissions reduction programmes
- Minimizing the burden on members, directors and Native Sovereign Nations
- Providing an opportunity for members to establish an emissions baseline and document early action
- Developing a recognized platform for the credible and consistent reporting of greenhouse gas emissions
- Promoting full and public disclosure of greenhouse gas emissions while respecting business confidentiality

6.3 Carbon Registry / Global Financing Mechanism / TWG Recommendations

The Technical Working Group (TWG) project goes on to explore the opportunities of a Climate Registry (CR) approach as proposed by the Global Financial Mechanism. This approach was proposed as a means of accelerating emission reduction activities, i.e. reducing emissions from deforestation and forest degradation, as well as strengthening the involvement of market-based mechanisms, including private sector resources. One factor which will not work in favour of this approach is that, while contributing countries have pledged substantial resources for an emerging emissions reduction partnership, they have also stated that the majority of the pledges will be implemented through their own bilateral agencies.

6.3.1 Functions of a Climate Registry

The Registry is a mechanism to align the needs of developing countries with the expertise and financial resources provided by public and private funding sources. Through that alignment process, the Registry works towards:

- Reaching agreed performance targets (including emission reductions)
- Verifiable emissions reductions (VERs)
- Increasing the resilience of vulnerable countries to the impacts of climate change through mitigation and adaptation measures.

The basic functions of a registry are similar across different types of activities and serve as one component of a larger framework to address mitigation and adaptation.

6.3.2 The governance principles and advantages of a Climate Registry

The following principles for operating an emission reduction mechanism should be embedded in the design of the Climate Registry; these principles are consistent with the governance principles embedded in the 1992 UN Framework Convention on Climate Change (UNFCCC) and in decisions of the Conference of the Parties (COP):

- Accountability of the financial mechanism to ensure conformity with the policies, programme priorities and eligibility criteria established by the governance bodies
- Equitable, balanced representation of developing and developed countries within a transparent system of governance
- Institutional economy that limits, where possible, the creation of new institutions while tapping into and coordinating the comparative advantages of existing institutions. This approach does not, however, preclude creating a new institution when it is needed and where it is appropriate.
- A non-exclusive, but coordinated approach to finance that allows for financial resources related to the implementation of the Convention through bilateral, regional and other multilateral channels
- The right to appeal decisions and challenge interventions through a formal transparent review process and the right to seek remedial actions to correct injustice.

The Climate Registry is also consistent with the 2005 Paris Declaration and the Accra Agenda for Aid Effectiveness in that it increases harmonization, alignment and management of aid with a set of actions and indicators that can be monitored and verified.

Advantage of information and knowledge management functions

The information and knowledge management function provides a central medium through which statements of national needs and financing opportunities are rendered public. Once matched successfully, funded programmes and projects move through implementation. Results, independently verified evaluations, lessons learned and formal reports are posted to inform the public of progress, best practices and encountered challenges. The Climate Registry:

- Collects and posts information on approved national emission reduction needs including emission reduction strategies, action plans or equivalents
- Collects and posts information on financial operations of bi- and multilateral institutions and private investors relevant to emission reduction
- Posts progress reports and MRV results toward achieving agreed performance targets
- Shares lessons learned.

Advantage of clear regulatory functions

The governing bodies of financing institutions need to set submission standards for acceptance of national emission reduction strategies, action plans or equivalents. Implementing agencies have to ensure the application of agreed methodologies or methodological standards for MRV functions in approved projects or programmes.

Advantages of matching functions

The Climate Registry pro-actively aligns needs expressed in approved national emission reduction strategies, action plans or equivalent documents with finance and technical services offered by financing sources. It identifies and assesses funding gaps and barriers and facilitates the channelling of financial resources to address identified needs and gaps.

Advantages of verification functions

The Registry provides information on standards and rules set by a funding source with which a recipient country needs to comply in order to access resources provided by that funding source. The Registry must also independently verify the delivery of performance targets in keeping with approved methodologies to enable the engagement in performance-based payment schemes, including access to the carbon market.

6.3.3 Available finances and financing institutions

Funding arrangements have already been made through international cooperation. For example, funding can be made available through:

a. The Forest Carbon Partnership Facility (FCPF)
   Implementation arrangement through the World Bank (A Registry Approach for REDD+/Technical Working Group (TWG), 2010)

Current funding level: Readiness fund: about US$ 115 million; an additional contribution of approximately US$ 20 million is considered by Germany and US$ 5 million by US for the 2010 financial year. Carbon fund: about US$ 34 million signed off; an additional US$ 16 million by UK through the Strategic Climate Fund and

US$ 5 million by US in FY10 budget process.

b. The United Nations Collaborative Programme on Reducing Emissions from Deforestation and Forest Degradation in Developing Countries (UNREDD), Implementation arrangement through UNDP, UNEP and FAO
Current funding level: about US$ 107million

c. The Forest Investment Programme (FIP) that operates under the Climate Investment Funds (CIF)
Implementation arrangement through AfDB, AsDB, EBRD, IADB, IFC and World Bank
Current funding level: about US$ 560million

A number of pilot countries, including Uganda, are already participating in the above arrangements.

6.3.4 The Certification/verification functions

An important factor which emerges from the above is the necessity for information, certification and/or verification as indicated in Chapter 6.3. In light of the fact that most contributor countries have announced that the majority of the pledges will be implemented through their own bilateral agencies, it is necessary to focus on other available opportunities for the achievement of the desired outcomes.

6.4 Concluding Remarks

As highlighted above, a Climate Registry approach has many advantages and therefore is one of the recommended options for Uganda. It is anticipated that when Government has finished strengthening the capacity of the Climate Change Unit, it will most likely consider it prudent to increase its database to include some adaptation of a Climate Registry. It should be noted, however, that most contributor countries have indicated that the majority of their pledges will be implemented through their own bilateral agencies. Hence, these funds will be subject to the rules and regulations of separate national regimes rather than flow through an integrated funding system. In the meantime, Uganda can continue to work with and become more involved with those NGOs and CSOs which are playing a prominent role in climate hange issues; such organizations would have a front line role in promoting such activities.

7 RECOMMENDATIONS FOR UGANDA AND THE INTERNATIONAL COMMUNITY

7.1 International Obligations, Overall Policy and Standards for Climate Change

The UNFCCC (adopted in 1993) and the KP oblige Uganda to put appropriate mitigation and adaptation measures in place to address the cause and effects of climate change as well as undertake education and awareness programmes. However most of the relevant sector policies have not integrated climate change. Even so, Government has already started the process of putting a number of measures in place. Our recommendation is that these measures need to be speeded up.

7.2 Recommendation to Accelerate the Strengthening of the Climate Change Unit to a full Secretariat

Steps towards strengthening the CCU to a full Secretariat are already undertaken (NDP 2010: 315) - this will improve the CCU's capacity and mandate to allow for effective sector coordination and streamline roles and linkages with other stakeholders. Thereafter, the CCU will be able to look at other sectors in order to identify each sector's role in climate change action. Following this, it will then develop national a climate change policy to provide a conducive policy and regulatory framework.

The CCU will then be better able to work towards increased climate change awareness, training and education at all levels. This should be complemented by the implementation of the already formulated NAPAs with a focus on building community and ecosystems' resilience to adverse impacts of climate change. Capacity will also be built through institutional and human resources development.

Weather and climate monitoring will be strengthened for improved data collection. There will also be a need to conduct climate change research (adaptation and mitigation) and technology development as well as the development of mainstreaming guidelines, with a strategy to climate-proof development initiatives for use at all levels of Government.

There is a need to intensify public education on the role of emissions in global warming as well as on the development and implementation of incentive mechanisms for reduced or avoided emissions. Also, there will be a need to build private sector capacity to effectively participate in clean energy development initiatives. This will go hand in hand with a reduction of overheads for CDM project formulation and development.

With a strengthened CCU, Uganda will then be able to follow up the commitments and obligations in the conventions as well as implement COP decisions and continue to participate in climate change fora.

Clearly, Government needs to play a leading role in this; however, Government will need to work in close cooperation with the international community, the private sector, NGOs and CSOs such as WWF and UCO.

7.3 Recommendations for the Acceleration of Reforms/Restructuring Within the Energy Sector

Similar to the CCU, the MEMD is being restructured and reformed (The Renewable Energy Policy for Uganda, 2007: 23). These reforms will lead to the creation of a Renewable Energy Department within the ministry to focus particularly on the promotion of RE, RETs and to spearhead the improvement of energy efficiency and conservation. At the same time, qualified personnel should be recruited into the sector to support renewable energy investments.

As a further encouragement for investments, the Standardized Power Purchase Agreement with Feed-in Tariffs for renewable energy generation projects of up to 20 MW capacity (REFIT2, 2010) should be updated whenever required. In addition, legislation and regulations on the promotion and use of renewable energy and renewable energy technologies need to be put in place in all sectors. This includes appropriate regulations for grid connections and incorporation of electricity generated from renewable resources. Urban authorities should be obligated to incorporate solar water heating in building plans. Local authorities should be encouraged to secure agricultural land for energy farming to produce biofuels. For the purpose of providing sustainable energy services, energy issues should be also integrated into non-energy sector policies and planning.

A sector-wide approach (SWAP) to energy planning and implementation needs to be developed. The establishment of a National Energy Committee should be a component of SWAP. The National Energy Committee should consist of stakeholder representatives to provide strategic policy guidance to the sector. Decentralized coordination at District Local Government levels should also be put into place to support the promotion of renewable energy investments at the lowest level.

These are far-reaching activities and here too, Government needs to play a leading role; as before, there will be a need to work hand in hand with the international community, private sector, NGOs and CSOs.

7.4 Recommendation for Adoption of a Renewable Energy Standard

This is an area where Government will need the support and participation of other stakeholders, bi-lateral and multilateral funding agencies, NGOs and CSOs knowledgeable in these matters. In order for Uganda to become fully committed to sustainable energy production and to be able to achieve the renewable energy goals as set out in the Renewable Energy Policy, a renewable energy management standard (RES) needs to be adopted. For the standard to be effective, it should be part of the policy specifying requirements for energy management systems, and should include:

- A renewable energy standard (potentially set at 60% of all electricity generated by 2015)
- Rigorous documentation to clearly describe the standard so that its fulfilment is replicable;
- For ease of standardization provide basic indicators that can be monitored
- Include a system of self-auditing complemented by external auditing
- Be continually improved.

Like other standards, the RES should be based on methodology known as plan-do-check-act (PDCA). In other words:

- Plan: set the objectives and processes required to deliver renewable energy in accordance with Uganda's sustainable development initiative
- Do: implement the process
- Check: through planning, monitoring and auditing
- Act: take action to improve the RES continually.

7.5 Recommendations for the Building Sector (Commercial / Institutional / Residential)

A substantial amount of electricity produced usually goes into heating and cooling systems, domestic refrigerators, ovens, lamps and other household appliances and equipment. This means that there is a huge untapped potential for energy savings in the residential sector. A fall in CO^2 emissions would boost international climate change mitigation efforts and the public would save money at the same time.

As already pointed out in Chapter 5, there is a growing trend in Uganda for the construction

industry to put up buildings which rely on air conditioning rather than on natural air circulation. In addition, the use of re-conditioned refrigerators and other second-hand household appliances is becoming wide-spread; all these trends serve to increase the emission of CO_2.

- A wide range of policies on buildings standards, procurement regulations, appliance standards and energy-efficiency obligations is already in place. They can be used to assess the potential costs and benefits of achieving emission reductions.
- Efficiency gains in the building and residential sectors can be achieved thorough regulations and information. Public actions can improve consumer awareness; policy can also be instrumental in creating strong disincentives for practices that decrease efficiency and increase carbon emissions, or prohibit them altogether.
- The regulations of building standards and their enforcement can result in a large reduction of CO_2 emissions.

Uganda is currently engaged in activities geared toward this goal. It would do well to continue this drive in a sustained fashion. Here too, Government will need additional support and participation of other stakeholders, be they bi-lateral or multilateral, NGOs and CSOs.

7.6 Recommendations Regarding Vehicle Emission Standards

Motor vehicles in general and personal transportation in particular are the world's largest oil consumers. At the same time, motor vehicles are also fastest growing source of CO_2 emissions. A study conducted in 2001/2002 estimated that CO_2 emissions from petroleum products consumed by the transport sector totalled around 708.61 Giga grams (Carbon Trading through the Clean Development Mechanism (CDM), 2010: 4). However, this study should be updated. Examples could be drawn from other countries where vehicle emission standards are in place.

Mileage travelled per litre of fuel: A primary driver of the upsurge in emissions is the lessening fuel efficiency of vehicles. Increasing numbers of low-efficiency sports utility vehicles (SUVs) contribute hugely to a lowering of the standard, although an increase in the use of light duty trucks makes a positive impact.

Car taxation: an additional powerful instrument to complement regulatory measures. This would be in the form of a tax increasing with the level of CO_2 emissions.

Biofuels: The development and use of biofuels has a double advantage over petroleum products. Biofuels such as ethanol are far less polluting as they do not produce CO_2 emissions to the same degree as petroleum products.

7.7 Recommendations for Research, Development and Use of Low-carbon Technology

Traditionally, plants that generate energy from non-renewable resources enjoy a commercial advantage because their prices do not reflect the costs of their contribution to climate change. This poses a problem to the accelerated development of improved technologies; for this reason, they currently are not widely available. With the imposition of a carbon tax or the introduction of a cap-and-trade scheme, the incentive structures in the coal industries would be transformed, putting those power generators that pollute more at a disadvantage. Such a measure would create appropriate market conditions for a low-carbon transition energy policy.

7.7.1 Improved technology: Integrated Biomass Gasification Combined Cycle (IBGCC)

Plant types that use integrated gasification combined cycle technology are an example of improved technology: they burn synthetic gas produced from coal or another fuel to clean the emissions. Supported by public funding in the US and the EU, these new technical developments have attained levels of thermal efficiency which compare very well with conventional plants – and with high levels of environmental performance.

7.7.2 Research efforts: Carbon Capture and Storage (CCS)

Carbon capture and storage (CCS) is an example of progress being made in the area of research and development. Internationally, there is a move in the direction of CCS. With this technology, the gas that is emitted during the burning of a fossil fuel is separated and processed into a liquefied or solid form and transported to a safe location for storage. Storage sites might be below the sea bed, in disused coal mines or depleted oil wells. In theory, CCS technology could be fitted into a conventional plant; it therefore offers the potential for zero CO_2 emissions, taking the carbon out of electricity generation and any other carbon-intensive production sites such as cement factories and petrochemical facilities.

7.7.3 Local Research Efforts

Locally, there is a need to intensify efforts in research and market development for improved cooking technologies, and the standardization of technology for cooking, heating and ventilation, and of indoor air pollution exposure and health monitoring.

As illustrated in Chapter 3, Uganda has already embarked on a number of research efforts in some fields relevant to the country.

7.8 Recommendation for Increased Participation in the CDM

In line with the CDM international regulatory framework, a developed country (defined in CDM Annex I) may invest in a project in a developing country, e.g. Uganda (Carbon Trading through the Clean Development Mechanism (CDM), 2010). If the project reduces GHG emissions or avoids them altogether, then the developed country party can claim a portion of the certified emission reduction units (CERUs). CERUs can be used by northern companies to 'redeem' emissions against their national commitments, or be traded on the open market.

Uganda is already a participant in the CDM process: a number of projects are participating already and a fair number is in the pipeline. In order to promote this further, the Climate Change Unit gives potential participants some guidelines. They should particularly look for areas where:

- The country has an advantage compared to neighbouring countries
- They can identify the hotspots of GHG emission and potential sinks vis-a-vis Uganda's developmental path.
- They can attract the private sector to be the main vessel for CDM implementation

From the above it can be concluded that currently there is an enormous potential to exploit CDM opportunities in Uganda. Possible project areas include energy, transport, forestry, agriculture and waste management.

Constraints have been identified and steps to address them have already been set in motion. However, it is evident that it will take some time for these steps to come to fruition. As noted by the CCU, delays in implementing CDM will hurt poorer countries like Uganda most as adaptation costs will be prohibitively high at a later date.

In the meantime, many activities are undertaken which need to be supported and financed. Notable among these are those of the Uganda Carbon Bureau – they definitely should be supported at this important time, as Government inventions gradually take shape.

7.9 Concluding Remarks

As stated above, constraints have been identified and steps are already being taken to address them. However, it is evident that it will take some time for these steps to come to fruition. As noted by the CCU, delays in implementing CDM will hurt poorer countries like Uganda most and adaptation costs will be prohibitively high at a later date. Much needs to be done in the areas of renewable energy and energy efficiency. Government cannot handle all these tasks alone - Government will need the support and participation of other stakeholders, the international community among them, i.e. bilateral and multilateral funding agencies, NGOs and CSOs.

8 APPENDICES

Appendix 1: References

1. Ministry of Energy and Mineral Development, 2004. Alternative Energy Sources Assessment Report.
2. B.T. Nijaguna, Biogas Technology, 2002. New Age International Publishers Ltd , N. Delhi.
3. Climate Change Unit, Government of Uganda, 2010. Carbon Trading through the Clean Development Mechanism (CDM). October-December 2010.
4. Climate Registry Publication, 2010. Benefits of Joining the Registry.
5. DANIDA (Danish International Development Agency), 2008. Climate Change Screening of Danish Development Cooperation with Uganda.
6. Electricity Regulatory Authority, 2007. Small Hydropower Development in Uganda.
7. Electricity Regulatory Authority, 2008. Constraints to Investment in Uganda's electricity Generation Industry.
8. Electricity Regulatory Authority, 2010. Uganda Renewable Energy Feed-in Tariff (REFIT) Phase 2 Approved Guidelines for 2011-2012.
9. Government of Uganda, 1999. The 1999 Electricity Act.
10. Government of Uganda, 1999. The National Environment (Waste Management) Regulations, S.I. No 52/1999.
11. Government of Uganda, 2001. Investment Guide for Rural Electrification.
12. Government of Uganda, 2001. The Uganda Forestry Policy.
13. Government of Uganda, 2007. Uganda National Adaptation Programmes of Action.
14. Government of Uganda, 2008. National Industrial Policy.
15. Government of Uganda, 2008. National Oil and Gas Policy for Uganda.
16. Government of Uganda, 2010. MEMD Information brochures on variouss projects.
17. Government of Uganda, 2010. National Development Plan 2010/11 – 2014/15.
18. Government of Uganda, 2010. The Petroleum (Exploration, Development, Production and Value Addition Bill).
19. Government of Uganda, 2011. The National Agricultural Advisory Services (NAADS) publication.
20. Government of Uganda, 2001. National Biomass Energy Demand Strategy. 2001 – 2010.
21. Ministry of Energy and Mineral Development, 2002. Energy Policy for Uganda.
22. Ministry of Energy and Mineral Development, 2007. The Renewable Energy Policy for Uganda.
23. Ministry of Energy and Mineral Development, 2009. The Development of a Power Sector Investment Plan For Uganda: Power Sector Investment Plan.
24. Ministry of Energy and Mineral Development, 2009. Power Sector Development Operation.
25. Renewable Energy Network for the 21st Century, 2010. Renewables 2010 Global status report.
26. Technical Working Group (TWG), 2010. A Registry Approach for REDD+.
27. The Climate Registry Publication, 2009. Resolution 01.14.09-4.
28. Uganda Carbon Bureau Publication, 2010. The Experience of our Company.
29. UNDP (United Nations Development Programme), 2007. Human Development Report 2007/2008. Fighting Climate Change: Human Solidarity in a divided world. Palgrave Macmillan, New York.
30. World Bank, 2011.Press Release - World Bank 24/1/2011.

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Appendix 3: Terms of Reference

Overall goal

The overall goal of the Global Financial Mechanism and the Technical Working Group projects of the WWF US Policy Programme is to contribute to the international climate change agenda through analytical work and a proposal of practical financial and institutional arrangements that could be attractive to a large spectrum of climate change stakeholders.

Purpose of this study

The purpose of this study is to assess opportunities and barriers to the use of renewable energy and energy efficiency technologies in Uganda and produce recommendations on how to accelerate this process for the 2020-2030 period.

Content of study

- The study will focus on opportunities and barriers affecting all forms of available and foreseeable renewable energy development in Uganda (wind, hydropower, biomass, solar, geothermal, etc.). Issues affecting solar energy, wind energy, biomass energy and hydropower (small and large) technologies will be analysed in detail.
- The study shall look at Uganda's current official low-carbon and/or renewable energy strategies, highlighting the country's goals, listing accomplishments made to date and identifying new opportunities for renewable energy and energy efficiency investments and major barriers to accelerated investment and development.
- The study will consider policy, institutional, technological, economic, financial and capacity requirements for a significant scaling-up of renewable energy use and energy efficiency improvement for the 2020-2030 period, looking at what is being done already and what could still be done by the country itself and by international cooperation.
- The study will pay attention to all the interlinked dimensions of opportunities and barriers, including, but not limited to, energy supply and demand, existing and planned energy infrastructure, policies, institutional, technological, economic, financial, cultural and human capacity issues and other footprint issues in connection with proposed energy solutions.
- The study will also explore the opportunity of using a Climate Registry (CR) approach as proposed by the Global Financial Mechanism and the Technical Working Group (GFM/TWG) project. The CR would act as a clearinghouse mechanism to facilitate the coordination and efficient use of multiple sources of financing, including private sector investors, multilateral, bilateral and national development banks as well as carbon market instruments. This consideration must be made in the context of work already undertaken by the Uganda Carbon Bureau
- The study will propose recommendations both for Uganda and for the international community regarding policy, institutional, financial and technology initiatives that may accelerate the use of renewable energy and energy efficiency technologies in Uganda. The study will also elaborate on lessons from case studies in Uganda that may be relevant to other countries at a comparable level of development.

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