EXPLORING THE ROLE OF THE CLEAN DEVELOPMENT MECHANISM IN PROMOTING ACCESS TO CLEAN RENEWABLE ENERGY IN UGANDA

By

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DECLARATION

I, Bbosa Henry, Registration number BU/GS15/MCC/20 hereby declare that the work presented in this dissertation is original and has not been submitted for award of a degree or published at any university.

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DEDICATION

This work is dedicated to my dear parents Dr. Kamwaka Edward and Mrs. Nalongo Alex Luyiga. To my brothers: William Kiyingi, Ally Winston, Kyobe Cartwright, Andrew Kibuuka, Sisters: Ritah Nalugwa Sarah Nakiyingi, Alice Nassuna Nalugya Besmeth, Nakibuuka Juliet, , Nalwanga Lydia, and Samalie Kiwanuka. To the families of Festus Bamutye-Kampala, Nyanama Okuraja Charles Esimu-Serere District; Chebet Maikut-Kapchorwa District; Christopher Senteza Kalyango-Gayaza, Bulamu, and to you my dearest Paula and Alice Bbosa.

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May the Lord meet each and every one of you at your point of need.

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Acronyms

CDM	Clean Development Mechanism
CERs	Certified Emission Reductions
ERA	Electricity Regulatory Authority
GHG	Greenhouse Gas
IPCC	Intergovernmental Panel on Climate Change
JI	Joint Implementation
LPG	Liquefied Petroleum Gas
MEMD	Ministry of Energy and Mineral Development
MFPED	Ministry of Finance, Economic Planning and Development
MW	Megawatts
NAMA	Nationally Appropriate Mitigation Action
NDC	Nationally Determined Contributions
NDP	National Development Plan
NFA	National Forestry Authority
PFCC	Parliamentary Forum on Climate Change
PoA	Programme of Activities
SE4All	Sustainable Energy for All
UBOS	Uganda Bureau of Statistics
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
UNIDO	United Nations Industrial Development Organisation

Definition of Key Terms

Energy

Energy is referred to int the study as the scalar physical property that enables physical systems to perform work through the operations that the given systems are designed to undertake. Energy exists in several forms such as heat, kinetic or mechanical energy, light, potential energy, magnetic energy and electrical energy.

Clean energy

Clean energy is understood in the study as energy that is generated from sources and through processes that do not create or that create fewer and lesser polluting impacts to the environment.

Renewable energy

This is used to mean energy that is collected from resources which are naturally replenished on a human timescale, such as sunlight, wind, rain, tides, waves, and geothermal heat.

Energy access

This is the ability of households and other public and private entities to reliably and affordably obtain a basic level of electricity and a relatively clean, safe means of cooking. It describes the ease with which households and other entities can get the energy that is technically available, adequate, reliable, convenient, safe and affordable.

Clean Development Mechanism

The Clean Development Mechanism is a carbon trading system which was established by the Kyoto Protocol as a tool for enabling developed countries to fund activities that cut greenhouse gas emissions in developing countries. It is designed to offer industrialized countries an efficient market mechanism to achieve some of their emissions reduction obligations at a lower cost by installing green technology in developing countries. CDM is known to be the world's main carbon credit scheme.

Emissions

Emissions consist of the gases and particles which are put into the atmosphere or emitted by various sources.

Greenhouse Gases

Greenhouse gases are gaseous compounds in the atmosphere that are capable of absorbing infrared radiation, thereby trapping and holding heat in the atmosphere. Because they increase the heat in the atmosphere, greenhouse gases are known to be a cause of the greenhouse effect, which ultimately causes global warming. The primary greenhouse gases in Earth's atmosphere are water vapor, carbon dioxide, methane, nitrous oxide, and ozone.

Emissions reduction

Emissions reduction is the deliberate endeavor to undertake measures for cutting or lowering the amounts of greenhouse gases emitted into the atmosphere from human activities.

Market-based approaches/tools

These are approaches and tools for emissions reduction that use principles of markets and trading to control emission of greenhouse gases into the atmosphere by providing economic incentives for achieving reductions in the emissions of pollutants. They are government-mandated cap and trade schemes which are based on flexible environmental regulation that allows organizations to decide how best to meet policy targets. Cap and trade approaches and tools are based on credits that pay for or offset GHG reductions and are majorly meant to provide the private sector with the flexibility required to reduce emissions while stimulating technological innovation and economic growth.

CDM project

CDM projects consist of emissions reduction projects which generate Certified Emission Reduction units (CERs) which may be traded in emissions trading schemes. They include projects which generate clean and renewable energy such as wind farm projects and hydro power projects; projects which reduce emissions by using fossil fuel alternatives such as biogas projects, landfill gas to electricity projects and projects which avoid emissions through better treatment of waste such as composting projects and the sequestration of carbon through forestry sinks.

CDM Programme of Activities

This is a programmatic modality of project development under the Clean Development Mechanism (CDM) through which replicable emission reducing projects with low and physically spread Greenhouse Gas reductions are bundled together and entered as an aggregate group of emissions reduction activities into the CDM framework. Programmes of Activities include projects that distribute compact fluorescent lamps, efficient cook-stoves, building refurbishment or solar water heaters; small hydro power plants; composting, among others.

ABSTRACT

Access to and utilization of clean renewable energy remains low in Uganda where the impacts of climate change are expected to exacerbate energy insecurity-related problems. Thus, the country joined the rest of the world in attempting to use market-based approaches and tools such as the Clean Development Mechanism to motivate and incentivize the development of clean renewable energy. This cross-sectional descriptive study undertook to explore the actual impact that the CDM framework has had on energy development in the country. The data, which were collected through questionnaire-based interviews, revealed the impact of CDM as being positive in spurring the development of projects that sought to address energy insecurity in Uganda and a range of challenges and risks that are inherent in the use of CDM and other market-based approaches in the country, as well as the interventions that need to be undertaken to make these approaches more effective for the country.

CHAPTER ONE

INTRODUCTION AND BACKGROUND

1.0 Introduction

This report presents a research that was conducted to assess the role and impact that CDM has had in the development of clean and renewable energy in Uganda as a means for promoting the reduction of greenhouse gas emissions, addressing energy security challenges that the country is facing and generating other environmental, economic, social development benefits and resilience outcomes in the face of climate change.

Uganda has put in place energy policies which aim to promote the use of modern, clean and energy efficient technologies to provide renewable sources of energy. However, despite possessing a huge overall renewable energy power generation potential estimated to be about 5,300 MW (ERA, 2013; energypedia, 2017), the production, distribution, access to and use of this form of energy is still minimal as wind, solar and geothermal energy remain underdeveloped. The country's energy matrix therefore continues to be dominated by biomass-based energy sources, which contribute about 95% to the total primary energy consumption, with electricity and petroleum products contributing 4% and 1 % respectively (UBOS, 2016). More than 90% of the population depends on non-sustainable charcoal and firewood as the primary source of cooking fuel. Developing and harnessing of the country's renewable energy potential is still demanding if the country's energy needs are to be met. This requires a huge investment in funding for the country to achieve her policy goal of increasing the use of modern renewable energy sources from the current 4% to 61% by 2030 (MEMD, 2011).

The Clean Development Mechanism (CDM), which is a flexible mechanism of the Kyoto Protocol, is one of the tools that were conceived to address the kind of the challenge of huge deficits that most developing countries face in funding emissions reduction and sustainability, by providing an incentive for actors to invest in projects that reduce greenhouse gases and contribute to the sustainable development. The CDM incentivizes investment in low-carbon development projects by availing project developers the opportunity to obtain carbon finance through rewards in form of Certified Emission Reductions (CERs) which are issued for projects that reduce or avoid greenhouse gas emissions and contribute to sustainable development. Uganda has been known to possess enormous potential to exploit opportunities under the CDM in the areas of energy, transport, forestry, agriculture and waste management among other areas.

1.1 Background

Access and utilization of clean energy remains low in Uganda, where only 14.88% of the population has access to grid electricity services. Out of the population that has access to the national grid, 54.8% reside in urban areas and 7% in rural areas. Consideration of the rural households using solar home systems and diesel generators brings the proportion of rural households that have access to electricity to 19.9% (UBOS, 2013). This leaves the larger portion of the population both in the rural and urban areas of the country (more than 89%) relying on traditional biomass energy obtained from firewood, charcoal and crop residues for household, commercial and industrial use (MEMD, 2012). It also explains why traditional biomass energy contributed a share of 88.9% of the total energy consumed in Uganda in 2012, compared to petroleum products and electricity which respectively contributed 9.7% and 1.4% of the share of the total energy consumed in the country that year (MEMD, 2015).

Yet, it is predicted that this heavy reliance of the country's population and economy on traditional biomass energy could continue for a long time and even rise over the period 2010-2050 (MWE, 2015). The consequence of this will be that because the high demand for biomass supply in the country is mainly met through deforestation, such a trend would threaten to reverse the current decline in the rate of deforestation and pose prolonged and exacerbated degradation of the country's forests and land. In a vicious cycle of effects, this will not only expose forests and other ecosystems to adverse impacts of climate change and reduce the capacity of forests, other ecosystems and the people who rely directly on them for survival to adapt, but it will also create a huge deficit of biomass in the country (NFA, 2009; Helio International, 2009). The exacerbated degradation of forests would also reduce the potential of the country's forests to absorb carbon emissions, thereby accelerating the accumulation of carbon in the atmosphere; and it could also contribute to land and soil degradation, increase the susceptibility of poor communities to climate change disasters such as landslides, exacerbates the severity of other disasters like floods and windstorms, and heightens food insecurity and its associated impacts.

Moreover, it is predicted that the impacts of climate variability and change could diminish the availability of biomass by directly causing the destruction of thousands of tons of biomass, even in single incidents as for example observed among other incidents at Bujawe and Kyamugongo central forestry reserves in Masindi district where prolonged droughts caused forest fires in 2012, and in areas around Lake Kyoga in central Uganda and River Kanabelumu in Rakai district where woodlands died off due to prolonged waterlogging caused by heavy rains (MWE, 2015). It is also foreseen that the variability and changes in climate could cause changes in water flows, which could alter the capacity of hydropower systems to generate hydropower (Baastel Consortium, 2014). The impacts that climate change poses on the availability of biomass

and water for hydropower generation would heighten energy insecurity across the country and worsen the demand for biomass resources, thereby creating more pressure on forests and other sources of biomass, and causing a spiral of reciprocal effects between the forest degradation and land degradation, and biomass deficits.

It is therefore imperative that the country responds with interventions to stem the huge dependence on biomass energy and avoid the undesirable effects that the predicted trends of rising demand for biomass for energy against decreasing biomass availability would pose on, ecosystems, energy security and mitigation of climate change. There is need to urgently find ways of promoting the development, innovation, and adoption and use of cleaner and renewable energy sources so as to reduce the huge reliance on biomass for energy. This would not only avert the predicted challenges but also, as a co-benefit, help to address the adverse impacts that the use of traditional biomass energy poses on the health of people who primarily meet their energy needs by burning biomass, and the emission of greenhouse gases (Adam, 2009).

One of the options that countries like Uganda could pursue to reduce dependence on biomass so as to make the transition to a low biomass demand scenario and secure a sustainable energy system for the country is to diversify energy sources by promoting the widespread use of alternative sources of energy consisting of renewable energy technologies such as solar, mini-hydro, geothermal and wind (MWE, 2015). These technologies essentially have the potential to supply energy infinitely, at low operating costs; and are largely free of external costs like degradation of forests and land, and health hazards which are associated with the use of traditional sources of energy such as biomass (BMU, 2007). They therefore present a vital opportunity for preventing the looming energy insecurity which will result from the impact of climate change on the availability of biomass to meet the country's rising energy demand. Such technologies would also enhance the country's contribution to global efforts to abate greenhouse gas emissions and help the country to shift to a less emissions-intensive economy.

The renewable energy technologies however currently still have relatively high initial costs. This factor discriminates against the renewable energy technologies when compared to the traditional energy sources like biomass which still appear to have better economic performance and yet present bigger external costs in terms of environmental degradation and health risk for communities. There is therefore a need to remove the market distortions that discriminate against renewable energy technologies so as to make them more accessible to communities and businesses. This requires a mix of policy instruments to be implemented to lower the barriers

to renewable energy development and adoption by bringing down the cost of renewable energy technologies and the associated energy services. There is a particular need to especially address the financial and economic aspects since they form a key component of the barriers that impede the development and use of renewable energy technologies (BMU, 2007).

A useful way of achieving this is to adopt policy instruments or measures that provide financial incentives for stakeholders to develop, and adopt and use renewable energy technologies to provide additional economic benefit and hence motivation for the development and use of renewable energy technologies over traditional sources of energy. One of the instruments that is available for Uganda to promote cleaner and emission-free technologies for energy production is the Clean Development Mechanism (CDM) which is one of the instruments that was developed under the Kyoto Protocol to assist developing countries with a flexible financial option for contributing to climate change mitigation and promoting development processes that limit the emission of greenhouse gases from various sectors, including energy (Basu, et al, 2013).

However, to develop capacity to derive optimal benefit from the CDM as a mechanism for promoting clean, renewable energy requires policy makers, planners, service providers and project developers in the field of energy to know and understand the role and that the mechanism plays and the impact has it has had in driving policy, strategies and action in the energy sector. The research aimed to contribute to the generation of such knowledge to support these stakeholders in their day-to-day decision making and the activities and to support design and implementation of other approaches and tools for promoting access to clean renewable energy, emissions reduction and sustainable development.

1.2 Statement of the problem

There are two projections for the demand for wood: a Base Case where it grows at 4 percent per year and a low case where the growth rate is reduced to 1.9 percent with a combination of measures involving increased efficiency, improved wood-to-charcoal production efficiency and fuel substitution to LPG, electricity, biogas and other sources of energy.

Whereas the potential that Uganda has to develop viable CDM projects in the energy and other sectors, and whereas the potential economic benefits the country could reap and stakeholders involved are known, the role and the real impact that CDM as a mechanism and that CDM projects and project development processes have over the recent decades had on the energy sector in Uganda hitherto remain unknown and ununderstood by stakeholders, and so the mechanism continues to be underplayed. This is because there has been no attempt to explore the real impact that the CDM has had on the energy sector of Uganda and the sub-Saharan re-

gion in general is limited. The effect of this lack of knowledge and understanding is the risk of missing the opportunities that the mechanism presents, thereby undermining efforts to foster the development and innovation of clean renewable energy and build resilience of communities in Uganda to energy insecurity.

The research therefore set out to find out the impact that CDM projects and project development processes have had on the policy context and on innovation processes in the energy sector of Uganda, what can be learned from current efforts to promote CDM project development in the energy sector, if and how these efforts have provided communities in Uganda with better access to clean energy, and if and how the efforts have provided agencies in Uganda with leverage for more efficient policy-making and programming for energy security. This was intended to spur and catalyse meaningful action focused on solving the current challenges related to the nexus of climate change and energy that the country faces.

1.3 Objectives of the research

1.3.1 General objective

The overall goal of the study was to generate knowledge on the contribution that the CDM has made towards the development of the energy sector in Uganda. The research aimed to find out if and how the implementation of the CDM has influenced access to clean energy and the general response of the energy sector to the challenges posed by the global climatic changes.

1.3.2 Specific objectives

The specific objectives were:

i) To establish the types of CDM projects which have been developed in Uganda.

ii) To determine the problems associated with the use of CDM and other market-based approaches and tools for promoting emissions reduction and energy development.

iii) To determine the constraints which have hindered the effective implementation of CDM in Uganda.

iv) To generate suggestions on strategies for improving the implementation of market-based mechanisms for promoting emissions reduction and energy development.

1.3.3 Research questions

The objectives were intended to generate answers to the research questions:

a) What types of projects have been inspired by the implementation of the CDM in Uganda?

b) What are the risks of using CDM and other market-based approaches for pursuing the twin goals of promoting emissions reduction and energy development?

c) What factors have hindered the implementation of the CDM in Uganda?

d) What can be done to address the obstacles hindering the implementation of CDM and to improve the implementation of CDM and other market-based approaches and tools?

1.4 Scope of the study

The study focused on the interplay between the factors of CDM, the energy sector of Uganda and climate change in shaping the country's sustainable development goals and agenda.

1.5 Purpose of the study

In answering the research questions, the research served the purpose of generating knowledge on what works for the energy sector. The study identified the challenges faced in the development and implementation of CDM processes and the interventions that need to be taken to improve on the CDM framework and its processes and hence to make the CDM and other market-based approaches and tools more effective for promoting clean renewable energy in the country. This was purposed on generating guiding information for policy makers and planners in the fields of energy, climate change and market-based approaches to greenhouse gas emission reduction.

1.6 significance of the study

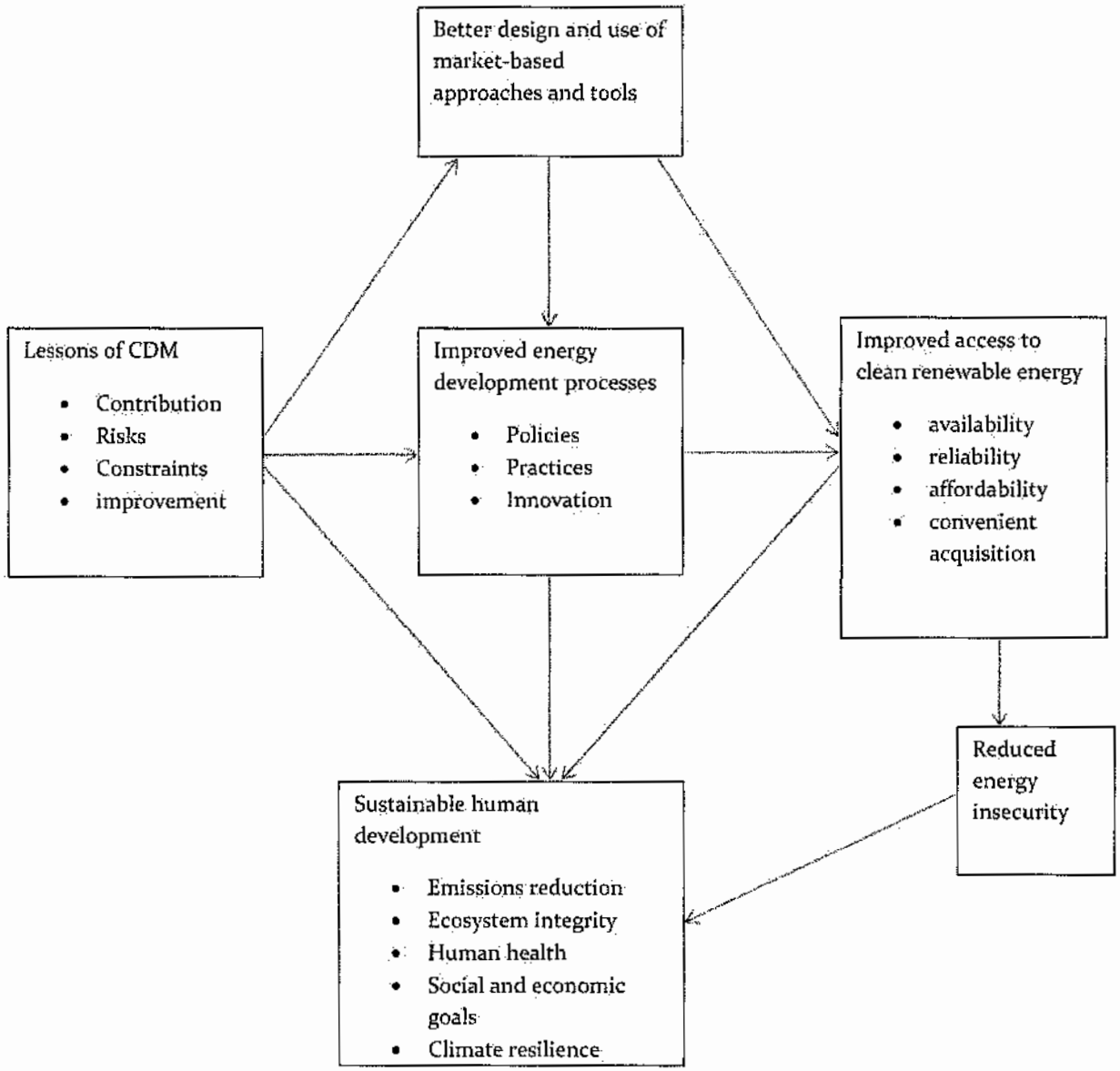
It was hoped that the knowledge that the study would generate would be significant for helping the relevant stakeholders to better focus their effort and the limited resources available to support the development of CDM processes and market-based approaches and tools that will form an effective basis for the elaboration and design of future carbon credit mechanisms for driving the implementation of emissions reduction objectives set out under the Paris Agreement and/or the country's NAMA and NDC arrangements.

1.7 Conceptual framework of the research

Based on the researcher's own ideas, the proposed research was premised on the theory that knowledge of the state of affairs with regard to CDM in the energy sector and knowledge of the actual impact that the mechanism has had on the energy sector in Uganda would guide more efficient development and definition of strategies for the development of more effective policies, innovations and practices in the energy sector that would promote more and easier access of communities in Uganda to cleaner energy, and hence to the emissions reduction and health co-benefits that clean renewable energy sources bring. It is held in this research that this would protect and improve the integrity of

forests and other ecosystems, thereby helping the ecosystems, the people who depend on them directly for subsistence and the entire country and globe to adapt and become resilient to the changing climate. Better and increased access to clean renewable energy will also boost incomes and savings on health and energy expenditure, leading to increased private investment and hence revenues for local and national governments which will in turn lead to increased investment in public services, thereby contributing to reduction of poverty and inequality. The conceptual framework of the study is presented in Figure 1.1.

Figure 1.1: The conceptual framework of the study



CHAPTER TWO

LITERATURE REVIEW

2.1 Clean Energy

Clean energy refers to sources of power that do not pollute or harm the environment. It is an approach to producing power whose primary goal is to use sources that do not emit or only emit minimal quantities of carbon and other elements that could pollute the environment and pose health hazards. It is thus a method of counteracting the production of power from "dirty" sources that release high amounts of carbon emissions and cause other forms of environmental pollution.

The primary examples of clean energy or non-polluting sources of power include:

Solar power

This form of energy is generated using systems which capture the sun's energy and turn it into electricity or other forms of energy that can be used for other purposes. Solar systems exist in forms of Solar Photovoltaic (PV) systems which use the sun's energy to generate electricity, and Solar Thermal systems which use the sun's energy to generate heat for various applications.

Geothermal energy

This is a form of power that is harnessed by using the constant temperature of the ground below the Earth's surface. It is energy that is obtained by using steam that is produced by the internal heat that is contained in the rock and fluids beneath the earth's surface to turn steam turbines which allow generators to convert the thermal energy (heat) to electricity through a process of electromagnetic induction. The heat energy can also be harnessed and used directly for a wide of applications. Geothermal energy can be obtained from resources that range from the shallow ground to hot water and hot rock found a few miles beneath the Earth's surface, to extremely high temperatures of molten rock (magma) found deeper into the earth.

Wind energy

This is a form of energy that is generated by using turbine systems to harness the power of wind to produce electricity. It is a form of power that is generated by using wind turbines to convert the kinetic energy in the wind into mechanical power which is then converted into electricity using generators. The generated electricity can be used for a wide range of domestic, commercial and industrial applications, while the mechanical power generated by the wind turbines can also be used directly for specific tasks such as grinding grain or pumping water. However, wind speed in Uganda has been found to be too low for the resource to be used to generate electricity. The more favourable application for wind energy in Uganda would therefore be for pumping water.

Biomass energy

This is energy produced that is produced from organic matter. It is a form of energy that is generated by converting the chemical energy that is stored in plants or in animal waste to thermal energy (heat) which can then be used for various applications. The heat energy can be generated for direct use in meeting domestic, commercial and industrial heat requirements by burning biomass materials such as wood chips, logs, firewood, charcoal and other organic matter, or biofuels that are obtained from used cooking oils, processed wood, farm waste, algae or other materials. The heat energy obtained from burning biomass can also be used to produce steam which is then used to turn turbines to produce electricity for various applications. Other ways in which biomass is now used to generate energy include: bacterial decay to produce methane; fermentation to produce alcohol (ethanol) or to produce biogas; and conversion into gas and liquid fuels through heating or adding chemicals. The various gas and liquid fuels generated through these ways can then be burned to produce heat or electricity, or as fuel for automobiles. Thus, the systems which can be used with biomass energy range from basic wood burning stoves to modern, automated systems.

Ocean energy (tidal power)

This is a form of hydropower that is generated by using underwater turbines to convert the energy obtained from the movement of tides and waves into electricity. This form of energy is however not applicable in Uganda, since it is a landlocked country.

Hydropower/Hydro Electric Power

This is a form of energy that is generated by using water stored in dams or flowing in rivers to turn turbines whose rotating blades spin generators that convert the mechanical energy of the spinning turbine into electrical energy.

2.2 Renewable Energy

Renewable energy in the context of this study refers to power that is generated from sources that do not get depleted when used. It is energy that is produced using natural resources that are constantly replaced or naturally replenished and cannot run out. The development and use of renewable energy is therefore an approach to sustainable development that is primarily focused on strengthening societies' ability to reuse resources and thereby ensure constant and abundant availability of energy. Renewable energy is collected from sunlight, wind, rain, tides, waves, and geothermal heat and converted using renewable energy technologies to generate hydropower, solar power, wind energy, and geothermal power among other forms of energy, as highlighted in section 2.1.

2.3 Clean Renewable Energy

As highlighted by the commonality of the examples of energy sources pointed out in sections 2.1 and 2.2, the concept of clean renewable energy is therefore based on the combination of the of the two concepts of clean energy and renewable energy, relying on the close interdependence and consistent crossover between the two concepts to refer to sources of power which are "clean" and "renewable". It thus designates types of energy whose generation and use do not release significant amounts of carbon and pollutants and whose sources are constantly naturally replenished, and whose production and use is therefore safe for human health and the environment and ensures constant and long-lasting availability of energy resources to serve the environmental and energy needs of both contemporary and future generations.

2.3 The Importance of clean renewable energy

Clean and renewable energy and associated technologies provide substantial benefits for the environment and climate, health, and economies. These include:

Improved public health and environmental quality

The use of clean renewable energy brings the benefit of offsetting the air and water pollution emitted from the fossil fuel sources such as coal, natural gas and crudely combusted wood used in rudimentary stove systems. The use of polluting sources have for long been linked to breathing problems, neurological damage, heart attacks, and cancer, and their replacement with renewable energy has been observed to reduce premature mortality, lost workdays, and overall healthcare costs (Machol, 2013).

Reduced carbon emissions

As the data aggregated by the International Panel on Climate Change indicates, most renewable energy sources produce little to no carbon emissions throughout their life-cycle, from their manufacturing, installation, operation and maintenance, and dismantling and decommissioning (IPCC, 2012). It is stated for example that whereas natural gas emits between 0.6 and 2 pounds of carbon dioxide equivalent per kilowatt-hour (CO_2e/kWh), and coal emits between 1.4 and 3.6 pounds of CO_2e/kWh, wind emits only 0.02 to 0.04 pounds of CO_2e/kWh, solar 0.07 to 0.2, geothermal 0.1 to 0.2, and hydroelectric between 0.1 and 0.5 (ibid). It has also been observed that compared to unsustainable sources of biomass, sustainably sourced biomass has a low emissions footprint. The use of clean renewable energy therefore clearly presents positive outcomes for the reduction of greenhouse gas emissions and hence for the curbing of global warming.

Wide, constant and long-lasting energy supply

Clean renewable energy is generated from a diverse set of sources including sunlight, winds, fast-moving water and earth which are widely available and constantly supplied and replenished by nature. These resources have been found to possess the technical potential to provide many fold of all the electricity needed by even the biggest economies, even when potential constraints such as conflicting land use needs, higher short-term costs of installing required technologies, and constraints on scaling up their use such as limits on transmission capacity, barriers to public acceptance, and other hurdles are taken into consideration (Cochran et al., 2014; NREL, 2013; 2012).

Creation of employment opportunities and other economic benefits

The renewable energy industry has been found to be more labor-intensive than the fossil fuel technologies, which are known to be typically more mechanized and capital intensive. Thus, it has been observed that on average, more jobs are created for each unit of electricity generated from clean renewable sources than from fossil fuels (Bazilian et al., 2013; AWEA, 2012; UCS, 2009). The other economic benefits that can be realized from growth in clean renewable energy industry include the "ripple" effects that could arise from economic gains achieved by industries in the renewable energy supply chain which can boost other unrelated local businesses as a result of household and business incomes being increased.

These benefits can be compounded with: a) increased revenues for local governments from property and income taxes and other payments from renewable energy project owners, which can be used to provide vital public services, especially in rural communities where projects are often located; b) earnings for owners of the land on which renewable energy projects are built in form of lease payments, payments for power line easements and road rights-of-way or royalties based on the project's annual revenues; and c) supplemental income for farmers and rural landowners from production of feedstock for biomass power facilities (Cochran et al., 2014; Deyette and Freese, 2010; EPA, 2010; UCS, 2009).

Affordable energy and stable energy prices

Studies conducted in places where clean renewable energy technologies have taken firm root have indicated that clean renewable energy can provide affordable electricity across countries at affordable costs and can help stabilize energy prices in the future. It is believed that whereas their installation requires upfront investments, the costs of operating renewable energy facilities are very low since most of the technologies use naturally and freely available fuel. Several studies have also shown the costs of renewable energy technologies to be continuing to decline steadily and renewable energy prices to be relatively stable over time, compared to fossil fuels whose prices are known to be higher, to vary dramatically and to be prone to substantial swings (Brinkman, 2015; Bazilian et al., 2013; UCS, 2011; UCS, 2009).

More reliable and resilient energy systems

Clean renewable energy-based systems such as those that rely on solar and wind energy have been found to be less prone to large-scale failure due to the nature of their being spread out and distributed over large geographical areas. The wide and spread out distribution of clean renewable energy facilities over large geographical areas helps these energy systems in such a way that a severe weather event in one location would not cut off power to an entire region. This advantage is enhanced by the fact that the modular design of clean renewable energy systems equips them with many individual power-generation units, meaning that even if some of the equipment in a renewable energy plant gets damaged, the rest of the units can typically continue to operate and generate power (Unger, 2012).

This attribute makes clean renewable energy sources more resilient against extreme weather events than coal, natural gas and nuclear power plants (ibid). This resilience is a very vital attribute in the face of the increased risk of disruptive events such as droughts, floods, heat waves, more intense storms, and increasingly severe wildfires become more frequent due to global warming.

It is thus clear that clean renewable energy has numerous advantages and positive outcomes for the environment, health social welfare and local, national and global economic development. It is therefore imperative that the production and use of clean renewable energy is promoted and access to it provided and guaranteed for all people across the globe.

2.4 Energy access in Uganda

According to UBOS (2012), 14.88% of Uganda's population has access to grid services, out of which 54.8% reside in urban areas and 7% in rural areas. Considering rural households using Solar home systems and diesel generators, 19.9% of rural households have access to electricity and the national electrification access rate turns to 26.1%. UBOS's survey indicated that 618 000 households in urban areas and 4.85 million households in rural areas did not have access to electricity by 2014, out of the total households of 7,416,343 in that year (Uganda's SE4All Action Agenda, 2015). Access to energy from thermal processes in Uganda generally depends heavily on the non-sustainable use of biomass, which accounts for over 89.9% of the energy generated in the country. On the other hand access to energy from electric sources majorly relies on renewable energy which dominates the country's electric power sector by about 90% (UBOS, 2016; MEMD 2013). With regard to access to modern cooking energy, it was estimated that only 500,000 households (7% of the population) were using clean and efficient cookstoves and only 35,000 households were using LPG stoves by 2014 (MEMD, 2015).

Given the country's high population growth rate of 3.3%, Uganda is expected to contain 56.2 million people and 11,956,636 households by 2030 (UBOS, 2014). This means that to achieve her goal of attaining universal access to renewable energy by 2030, the country will need an average 670,000 new access to electricity per annum, which is way above the current rate of new connections to electricity which is below 100,000 per year (UNDP and UNIDO, 2015). However, the attainment of the required rate of access to renewable energy might be difficult by the low power consumption and the incapacity of the citizens living below the poverty line (34% in rural and 11% in urban areas) to pay (ibid).

These statistics evidently show that the country is falling short in promoting its energy policy and Vision 2040 aims of the use of modern, clean and energy efficient technologies a rural electrification rate of 22% by 2022 and universal access to renewable energy by 2030. The country is also clearly under pressure to find additional energy sources, as the demand for clean energy is growing at a rapid annual rate of 10-12% (MEMD, 2015; ERA, 2013). Additionally, the fact that the country's energy matrix is dominated by non-sustainable use of biomass-based ener-

gy sources means that the Ugandan population is forfeiting the variety of benefits that clean renewable energy present for their environment, health and socio-economic welfare, as well as the positive outcomes that the use of clean renewable energy presents the adaptation and resilience of communities to climate change.

There is thus need for the country to heighten and accelerate the harnessing of the potential that it possesses for the generation, distribution and use of sustainable energy by enhancing the grid expansion and densification policy through diversification with increased implementation of off-grid solutions including mini- and micro-grids, solar and geothermal technologies, production and distribution of clean and efficient stoves, installation of domestic biogas plants for rural and urban households, and promoting access to and use of LPG and LPG stoves.

2.5 Potential for renewable energy in Uganda

Uganda is said to be richly endowed with abundant renewable energy resources for energy production and the provision of energy services, which are known to be fairly distributed throughout the country and to possess a total estimated potential of about 5,300 MW (REA, 2007). Hydro and biomass are considered to hold the largest potential for electricity generation, as solar power continues to gain increasing consideration. Uganda's location in the East African Rift Valley also gives the country potential for exploiting of geothermal energy, while the generally low wind speeds recorded in the country gives it only negligible potential for exploiting wind power (ibid). The potential for renewable energy from the different sources is summarized in Table 2.1.

Table 2.1: Potential for renewable energy generation by source

Source	Attributes	Estimated Electrical Potential
Hydropower	Major source of electricity generation. Considerable potential.	>2,000 MW
Solar	Favorable solar irradiation of 1,825 kWh/m^2 to 2,500 kWh/m^2 per year.	200 MW

Source	Attributes	Estimated Electrical Potential
Biomass	Abundant and diverse due to different vegetation and land use types. Total standing biomass stock of 284.1 million tons with a potential sustainable biomass supply of 45 million tons.	1,650 MW
Geothermal	Under reconnaissance and exploration	450 MW
Wind	Low average wind speed of 3.7 m/s at altitudes of 20 meters. Resource insufficient for large scale electricity generation	Negligible

Source: *The Renewable Energy Policy for Uganda, November 2007; energypedia, 2017*

However, despite Uganda's vast clean renewable energy potential, these resources remain largely undeveloped and unexploited with, for example, by 2015, less than 10% of the estimated 2000 MW hydropower potential which country had then had been exploited (RECP, 2015; ERA, 2014). This dismal performance in the exploitation of the huge potential of the country's renewable energy resources is mainly attributed to limitations in the country's capacity to finance the development of clean renewable energy technologies (UNDP and UNIDO, 2015). For example, Uganda's power sector investment plan and least cost strategy indicates that to achieve its universal access goals, the country needs to invest more than US$ 95.2 billion through 2030, mostly for generation alone (MEMD, 2011).

For a low-income country like Uganda which has limited budget capacity to cater for the many priorities that it needs to address, obtaining and allocating such an amount financing for renewable energy development within the required time would be very difficult. This thus poses a need for tools and approaches for attracting and engaging a wide range of actors and promoting and incentivizing investment in the clean energy sector. Cognizant of such a need, Uganda embraced the market-based approach that the CDM presented. This study researched the impact that the CDM had on promoting the development of clean energy projects, initiatives and technologies, what could have gone wrong during implementation of the mechanism and what could be done to improve future approaches or tools for promoting clean energy and its benefits for emissions reduction.

2.6 The Clean Development Mechanism

Clean Development Mechanism (CDM) is an agreement under the Kyoto Protocol (1997), which allows industrialized countries (listed on Annex-I of the Kyoto Protocol) that have commitments to reduce emission of Greenhouse Gases (GHG) to invest in or finance projects that reduce emissions in developing countries (Non-Annex I which are countries not listed on Annex I of the Kyoto Protocol) that use clean technologies. Under the CDM, a developing (Non-Annex-I) country earns one carbon credit for every tonne of CO_2 that does not enter into the atmosphere (IPCC, 2007). Developing countries can then sell the earned carbon credits to developed countries (Annex-I) through the international carbon market. This gives developed countries an instrument for meeting their emission reduction commitments by exchanging carbon credits in terms of money and technology transfer with developing countries to meet their GHG emission reduction targets (Carbon Trust, 2009).

The CDM was intended to meet the objectives of assisting developing countries in achieving sustainable development and in contributing to the ultimate objective of the United Nations Framework Convention on Climate Change (UNFCCC) of preventing dangerous climate change; and assisting developed countries in achieving compliance with their quantified emission limitation and reduction commitments with respect to set GHG emission caps (Clifford Chance LLP, 2013). Thus, overall, the CDM was fundamentally conceived as a project-based means for promoting the clean and sustainable development of developing countries by allowing and encouraging countries or companies to financially contribute towards GHG reduction and sequestration measures in developing countries, through projects that supplement countries' domestic actions to reduce GHG emissions, deliver co-benefits for the host country's sustainable development, and are implemented in a manner that does not create any environmental risks (Grubb, 2003; Toth et al, 2001). The number of CDM projects registered worldwide stood at 7770 by May 2017, out of which more than 80% were under the energy industry sector (UNEP DTU, 2017).

2.7 Types of CDM Projects

CDM projects can be categorized in several ways including categorization by among other criteria scale, scope and sector. The most common method of categorization however is by broad economic sector or industry (Pembina Institute, 2003; Ecofys and NewClimate Institute, 2015). In this respect, CDM projects can be categorized as: industrial, residential and community, transportation, agriculture, forestry project, and energy projects. The study considered the categories of sectors for which Uganda is known to possess significant potential. Each of these sec-

tors can also be divided into sub-types. The energy sector projects can be categorized according to the technological approach and/or mitigation actions. Under this form of categorization, energy projects can be typified as renewable energy projects such as those involving generation of energy from wind, hydro, waste heat recovery; energy efficiency improvement projects such as those involving efficient lighting; and fossil fuel switch/fuel substitution projects which involve use of other forms of energy sources other than fossil fuels (ibid; UNFCCC, 2016).

This study focused on analyzing CMD projects in Uganda by mitigation activities based on UNFCCC methodologies (UNFCCC, 2016), which provides a means for analyzing CDM projects depending on the nature of their contribution to GHG emission reduction, sector served and approach or technology used. The assumption taken was that countries tend to focus their mitigation effort to priority sectors through which they can contribute the most emission reduction impacts and sector through which they can realize the most positive outcomes for sustainable development. It has also been assumed that the contribution of CDM to the development of a sector and to achievement of emissions reduction from a given sector is directly proportional to the number and scale of projects in the given sector.

2.8 Challenges facing the CDM at the global level

Warnecke et al. (2015) point out some of the major challenges facing the development and implementation of the CDM those relating to the considerably reduced demand for carbon credits triggered by the global economic crisis, a stronger focus on domestic mitigation action, criticisms with regard to transaction costs and environmental integrity of the mechanisms, as well as the time lag in arriving at a new major international climate change agreement with a clearly defined role for flexibility mechanisms which did not occur before 2012 as formerly planned but only in 2015.

They also point to the dramatic collapse in the price of CDM and JI credits in recent years caused by a discourse between supply and demand and that this market price collapse, amongst other challenges, has consequences for market and investor confidence, current actors in the market mechanisms, and future potential uses for international market mechanisms. These challenges have affected the CDM arrangement in most countries, although each country could have experienced the issues and effects differently and in ways that are unique to their contexts. This study sought to find out the challenges that the CDM framework has faced in the country context of Uganda.

2.9 CDM and climate change policy context in Uganda

Works done by Namanya (2008) and Tadeus (2008) found out that the CDM was set to play a role of growing importance in shaping policy and approaches to the contributions the country aimed to make to the global effort to reduce emission of greenhouse gases. Both studies state that CDM has been rising along with climate change on the public agenda of Uganda in the last decade. The studies reported that whereas general awareness had been low, slowly more and more policy makers and politicians are becoming aware and starting to engage meaningfully in driving CDM as a way of addressing climate change and the challenges it poses.

The literature also indicates that many stakeholders and organisations agree that the engagement of the public and of the politicians is highly important and that it is vital for CDM and climate change to be mainstreamed in policy documents and national budgets as these issues were set to become the main factors influencing the actions of the state and the day-to-day well-being of the country's populace. Studies point out that the creation of the Parliamentary Forum on Climate Change (PFCC) was a step in that direction and that improvements were also visible in the National Development Plan (NDP) I and II which have both addressed climate change more comprehensively than the Poverty Eradication Action Plan 2004/5-2007/8, where these issues were addressed as fairly isolated issues to be dealt with by the Department of Meteorology (NPA, 2010; MFPED, 2005).

2.10 CDM state of play and its relation to the energy sector in Uganda

Studies done by Meena (2003), Apuuli (2004), Namanya (2004) and Olsen (2006; 2008) separately investigated the relevance, policy responses and state of affairs in Uganda with respect to CDM as a tool for promoting the reduction of greenhouse gas emissions and to CDM project development. The general view that can be drawn from these studies is that Uganda should embrace the CDM and work out ways for strengthening the institutional framework to facilitate CDM investments so as to be able to harness sustainable development benefits from these investments. The literature identifies the sectors in which Uganda has potential to develop and benefit from CDM initiatives as industry, forestry, renewable energy, waste and transport. Of these sectors, these studies, along with GTZ REAP (2007), identify forestry and renewable energy as the sectors with the highest mitigation and hence CDM project development potential in Uganda.

It is stated that Uganda could tap from CDM to supply more Ugandans with renewable energy. The GTZ REAP (2007) highlighted that the hydropower and solar projects being developed under the CDM could expand the country's capacity of electricity supply from around 350 MW that is currently installed to 2000 MW. This clearly shows the important roles that CDM is playing in shaping the country's energy sector and in impacting on the lives of people through the co-benefits generated. There are however challenges that have been cited as hindrances in this respect, and these range from project proposals aiming to supply communities with solar electricity being too small to be considered for CDM project registration, less potential due to the limited size of the potential market, to inadequate policy and institutional frameworks. These need to be overcome if the country is to improve on CDM project development capacity and hence benefit from the positive influences that the CDM and CDM project development processes could have on the country's energy sector.

2.11 CDM stakeholders in Uganda

The EDRC (2002) and UMI (2003) describe CDM in Uganda as involving a wide range of actors, from industrial to forestry players and from NGOs to ministries, all having different roles and responsibilities. The most relevant stakeholders in Uganda include:

a) *public institutions* such as the Climate Change Department of the Ministry of Water and Environment, Ministry of Energy and Mineral Development (MEMD), National Environment Management Authority (NEMA), National Forestry Authority (NFA), Uganda Cleaner Production Centre (UCPC), Uganda Investment Authority (UIA), and Uganda Wildlife Authority (UWA)

b) *development partners* including African Development Bank (ADB), Department for International Development UK (DFID), German International Cooperation (GIZ) through the Regional Energy Advisory Platform (REAP), Royal Belgian Embassy (RBE) through Belgian Technical Cooperation (BTC), Royal Danish Embassy (RDE) through the Danish Development Cooperation Agency (DANIDA), Royal Norwegian Embassy (RNE) through Norwegian Agency for Development Cooperation (NORAD), United Nations Development Programme (UNDP) and the World Bank (WB).

c) *non-governmental organisations* such as Climate Change Concern (CCC), Ecotrust (Eco) Environmental Alert (EA), International Union for Conservation of Nature (IUCN), Joint Energy and Environment Projects (JEEP), Katoomba Group (KG), and Uganda Coalition for Sustainable Development (UCSD) among others.

d) *Research institutes* including Makerere University (MU) Faculty of Technology, Forestry Department, National Agricultural Research Institute (NARO) through the National Agricultural Research Laboratories (NARL) / Natural Agricultural Forest Resources Research Institute (NAFORRI), and Uganda Management Institute (UMI).

e) *private sector organisations* such as Sawlog Production Grant Scheme (SPGS), Stanbic Bank (SB), Uganda Carbon Bureau (UCB), Uganda Manufacturers Association (UMA), Uganda Timber Growers Association (UTGA).

f) *Groups and forums* which include Climate Change Policy Committee (CCPC), Carbon Emission Reduction Association (CERA), Energy and Environment Donor Working Group (EEDWG), National Team Uganda (UNT), Parliamentary Forum for Climate Change (PFCC).

CHAPTER THREE

METHODOLOGY

3.1 Research Design

3.1.1 Design of the study

The research was a study of descriptive cross-sectional design, which entailed an exploratory-explanatory approach on a scale that allowed for detailed investigations from a qualitative perspective. The overall approach to the study was a combination of semi-structured interviews with key informants and review of relevant literature. Data was collected through a combination of in-depth open-ended interviews, open-ended questionnaires, and documentary analysis.

3.1.2 Target Population

The target population in the study included all basic aspects of CDM, clean renewable energy and climate change. To ensure that the dynamic relationships of the three concepts were fully explored and exposed, input was be sought from technocrats and agencies in the fields of energy, climate change, CDM project development and related policies; key research institutions; private sector and opinion leaders consisting of independent consultants working in the fields that were investigated. These categories of actors formed the target respondent groups. The study therefore mainly targeted CDM implementers and actors associated with CDM implementation processes.

3.1.3 Study area

The study covered on the parts of the country in which CDM projects have been proposed or implemented, with the main focus being on the specific proposed or implemented projects and their respective stakeholders and contact points. Most of the work was thus done in Kampala, where majority of the stakeholder agencies are headquartered.

3.2 Research methods

3.2.1 Data collection methods and tools

The general approach that was adopted for collecting data involved the use of questionnaire interviews and literature review.

Three semi-structured questionnaires were drafted for collecting information and perspectives of various actors relevant for the fields of CDM, clean renewable energy and climate change: one questionnaire for agencies that are responsible for managing and implementing policies that are relevant to the areas of climate change, energy and CDM; one for agencies that have implemented or are still implementing CDM projects in Uganda; and one for observer agencies such as civil society organisations and research institutes among others, which have interest in the areas of climate change, energy and CDM and/or have done research or development work in these fields. The content of the three questionnaires was similar for the most part, but due to the differences in roles, approaches and perspectives, specific questions were modified to fit the type of stakeholder and the information sought from them. Probing was applied to obtain clarifications and additional information. The completed questionnaires provided the basis for analysis of the data that was collected.

Literature was obtained from peer-reviewed journals, books and internet sources. It was primarily used for delineating the research. The literature also provided a framework for policy analysis, additional information for the analysis, and background information for increased understanding of the issues that were under investigation. A range of documents was reviewed, including CDM programme/project-related documents to provide detailed information on specific programmes or projects, while policy documents aided the definition of the framework, strategies, priorities and actions through which the CDM was being implemented in the country.

Data collection per objective was done as follows:

a) To establish the types of CDM projects which have been developed in Uganda.

This was done by obtaining lists of projects that had been proposed and or had entered the CDM pipeline in the period between 2005 and 2017. Lists of projects were sought from the Ministry of Water and Environment, Ministry of Energy and Mineral Development, Ministry of Trade Industry and Cooperatives, National Environment Management Authority, Uganda Investment Authority and GIZ. Alongside the lists, contact information was obtained for each of the projects listed and the identified contact persons were designated as respondents and

contacted to set up appointments for interviews. Visits were then made to project offices from where the identified contact persons were interviewed.

The questionnaires used in the interviews were designed with questions that asked respondents for their views on the sectoral contribution and focus of their CDM projects. Only respondents in the project developers' category were asked for views on categories of CDM projects. Project development documents were then obtained and reviewed, with attention paid to the descriptions of the scopes of the projects. The identified project scopes were then used to typify the projects, based on the categorization criteria provided under UNFCCC methodologies (UNFCCC, 2016), which were used to verify and corroborate respondents' views on the types of their respective projects.

b) To determine the problems associated with the use of CDM and other market-based approaches and tools for promoting emissions reduction and energy development.

This was done through semi-structured interviews which were delivered directly by the researcher. The questionnaires used to guide the interviews were designed to include questions that sought respondents' expert views and personal opinions on the potential risks presented by the use of market-based approaches for promoting emissions reduction and energy development. All respondents who participated in the study were asked for their views and opinions. Probing was applied to ensure that the responses obtained were complete and provided the respondents' intended message. The responses obtained were recorded separately for each respondent and coded during data analysis so as to identify the main themes expressed in the responses. Literature that was relevant to the issue was then used to corroborate and to support the critical analysis of the respondents' ideas.

c) To determine the constraints which have hindered the effective implementation of CDM in Uganda.

This was done through the semi-structured interviews which were delivered directly by the researcher. The questionnaires used to guide the interviews were designed to include questions that sought respondents' expert views and personal opinions on the constraints that hindered the implementation of the CDM in the country. All respondents who participated in the study were asked for their views and opinions. Probing was applied to ensure that the responses obtained were complete and provided the respondents' intended message. The responses obtained were recorded separately for each respondent and coded during data analysis so as to

identify the main themes expressed in the responses. Literature that was relevant to the issue was then used to corroborate and to support the critical analysis of the respondents' ideas.

d) To suggest strategies for improving the implementation of market-based mechanisms for promoting emissions reduction and energy development.

This was also done through semi-structured interviews which were delivered directly by the researcher. The questionnaires used to guide the interviews were designed to include questions that sought respondents' expert views and personal opinions on how they thought market-based approaches could be implemented effectively in the country and how the implementation of the CDM could be done better. All respondents who participated in the study were asked for their views and opinions on this. Probing was applied to ensure that the responses obtained were complete and provided the respondents' intended message. The responses obtained were recorded separately for each respondent and coded during data analysis so as to identify the main themes expressed in the responses. Literature that was relevant to the issue was then used to corroborate and to support the critical analysis of the respondents' ideas.

3.2.2 Sample size and Sampling procedure

A total of 70 participants comprising of representatives of the target respondent populations was selected to take part in the study. Sample selection was done on purposive basis so as to ensure that information was acquired from relevant resource persons. Purposive selection was also done to ensure adequate representation of target respondent groups. The target respondent population was divided into 3 respondent groups consisting of the 1) policy group consisting of respondents working in the energy, climate change, environment and economic policy making and implementation context; 2) project developer group consisting of respondents involved in the design, development and implementation of CDM projects and programmes of activities; and 3) key informant experts group consisting of observer individuals or staff of observer agencies who possess expert knowledge of energy, climate change, environmental, economic and CDM issues in Uganda. A total of 10 respondents were selected from the policy group, 10 respondents were selected from the key informant expert group and 50 respondents were selected from the project developers group.

Respondents in the policy group were sampled by targeting relevant officials in the departments and agencies under the Ministry of Water and Environment, Ministry of Energy and Mineral Development, Ministry of Finance Economic Planning and Development, and Ministry of Trade Industry and Cooperatives.

Respondents in the key-informant experts group were selected through a referral process in which participants from the ministries and agencies and those involved in project development suggested the names of experts working as CDM consultants and researchers that they viewed as possessing authoritative knowledge and opinion of CDM and market-based approaches to emissions reduction, energy, climate change and environmental or energy economics. The identified experts were ranked by popularity, based on the number of times in which they were referred to. The 10 most mentioned experts were selected and approached to participate in the study.

To select respondents in the project developers category, lists of projects and programmes of activities indicating the proposer or developer that had been proposed or registered in the period 2005-2017 were obtained and a representative was selected for each project developer or proposer. In cases where several of the projects selected for projects which had a common proposer or developer, only one representative was picked. The lists were obtained from the NDA in the Ministry of Water and Environment and from the Uganda Investment Authority.

Adequate consideration was given to ethics relating to consent of respondents to participate, and access to and protection of participants identity and information. The researcher took care to duly introduce himself and the purpose of the study to the respondents.

3.2.3 Data Analysis methods and procedure

Combined approaches for qualitative and quantitative data analysis methods were adopted. The approach that was used for qualitative data consisted of content analysis. The process involved transcription of notes taken from interviews into typed text. Through the transcription processes, data were edited, segmented by source and categorized into themes of responses, thereby allowing the large quantities of data collected to be condensed.

The generated categories of data were then coded by giving category names signifying the kind of information represented by the particular segments of responses in relation to the research questions.

Quantitative analysis was then be done by tallying, tabulating and ranking responses. Computations were done to determine percentages. Quantitative data were analyzed using simple descriptive statistics of tabulated frequencies, totals and percentages. Computation was done using Statistical Package Social Scientist (SPSS) computer package.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Types of CDM projects in Uganda

Data obtained from interviews and review of documents indicated that 39 standalone CDM projects had been conceived in Uganda in the period 2005 - 2017. It was found that 19 of these projects were registered by the UNFCCC. The data also indicated that 17 Programmes of Action (PoA) had been conceived within the 2005-2017 time period, of which 10 were registered by the UNFCCC. When combined, the two streams namely standalone projects and PoA gave a total of 56 CDM projects that had entered the CDM pipeline in the period 2005-2017. Table 4.1 and Table 4.2 below indicate the categorisation of the projects according to the major sectors for which Uganda is known to possess significant CDM potential.

Table 4.1: Proportion of standalone CDM projects by sector

Sector	No. of projects	Percentage (%)
Energy	23	59
Forestry (agroforestry and reforestation)	14	36
Agriculture	01	3
Transport	00	0
Waste management	01	3
Total	**39**	**100**

Table 4.2: Proportion of CDM Programmes of Action (PoA) by sector

Sector	No. of projects	Percentage (%)
Energy	16	94
Forestry	00	00
Agriculture	00	00
Transport	00	00
Waste management	01	06
Total	**17**	**100**

Table 4.1 and Table 4.2 show information collected from respondents and document review. Energy projects constitute the largest proportion of CDM projects and programmes of activities. From Table 4.1, of the standalone CDM projects, energy projects accounted for 59%, for-

estry projects 36%, agriculture 3% and waste management 3%. From Table 4.2, of the CDM PoA, energy projects accounted for 94% and waste management 6%. In total, 39 (70%) of the 56 CDM projects that had entered the CDM pipeline pursued objectives that supported the development of clean and renewable energy.

4.2 Significance of CDM's market-based approach to the energy sector in Uganda

The respondents' views on the significance of market-based approaches in general to the promotion of emissions reduction and energy development are analysed in Table 4.3 below.

Table 4.3: Views on significance of market-based approaches and tools

View	No. of Respondents	Percentage (%)
Significant	54	77
Not significant	16	23
Do not know/unsure	0	0
Total	**70**	**100**

Based on their expert judgment and opinions, the majority (77%) of the respondents agreed that market-based approaches and tools can play a significant role as a means for promoting the reduction of greenhouse emissions and the development of clean renewable energy. In contrast, only 23% of the respondents thought that in general, market-based approaches would not be useful in driving emissions reduction and the development of clean renewable energy in the country.

On the particular significance of the CDM as a market-based approach (Table 4.4), the larger proportion (56%) of the respondents stated that the CDM has been useful in driving the development of clean renewable energy in the country. This is contrast to a considerable number (44%) of the respondents who stated that the CDM has not played a significant role in influencing the development of clean renewable energy in the country.

Table 4.4: Views on the significance of the role of CDM in promoting the development of the energy sector in Uganda

View	No. of Respondents	Percentage (%)
CDM plays a significant role in promoting the development of the energy sector of Uganda	39	56
CDM plays a significant role in promoting the development of the energy sector of Uganda	31	44
Do not know/unsure	0	0
Total	**70**	**100**

When the role of CDM was explored further so as to understand the impact it has had in motivating and influencing the development of energy projects, the results were obtained as analysed in Table 4.5.

Table 4.5: Respondents' views on the primary factors that motivated the development of their energy projects

Driving factor	No. of respondents (energy project developers)	Percentage (%)
The conception of the energy project was primarily influenced by CDM	21	54
The conception of the energy project was primarily influenced by objectives other than CDM	18	46
Total	**39**	**100**

Of the 39 energy projects that entered the CDM pipeline, the larger proportion (54%) were formulated in direct response to the project developers' desire to participate in and benefit from the CDM, while the remaining proportion (46%) of the energy projects had been formulated to meet the project developers' other objectives, with entry into the CDM framework only being a secondary or additional consideration.

The way in which CDM has shaped the focus of sectoral approaches to the development of clean renewable energy is analysed in Table 4.6 below.

Table 4.6: Sectoral scopes of the CDM energy projects

Scope	No. of projects	Percentage (%)
Energy Generation (clean and renewable)	28	74
Energy Efficiency	04	09
Fuel switch/substitution	07	17
Total	**39**	**100**

The majority (74%) of the CDM energy projects focus on the generation and distribution of renewable energy, while 17% of the projects focus on promoting the switch from use of fossil fuels to the use of cleaner fuels and 9% of the projects focus on promoting the efficient use of energy at the household, institutional, business and industrial levels.

4.3 Problems associated with market-based approaches to emissions reduction in Uganda

The development and implementation of market-based approaches to promoting emissions reduction and the production and use of clean and renewable energy is associated with a wide range of problems. Some of the risks identified during the study are summarized in Table 4.7.

Table 4.7: Risks associated with the use of market-based approaches in promoting emissions reduction and the development and use of clean renewable energy

Risks	No. of Respondents	Percentage (%)
Distraction from primary emission reduction goals	23	33
inhibition of innovation due to narrowing of focus	07	10
Fraudulent abuse	26	37
Lessening of voluntary efforts to reduce emissions and produce clean renewable energy	14	20
Total	**70**	**100**

The biggest risk from using market-based approaches and tools for promoting emissions reduction and energy development pointed out by respondents was fraudulent abuse of market-based tools which accounted for 37% of the responses obtained, the risk of distraction from the primary goals of emissions reduction to focus on economic gains accounted for 33% of the responses, while the risk of diminishing voluntary effort in favour of economically gainful activities accounted for 20% of the responses, with the risk of inhibiting innovation only to tradable projects, technologies and methodologies accounting for 10% of the responses obtained.

4.4 Constraints to the implementation of CDM

Developing countries are faced with a wide range of constraints in implementing the CDM. Some of the constraints identified during the study are summarized in Table 4.8.

Table 4.8: Constraints faced in the implementation of CDM

Constraints	No. of Respondents	Percentage
Low economic viability	23	33
Low availability of market	18	27
Protracted registration processes	12	17
Low institutional capacity	12	17
Other	5	7
Total	**70**	**100**

Source: Data collected from the field

The low economic viability of CDM projects featured in 33% of the responses obtained, low availability of market for carbon credits in 27% of the responses while challenges associated with protracted project registration processes and low institutional capacity at the National Designated Authority (NDA) level each featured in 17% of the responses and other responses such the low technical capacity and the lack of awareness among the population about CDM was mentioned in 7% of the responses.

4.5 Suggested strategies for improving the implementation of CDM and other market-based approaches

A number of strategy suggestions were put forward by respondents on what should be done to improve the implementation of CDM and other market-based approaches and tools in Uganda. These are summarized in Table 4.9.

Table 4.9: Respondents' suggestions on strategies for improving the implementation of CDM in Uganda

Suggested strategy	No. of Respondents	Percentage
Design and implementation of simplified procedures	22	32
Awareness creation, sensitization and training	21	30
Reduction or subsidization of costs	20	28
Strengthening of the policy and institutional	07	10
Total	**70**	**100**

Most of the respondents (32%) suggested that the design and implementation of simplified processes in the enlisting of projects in carbon trading frameworks would improve the performance of market-based approaches and tools, including CDM, in driving emissions reduction and clean renewable energy development activities. A comparably large number (30%) of the respondents pointed out that the creation of awareness and cultivation of education related to market-based approaches and tools such as CDM would lean to more efficiency in future adoption of such approaches for promoting emissions reduction and clean renewable energy development. The other suggestions related to the implementation of means such as cost cutting, subsidization and/or credit facilities for supporting project developers in meeting the costs of developing and registering projects into the CDM framework, as suggested by 28% of the respondents; and strengthening the policy and institutional frameworks to enhance the ability of government to support the implementation of CDM and other market-based tools as pointed out by 10% of the respondents.

4.6 Discussion

4.6.1 Types of CDM projects

From the study, four types of CDM projects were found: energy, forestry, waste management, and agriculture projects. The main types of projects were those whose objectives target effort at addressing energy insecurity and developing, distributing and encouraging the use of clean renewable energy. Whereas the study did not measure the actual amount of clean and renewable energy that have been generated from these projects, the fact that the largest number of CDM projects have been focused at addressing challenges related to energy implies that the CDM has had a positive impact in directing the focus of emission reduction effort towards the energy sector and has led to increased activity in the energy sector.

This has been useful in demonstrating that market-based approaches and tools could play a significant role and yield positive outcomes for the promotion of clean renewable development in the country. It has demonstrated the country possesses huge potential to achieve emissions reduction through the energy sector while deriving economic and social development benefits, and that approaches and tools for reducing and trading in emissions could provide a valuable opportunity for developing countries to spur the development of clean renewable energy so as to sustainably address energy insecurity while gaining other economic, health and climate change mitigation and resilience-building benefits.

4.6.2 Significance of CDM to clean renewable energy development and access

The study revealed that the role and significance that the CDM has had in influencing energy development in the country was debatable. As Table 4.4 indicates, a considerable proportion (44%) of the experts who participated in the study expressed discontent in relation to the importance of the CDM to the development of the energy sector in the country. This discontentment was mainly attributed to the fact that this category of respondents viewed the absolute contribution of the CDM to the energy sector in terms of the number of projects and the amount of energy generated or redeemed by the projects as being minimal and negligent. This category of respondents also attributed their view to the inability of most of the project developers to get their projects registered by the UNFCCC and the fact that many small-scale emissions reducing activities could not qualify individually as CDM projects, making large numbers of people to miss out on the opportunities that the Mechanism presented. This view can be observed from such respondents' statements as that:

"the whole world now knows that CDM has been a major fail"

And that:

> *"when you design something in a way that it cannot work or do what you want it to do, does it remain useful?"*

However, the larger number (54%) of experts who participated in the study expressed contentment with the CDM approach. Respondents in this category considered the fact that there were energy projects that were running on the basis of CDM and that the approach could be improved to yield even bigger and better outcomes for clean renewable energy development. The views of the experts in this category can be inferred from such submitted statements as that:

> *"....the CDM and its outcomes cannot be discounted on the basis of the countries' failure to maximize their potential and glean optimal benefits....."*

And that:

> *"there are challenges hampering the implementation of the CDM..... but these can be overcome to make it work better or even avoided altogether in the development of new [market-based] tools in future"*

The role that the CDM has played in enhancing the promotion of clean renewable energy has consisted of motivating the conception of energy projects and boosting the implementation of energy projects that existed before its advent. As Table 4.5 indicates, 54% of the energy projects that had entered the CDM pipeline were conceived as a direct response to the opportunity that the CDM had created for project developers to realize economic benefits while reducing emissions and developing clean renewable energy. This spells a possibility that most if not all of these projects might not have been conceived and developed or might have been conceived and developed at much later time and/or more slowly if it were not for the advent of the CDM. It is also possible that some of the other 46% of the energy projects whose conception was primarily motivated by other factors other than the CDM might have developed at a slower pace if the CDM had not come into the equation.

It can also be seen from the findings of the study that the CDM has played a significant role in shaping the sectoral approach and scopes of the energy projects. As shown in Table 4.6, it was found that majority (74%) of CDM energy projects fell in the sectoral scope of clean and renewable energy generation, with 17% and 9% falling the fuel switch and substitution and energy efficiency sectoral scopes respectively. It was found from interviews that this is because the clean and renewable energy generation sectoral scope yielded much more emission reductions and hence carbon credits than the other two sectoral scopes. Thus, most energy project developers were attracted to the clean and renewable energy generation scope in order to be able to gain more from the CDM framework.

Thus, it is apparent that as a market-based tool, the CDM has generally been significant in promoting the generation of energy from clean and renewable sources, the efficient use of energy and the change from generation and use of energy from fossil fuels and non-sustainable biomass to cleaner fuels and sustainable biomass. These are all vital contributions towards the realization of increased amounts of clean renewable energy, thereby making it more constantly, conveniently and reliably available. These preconditions could lower the costs of acquiring clean renewable energy, thereby ultimately making more accessible to households, institutions and business and industrial establishments.

4.6.3 Problems associated with market-based approaches to promoting emissions reduction and energy development

The country faces a number of risks from using market-based approaches like the CDM to promote emissions reduction and the development of clean renewable energy. Respondents pointed out that there is a likelihood that most actors would focus on gaining economic benefits out of mechanisms such as the CDM, making the primary goals that the mechanisms are meant to achieve only secondary. This, as respondents pointed out, poses the danger of making the actors that participate in developing emissions trading activities to concentrate their attention and effort only on sectors, activities, methods and technologies that provide the most emissions trading opportunities and benefits without necessarily considering the extent of emissions reduction outcomes. Project developers would thus be tempted to focus on the simplest project ideas that would yield quick trading and earning outcomes. This would pose limitations to the width of the range of sectors, activities, methods and technologies that would be explored and to innovation.

Respondents also stressed that there would be a danger of project developers undertaking underhand methods such as fraud and other forms of abusive exploitation of the market-based approaches and tools or the loopholes that would exist in the design of their frameworks. Project developers could for example fraudulently or abusively overstate their efforts, investment and emission reduction contributions, thereby creating a false picture of the amount of emissions reduction or clean renewable energy developed. Such use of fraudulent and abusive methods could also be used to cause, justify or hide excessive emissions, thereby encouraging emissions, if emission increases are not uncovered and penalized.

Market-based approaches use economic (monetary) gain as the primary driver or motivation for action, and respondents pointed out that such an approach to motivating initiative and action poses the danger of actors perceiving that they can only act and participate in contributing to the reduction of emissions and development of clean renewable energy if or when they can reap economic gains out of their participation. This means that the categories of actors who are unable to develop viable project ideas or to make economic gains of such ideas become unmotivated to join or continue participating in emissions reduction and clean renewable energy development. The danger that this would pose would be that of overshadowing and diminishing the critical voluntary participation in emissions reduction and energy development and this would create counterproductive outcomes for emissions reduction and energy development goals.

4.6.4 Constraints faced in the implementation of the CDM

Most of the constraints faced in the implementation of the CDM were related to limitations in the financial capacities of project developers, difficulties inherent in the project registration process and the challenges that exist in the global carbon market. Respondents asserted that to be considered for entry into the CDM pipelines, an activity or projects would need to demonstrate that it could deliver a significant amount of emissions reduction. Respondents asserted that creating significant emissions reductions require the use of substantial levels of clean technologies and methodologies, which cost high amounts of financial and other resources to put in place. It was argued that not many actors in the country could afford to invest in putting in place the required of clean technologies and methodologies, meaning that many potential actors and their activities or projects are cut off from participating in and benefiting from the CDM framework. This minimizes the country's ability to harness its CDM potential which is known to be huge.

The process of developing and registering CDM projects and activities was described as protracted and costly. Respondents pointed out that the up-front investment cost for developing a CDM project included costs met in the preparation and organization of a local stakeholder consultation, preparation of documentation and following up on host country letter of approval, enlisting a CDM consultant, and enlisting the services of a Designated Operational Entity (DOE) for validation. On top of this project developers have to meet costs for monitoring and verifying emission reductions which include expenditure on monitoring, CDM consultant and DOE for verification. Respondents also described the project development and registration process as lacking in standardization and as containing restrictive bureaucratic procedures.

The combination of the factors of lowness of the market for carbon credits, the low emission levels in the country and the instability and lowness of carbon prices were pointed out as major hindrances in the development of the CDM in the country. This is because when coupled with the low emissions levels and the high transaction costs of developing CDM projects in the country, those factors make the economic viability of projects significantly low, thereby deterring the development of many potential initiatives and some existing projects. The low economic viability of projects was pointed out as the single most important constraint.

Thus, the major constraints to the implementation of the market-based approaches like CDM relate to difficulties brought up by the cost of project development, registration and monitoring; strains related to the design of the approaches and tools and the processes through which they are implemented, and the influence of global forces that shape the carbon market. These would be the factors that would need to be accorded consideration in the design and implementation of market-based approaches for promoting emissions reduction, and in the improvement of the CDM.

Thus, inevitably, respondents' suggestions for ways of improving the use of CDM and other market-based tools all related to putting in place mechanisms for enabling project developers to overcome the constraint of financial limitations, and addressing the design of the processes for implementation of the approaches by making the processes simpler and more adaptable.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

The types of CDM projects that had entered the CDM pipeline were varied but majority of the projects focused on addressing energy challenges in the country and promoting energy development while pursuing emissions reduction. This implied that market-based approaches and tools generally present a useful avenue for spurring activities that facilitate the achievement of the twin goals of reducing greenhouse gas emissions and energy development in a country like Uganda.

The CDM has for example shown positive promise and useful outcomes in shaping energy development in the country by stimulating the development and implementation of activities that promote the production, distribution and use of clean and renewable energy; promote efficient use of energy; and drive a change from the use of fossil fuels and non-sustainable biomass which are inefficient and polluting to the use of clean fuels. This creates conducive conditions for the realization of constantly available, reliable, conveniently reachable and affordable clean and renewable energy. This in turn creates a good opportunity for reducing emissions from the day-to-day activities that communities and businesses undertake.

However, although the country possesses huge potential to harness the utility that market-based approaches and tools present for drive emissions reduction and energy development, the use of market-based approaches poses risks that include detracting the focus of effort and action from the pursuit of emissions reduction and energy development to a narrowed focus on the pursuit of economic benefits; narrowing of innovation and diminishing of the voluntary spirit, effort and action which are vital for the mass pursuit of emissions reduction; and fueling of fraudulent behavior which could bring about counterproductive effects for emissions reduction and energy development.

The attainment of the optimal utility of the CDM in Uganda has been hindered by challenges related to the high cost and protracted processes of developing and registering projects coupled with unstable market and low prices for carbon credits, which makes CDM projects less economically viable.

5.2 Recommendations

Recommendations for project developers

There is need for project developers to enhance their financial and technical capacity to implement projects in such a way that they yield meaningful emission reduction impacts and hence are competitive. This includes project developers engaging in advocacy for subsidization and/or credit arrangements for project implementation funds and actively seeking training both at the local and international levels.

Project developers should explore and build functional synergies and partnerships in order to improve their technical and financial capacity to develop and implement competitive and impactful projects.

Recommendations for the government

The government should ensure that simplified processes for the implementation of projects are designed and implemented in a way that suits the context of the country. This will help to cut the financial and time resource costs of implementing market-based approaches and tools, thereby making them more economically viable and attractive for actors to invest in.

The policy, institutional and financial frameworks should be strengthened so as to create favorable ground for the development of projects that could prove competitive in the emissions trading schemes or market. This could include developing strong financial ability and to provide subsidies and/or loan facilities and other credit arrangements for supporting actor's participation in project development and hence emissions reduction and energy development.

Mass awareness about market-based approaches to emissions reduction and energy development should be created among the general population so as to expose the potential benefits that these activities create for people and the planet, as well as the opportunities they present for the livelihoods of people in the country and the economy at large. This should be accompanied with provision of emissions trading-related education to project developers and other categories of existing and potential participants. The awareness and education would increase participation and encourage and strengthen actor partnerships in the development of innovative and competitive projects.

International relations with both Annex I and Non-Annex I countries should be strengthened so as to allow for cooperation and exchange of lessons learned, and so as to create good ground for showcasing the country's emissions trading potential and hence for actively canvasing the needed market for carbon credits.

Recommendations for the international community

The international community should ensure that market-based approaches and tools are provided with strong monitoring and accountability frameworks and processes so as to ensure that such approaches and tools are not abused and/or fraudulently exploited. This should go hand-in-hand with regulation of the market in ways that ensure that the prices are stable and that the credibility of the market is sustainably maintained. This will be very critical for creating grounds that motivate both suppliers and buyers of carbon credits to participate in emissions trading.

The processes of accrediting or registering projects and activities should be designed and implemented in such a way that they are simplified and flexible enough for countries to adapt to their unique contexts. This should be coupled with strengthening and expanding the financial capacity to offer loans or other forms of credit arrangements to enable countries and project developers to access funding for implementing their activities. A strengthened and expanded financial capacity can then be used to encourage and strengthen partnerships arrangements such public-private partnerships at both local and international levels so as to strengthen effort to achieve global emissions reduction goals.

Recommendations for institutional arrangements:

It is recommended that institutional arrangements for the CDM framework are designed to accommodate both state (government) and non-state (non-governmental and private) actors playing different roles.

It is recommended that the government through the Climate Change Department of the Ministry of Water and Environment should remain responsible for: the development, implementation and evaluation of procedures related to project approval, in line with international requirements; provision of necessary data for baseline calculations and reporting; capacity building and CDM investment promotion; provision of a proper framework for the development of the

private sector and provision of the required information in relation to traditional investment licenses to investors.

It is recommended that National Funds such as the National Environment Fund should be included in the institutional framework to play the role of providing financial support for capacity building and development of support small projects. Government agencies such as Uganda Investment Authority, Uganda National Chamber of Commerce and Industry and Ministry of Trade Industry and Cooperatives which are responsible for promoting and managing investment opportunities, processes and activities in the country should play the role of building national capacities in the fields of consultancy capacities for the formulation of CDM projects and generating and providing information to investors, their members and the general public about the possibilities of the Kyoto Protocol mechanisms, and contact international partners.

It is recommended that the institutional frame work for CDM development in the country should also contain universities and research institutes, non-governmental organisations and private sector agencies to respectively play the roles of: providing and disseminating technical data on baselines and other project development aspects; contributing to observing, monitoring and evaluating the development, evolution of the Mechanism in the country including aspects such as transparency; and investing in CDM project development, among other respective roles.

Recommendations for further research

It is recommended that further research is conducted to understand the context, actuality and extent of the risks of using market-based approaches to promote emissions reduction and energy development in Uganda, and the environmental, social and economic implications for the country. This is because the risks revealed by this study were based on the expert judgment and views of respondents, which could be subjective. There is also need to compare the economic cost of using market-based approaches for promoting emissions reduction and energy development with the costs of using other non-market based approaches.

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Appendices

Questionnaire for project developers

Date.....

Name of organization.....

Name of project/programme of activities.....

.....

.....

1. Type of CDM project

1.1 What are the main characteristics/elements of your project(s)?

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1.2 When was the project/activities initiated?

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1.3 In which of the following sectoral categories would you place your project/programme of activities?

(Please tick as appropriate/applicable)

a. Agriculture
b. Community
c. Energy
d. Forestry
e. Industrial
f. Transport
g. Waste management

1.4 What is the main objective of your project(s)?

.....

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.....

1.5 If you indicated your project(s) as belonging to the energy sectoral scope in question 1.3, please state the mechanism by which your project(s) aims to promote emissions reduction.

(Please tick as appropriate/applicable)

a. By the generation of clean renewable energy ☐

b. By promoting energy efficiency ☐

c. By promoting the switch/substation of fuel from fossil fuel to cleaner fuel ☐

d. By other mechanism/approach (please specify) ☐

.....

.....

.....

2. Significance of CDM's market-based approach

2.1 Do you think market-based approaches can play a significant role in promoting emission reduction and energy development in the country?

Yes ☐ No ☐ Not sure ☐

2.2 Please explain your response to question 2.1, citing reasons for your choice of answer

.....

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.....

.....

2.3 In your view, do you think the CDM has played a significant role in promoting emission reduction and energy development in the country?

Yes ☐ No ☐ Not sure ☐

2.4 Please explain your response, citing reason for your answer in question 2.3 above.

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.....

2.5 Which of the following statements do you hold to be true about your project(s)?

a. The project was conceived and developed as a direct response to the opportunity presented by the CDM ☐

b. The project was conceived and developed to meet other ☐ organizational/ community needs and CDM was only a secondary motivator

c. Don't know ☐

3. Risks associated with market-based approaches

3.1 What risks do you think would be posed by the use of market-based approaches for promoting emissions reduction and energy development in a country like Uganda?

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3.2 In your opinion, what measures should be adopted at the project, national and international levels to avert the risks you have named in 3.1 above?

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4. Constraints hindering implementation of CDM projects

4.1 What constraints have you/your organization faced in implementing the CDM project(s)?

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4.2 What, in your view, are the factors underlying the hindrances you have pointed out in 4.2 above?

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5. Suggestions for improving the implementation of CDM in Uganda

5.1 What do you suggest should be done to improve the development and implementation of CDM projects in Uganda?

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Questionnaire for other stakeholders (policy and observer agencies)

Date.....

Position of respondent.....

Affiliation.....

1. **Type of CDM project**

1.1 What in your view are the main characteristics/elements of CDM project(s)?

.....

.....

.....

1.2 Which of the following sectoral categories would you say make up the largest number of CDM projects?

(Please tick as appropriate/applicable)

h. Agriculture

i. Community

j. Energy

k. Forestry

l. Industrial

m. Transport

n. Waste management

2. Significance of CDM's market-based approach

2.1 Do you think market-based approaches can play a significant role in promoting emission reduction and energy development in the country?

Yes ☐ No ☐ Not sure ☐

2.2 Please explain your response to question 2.1 above, citing reasons for your choice of answer

.....
.....
.....
.....

2.3 In your view, do you think the CDM has played a significant role in promoting emission reduction and energy development in the country?

Yes ☐ No ☐ Not sure ☐

2.4 Please explain your response, citing reason for your answer in 2.3 above.

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3. Risks associated with market-based approaches

3.1 What risks do you think would be posed by the use of market-based approaches for promoting emissions reduction and energy development in a country like Uganda?

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3.2 In your opinion, what measures should be adopted at the project, national and international levels to avert the risks you have named?

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4. Constraints hindering implementation of CDM projects

4.1 What do you think are the constraints that have hindered the development and implementation of CDM project(s) in Uganda?

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4.2 What, in your view, are the factors underlying the hindrances you have pointed out in question 4.1 above?

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5. Suggestions for improving the implementation of CDM in Uganda

5.1 What do you suggest should be done to improve the development and implementation of CDM projects in Uganda?

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