“ANALYSIS OF THE ROLE OF RENEWABLE ENERGY TOWARDS SUCCESSFUL IMPLEMENTATION OF SUSTAINABLE DEVELOPMENT PILLARS” A CASE STUDY OF UGANDA.

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RS19M23/022

A DISSERTATION SUBMITTED TO THE FACULTY OF LAW IN PARTIAL FULFULMENT OF THE REQUIREMENT FOR THE AWARD OF MASTER OF LAWS IN OIL AND GAS LAW AT THE INSTITUTE OF PETROLEUM STUDIES KAMPALA IN AFFLIATION TO UCU.

MAY 2023

DECLARATION

I declare that this Research thesis with the exception of quotations and references contained in published works, which have all been identified and acknowledged, is entirely my own original work and it has never been submitted/ presented to any higher Institution, either in part or whole for any academic award elsewhere.

Signature……..... Date.....

APPROVAL

This is to satisfy that this research thesis is done under my supervision and it is now ready for submission to the Faculty of Law with my approval.

Signature …… Date ……

DEDICATION

I dedicate this thesis to all my learned and learning comrades in this honourable profession eyeing the sky as the limit of our national development and all those nationalists driven by the urge to make better resource utilization for the benefit of our nation at large. I have provided a good foundation for your clean start in this thesis.

To my parents Mr. Mbalire Jackson and Mrs. Nakitende Mary Calm Mbalire of course, you are too exceptionally prised to deserve this master piece in due appreciation. Nevertheless, I can never thank you enough. You have not just mentored me, but were a constant solace and supporter in pursuit of my Bachelor of Laws (LLB) degree, I love you dearly.

ACKNOWLEDGEMENT

I convey special thanks to my family most especially my parents for their resolve to believe in me, the financial support they have given me through my entire school time, and for their constant prayers, encouragement and patience they demonstrated when I was undertaking my LLB studies. Thank you for your support and sacrifice to see me ascend to another level in my academic journey.

I thank **UCU, Faculty of Law** under the stewardship of **Dr. Peter Davis Mutesasira** such a great dean and of parental character for availing such an environmental favourable for one's success. To the brilliant lecturers for their consistent, persistent input in me. I am grateful to my Parents

I pledge this hard work to my dear Angella Nakafeero (Malaika) for her moral and spiritual support and guidance to me through my career. Even your fellow angels in Heaven agree with me on this. I do this in honour of you my dear. Until we meet again.

Lastly, I give thanks to my siblings as I am sure you gave prayers for this cause. My classmates ***H/W Atingu Beatrice Stella and Ms. Yaledi Elizabeth*** am forever grateful for you journeying along with me academically; surely, our efforts were not in vain. God bless you all.

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ACRONYMS

MEMD	-Ministry of Energy and Mineral Development
REA	-Rural Electrification Agency
ERA	-Electricity Regulatory Authority
RE	-Renewable Energy
RET	- Renewable Energy Technology
LNG	- Liquefied Natural Gas
REP	-Renewable Energy Policy for Uganda, 2007
UN SDGs	-United Nations Sustainable Development Goals
SE for All	- Sustainable Energy for All
SD	-Sustainable Development

ABSTRACT

Sustainable Development is all about future centric. The judicious use of resources to facilitate a better tomorrow. Renewable energy is one of the way we can contribute towards a sustainable future. This is a useful energy collected from renewable resources which are naturally replenished or restored.

Access to energy services is s a pre-requisite for a life of dignity. Natural energy like wind, sun and water are for free. Renewables are in fact the only technologies to produce and provide affordable, reliable, sustainable and modern energy for all. The implementation of 100% of renewable energies in Uganda and worldwide is the cheapest and fastest way to live no one behind hence achieving other objectives and SDG goal 7 and 13.

The Uganda Vision 2040 states that *"Ugandans aspire to have access to clean, affordable and reliable energy sources to facilitate industrialisation".* Even the second National Development Plan (NDP II) (2015/2016 to 2019/2020), which prioritized energy as critical for Uganda's aspirations for Vision 2040 and the attainment of upper middle-income status mimics this. The Vision acknowledges energy as one of the key fundamentals required to harness the country's opportunities and drive the industrial and service sectors.

Renewables are easy, modular and flexible technologies to install and manage. With the right financial mechanism, energy systems can be installed to create local value and create employment. Renewable energy has potential to reduce inequalities in urban and rural population.

Renewable energy is the only way to combat climate change. They save bio diversity through cooking using Electricity thus reducing air pollution and greenhouse emissions.

Clearly, renewable energy is the way to go. However, the road to attaining this is not that smooth as it can be imagined. Uganda's population at of 2021 stood at 45.85 million and as such, increase in population leads to an increase in the demand for energy and thus open the sector for further development.

In the same vain, besides the increase in demand for energy, implementation in the renewable energy sector is currently met with other considerable challenges including but not limited to; acute power shortages and Climate change which impacted on hydropower generation, while

investment in other forms of renewable energy is hampered by the high upfront cost of technologies such as solar but the sector has nonetheless strived through it all.

This thesis stands surety for the achievement of the SD pillars using this channel of focus on renewable energy and the case study being Uganda. It gives a rich introduction to renewable energy and the existing renewable resources, analysis of the existing literature in relation to Renewable Energy and the role it has played in attaining the Sustainable Development pillars in Uganda, it examines the challenges encountered along the path of developing renewable energy sector, in pursing Sustainable Development therefrom. My research methodology is spick and span together with its design, Sampling Techniques and Data Analysis. Finally, the legal analysis of renewable energy sector and of course, the findings and what I opine to recommend.

CHAPTER ONE

1.0 GENERAL INTRODUCTION

1.1 Background to Uganda's Renewable Energy Sector

Renewable Energy

Uganda is abundantly endowed with renewable energy sources for energy production and the provision of energy services. These energy resources are fairly distributed throughout the country and include hydropower, solar power, thermal power, wind and biomass. The energy sector is directly linked to other sectors of the economy and generally provides their lifeblood.[1] The sector is a major contributor to national development and government revenue, and its performance impacts the performance of other sectors.

Currently, with the exclusion of biomass, only a small segment of the country's renewable energy potential is exploited[2].

Renewable energy plays a great role in promotion of sustainable development because of its advantages such as reduction in emissions leading to health and environment benefits, long term energy supplies, low maintenance requirements, reduction of reliance on energy imports among others. In 2019, biomass contributed 88% of the total primary energy consumed in Uganda[3]. Biomass is consumed through firewood, charcoal and crop residues. Electricity contributed approximately 2% while fossil fuels (oil products) accounted for 10% of the national energy mix. It should however be noted that biomass is derived from the unsustainable practices especially depletion of forests which have direct side effects such as environmental degradation.

[1]Draft national energy policy, ministry of energy and mineral development, October 2019

[2] Intersessional panel of the united nations commission on science and technology for development (cstd) Geneva, Switzerland 6-8 November 2017

[3]Supra note 5

1.2 Introduction

The Brundtland Report[4] defines sustainable development as the development that meets the needs of the present without compromising the ability of future generations to meet their own needs. Specifically, sustainable development is a way of organizing society so that it can exist in the long term. This means taking into account both the imperatives present and those of the future, such as the preservation of the environment and natural resources or social and economic equity[5].

According to Tomslav Karin[6], the history of the concept of sustainable development is divided into three periods. The first period covers the period from economic theories, where certain theorists Adam Smith, Karl Marx, Malthus, Ricardo and Mill recognized the boundaries of development and environmental requirements, through the activities of the Roman Club, which warned on the negative consequences of economic development, to the First United Nations Conference on the Human Environment held in Stockholm in 1972.

The second period of was years after the Stockholm conference. In1983, the United Nations World Commission on Environment and Development (WCED) was established to develop a global change programme. -term and sustainable development in accordance with the environmental protection and conservation. In 1987 the Commission published a report Our Common Future, better known as the Brundtland Report, where the concept of sustainable development was introduced in its true sense. The report provided a clear overview of the conditions in the world (socio-economic development and order, environmental degradation, population growth, poverty, politics, wars, etc.) and elaborated the concept of sustainable development. The report provided the definition of sustainable development in the second chapter and the concept soon became a generally accepted and probably the most cited definition in the literature, no matter where the context of sustainable development is being discussed.

The third period is the After Brundtland period, which lasts until today and included several significant events. The Earth Summit or the Rio Conference was held in Rio de Janeiro in 1992.

[4]Brutland, g. (1987). report of the world commission on environment and development: our common future. oxford university press

[5]Sustainable development definition: historical background and examples https://youmatter.world/en/definition/definitions-sustainable-development-sustainability/

[6]Tomslav Karin, the concept of sustainable development: from its beginning to the contemporary issues

Its focus was to define a global framework for solving issues of environmental degradation through the concept of sustainable development, considering that in the 20-year period the integration of environmental concerns and economic decision-making was ignored and the state of the environment was worse. As a result of the Rio Conference, the Rio Declaration on Environment and Development, Agenda 21, non-legally binding authoritative statement of principles for a global consensus on the management, conservation and sustainable development of all types of forests, the Climate Change Convention and the Convention on Biological Diversity were adopted.

Sustainable development has been recognized or expressed in several international declarations, conventions, treaties and legal documents. However, it has also been argued by international human law lawyers that the reference of sustainable development in the said instruments is of little significance since it is mostly in the preamble which is not binding.

Uganda is party to many international and regional guiding frameworks that provide for the concept of sustainable development. These include the Rio Declaration and Development, Agenda 21, The United Nations Framework Convention on Climate Change (Climate Change Convention), The Tokyo Protocol, The Paris Agreement, The New Delhi Declaration 2002, the UN SDGs (2015), Sustainable Energy for All (SE for All) Initiative (2012),East African Community laws and policies, among others.

Sustainable development pillars are;

- environmental sustainability
- sustainable business
- intergenerational equity (WCED, 1987).

The deployment of renewable energy is essential for the achievement of the SD pillar on environmental protection. Environmental sustainability focuses on maintaining the quality of the environment which is necessary for conducting the economic activities and quality of life of people. Renewable energy is the only way to combat climate change. They save bio diversity through cooking using Electricity thus reducing air pollution and greenhouse emissions.

Also, Renewables are essential for the achievement of social sustainability which strives to ensure human rights and equality, preservation of cultural identity, respect for cultural diversity, race and religion,

And lastly, renewables are essential for achievement of economic sustainability which is necessary to maintain the natural, social and human capital required for income and living standards.

Mark Golden reported that China and India are aggressively investing in wind and solar power. In the period of 2008 through 2018, China's use of renewable energy with exclusion of hydroelectricity- increased from 33% annually[7] . in India, renewable energy was growing from 17% per year 2008 through 2018[8] and Uganda renewable energy capacity as of 2021 stood at 1.2 gigawatts[9]

Recent policy developments in Uganda recognise the interconnectivity of implementation of renewable energy and the promotion of sustainable development and therefore propose to facilitate sustainable development via the implementation of renewable energy among other methods. To this end, the Uganda Vision 2040 states that "Ugandans aspire to have access to clean, affordable and reliable energy sources to facilitate industrialisation". This commitment was further reaffirmed in the second National Development Plan (NDP II) (2015/2016 to 2019/2020), which prioritized energy as critical for Uganda's aspirations for Vision 2040 and the attainment of upper middle-income status. The Vision acknowledges energy as one of the key fundamentals required to harness the country's opportunities and drive the industrial and service sectors. That strong growth in the national economy is bound to increase the demand for energy and thus open the sector for further development. Ensuring effective strategies in the development of energy resources and delivery of energy services will be essential; to achieve targeted socio-economic transformation.

Clearly, Renewable Energy is the way to go. The implementation of 100% of renewable energies in Uganda and worldwide is the cheapest and fastest way to live no one behind hence achieving other objectives and SDG goal 7 and 13.

[7] According to BP's statistical review of world energy

[8] Report on renewables growth in china, India underappreciated but "no vaccine for climate crisis" by mark Golden dated 11th September 2020

[9] Article on total renewable energy capacity in Uganda 2012-2021 published by Doris Dokua Sasu on june 23rd 2022

However, the road to attaining these sustainable pillars this is not that smooth as it can be imagined. Uganda's population at of 2021 stood at 45.85 million and as such, increase in population leads to an increase in the demand for energy and thus open the sector for further development. Further, process of achieving its goals each pillar of sustainability must respect the interests of other pillars not to bring them into imbalance. So, while a certain pillar of sustainable development becomes sustainable, others can become unsustainable, especially when it comes to ecological sustainability, on which the overall capacity of development depends.[10]

The implementation in the renewable energy sector towards attaining the aforementioned SD pillars is currently met with other considerable challenges including but not limited to; acute power shortages and Climate change which impacted on hydropower generation, while investment in other forms of renewable energy is hampered by the high upfront cost of technologies such as solar but the sector has nonetheless strived through it all.

With the aforementioned challenges, the term SD has lacked practical implementation and has remained a principle that is well endowed in the world but with no success at all relating it with its pillars of sustainable business, environmental sustainability and intergenerational equity. Many aspects of climate variation have proposed methods to attain SD[11]. Sathayeet al. (2007) expounds on how climate change policy should be comprehended in the perspective of SD goals. Despite all the success stories paraded for sustainable development, it has been much more of an idea and conceptual framework. People have hidden in the concepts of environment rather than warranting a sustainable world for today's and future generation.[12] This has led to SD being seen as an environmental matter which has become fundamental that governments have started to perceive SD as an environmental issue which has enticed involvement of different environmental sectors.[13]

Amidst all the environmental, economic and social challenges, the adoption and development of renewable energy sector will ensure and promote SD pillars.

[10]supra note 4
[11] (Drexhage & Murphy, 2010)
[12] . (Drexhage & Murphy, 2010)
[13] (Chasek, 2000)

1.3 Statement of the problem

The use of Renewable energy is a significant preliminary factor in reducing the emission of greenhouse gases. Bearing in mind the high standards of currently available renewable energy technologies, the mere development and distribution of available energy technologies will not be sufficient in meeting the requirements of international sustainability standards towards attaining of the sustainable development pillars.

Drexhage and Murphy (2010) stipulate that in previous 20 years, regimes, civil societies have embraced and acknowledged SD as a guiding principle.

Though this has been the case, the problem is that the Implementation of this idea remains challenging. This has been so because the concept has been much of a theory than action being put into practice.

Due to this problem, the universal atmosphere remains affected, there is harm to biodiversity, emerging states are still defenceless, and air, water and marine contamination remains affecting lives, effects of climate variation are also still proved. (U.N., 2002b)

Developing countries like Uganda must be given and should embrace technologies that ensure the supply of cheap energy of which the best is RE of which they will be able to play a big role in ensuring that the SD pillars of sustainable business, environmental sustainability and intergenerational social equity are promoted hence achieving the mandate of the concept of SD. U.N. (2002c).

1.4 Purpose of the study

The purpose of this study to examine the role of renewable energy in the implementation of SD pillars in Uganda. Having the Uganda's energy policies, law and regulation in place to encourage the use of renewable energy resources for the production of energy is the most efficient and effective strategy for ensuring attainment of the SD pillars that the environmental sustainability, economical sustainability and inter-generational equity. This is greatly reflected in countries like China, USA, and India.

1.5 Significance of the research

The significance of this study is to evaluate the role of renewable energy sector has played towards successful implementation of SD pillars in Uganda.

Also it seeks to address the legal framework gaps and the gaps in the energy policy in place towards successful implementation of the SD Pillars.

1.6 Research Objectives

The overall objective of the study is to demonstration the role of renewable energy towards successful implementation of the SD Pillars. How the RE Laws, policies and regulations in place have integrated towards attaining the SD pillars i.e. how the policies have integrated to promote environmental sustainability pillar.

1.6.1 Specific objectives

The specific objectives of the study include;

1. To analyse how Uganda's legal framework in place contributes towards promoting SD Pillars through the management of the Renewable Energy Sector.
2. To examine the challenges faced in attaining the sustainable development pillars in Uganda. For instance, despite the fact that environmental sustainability as an SD Pillar is conceived and advocated by the international communities, it can only be achieved by regulating the energy sector of individual countries. This will call for analysis of the legal framework of Uganda to ascertain whether it depicts the core standards required at the international level and where the policies in place protect and advocate for environmental sustainability as an SD pillar.
3. To make recommendations on the renewable energy policies and legal framework in place towards promotion of sustainable development pillars.

1.7 Research Questions

This research attempts to respond to the following questions:

1. What is the legal framework in place on renewable energy sector in Uganda and how has it impacted towards successful attainment of SD pillars?
2. What challenges are encountered in the renewable energy sector that bar the successful attainment of sustainable development pillars in Uganda?
3. What are the recommendations on the policy and legal framework on promotion of sustainable development pillars via implementation of renewable energy?

1.8 Scope of the study

The study focuses on the renewable energy and sustainable development pillars in Uganda, a general concept and specifically the role of renewable energy in the implementation of sustainable development pillars.

The study in question further seeks to establish whether there is an effective legal and regulatory framework that promotes adaptation of renewable energy towards implementation of sustainable development pillars in Uganda. The conceptual framework here in will discuss how the variables of the study interrelate.

1.9 Theoretical Framework

The theoretical framework is the "blueprint" for the entire dissertation inquiry. It serves as the guide on which to build and support your study, and also provides the structure to define how you will philosophically, epistemologically, methodologically, and analytically approach the dissertation as a whole[14]. It has been defined as "a structure that guides research by relying on a formal theory…constructed by using an established, coherent explanation of certain phenomena and relationships"[15]. Thus, the theoretical framework consists of the selected theory (or theories) that undergirds the thinking with regards to how one understands and plans to research the topic,

[14]camp, w. g. (2001). formulating and evaluating theoretical frameworks for career and technical education research. *journal of vocational educational research, 26*(1), 27-39.

[15]torraco, r. j. (1997) theory-building research methods. in swanson r. and e. holton iii (eds.), *human resource development handbook: linking research and practice* (114-137). san francisco, ca: berrett-koehler

as well as the concepts and definitions from those theories that are relevant to the topic. Lovitts[16] empirically defines criteria for applying or developing theories to the dissertation that must be appropriate, logically interpreted, well understood, and align with the question at hand.

The paper is premised on the theories of integrated rural development and sustainable energy theory. This can be through the deterrence theory and the citizen enforcement theory. It has been submitted that integrated rural development and sustainable energy are key to ensuring renewable energy utilization. Hence the theoretical framework guiding this study comes from the two different theories: the integrated rural development theory and theoretical sustainable energy theory.

1.10 Chapter synopsis

The research is composed of five chapters of which, Chapter One details the introduction of the research topic, Chapter Two entails the analysis of the existing literature in relation to Renewable Energy and the role is has played in attaining the Sustainable Development pillars in Uganda. It also examines the challenges encountered thereof. Chapter Three entails the research methodology inter alia research design, Sample size, Sampling Techniques, Data Collection Instrument, questionnaire, Interview Guide, Data quality control and Data Analysis. Chapter Four entails a legal/ non legal analysis of renewable energy, lastly chapter five entails findings, conclusions and recommendations.

1.11 Conclusion.

Renewable energy is without doubt, additive to the achievement of Uganda's Sustainable Development pillars if at all the process is handled with great care and attention paid to proper strategic planning tools and development of relevant infrastructure. Having the Uganda's energy policies, law and regulation in place to encourage the use of renewable energy resources for the production of energy is most efficient and effective in ensuring attainment of the SD pillars thus attainment of environmental sustainability, economical sustainability and inter-generational equity.

[16]lovitts, b. (2005). how to grade the dissertation. *academe, 91*(6), 18-23

CHAPTER TWO

2.0 LITERATURE REVIEW

Variety of scholarly articles, books, laws, policies and directives have been passed and published relating to Renewable Energy and the role RE plays towards attaining Sustainable development pillars**.**

This chapter further evaluates evaluate the policy framework, the legal framework and the institutional framework in place, there contribution towards attaining of the SD pillars that's is environmental sustainability, sustainable business, and intergenerational equity.

A Review of the Energy Situation in Uganda

K.O. Adeyemi and A.A.Asere notes that Energy is the engine for economic growth and development for any society or country. With a projected population of 34.1 million in mid 2012, Uganda is richly endowed with abundant energy resources that are fairly distributed throughout the country. These include hydro, biomass, solar, geothermal, peat and fossil fuels. Uganda's energy matrix is dominated by biomass based energy sources contributing about 95% to the total primary energy consumption. Electricity and petroleum products contribute 4% and 1 % respectively. With a per capita energy consumption of 0.3TOE or 12.72 GJ, Uganda's energy consumption is among the lowest in the world. It is amongst the countries with lowest levels of electricity development as well as lowest per capita electricity consumption of 72 kWh. Over 90% of the country's population is not connected to the national grid, much of the electricity network at present is poorly maintained and the country experiences frequent power cuts. The energy resource potential of the country includes an estimated 2000 MW of hydro power, 450 MW of geothermal, 460 million tonnes of biomass standing stock with a sustainable annual yield of 50 million tons, an average of 5.1 kWh/m2/ day of solar energy, and about 250 million TOE of peat. In addition, an unspecified amount of petroleum has been discovered in the western part of the country though all fossil fuels used in Uganda presently are imported with a petroleum import bill of about US$ 120 million per year. This constitutes about 8% of total national imports and represents slightly above 20% of the country's total export earnings. Biomass constitutes 93% of energy consumption mainly in the traditional form. Wood fuel will continue to be the

dominant source of energy in Uganda for the foreseeable future, even if the entire hydroelectric potential in Uganda was fully utilized, wood would supply more than 75% of the total energy consumption in year 2015 [7].Ugandan Power Sector Investment Plan estimates that a cumulative investment of close to USD 9 billion (7.2billion euros) in funding is needed between 2009 and 2030 to accommodate rising electricity demand and to achieve close to universal access to electricity.

Despite Uganda's vast hydropower potential, estimated at over 2000 MW, less than 10% is currently exploited. Hydropower contributes only 1% to Uganda's energy supply. Uganda has a hydropower-installed capacity of 683MWwith current peak demand of 400MW. This has been growing at an annual rate of 8%. To meet this growth in demand about, 20 MWof new generating capacity needs to be added each year. Given the large and growing gap between electricity supply and demand in Uganda, large-scale hydroelectric development is the most economical way forward for the country in the short and medium term. Due to drought, only 135 MW is generated from the hydropower facility. The generation output might reduce to 80-90MW depending on the weather situation. 50 MW is obtained from a thermal power plant installed in May 2005 as a partial solution to the electricity supply problem. The demand for electricity is 260 MW during the day and rising to 350MW in the evening. The evening peak is mainly due to the domestic users who constitute the bulk of Uganda power distribution company customers (UMEME). The current power shortage has adversely impacted on the industrial and commercial sectors. Production has been disrupted. As a result, the GDP, which was expected to grow at 6 – 6.5% in 2012, has dropped to 4.5% . Uganda will require 2,000 Megawatts (MW) electricity by the year 2025 to run its industries and homes. To provide access to electricity in the rural areas, the government with its development partners are constructing 10 mini hydro power plants with each power plant having 1-1.5MW generating capacity. **Prof. Dr. Ruerd Ruben**[17]

Thermal energy:

[17] Director Policy and Operations Evaluation Department (IOB) Ministry of Foreign Affairs, The Netherlands; Renewable Energy: Access and Impact; A systematic literature review of the impact on livelihoods of interventions providing access to renewable energy in developing countries

Improved stoves and biogas internationally, there is no standard or technical agreement about what should be understood by an 'improved' stove. In general, an improved stove reduces the amount of biomass needed to cook a meal, as well as reduces the quantity or composition of smoke that is produced by the use of the stove. In absence of clear international standards, the GIZ-Netherlands Energizing Development Programme, applies as broad guideline that an improved stove should reduce the use of biomass with at least 40% in a field test, as compared to a three-stone stove (Owsianowski & Barry, 2008). The Global Alliance on Clean Cookstoves, a public-private initiative promoting the use of clean cooking technology, distinguishes between four different indicators of 'improved': fuel use, total emissions, indoor emissions and safety, but no general set of standards exists.

The types of stoves included in this review differ substantially in physical characteristics and performance. Stoves distributed in Latin America as improved stoves are entirely different from the ones in Sub-Saharan Africa. Although this review does not elaborate on the technical merits of the different stoves, it must be noted that the potential benefits depend on the technical features of the stove. For example, not all stoves are designed to generate health effects, in particular not the smaller transportable stoves often found in Sub Saharan Africa. Hence, impacts on health can be expected to be substantially less as compared to the larger (fixed) stoves with chimney as found in Latin America.

Biogas can be used as an energy source for cooking and lighting. The amount of energy (biogas) that a biogas digester produces depends on the size of the digester, which can be large enough to serve entire schools, jails or other institutions. The bio-digesters regarded in this review are of a smaller scale, having a capacity of 4, 6, 8 or 12 m3 and are intended to provide gas at a household level. In most cases the digesters are used for cooking, and to a lesser extent for lighting.

Energy for lighting: electricity

Electricity free areas hardly exist in the world. Dry-cell batteries are used almost everywhere for flashlights or transistor radios, while households may 'store' some electricity in car batteries, for example for charging cell phones. Also relatively cheap pico-photovoltaic equipment is penetrating rural areas all over the world, usually attached to small electrical appliances like

torches, clocks or cell phone chargers. But the volume and power of electricity required for daily lighting and entertainment cannot be provided by pico-PV only, but requires either a solar home system (SHS), or communal facilities, like micro hydro electricity generation, and/or mini-grids that are powered by either a single source (hydro or solar, for example) or combination of sources (i.e. hybrid solar-diesel).

The legal and institutional framework on RE elaborated earlier in chapter 1 is evaluated on how it has contributed towards attainment of each SD pillar. In the same vain Energy policy framework in place is also considered and evaluated on its contribution towards attainment of SD pillars.

2.1 Review of the related literature on the Role of Renewable Energy towards successful implementation of Sustainable Development Pillars in Uganda

The term Sustainable Development was adopted after the world commission on Environment and development (1987) report and it is therein as earlier in chapter 1 noted, it is defined as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED, 1987). The commission was established by the United Nations due to pressing issues on our planets lands, water and other natural resources[18]

Sustainable development (SD) as a principle has been harnessed in the whole world, and it works hand in hand with three pillars that is;

a) Environmental sustainability
b) Sustainable business,
c) Intergenerational equity (WCED, 1987).

With time, these pillars kept on developing and there arose need for enthusiastic development hence enhancement of clean technologies like renewable energy which if well-developed will bring about probable SD through promoting and successfully implementing the three pillars.

[18] (Twidell & Weir, 2006).

Each SD pillar and how Re has impacted on each SD Pillar will be handled independently as hereunder;

SD Pillar of environmental sustainability.

The term 'environmental sustainability' generally means ability of the environment to carry life. The need to protect the environment in view of deleterious changes to it caught global attention in the decades following the Second World War, leading to the United Nations Conference on the Human Environment in 1972 which became the first global attempt at environmental governance. Environmental sustainability as it is now known is a subset of the concept of Sustainable Development (SD) which arose from the Brudtland report of 1987 and became firmly rooted through the 1992 Earth summit and other follow-up conferences and documents. It is noteworthy that The Stockholm Conference was the first United Nations conference on the environment as well as the first major international gathering focused on human activities in relationship to the environment, and it laid the foundation for environmental action at an international level. It produced the Stockholm Declaration and Action Plan which defined principles for the preservation and enhancement of the natural environment, and highlighted the need to support people in this process.76 It also led to the establishment of the United Nations Environment Programme (UNEP) in 1973.

The adoption and promotion of sustainable development concepts and sectors like Renewable Energy in Uganda which is a sustainable energy ensures and promotes SD pillars. However, throughout its transformation towards implementation of the SD pillars, Uganda's energy sector has faced considerable challenges including acute power shortages, increased demand and Climate change which impacted on hydropower generation, while investment in other forms of renewable nonetheless strived through it all.

SD Pillar of intergenerational equity

Intergenerational equity is a value concept which focuses on the rights of future generations. It is a notion that is implicit in ecological sustainability[19]. It is a concept that views the human

[19] j.ksummers and l. smith the role of social and intergenerational equity in making changes in human well-being sustainable, accessed on 9th December 2021

community as a partnership among all generations. Each generation has the right to inherit the same diversity in natural and cultural resources enjoyed by previous generations and to equitable access to the use and benefits of these resources. At the same time, the present generation is a custodian of the planet for future generations, obliged to conserve this legacy so that future generations may also enjoy these same rights. In this way, intergenerational equity extends the scope of social justice into the future. Intergenerational equity can be incorporated into a sustainable development and decision making, as has become common in economic valuations of climate economics[20]

SD Pillar of sustainable business

It is worth noting that from the United Nations Conference on Environment and Development (UNCED) of 1992 in Rio de Janeiro, Brazil, also known as the Earth Summit which was the first international attempt to conjure solutions and treaties based on sustainable development for economic development and environmental protection, the economic pillar has the most innovative potential to combine sustainable practices, technology, and money-making tools[21].

2.2 Role of Renewable Energy in bringing about Environmental Sustainability

Sathaye et al (2011) states that RE technologies are significant in the mitigation of environmental effects for energy structures, RE provides clean energy with low carbon emission thus attaining the SDG 7 in respect to clean energy for all[22].

The maximum concentrating solar power, hydropower geothermal, and wind energy is approximately 100g Co2eq/kwh, and average values for all RE vary from 4 to 6g Co2eq / kwh.
RE technologies have the potential to considerably lessen local and regional air contamination. Impacts on water and biodiversity (Sathaye et al., 2011)

[20] heal, g. (2009). "climate economics: a meta-review and some suggestions for future research". review of environmental economics and policy. 3 (1): 4–21. doi:10.1093/reap/ren014. s2cid 154917782.
[21] Sustainability and the 5 examples of economic growth article by akari giraldo, published on 17th February 2019.
[22]sustainable development goal 7

Growths in 2015 revealed the significant role of RE in the energy mix. In December 2015, RE disposition received world-wide awareness at the COP21 climate change conference in Paris (UNFCC, 2016)

As portrayed above renewable energy technologies are essential in ensuring environmental sustainability. The promotion and adaptation of RE technologies as discussed demonstrates that they have the potential to promote environmental sustainability in that their use reduce on the GHG emissions which is one of the major threats and a concern of climate change trends in the world today.

2.3 Role of Renewable Energy in bringing about Intergenerational Social Equity

WCED (1987) states that energy is essential for day to day living, Future development significantly depends on its accessibility in increasing quantities from sources that are dependable, safe and ecologically sound.

Bearing in mind the need to balance essentials for the present and the future generation, in this sense, social equity engulfs and ensure the fair treatment of all members of society promoting spatial sustainability[23]. On the intergenerational equity deals with the well-being through time, ensuring the well-being of present and future generations It basically promotes progressive sustainability of a well-being decision[24].

L.M. Smith urges that Social equity is the least defined and least understood element of the triad that is sustainable development yet is integral in creating sustainability—balancing economic, environmental, and social equity[25]. He further argues that Social equity implies fair access to

[23]**The role of social and intergenerational equity in making changes in human well-being sustainable journal by** j. k. summers and l. m. smith accessed on December 23rd 2021
[24]**The role of social and intergenerational equity in making changes in human well-being sustainable journal by** j. k. summers and l. m. smith accessed on December 23rd 2021
[25] ibid

livelihood, education, and resources; full participation in the political and cultural life of the community; and self-determination in meeting fundamental needs[26]

Intergenerational equity is a value concept which focuses on the rights of future generations. It is a notion that is implicit in ecological sustainability. However, since skills to facilitate thinking about long-term consequences are not typically included in educational curricula, this value is presented as distinct from ecological sustainability to emphasize the need for thinking about how human actions that directly or indirectly degrade the environment in the present will affect future generations of humans and other life forms.[27]

Renewable energies have contributed towards provided better social equity to our communities[28]. Looking at the proportion of renewable energy to total primary energy production as an indicator of intergenerational equity

presently Intergenerational equity requires that future generations be able to meet their needs. Although we do not know these future needs, it is unlikely that future generations' needs can be met without access to some sort of energy. There is hope that the RE shall contribute 27% of the energy production hopefully by 2030

To ensure that intergenerational equity as SD principle is achieved, there is a need for energy security. It is advantaged to be cheap, thus affordable to be harnessed to the communities. RE is one of the best options that enhance energy security. IEA (2010) stipulate that there is uneven distribution of fossil fuels which is the major cause of energy insecurity. It shows that 75% of natural gas reserves are owned by OPEC countries and 80% of the universal gas market is supplied by the 10 exporters. The concentration of such energy resources in countries with political events that can hinder the extraction of these fossils create and threaten energy supply (E.Gupta, 2008).

Encouraging the application of RE can prolong the period of energy resource and extends the period to expand the commercial activities by reducing the reliance on resource traded out. This will enhance the promotion of intergenerational equity since effective use of RE preserves over

[26] ibid
[27] ibid
[28]campbell, scott (1996). "green cities, growing cities, just cities? urban planning and the contradictions of sustainable development". journal of the american planning association. **62** (3): 296–312.

exploitation of the fossil fuels endeavouring preservation of the resources for generations to come.

2.4 Challenges faced in the Renewable Energy Sector towards attaining the SD Pillars

Policy gaps

No doubt that Uganda has endeavoured to enact laws and pass policies towards enhancement of RE Sector in implementing SD pillars as were stated in chapter 1, however, it is noteworthy to acknowledge the lacunas within these policies, regulations and laws governing the RE sector which have challenged successful implementation of the SD pillars. The legal framework in place does not necessarily favour the investment in the sector. Thus the need to adjust the laws and policies in place to create an environment that favours investment in the RE sector in order to attain the SD Pillars

Political will

This relates with issues of corruption and this has greatly affected the successful implementation of the SD pillars in the RE Sector.

Lack of Information and Public Awareness

The lack of public awareness has been known to be a main barrier in the utilization of renewable energy technologies (herein after referred to as RET) in Uganda. The most common issues associated with this are inadequate knowledge regarding the use, importance, socio-economic and environmental benefits that are derivable from RE and its technologies and the fears in relation to the economic feasibility of RE installation projects. Because RETs are relatively new in Uganda, a large number of the public sector knows nothing or little about them Also, the public sector is not provided with adequate and sufficient training required to make informed choices (i.e., there is a deficiency of technical information). The absence of vital information and proper awareness has generated a disparity in the RE technology market that has given rise to a higher risk perception for potential RE prospects.

Nevertheless, the accessibility of such crucial information could increase investors' interest and thus RE project development hence enhancing accessibility of power by people of Uganda.

Capital intense projects

It is clearly evident that these projects require huge sums of money during their initial stages. The high initial cost may also be a key contributing factor to continued investor confidence and an overall inadequacy of financing tool as well as uneven financial sector. Worse, given today's economic freeze resulting from corona virus outbreak, its challenging for an investor to finance in this kind of capital intense project at the moment.

Still, there are little or no incentives for local manufacturing or importation of RE technology such as solar devices in Uganda. It is therefore very difficult for an average Ugandan/company to invest in RE technology systems.

High Operation and Maintenance Cost

In spite of the fact that 85% of the Ugandan population live in rural areas, there are only a few public and private sector enterprises that are involved in the energy business in these communities. imagine in rural areas, say the western region in Uganda where one person owns square miles of land with no squatters but rather a farm, and the neighbourhood is as far as the next square mile. Such community is going to peg high operation costs in terms of installing electricity poles, wiring metering and distribution process. This kind of rural setting hinders from increased participation and benefits, which would have arisen from suitable RE interventions.

Lack of Human Capacity & Training

Developing a skilled workforce to operate and maintain Renewable Energy Technology equipment is essential for a successful deployment and development of Renewable Energy projects in Uganda. It requires skills in different fields that may include physics, materials science, chemical, mechanical, and electrical engineering, business management and social science Presently, in Uganda, there are limited trained personnel and training facilities for the installation, operation, and maintenance of RETs which make it very difficult for the country to achieve a sustainable RE market.

Grid Unreliability

At present, there are few transmission and distribution lines in rural and remote areas where load demand is low. The reason has been that the extension of high-voltage transmission lines to these areas is not cost effective and inefficient. The unsteady nature of the electricity grid in most parts of Uganda is also seen as a big challenge during power off-take (shedding of power) from the main RE source, i.e., hydropower. As a result, off-grid/standalone RE technology projects will better serve as suitable solutions to the development of rural and remote electrification.

A further infrastructure challenge is that, unlike most RETs which are generally decentralized in nature, the current electrical power system used in Uganda has been designed in a way to support the needs of centralized systems. This implies that there is a need to adapt decentralized energy systems that can efficiently and effectively support RETs.

Institutional Barriers

The institutional structure of the energy sector in most developing/least-developed countries such as Uganda is still under government monopoly, with the responsibility for energy generation and distribution allocated among a number of government departments. However, insufficient coordination due to an array of government bodies with energy authority and the limitation of institutional capacity constituent critical institutional hindrances to the production of RETs in Uganda]. This in turn creates an unsteady macro-economic environment which increases risks and dampens investments. This barrier exists not only because Uganda is still a low-income/less-developed country, but also as a result of the inadequate attention of the government to R&D and the government's failure to facilitate science activities while improving human resources. In addition, there are no regional or national research centres with the required basic research facilities and infrastructures for RETs.

Furthermore, the Government of Uganda needs to realize that, at the institutional level, the centralized energy model is becoming increasingly redundant in developed nations. Instead of expanding its centralized power systems, Uganda needs to focus more on the development of a decentralized energy structure that would better match its current capital resources and management ability. This will help position the country to adapt to future energy technologies and systems.

Integrated Rural Development Theory

Integrated Rural Development is a concept prevalent in Western donors in the 1970s, which received renewed attention in the 1990s. This concept effectively combines multiple sectors and techniques from health care service provision, agricultural expansion, education, and improvement of infrastructure to technical transfer, regarding local governments as counterparts to deal with the multidimensional causes of poverty. Some projects based on this concept are implemented under JICA's Project-type Technical Cooperation, Team Dispatch of JOCV, and JICA Partnership Program. The advantages of integrated rural development are described as; To enable multidisciplinary anti-poverty efforts in rural areas; To enable solutions to regional problems, targeting impoverished groups; and To promote the participation of local people, local administrative organizations, and civil society.

However, intensive investment in a specific area does not necessarily disseminate spillover effects to other areas. Also, it is difficult for activities of integrated rural development to make consistency with sectoral measures at national levels.

The definition of "rural" differs by country, though it is usually used in contrast to "urban". For instance, this word is defined based on population density in Japan, indicating an area other than "an area with over 5,000 people, which consists of each district with a population density of over 4,000 per square kilometre". However, we cannot simply apply this definition to other countries. Moreover, due to the fact that the concept of "rural" varies from Asia to Africa, it is difficult to define it uniformly. Therefore, the use of "rural" (including fishing and mountain villages) as a relative concept to "urban", based on social, economic, and natural conditions in each country may be most adequate. The term could also be used to describe areas where a majority of the residents are engaged in agriculture in a broad sense (including livestock farming, forestry, and fisheries). The final beneficiaries of development assistance are local people in both rural and urban areas. However, their livelihoods are based on significantly different social, economic, and natural environments. Most rural residents in many developing countries (especially in the least developed countries, or LLDC) are engaged in and depend on local agriculture, forestry, and fishery resources to make a living. If the local people are final beneficiaries of development assistance, the aim of rural development can be defined as the improvement of sustainable livelihoods (especially impoverished groups); with careful attention paid to local

characteristics[29].Frequently, the concept of rural development is used confusedly with "agricultural development" or "regional development".

Rural development[30] is in fact a multi-sectoral activity that generates synergy effects. This approach includes "Integrated Rural Development," which effectively combines multiple sectors and techniques from health care service, agricultural expansion, education, improvement of infrastructure to technical transfer, choosing specific regions and treating the local governments as counterparts. This approach has advantages when coping with multidisciplinary issues such as poverty, or tackling regional problems and in obtaining participation of the people concerned. However, despite intensive investment in a limited area, effects are not easily spread to other areas. Actually, there are a considerable number of JICA projects that have not been applied to other areas in the past, even though they were considered "model" projects.

For this reason, it is important to establish a system to disseminate know-how acquired from the implementation of rural development projects and programs. This is because activities that are implemented in a limited area and have an only slight spill over effect are not suitable to Japanese ODA as public work from the viewpoint of equity and public interests. Also, NGOs may be able to implement more cost effective activities. With this in mind, projects that draw on the strengths of JICA as an ODA executing agency should be implemented. Coordination between concerned organizations such as governmental organizations, donors, NGOs and communities must be coordinated in multi-sectoral rural development projects. Also, it is important to implement projects with the cooperation of two or more ministries or agencies. Furthermore, JICA should aim to implement assistance with a variety of people and organizations including rural communities and NGOs. When a program includes comprehensive rural development approaches, strategic choices will have to be made in the selection of projects.

[29]according to the world bank (1975), rural development is defined as "a strategy aiming at the improvement of economic and social living conditions, focusing on a specific group of poor people in a rural area. it assists the poorest group among the people living in rural areas to benefit from development".
[30]the contents of "rural development" need to be revised after coordination between "rural development" and "poverty reduction" jica thematic guidelines

2.5 Theoretical Aspects of Sustainable Energy Theory

The concept of sustainable development is based on three pillars: economic, environmental and social development[31]. Analysis of energy and its efficiency usually focus on environmental aspects, sometimes taking into account economic issues. The third pillar is marginalized or even ignored. The result is that most of the energy policies take account of environmental issues should be considered more as a climate policy than sustainable. The importance of energy for the development of civilization is evident. However, still about 1.5 billion people have no access to electricity and another billion use unsafe network. In addition, about 3 billion people use only biomass to prepare food and provide heat[32]. This means that over 40% of the populations have problems with access to energy. This group should be regarded as excluded from the path of development. The international community take the initiative to change this situation, but it seems that, despite attempts to grant them the right rank, e.g. in the form of one of the priority tasks of the Millennium Development Goals, the results are unsatisfactory[33].

In this situation, given that the energy is one of the main factors of development, the social aspects of sustainable energy should be a primary issue of this concept[34]. However, we can see just the opposite tendency, i.e. actions excluding these issues. Initiatives to as early as possible implementation of renewable technologies are often made against the needs of society. In this respect, usually attention is attracted to measures to reduce the development of dirty energy technologies in developing countries. This is explained by the need to care for the Planet. However, usually it turns out that greenhouse gas emissions per capita are much lower in developing countries, than in developed ones. This means trying to regulate the world without the principles of social justice. Increasingly, can be observed that the regulations aimed to make high-quality environmental standards result in higher energy prices also in countries regarded as developed. It is sometimes so significant that in these areas there are also groups of excluded

[31]wced, g. h. brundtland, and world commission on environment and development, our common future. oxford [u.a.]: univ. press, 1991.
[32]agecc, "energy for a sustainable future," united nations, the secretary-general's advisory group on energy and climate change, new york, 2010.
[33]C. cooremans (2012): investment in energy efficiency: do the characteristics of investments matter?, energy effic., vol. 5, pp. 497–518, 2012.
[34]Agecc, "energy for a sustainable future," united nations, the secretary-general's advisory group on energy and climate change, new york, 2010.

people who cannot afford the unrestricted use of energy. These trends can be seen among others in Germany, which is the most developed renewable energy market in the world[35].

Another problem associated with the use of renewable energy sources are massive fluctuations of voltage in the mains. In many cases, especially in enterprises, they can lead to serious consequences and costs, due to shut-off of the sensitive automatic equipment, such as machinery or computers. Connecting to a network large amounts of renewable power, particularly wind also increases the risk of failure, because energy cannot be stored, which means that during periods of high production (with proper, strong wind) there is an excess of energy, which must be used. This problem is noticeable everywhere in the world. In Central Europe, it leads up to the political disputes. Because of excess of wind energy in Germany cause problems not only in this country but also in the neighboring ones, including in the Czech Republic and Poland[36].

In recent decades, you can see a clear trend to reform energy markets, such as the shift from monopoly to the greatest possible marketability and competitiveness. These initiatives have resulted in the need for price competition in the sector of producers and intermediaries. The result is access to cheap energy. From a social point of view it is desirable. However, such action may cause a number of negative consequences. The first is the previously mentioned decline in propensity to save energy at low prices. Another is a lack of investment in new technologies and transmission networks. This is particularly evident in Europe, where up to 2020 it is necessary to replace about 1/3 of the ability to produce energy, and about 30 000 km of transmission lines[37]. Investment restrictions apply not only to modernization of the existing infrastructure, but also limit innovation and increase of efficiency and decrease of environmental harm resulted from energy conversion installations. The best example is the European market, where, despite a number of initiatives, such as the emissions trading and green certificates, electricity production costs of the clean technology are higher than market prices, causing little interest in the market. It is expected that due to the situation in the near future the European Commission will put pressure on Member States to amendments to the emissions trading scheme to manually increase the price

[35]Jlp (2012): "rising energy prices: Germans grow wary of switch to renewable," spiegel online international, 2012.
[36]l. bauerova and t. andersen, (2012): "windmills overload east europe's grid risking blackout: energy," bloom. news, oct.2012
[37]Ec, "europe (2020): a strategy for smart, sustainable and inclusive growth," european commission, brussels, com(2010) 2020 final, mar. 2010.

of single permit. Such actions cause that the analysis of sustainable energy should focus more on social and market issues, not only environmental one.

2.6 Energy Development: Theories and Realities

It is important to conclude the Theoretical Framework with the discussion of Energy Development: Theories and realities. Before we can delve into an examination of an energy-focused social enterprise, we need to critically explore the various contested interpretations of 'energy development' in the literature[38]. As noted in chapter one, the concept of 'development' is politically infused. Energy development, with its strong connection to national economic growth and issues of sustainability, is a particularly contentious component of development. It has been most simply defined in the literature as the "increased availability and use of energy services"[39]. Debates over the role and benefits of energy in development, however, go deeper than energy supply and demand; they involve power struggles over national priorities, energy paradigms and development discourses.

Of most significance to this thesis is the difference between the dominant neoliberal conception of energy development and those which seek to provide an alternative or contrasting energy discourse and focus. In the following review of energy development, three energy paradigms will come to the fore, providing a basis for analysis of how power relations and international norms influence energy development foci. Specifically, examination of how alternative energy paradigms are resistant to, and mainstreamed by, the dominant energy ideology will prove essential.

Following an unpacking of the energy development literature, then, we explore the activities of the main actors in the energy sector. Doing so will reveal interesting insights into the priorities and theoretical constructs employed by those in power. Analysis of the energy sector will not only highlight which energy paradigms and priorities dominate the arena, but also what areas of energy development, and whose energy needs, are being most neglected. Further examination of the political dimensions of these 'peripheral' energy issues will set out the challenges for a social enterprise, in developing a more comprehensive approach to energy development in rural areas in Uganda.

[38]Michelle therese hackett (2012): economy of social enterprise: lessons from grameen shakti in bangladesh; thesis submitted for the degree of doctor of philosophy in the discipline of politics - the university of adelaide - south australia

[39]Michaitoman & Barborajemelkova (2003): energy and economic development

2.6.1 Energy Development Paradigms

For developing countries, energy is often considered a prerequisite for development, as "the existing literature on energy and development does show that energy development is an important component of broader development"[40]. Whether energy is *sufficient* for development, however, is hotly contested in the literature[41]. Many authors and actors have touted the role of energy in a developing country's economic growth[42]; while others have focused more on energy's role in improving social welfare and quality of life[43]. As noted above and highlighted below, however, an author or actor's position on the debates over the role and benefits of energy in development (and indeed, which debates are even engaged in) are closely linked to their theoretical and methodological perspective and how this contrasts to, or agrees with, the dominant energy development paradigm.

A review of the current literature on energy development reveals the emergence of three prominent themes, which can be labelled: **energy security, energy sustainability, and energy poverty**. Each of these energy paradigms concerns a different focus and scale, and each is based on energy concepts which are dynamic and contested. Categorisation of energy development into these three paradigms is helpful in distinguishing different trends, priorities and ideological stances in the literature. A review of these disparate approaches to energy development will also prove useful in determining which approaches to energy development are most prevalent, and which are most neglected, in the Ugandan energy sector.

2.6.2 Energy security paradigm

Historically, national and international energy priorities for developing countries have reflected the dominant development ideology of the time. The vast majority of energy policies, funding and research over the past decades for example, have focused on the energy forms which best facilitate the modernisation and neoliberal aims of industrialisation and macro-economic development. Consequently, there has been "a predominance of attention to and investment in

[40] Michal toman & Barborajemelkova (2013): energy and economic development: an assessment of the state of knowledge.
[41] Michal toman & Barborajemelkova (2013): energy and economic development: an assessment of the state of knowledge.
[42]Birol andrew (2005): the 5 catalysis of 7 figure growth; paperback 2005
[43]UNDP (2005): renewable energy

large-scale energy infrastructure"[44] in order to provide for the energy consumption needs of the "commercial energy segment"[45] . While variations on this theme have surfaced over the years, the focus on large-scale modernising energy for commercial urban and industrial actors has remained a constant. One of the consequences of this has been a continuing preference for expedient and cost effective fossil fuels; reliance on the oil, coal and gas MNCs who run these energy industries; and a focus on the ability of countries to secure these energy resources[46].

Thus, energy security, as the currently popular conception of energy development in the literature[47], appears to maintain and further legitimise the energy development theme of large-scale energy production for macro-economic growth[48]. The consequences of this, for energy development in developing countries, is a continued focus on energy supply for urban and industrial centres rather than rural and urban slum areas[49], expedient fossil fuel use for energy supply rather than renewable, non-polluting energy production[50], and centralised control of energy supply rather than decentralised energy ownership[51] That is, by prioritising the 'security' of energy supplies for activities which drive national macro-economic growth, the bulk of government and international investments are still focusing on and reinforcing the importance of large-scale business industrial actors, often at the expense of the energy needs of 'peripheral' activities, people and environmental concerns. It is these issues which have led to the establishment of alternative energy paradigms, ones which attempt to re-orientate energy development in a more environmentally and socially conscious direction, as we will now explore.

2.6.3 Energy sustainability paradigm

An alternative energy discourse, which has grown significantly in international awareness over the last decade, surrounds the concept of sustainability. The original environmental movements

[44]Birol andrew (2005): the 5 catalysis of 7 figure growth; paperback 2005
[45]Jamal Saghir (2005): infrastructure, energy, water international finance, economic development, and policy
[46]Clancy j.s and Skutschm. (2003): the gender - energy- poverty nexus; finding the energy to address gender concerns in development dfid project cntr998521
[47]Birol andrew (2005): the 5 catalysis of 7 figure growth; paperback 2005 pg. 2
[48]there is, of course, also a national security component to the concept of energy security. this is more prominent, however, for western countries such as the us, which are currently more heavily invested in the securitisation discourse.. for developing countries, energy security appears to be used to further legitimise the need for trade and foreign direct investment, by actors such as the world bank (saghir 2006), though it is also being used by some developing country governments to promote their desire to have nationally-owned energy supplies.
[49] Barnes and floor (1996): rural energy in developing countries: a challenge for economic development, p.498
[50]Maynard-gibbs *et all* (2010): rural energy in developing countries: a challenge for economic development
[51] UNDP (2004): sustainable energy

of the 1970s arose, in part, due to the environmental degradation (such as deforestation and air pollution) caused by an industrialising modernisation approach to development around the world. Initially, the sustainable energy discourse which was promoted by these environmental movements focused not only on the type of fuel used (*i.e.* non-renewable fuels), but also attempted to challenge the economic and political systems which supported conventional energy development and consumption[52]). The original sustainable energy movement advocated for a fundamental shift in our understanding of energy in society: arguing against the energy production and ownership patterns which propagated global energy inequalities, to instead focus on an energy discourse which promoted a more socially and environmentally-conscious direction[53]

In recent years, global events have led to the re-emergence of the securitization discourse in international affairs. Consequently, the current literature concerning energy development has tended to focus on the concept of 'energy security'[54]. Energy security broadly refers to a government's desire to secure energy for the current functioning and future needs of a country. Barton *et al.*[55](2004, p.5) define it as "a condition in which a nation and all, or most, of its citizens and businesses have access to sufficient energy resources at reasonable prices for the foreseeable future free from serious risk of major disruption of service".

In the literature concerning developing countries, energy security has been described in terms of: avoiding energy price shocks[56]; making energy trade profitable[57]; and, most prominently, ensuring that there is sufficient energy available for national economic growth[58]. Apart from some attempts to use 'energy security' to focus on the energy needs of households[59] the term is predominantly used in the literature to describe or prescribe energy development strategies at a

[52]Bryn, toy and wang (2006): energy development theories; glover (2006): postmodern climate change and environment.

[53]John Byrne **and** Noah toy (2006): **energy as a social project: recovering a discourse**

[54]For many countries, such as the united states, energy security has had varying degrees of importance in national policymaking since the oil crises of the 1970s (barton et all (2004): transition pathways for a uk low-carbon electricity system: comparing scenarios and technology implications): transition pathways for a Uk low-carbon electricity system: comparing scenarios and technology implicationsp.4; and, according to birol andrew (2007): the 5 catalysis of 7 figure growth; paperback 2005, p.2): "safeguarding energy supplies is once again at the top of the international policy agenda".

[55]barton et all (2004): transition pathways for a uk low-carbon electricity system: comparing scenarios and technology implications, p.5

[56]Michaitoman & Barborajemelkova (2003): energy and economic development

[57]Jamal Sather (2006): infrastructure, energy, water international finance, economic development, and policy

[58]Upmanulall (2009): the acquisition of technological capability by india

[59]Pramodjain (2010): a practical guide to wind energy engineering and management

national level. According to Jamal[60], the former World Bank 'Director of Energy and Water', for example, this includes "attracting investments in the energy sector" and creating "the right policy and pricing frameworks" to achieve national "energy efficiency", "diversity" and "regional energy trade".

Thus, energy security, as the currently popular conception of energy development in the literature[61], appears to maintain and further legitimise the energy development theme of large-scale energy production for macro-economic growth[62]. The consequences of this, for energy development in developing countries, is a continued focus on energy supply for urban and industrial centres rather than rural and urban slum areas[63], expedient fossil fuel use for energy supply rather than renewable, non-polluting energy production[64], and centralised control of energy supply rather than decentralised energy ownership[65] That is, by prioritising the 'security' of energy supplies for activities which drive national macro-economic growth, the bulk of government and international investments are still focusing on and reinforcing the importance of large-scale business industrial actors, often at the expense of the energy needs of 'peripheral' activities, people and environmental concerns. It is these issues which have led to the establishment of alternative energy paradigms, ones which attempt to re-orientate energy development in a more environmentally and socially conscious direction, as we will now explore.

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[63]Barnes and floor (1996): rural energy in developing countries: a challenge for economic development, p.498
[64]Maynard-gibbs *et all* (2010): rural energy in developing countries: a challenge for economic development
[65]UNDP (2005): environment and energy in Uganda

[66]For many countries, such as the united states, energy security has had varying degrees of importance in national policymaking since the oil crises of the 1970s (barton *et al*. 2004, p.4; khatib 2000, p.112; reddy 2000, p.41). and, according to birol (2007, p.2): "safeguarding energy supplies is once again at the top of the international policy agenda".

government's desire to secure energy for the current functioning and future needs of a country. Barton *et al*[67] define it as "a condition in which a nation and all, or most, of its citizens and businesses have access to sufficient energy resources at reasonable prices for the foreseeable future free from serious risk of major disruption of service".

As Climate Change has become more widely acknowledged, the global desire for a more environmentally-conscious approach to our current energy practices has gained traction. Sustainable energy, consequently, has recently become a more broadly used and defined concept, with the term 'sustainability' becoming increasingly integrated into the mainstream energy discourse[68]. We also see sustainability being used to describe the 'financial sustainability' of an energy project, or the 'economic sustainability' of an energy policy, rather than (or as well as) its environmental credentials[69] argue that much of this recent literature on sustainability does not challenge the status quo of "energy capitalism"[70]. The construction of large-scale solar or wind power plants to feed electricity into the national grid[71], for example, can be seen to help continue, rather than challenge, the current over-consumption of energy in urban centres. That is, while some voices in the literature promote the rise of sustainability as a new direction in energy strategies, others have highlighted the manipulation of the term such that it is now integrated into, rather than contending against, the dominant energy practices[72]

Despite the rising popularity of energy sustainability, however, it is still a sub-dominant paradigm in the broader energy development arena. According to a recent report by the NGO 'Oil Change', while the World Bank publicly highlights its renewable energy initiatives, its funding of energy development is still heavily dominated by fossil fuels[73]. According to a World

[67]Barton et all (2004): transition pathways for a uk low-carbon electricity system: comparing scenarios and technology implications

[68]UNDP (2005): energy efficiency

[69]Bennet et all (2005): the importance of heating system transient response in domestic energy labellingp.271; reddy (2000): energy poverty: global challenges and local solutions p.42;john byrne and noah toly (2006): energy as a social project: recovering a discourse, pp.18, 22

[70] UNDP (2005): energy efficiency

[71] energy sector management assistance programme (esmap) (2010): the energy progress report- tracking sdg7 (2010)

[72]Lele (2005): energy and environmental data

[73]For example, the commercial arm of the world bank quadrupled its funding of coal and other fossil fuels in developing countries from 2004 to 2008 (redman 2008, p.1).

Bank[74] report, investment in these "extractive industries" (*i.e*. oil, gas and mining) is justified, as it is considered essential for the national economic sustainability of developing countries.

The World Bank's position here helps to highlight the prioritisation of macro-economic growth in energy development and the continued commitment of major actors to secure this goal. And yet, despite this, there has been concerted international effort to elevate the status of renewable, non-polluting and more environmentally-conscious energy alternatives. While, as noted above, the sustainability discourse has been somewhat 'mainstreamed' and used to help continue the status quo of energy consumption, the energy sustainability paradigm is still powerful. It has sufficient international legitimacy, for example, to hold governments and international institutions to account (whether successfully or not) when they ignore environmental concerns[75]. It has also created community environmental norms and enabled the creation of an international Climate Change agenda[76]. The energy sustainability paradigm, while sub-dominant (and arguably somewhat manipulated), nevertheless, does provide a discourse for those attempting to resist the 'energy security' status quo.

2.6.4 Energy poverty paradigm: *The 'other' energy crisis*

While the concept of energy poverty has been defined in the literature in a variety of ways, the commonality is a focus on 'energy for the poor'[77]. "Energy poverty can be defined as the lack of adequate modern energy for the basic needs of cooking, warmth and lighting, and essential energy services for schools, health centres and income generation"[78]. Solutions to energy poverty are closely linked to poverty alleviation and development more broadly, as it is often those without adequate energy for cooking, light and farming who also go without other life essentials[79]. This third energy paradigm, then, moves away from issues of national energy supply and sustainable production, and instead focuses on a particular user group, namely, those without

[74]Clancy j.s and skutsch m. (2003): the gender - energy- poverty nexus; finding the energy to address gender concerns in development dfid project cntr998521
[75]Maynard-gibbs *et all* (2010): rural energy in developing countries: a challenge for economic development
[76]Pettenget (2007): international journal of development research (international peer reviewed journal of open access issn 2230-9926. environmental impacts originating from a pilot project in renewable energy at the federal university of campina grande.
[77]Birol a. (3005): the 5 catalysts of 7-figure growth provides the answers.; iea 2010;; jamal sather (2005): infrastructure, energy, water international finance, economic development, and policy
[78] Practical action (2009): energy access in the developing world - new solutions to old problems- energy access publication pg. . . .2
[79]Soycool and dworkin (2012): global energy justice: problems, principles and practices, p.17;

adequate or appropriate energy for their daily needs. This draws our attention, in particular then, to energy development in urban slums and rural regions of developing countries.

One of the most influential early movements to focus on the energy needs of the poor arose in reaction to the energy crisis of the 1970s. While the world was transfixed by the undermining of national energy security when oil prices sky rocketed in the 1970s, others were identifying and attempting to highlight the "other energy crisis"[80]. As emphasised by Eckholm[81]: "For more than a third of the world's people, the real energy crisis is a daily scramble to find the wood they need to cook dinner"[82]. Over the 1970s and 1980s, then, researchers such as Eckholm and Agarwal[83] brought fuel wood shortages and the cooking energy needs of the urban and rural poor into the world's energy agenda.

Consequently, much work was done to measure and address the perceived increasing gap between fuel wood demand and supply[84], with popular solutions including reforestation programs and more efficient cooking technologies.

Interest in the 'fuel wood gap' energy crisis, however, waned over the 1990s. Various explanations for this have been proposed. Some argue that the 'gap' did not materialise to be as large as expected, while others argue that funders were discouraged when many projects surrounding reforestation and improved cooking technologies failed to take-off or produce the desired results[85] argues that many of these fuel wood projects were unsuccessful due to the failure of implementers to understand the embedded socio-political difficulties which surround land use and fuel wood in developing countries. That is, while sufficient and sustainable fuel wood supply for the cooking needs of poorer people still remained a primary energy need,

[80]Eckholm (1975): energy crisis: firewood- the poor man's energy crisis; amoldet all (2003): energy return on investment (eroi) of global energy resources; clancy j.s and skutsch m. (2003): the gender - energy- poverty nexus; finding the energy to address gender concerns in development dfid project cntr998521; greeley (1987): handbook of research on power and energy system optimization , p.2; howe's (1987): the energy source book
[81]Eschol (1975): energy crisis: firewood- the poor man's energy crisis
[82]Am old et all (2003): energy return on investment (eroi) of global energy resources
[83]Agawam (1986): solar energy: applications, economics and public perceptions.

[84]Am old et all (2005): energy return on investment (eroi) of global energy resources, p.3
[85]Amulet all (2005): energy return on investment (eroi) of global energy resources; greeley (1987): handbook of research on power and energy system optimization, p.2 and agawam (1986): solar energy: applications, economics and public perceptions.

solutions to these problems were not easy to implement or up-scale, and thus lost their appeal for international funders and governments.

2.6.4.1 Rural electrification

In recent years, the focus on energy poverty appears to be re-emerging, as the link between energy and the 'Millennium Development Goals' is highlighted by various authors and institutions[86]. This time, however, there appears to be less focus on cooking needs and the fuel wood gap, and more of a focus on moving poor people up the 'energy ladder' to more modern technology[87]. The "classic" energy ladder places different fuels or sources of energy on consequential ladder rungs, with electricity, the most modern and 'desirable' fuel, at the top[88]. This linear energy fuel ladder provides, then, the rationale for the currently dominant solution to energy poverty in the rural development literature, namely 'rural electrification'.

According to Green[89], "in many less developed countries, rural electrification is consistently championed as the answer too many development policy challenges such as poverty alleviation, urban migration, economic development and even national security concerns". In practical terms, connection of rural homes and businesses to the national electricity grid is relatively easy to measure and quantify, and is compatible with a centralised government policy framework Primarily though, electrification of rural areas[90] is considered essential for increased rural economic development[91]: Access to electricity can help integrate poor rural families into the modern world, with better communication (*e.g.* with mobile phone recharging), income-generating opportunities (*e.g.* with electric lighting and agricultural machinery), and thus more connection with (and creation of) a formal rural market place.

Extension of the national grid into rural areas is the dominant approach to rural electrification in developing countries; however, it is often physically and financially difficult to extend

[86] Iea 2010; benet et all (2005): the importance of heating system transient response in domestic energy labeling; energy access in the developing world - new solutions to old problems- energy access publication 2009; UNDP (2005): renewable energy

[87] Barnes and floor 1996, p.500; o'brien *et al.* 2007, p.607; reddy 2000, p.45; jamal sather (2006): infrastructure, energy, water international finance, economic development, and policy

[88] Defla*te all* (2008): refreshing perspectives on fighting poverty p.8

[89] green (2005): international journal of renewable energy research (ijrer) vol.9 no. 2 p. 269),

[90] Reddy (2005): energy poverty : global challenges and local solutions, p.2142; byrne, toly and wang (2011): energy development theories

[91] Barnes and floor (2010): rural energy in developing countries: a challenge for economic development, p.30

transmission lines into more remote regions. One solution, which has become popular recently, is the adoption of solar, wind and mini-hydro energy technologies to supplement the existing systems[92]. That is, in the last few decades, rural electrification has taken on a new 'sustainability' dimension. As renewable energy technologies have become more affordable and accessible, actors such as the World Bank have been encouraging these options to aid in rural electrification[93]. Despite the apparent universal appeal of these energy poverty solutions, however, there have been concerns raised about the narrow focus of the electrification approach, as we will now explore[94].

2.6.4.2 Challenging rural electrification

A number of researchers have argued that the prioritization of electricity, in rural energy policy and projects, is potentially problematic[95]. A common theme in these studies is a criticism of the assumption, inherent in most rural electrification projects, that development is most assured by helping the poor 'leap frog' to the top of the energy ladder. Contrastingly, it is argued that people living in poor rural areas are best served with a more diversified and multi-stage approach, with a focus on improving the use of and access to both modern and traditional fuel sources. Interestingly, the need for more diversified energy projects is acknowledged by most development agencies, including some World Bank reports[96]. The issue, however, is that this does not often lead to increased funding, investment or research in non-electric energy alternatives.

Karekezi and Kithyoma[97] and Wamukonya[98] have argued, for example, that solar electricity is being prioritised in Africa despite it not being the most needed and suitable energy form. Wamukonya[99] expands on this to explore how rural electrification projects often exclude the

[92]**Gibbs (2005): rural energy in developing countries: a challenge for economic development**
[93]Barnes and floor (1996): rural energy in developing countries: a challenge for economic development, pp.509-510; martinol (2005): electric lighting and power p.691
[94]The concept of the energy ladder, and criticisms against it, has existed for several decades. interestingly, it could be hypothesised that the recent popularity of this approach is in part due to its compatibility with the new 'energy sustainability' aims of international funders (*i.e*. promoting solar-powered electricity). this sustainability dimension, however, does not address some of the basic criticisms of the rural electrification approach, as we will see below.
[95]Shonalipachauri and Daniel Spreng (2003): energy use and energy access in relation to poverty p.269; karekezi and kithyoma (2003): renewable energy in Africa- sustainable development p.1083; wamukonya, n. (2007): renewable energy technologies in Africa: an overview of challenges and opportunities.
[96]Byrne, toly and wang (2006): energy development theories
[97]Karekezi and Kithyoma (2002): renewable energy in Africa- sustainable development
[98]Wamukonya, n. (2007): renewable energy technologies in Africa: an overview of challenges and opportunities.
[99] ibid

poorest, who least can afford electric options. In India, analysis by Dutta[100] has shown that the preference for rural electrification is suboptimal for women and other marginalised energy users. According to all three studies, while improvement to traditional biomass cooking was found to be the most needed energy project, it was relatively neglected in these regions, as a focus on electrification had led to a lack of investment in non-electric rural energy projects. As noted by Practical Action: "Over-emphasis on the provision of solar PV [photo-voltaics], driven by international multilateral corporations, has meant that other viable and cost-effective technologies – such as small scale wind, micro hydro and biomass, which can be locally developed and manufactured – are hugely neglected and seem to 'fail' because there are limited resources available for their development beyond the pilot phase"[101].

Karekezi and Kithyoma[102] highlight modernisation assumptions by some western actors as reason for the promotion of electricity: "One of the key drivers to the interest in disseminating PV technology in sub-Saharan Africa is the preoccupation with electricity. … Since most of the experts come from countries with almost universal electricity access, the thought of any form of development without electricity is perceived as unthinkable". For others though, there is a connection between rural electrification and market-based development objectives. According to Wamukonya[103]some of the key drivers of solar-electric investment were poverty alleviation, cost-effectiveness, and creating and maintaining a market for the solar industry. Jacobson[104], more explicitly, argues that solar projects in Africa are motivated by underlying neoliberal assumptions about poverty and energy markets: "solar PV in Kenya are more closely associated with the neo-liberal idea that poverty alleviation is best achieved through the integration of poor people into world economic markets".

Thus, while rural electrification does deviate from the dominant energy security priorities of macro-economic growth in urban and industrial areas, it is still appears to support a development agenda which prioritises modern, market-based economic development. Interestingly then, it could be argued that the shift in attention from the 'fuel wood gap' to 'rural electrification' in the energy poverty literature over the past decades is indicative of how an originally alternative

[100]Dutta (2005): energy access and gender: getting the right balance
[101]The global plan of action for sustainable energy solutions in situations of displacement (2005)
[102]Karekezi and Kithyoma (2003): renewable energy in Africa- sustainable development
[103]Wamukonya, n. (2007): renewable energy technologies in Africa: an overview of challenges and opportunities.
[104]Glover (2006): postmodern climate change and environment, p.146

energy paradigm has been re-directed to better comply with neoliberal development objectives. That is, similarly to energy sustainability, the energy poverty paradigm appears to have been 'mainstreamed' or moulded into a more suitable development discourse.

This does not necessarily mean, however, that all actors are, consequently, supportive of a linear energy ladder approach. As we have explored above, rural electrification is already contested in some parts of the energy poverty literature. Furthermore, practitioners have continued to experiment with other interpretations of energy development for the rural and urban poor[105]. A more recently popularised approach to energy poverty called 'energy services', for example, looks less at how to achieve maximum electrification and more at what end-use the energy is expected to serve. "What this [energy services approach] implies is that far more consideration would be given to what people need energy *for* and identification of the constraints or conditions around these end uses"[106]. For example, 'energy services' focuses on lighting rather than solar panels, and cooking rather than fuel wood[107]. Importantly, as opposed to the assumptions in the rural electrification approach, 'energy services' has the potential to maintain the focus of energy policies and projects on the needs of a community, rather than on technocratic solutions[108].

In the last decade, influential actors such as the United Nations[109] have helped to popularise alternative energy approaches. However, in terms of practical funding dollars and studies in the literature, rural electrification still appears to be the dominant strategy for energy poverty alleviation in developing countries. It is important to remember though, that for those who are interested in drawing more attention to the energy situation of rural people (as opposed to energy for large-scale urban industry), the rising profile and investment in rural (especially solar) electricity is not necessarily a negative development. And for those who wish to challenge the

[105]Barnes and floor (1996): rural energy in developing countries: a challenge for economic development, pp.509-510; martinol (2005): electric lighting and power p.691
} (2003): energy use and energy access in relation to poverty
[106]Clancy j.s and skutsch m. (2003): the gender - energy- poverty nexus; finding the energy to address gender concerns in development dfid project cntr998521 p.10
[107]Shonalipachauri and Daniel Spreng (2003): energy use and energy access in relation to poverty;
[108]It is important to emphasise that it is not electrification of rural areas which is problematic, but the assumption by policy makers and funders that electrification should be the sole energy priority and/or an end-goal in itself.
[109] UNDP 2005

current ‘electrification’ status quo, alternative approaches such as ‘energy services’ can provide an avenue for dissent or re-direction.

2.6.5 Dominant energy ideologies and the ‘resistance’ of alternative paradigms

The three energy paradigms, explored above, present some of the different perspectives currently employed in the energy development literature. It was argued that the energy security paradigm currently directs decisions by governments and international institutions. This focus on national macro-economic energy security has maintained and legitimised the neglect of those energy needs and forms which are considered peripheral; namely, rural, decentralised, renewable, poor and/or traditional energy use and users[110]. The energy sustainability and energy poverty paradigms, in response, do appear to consider energy needs which fall outside the conventional energy parameters. However, while these energy paradigms may move away from the foci of the conventional energy paradigm, they are not unaffected by dominant development ideologies.

In the section above, we saw how energy sustainability has been somewhat ‘mainstreamed’, to better suit the energy consumption status quo; and how the energy poverty approach has shifted from traditional energy needs in the ‘fuel wood crisis’ to focus more on modern, market-based energy forms with ‘rural electrification’. Simultaneously, however, both the sustainability and energy poverty discourses have been fundamental in challenging and directing conventional energy norms. While energy for macro-economic growth has remained a constant historical priority, energy alternatives such as ‘renewable energy’ and ‘energy for the poor’ have helped to mould, and in turn been moulded by, the dominant energy paradigm. This is a theme that we will return to later in the chapter.

In the following examination of the energy sector in Bangladesh, the energy paradigms presented above will help us to probe which energy development ideologies underlie the choices of key actors. Primarily, the analysis above will help to explain how these actors’ choices, concerning energy policy, research and projects are critically entwined with their own conception of development and the current norms concerning what forms of energy should be prioritised. This will prove essential, in later chapters, in building our understanding of what energy development paradigms.

[110]Mainhardi-Gibbs *et al.* 2010, p.2 and Jamal saghir (2006): infrastructure, energy, water international finance, economic development, and policy.

CHAPTER THREE

3.0 Methodology

This part of the study focuses on the method and tools of data collection used in collection of the data. Qualitative method is appropriate for this research given its descriptive nature.

Bearing in mind that this is legal research, RE roles up with policy makers. I looked at the tools for collection of data which varied from; Questioners, Interviewing operational managers in different companies and institutions, policy makers.

Due to the out-break of covid-19, there are constrains for one to go to the field to collect data and as such, I have explored the available tools like relying online interview, incentive questionnaires, cases of categories of people in companies and face to face interview.

3.1 Research design

The researcher used descriptive and analytical cross sectional research design since it is suitable for data collection from skilled and experienced people in the field of research. It was preferred because it provides detailed information on the study.

3.2 Data collection methods

3.2.1 Interviewing

Semi structured interviews were used to get information by using closed and open ended questions, direct and leading questions. For example, conduct online interviews with the company directors and institutional heads in Renewable energy sector in Uganda.

3.2.2 Desk review

This research was conducted main during the nation-wide lockdown due to the outbreak of covid-19 and as such desk review method was largely adopted. I looked at a variety of existing literature including articles written by different scholars and reports made and legal policies on renewable energy and the role RE has played towards the achievement of sustainable development pillars.

3.2.3 Data analysis

The data which was collected was read thoroughly, edited and compiled by the researcher to accuracy and completeness. In this instance, I will consider the information from the data bank of the renewable energy institutions like the ministry of energy and mineral development in Uganda and other private companies on renewable energy production project in Uganda.

The study was conducted through mainly a qualitative doctrinal legal researchwhich provides a systematic exposition of the rules governing a particular legal category, analyses the relationship between rules, explains areas of difficulty and, perhaps, predicts future developments.' A doctrinal legal research was a suitable research design because this study was based on legal concepts and principles of law, statutes, cases and rules concerning environmental aspects in the oil and gas industry in Uganda and henceforth allowed the researcher to adequately address and discuss the legal concepts relating to environmental health and safety as analysed in the subsequent chapters.

The term 'doctrinal research' needs clarification. The word 'doctrine' is derived from the Latin noun 'doctrine' which means instruction, knowledge or learning. The doctrine in question includes legal concepts and principles of all types such as cases, statutes, and rules. 'Doctrine' has been defined as '[a] synthesis of various rules, principles, norms, interpretive guidelines and values. It explains, makes coherent or justifies a segment of the law as part of a larger system of law.

Doctrines can be more or less abstract, binding or non-binding'.[111]Historically, law was passed on from lawyer to lawyer as a set of doctrines, in much the same way as happened with the clergy. Legal training developed in the middle ages within a religious rhetorical tradition, with the monasteries existing as centres of learning.[112] The term 'doctrinal' is also closely linked with the doctrine of precedent.

Legal rules take on the quality of being doctrinal because they are not just casual or convenient norms, but because they are meant to be rules which apply consistently and which evolve organically and slowly. It follows that doctrinal research is research into the law and legal

[111]Trischa mann (ed), *australian law dictionary* (oxford university press, 2010) 197.
[112] j m kelly, *a short history of western legal theory* (clarendon press, 1992) 89.

concepts. This method of research was the dominant influence in 19th and 20th century views of law and legal scholarship and it tends to dominate legal research design.[113]

Legal academics may argue that a statement of doctrinal methodology would be out of place in a doctrinal thesis, and that, in any case, this aspect would have been examined during the earlier phases of the doctrinal research process. One commentator, Paul Chynoweth, asserts that 'no purpose would be served by including a methodology section within a doctrinal research publication', because the process is one of 'analysis rather than data collection'.[114]

We would argue that, while this may be true for published research in journals, the situation in relation to research grant applications and doctrinal legal research thesis is different. Chynoweth argues that legal academics need to seek to educate their interdisciplinary colleagues on the nature of the methodology they use and that, in order to do this, we should 'reflect upon our own previously unquestioned assumptions about the practices in our own discipline, and … articulate these for the benefit of others within the field'.[115] On this point we agree entirely.

This small study of a selection of law theses demonstrates that lawyers are not conforming to the formalities of describing methodology in the same way that occurs in other disciplines. Perhaps there is not the same need to articulate the method for an audience from within the law paradigm. However, academic lawyers are now participating in broader interdisciplinary environments than they previously did where there is little knowledge of doctrinal research processes and where there are different expectations in relation to explanations of research methodologies.

The nature of a qualitative doctrinal legal research methodology henceforth enabled the researcher to analyse the literature reviewed as stated in the previous chapter. The need to appreciate and articulate the legal aspects of this research such as laws, statutes, case law as indicated in the literature review doesn't require the researcher to undertake data collection as this is knowledge that can be acquired through desk and library research methods. Henceforth

[113] Desmond manderson and richard mohr, 'from oxymoron to intersection: an epidemiology of legal research' (2002) 6(1) *law text culture* 159, 161. for a breakdown of empirical and doctrinal phds in australia see desmond manderson, 'law: the search for community' in simon marginson (ed), *investing in social capital* (university of queensland press, 2002) 152.
[114] Paul chynoweth, 'legal research' in andrew knight and les ruddock (eds), *advanced research methods in the built environment* (wiley-blackwell, 2008) 37.
[115] ibid

being of legal nature, the researcher chose this as the best method to analyse the literature involved.

3.2.4 Doctrinal Method

Doctrinal method is normally a two-part process, because it involves first locating the sources of the law and then interpreting and analyzing the text. In the first step, it could be said that the researcher is attempting to determine an 'objective reality', that is, a statement of the law encapsulated in legislation or an entrenched common law principle.[116] However, many critical legal scholars would be quick to contest whether any such objective reality exists, as the very concept of objectivity is based in a liberal theoretical framework. Most would argue that the law is rarely certain.

As Christopher McCrudden comments, *'if legal academic work shows anything, it shows that an applicable legal norm on anything but the most banal question is likely to be complex, nuanced and contested'.*[117] However, if we take legislation as an example, the laws are passed by parliament and the words are written down. In that sense there is a positive statement of the law. It is at the next step where the law or rule is interpreted and analysed within a specific context that the outcome becomes 'contingent' or conditional on the expertise, views and methods of the individual researcher.

Before analysing the law, the researcher must first locate it. A research project, for example, may require the researcher to access and analyse all the current and historical legislation and administrative regulation of all the Australian states or Canadian provinces for the last century, covering three or four different but related legal subjects, along with any judicial interpretation of those rules and statutes. Even a mere description of the scope of such an exercise makes the breadth of the undertaking more apparent to the 'outsider'.

Having located this wealth of documents, the second step is more nebulous. Is it actually possible to plan and describe this second aspect of the doctrinal research methodology in an intelligible way for an 'outsider'? As Geoffrey Samuel has queried, 'Can legal reasoning be

[116]hutchinson, *researching and writing in law*, above n 66, 37.
[117]christopher mccrudden, 'legal research and the social sciences' [2006] (october) *law quarterly review* 632, 648.

demystified?'[118] Can the legal researcher describe what it is to undertake the distinct form of analysis involved in thinking like a lawyer? Perhaps it is simply the case that the 'medium is the message',[119] so that the doctrinal discussion and analysis of the law encapsulates and demonstrates the extent of research that has taken place and on which the arguments are based.

The tools at hand can range from '*stare decisis* and its complexities' to the 'common law devices which allow lawyers to make sense of complex legal questions'.[120] Those studying the methodologies of lawyers point to a number of techniques used within the synthesizing process once the documents are located and read. They call for a description of the particular line of inquiry being developed, whether it is conceptual, evaluative or explanatory. The application of such techniques, along with a description of, for example, the use of deductive logic, inductive reasoning and analogy where appropriate, would constitute the second part of the methodology.[121]

If the researcher intends to draw heavily on an approach which uses the standard tools of logic, then the methodology would require a description of the basic syllogism and the processes involved in inductive and deductive reasoning. Legal reasoning is often deductive because the general rules are 'given', for example through legislation. The lawyer researcher examines the legislative provision, examines the situation and then decides if the situation comes within the rule. By comparison, inductive reasoning uses a process of arguing from specific cases to a more general rule.[122]

Where the source of the rule is case law rather than legislation, 'the lawyer will have to examine several cases to find a major premise which underlies them all'.[123] So the lawyer will have to 'reason from particular case decisions to a general proposition'.[124] Analogy, on the other hand, involves locating similar situations arising, for example, in common law cases, and then arguing

[118] geoffrey samuel, 'can legal reasoning be demystified?' (2009) 29(2) *legal studies* 181; larry alexander and emily sherwin, *demystifying legal reasoning* (cambridge university press, 2008); geoffrey samuel, 'does one need an understanding of methodology in law before one can understand methodology in comparative law?' in van hoecke, above n 77, 177.
[119] Marshall mcluhan, *understanding media: the extensions of man* (mentor, 1964).
[120] Irene baghoomians, 'thinking like a lawyer: a new introduction to legal reasoning, by frederick schauer' (2009) 31(3) sydney law review 499, 499.
[121] Irene baghoomians, 'thinking like a lawyer: a new introduction to legal reasoning, by frederick schauer' (2009) 31(3) sydney law review 499, 499.
[122]Christopher enright, *legal reasoning* (maitland press, 2011), ch 6 <http://www.legalskills. com.au/>.
[123]Farrar, above n 93, 91.
[124] ibid

that similar cases should be governed by the same principle and have similar outcomes. As Farrar points out, 'analogy proceeds on the basis of a number of points of resemblance of attributes or relations between cases'.[125]

Set out in this way it is apparent that an overtly doctrinal research plan or methodology is feasible, and it would provide a rigour and discipline often missing in doctrinal research. And, as McKerchar argues so succinctly, perhaps this methodology is nothing more than the need for doctrinal research to follow accepted conventions, using clear rationales, and for the research to be 'systematic and purposive with a robust framework.[126]

3.3 Conclusion

This short examination highlights the need for an increased analysis and description by researchers of the doctrinal methodology they are using. The conclusion from this study is that the doctrinal research methodology is a discrete method. It is more than simply scholarship or an elaborate literature review of primary materials. However, it is not sufficiently delineated for the current research environment. This article has not attempted to fully explain the method, or even to provide a model for researchers to follow in setting out their methodologies. It has proposed the groundwork for the development of such an explanation, in drawing attention to the distinctive characteristics of doctrinal legal research and the characteristics it shares with other research methods. It has argued the need for a thorough examination of the current legal research record and context.

In the past, the under-description of the doctrinal method has not been problematic because the research has been directed 'inwards' to the legal community. The targeted audience has been within the legal paradigm and culture and therefore cognisant of legal norms. However, in a modern interdisciplinary framework, where the research is being directed, read and more importantly 'judged' by those outside a narrow legally trained discipline, articulation of method is vital especially if funding is tied to quality, and quality depends on methodological clarity.

Sample questioners and Interview guides

[125] ibid, at 102
[126]Margaret Mckerchar, *design and conduct of research in tax, law and accounting* (lawbook co, 2010) 116.

In order to have a better understanding of my research paper I conducted some interviews on 26 individuals while following a particular question guides as reflected in the findings and attached in the appendix, specific questions were asked in order to intuitively develop my findings included in last chapter.

CHAPTER FOUR

4.0 LEGAL FRAMEWORK

4.1 Renewable energy law and policies in Uganda

In a bid to attain the sustainable development goal (SGD) 7 and 13[127] of access to affordable, reliable and sustainable and modern energy, while adaption to climate change to attain environmental sustainability, economic sustainability and social equity, Uganda has developed a strong legal and institutional framework to ensure adequate, reliable and least-cost power supply to meet the country's demand, promoting the efficient operation of the power sector and scaling up rural and semi-urban access to maximize the impact on poverty reduction.

The Constitution of the Republic of Uganda[128]

The Constitution recognizes the relationship between the protection of the environment and sustainable development. *National Objectives and Directive Principles of State Policy under XXVII on the environment requires the State to promote sustainable development and public awareness of the need to manage land, air and water resources in a balanced and sustainable manner for the present and future generations[129]. It duty bounds the state to promote the rational use of natural resources so as to safeguard and protect the biodiversity[130]The same emphasis is provided under article 245 of the constitution which requires the parliament to pass such laws that are intended to manage the environment for sustainable development[131]the state is also duty bound to protect important natural resources, including, water, wetlands, minerals, oil, fauna and flora[132]in the same spirit, the state is further duty bound to promote and implement energy policies that will ensure that people's basic needs and those of environmental preservation are met[133]*

[127] Sustanable Development Goal 7 and 13
[128] 1995 (as amended)
[129] objective xxvii of national objectives and directive principles of state policy
[130] ibid xxvii (b)
[131]article 245 of the constitution of the republic of uganda
[132]objective xiii of national objectives and directive principles of state policy
[133]ibid xxvii (iii)

As a result of this mandate, laws and policies have been passed and implemented to inter alia;

The Energy Policy for Uganda, 2002

The government of Uganda implemented the Energy Policy for Uganda 2002 as the primary guiding document for the country's energy sector. The main objectives of the policy were to establish the availability, potential and demand of the various energy resources in the country, increase access to modern affordable and reliable energy services, improve energy governance and administration, stimulate economic development, manage energy-related environmental impacts among others.

The government made significant achievements on the objectives set out in the Policy. These include; increased electricity generation capacity from 317 MW (2002) to 1,182 MW (May 2029) resulting in a supply/demand surplus, increased electricity access from 5% (2002) to 28% (2019), reduction in electricity losses from over 35% (200) to 17.4% (2017), dominance of renewable energy in the national energy mix; enabling environment for private sector investments, increased energy sector contribution to the national GDP, increased efficiency initiatives in the biomass subsector, liberalization and improved sector regulation among others.

The Draft Energy Policy for Uganda 2019

The government is in the process of revising the Energy Policy for Uganda of 2002. The revised Energy Policy aims to consolidate the achievements of the Energy Policy for Uganda 2002, align the policy framework with recent international, regional and national developments and commitments and ensure that the government is well positioned to address the new and emerging socio-economic challenges of the energy sector in the coming decade. The Policy aims to have a stronger focus on gender and climate change mainstreaming in sector activities.

The Policy is to cover subsectors like renewable energy, clean cooking, electrical power, rural electrification and access, energy efficiency and conservation, nuclear energy and selected cross cutting issues.

The policy is to consider the efforts that are still required to achieve the targets of Sustainable Development Goals (SDGs) and Vision 2040.

The Electricity Act[134],

Electricity is a public good and its access and utilization by Ugandans is a right that should be recognized and protected at whatever cost.

Section 4 of the Act established the Electricity Regulatory Authority (ERA) to regulate the industry. The objective of the Act is to liberalize the electricity industry, disbanding of the Uganda Electricity Board (UEB) (historically a vertically integrated monopoly) into three entities namely generation, transmission and distribution, establishment of the Rural Electrification Fund (REF), with the main objective of enhancing rural access to electricity and establishment of the Electricity Dispute Tribunal (EDT) that has jurisdiction to hear and determine electricity sector disputes which are referred to it.

The Atomic Energy Act (2008) regulates the promotion and development of nuclear energy for use in power generation and other peaceful purposes

Bio fuels Act (2018) regulates the production, storage and transportation of bio fuels and blending of bio fuels with petroleum products.

The Renewable Energy Policy (2007**)** aims to increase the share of renewable energy in the national energy mix. This policy seeks to develop Solar PV, Bio Energy, Bio Fuels, Geothermal as well as Biomass for power generation. It is noteworthy that Uganda's renewable energy capacity is estimated at 5,300Mw being;

- *200Mw Solar PV*
- *800Mw Peat*

[134] Of 1999

- *400Mw Geothermal*
- *2,200Mw Hydro*
- *1,650Mw Biomass*
- *250Mw Wind*

The Electricity Connections Policy (2018) aims to increase access and provide leaner energy for Ugandans.

The sector's mandate is also governed by other sector policies, including the Gender Policy (2007), Climate Change Policy (2015), Environmental and Social Safeguards Policy (2018),

Energy sector institutions and agencies

The Ministry of Energy and Mineral Development oversees the regulatory institutions that in turn supervise the government and independent providers in the sector. The Ministry provides overall policy direction and guidance in the development and exploitation of energy, mineral, oil and gas resources.

Other agencies include;

Electricity Regulatory Authority, Atomic Energy Council, Electricity Disputes Tribunal, Rural Electrification Board, Rural Electrification Agency, Uganda Electricity Generation Company Limited, Uganda Electricity Transmission Company Limited (UETCL), The Uganda Electricity Distribution Company Limited (UEDCL), Uganda Energy Credit Capitalisation Company (UECCC), The Directorate of Water Development,

The above key state institutions and other partners like Umeme, Eskom, Bujagali hydro power public-private sector co-financed project, solar power plants in Soroti and Tororo have been central to this electricity generation, distribution and usage call and cause and greatly contributed in attaining the planned Uganda Vision 2040 of increasing in the country's electricity production in order to meet with energy needs of an ever-increasing population growth and socio-economic activities.

As showed earlier, sustainable development as a principle has been harnessed in the whole world, and it works hand in hand with three pillars that is; sustainable business, environmental sustainability andintergenerational equity (WCED, 1987).With time, these pillars kept on developing and there arose need for enthusiastic development hence enhancement of clean technologies like renewable energy which if well-developed will bring about probable SD through promoting and successfully implementing the three pillars.

4.2 Renewable Energy Policies

The Government of Uganda's Policy Vision for Renewable Energy is: *To make modern renewable energy a substantial part of the national energy consumption*[135].

The Overall Policy Goal is: *To increase the use of modern renewable energy, from the current 4% to 61% of the total energy consumption by the year 2017*[136]

The Renewable Energy Policy follows the commitment in the National Energy Policy 2002 to develop the use of renewable energy resources in Uganda. The Government's overarching policy vision for renewable energy is to make modern renewable energy a substantial part of national energy consumption, where modern renewable energy is understood to mean renewable energy resources that are transformed into modern energy services like electricity.

To achieve its goal, a number of supporting objectives are identified. These include: maintaining and improving the responsiveness of the legal and institutional framework to promote renewable energy investments; establishing an financing and fiscal policy framework for investments in renewable energy; increasing public awareness in renewable energy and promoting investment in this area; promoting research and development as well as international co-operation in renewable energy technologies (RETs); utilizing biomass energy efficiently and sustainably; and promoting the conversion of municipal and industrial waste to energy.

Various strategies and policy actions are elaborated in order to achieve these objectives. A power generation programme will support public and private sector investments in renewable energy, focusing on large hydropower schemes (hydropower being the most well developed RET) as

[135]renewable policy for uganda, 2007
[136]ibid

well as small and more diverse schemes. A rural and urban-poor electricity access programme will support the development of RETs in dispersed and remote settlements. A modern energy services programme will support RETs such as solar PV and solar water heaters, a bio fuels programme will support improvements in bio fuel technology, and a waste for energy programmes will support the conversion of waste to energy. An energy efficiency programmes will implement the Uganda Energy Efficiency Strategy.

The responsibility for the policy lies with the Ministry of Energy and Mineral Development and a Renewable Energy Department is to be developed within the Ministry. Moreover, a special financial mechanism, a credit support facility known as the Uganda Energy Capitalization Trust, is instituted to help realise the policy. The ultimate goal of the Renewable Energy Policy is to increase the use of modern renewable energy, from the current 4% to 61% of the total energy consumption by the year 2017.

The 2007-2017 Renewable Energy Policy (REP) aims to increase the share of renewable energy from 4% to 61% of national energy consumption by 2017[137].In order to facilitate reaching this goal, REP established appropriate fiscal and financial tools to attract investments and inserted renewable electricity access targets in gender and pro-poor policies. The policy also creates tools to disseminate information on sustainable biomass management and waste-to-energy conversion, encourages research and development on the benefits and opportunities of RE, and advocates bio fuels as a substitute to fossil fuels. Moreover, the REP exempts all renewable energy equipment from any tax levies.

Uganda has considerable renewable energy resources for energy production and the provision of energy services[138], yet they remain unexploited, largely due to the perceived technical and financial risks. These resources include: biomass, geothermal, large scale hydro, mini/micro/pico hydro, wind and solar energy. However, with the exception of biomass, whose contribution is very significant, the remaining renewable sources (including large hydrous), contribute about 5% of the country's total energy consumption.

[137]ministry of energy and mineral development (memd): http://www.rea.or.ug/index.php/policies-and-legislation
[138]renewable policy for uganda, 2007

This limits the scope and productivity of economic activities that can be undertaken in any part of the country. Thus it is imperative that the use of these abundant resources should be enhanced. Recently completed studies gave the potential as indicated below. The Renewable Energy Power Potential[139]:-

Table 2.1: Uganda's Renewable Power Potential

Energy Source	**Estimated Electrical Potential (MW)**
Hydro	2,000
Mini-hydro	200
Solar	200
Biomass	1,650
Geothermal	450
Peat	800
Wind	-
TOTAL	5,300

Source: Alternative Energy Sources Assessment Report, 2004.

To achieve above targets, the REP first supports large-scale hydro projects, through the implementation of Public Private Partnerships and the negotiation of project-by-project energy purchasing tariffs. It further created a Ugandan Feed-In-tariff[140] to support small-scale renewable projects and local Individual Power Producers. To further attract private investors, the government will secure stable Standardized Power Purchase Agreements.

The Government of Uganda has formulated Electricity Connection Policy (ECP) for a period of 10 years starting from 2018 to 2027. The primary objective of the policy is to increase electricity

[139]alternative energy sources assessment report, 2004, national biomass assessment study2003

[140]electricity regulatory authority: uganda renewable energy feed-in tariff (refit) phase 2 guidelines. Accessed 23rd December 2021

access and provide cleaner energy for Ugandans. The policy aims at addressing the major obstacles that hinders increasing electricity access in Uganda. Electricity access targets as spelt out in the government major development plans are to be achieved under the ECP. The ECP will initially aim at achieving the 26% rural access target by 2022 as set out in the Second Rural Electrification Strategy and Plan (RESP II) with 30% national coverage target by 2020 set out in the Second National Development Plan (NDP II). The ECP will also aim at accelerating access after 2020 in order to achieve 60% access rate by the year 2027, after which it will be revised to enable achievement of the 80% Vision 2040 connection target and thereafter universal coverage[141]. The 60% target is a minimum and may be surpassed as more funding becomes available. The policy has taken into consideration customers to be connected on the grid and off the grid. On the grid connection target is 67% and 33% shall be off grid in line with projections under the Sustainable Energy for All Action Agenda.

Although Government of Uganda has put in place plans and implemented several electricity access programmes, the level of electricity access in Uganda still remains low at 20% nationwide and only 10% in the rural areas for all forms of energy. The Uganda National Housing and Population Census 2014, estimates that 85% of the population in Uganda live in rural areas and are engaged in subsistence economic activities with negligible value addition partly due to unavailability of electricity connection

4.3 Renewable Energy Law

Renewable energy law is a particular kind of energy law, and relates primarily to the transactional legal and policy issues that surround the development, implementation, and commercialization of renewable source of energy, such as solar, wind, geothermal and tidal. Renewable energy, (RE) law also relates to the land use, silting, and finance issues encountered by developers of renewable energy projects.

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[141]ministry of energy and mineral development (2018 – 2027): *electricity connection policy- financing and implementation for connections*. period 2018 – 2027

Renewable energy law also relates to the land use, silting, and finance issues encountered by developers of renewable energy projects .Renewable energy law also encompasses policies that relate to renewable energy and legislative instruments that further encourage its growth.

One such form of legislation is feed-in tariffs, which provide economic incentives to the developers of renewable energy projects by setting a fixed price for the sale of energy produced from renewable sources. Feed-in tariff laws also provide financial certainty, are more cost effective and less bureaucratic than other support schemes such as investment or production tax credits, quota based renewable portfolio standards (RPS), and auction mechanisms[142]. In addition, the feed-in tariff generates more competition, more jobs, and more rapid deployment for manufacturing; it also does not pick technological winners, for instance between more mature wind power technology versus solar photovoltaic technology[143].

Renewable Portfolio Standards is the type of law is in force in 37 of the States within the United States, as well as Australia and a minority of European nations. It works by fixing the quantity of renewable electricity that must be produced, and leaving it to the market at what price this extra renewable electricity will be produced. This form of legislation typically employs a trade able certificates mechanism, where 1 Megawatt Hour of electricity is equivalent to 1 renewable energy certificate.

The Role of the Sector Regulator is specified in the enabling legislation. For example, regulatory oversight of feed-in tariff programs is essential, whether the price is based on a predetermined number (and with some maximum capacity), an auction/bidding process, or avoided cost. In each case, the regulator monitors activities to ensure abuses do not arise. How external (environmental and health) costs are factored into program evaluation is partly dependent on the enabling legislation (or executive order). If the law establishes Renewable Portfolio Standards, the energy regulator will need to oversee the system and evaluate its effectiveness in meeting RE objectives. Generally, some other agency is responsible for certifying the generators and handling the certification system.

[142]butler &neuhoff, *"competitive auction mechanisms for the promotion renewable energy technologies: the case of the 50 mw photovoltaics projects in cyprus". angelikikylili, paris a. fokaides (2008)*
[143]morris, *renewable and sustainable energy review **42** 2007 pp.226–233. <doi:10.1016/j.rser.2014.10.022 accessed 30 December 2021*

The sector regulator has a number of roles and responsibilities for operationalizing and implementing RE. The policy instruments include those oriented towards prices and quantities. The former (such as Feed-in Tariffs) provide the supplier with certainty regarding price, but the volume depends on whether that price is high or relatively low. The latter includes renewable portfolio standards that require distribution companies to purchase specific quantities of electricity generated by renewable technologies.

In addition, the sector regulator is in a position to give advice to the government regarding the full implications of focusing on climate change or energy security. Policymakers, however, may choose to delegate these decisions, or a subset of them, to regulators; on the other hand, they may choose to remain silent on such issues. In the former case, of course, regulators have the power to exercise their discretion. In the latter case, the scope of regulatory discretion depends on what the legal system provides. In either case, the internal practices followed by the regulator need to provide legitimacy for regulatory rulings related to RE. Such practices include transparency and evidence-based decision-making.

Electricity access is crucial for the social and economic development of Uganda. To improve the performance of the electricity sector, the electricity reforms were introduced. As a result the Electricity Act[144] was enacted to liberalize and regulate the electricity sector, and to provide for rural electrification.

It is now several years since Uganda's electricity industry was liberalised. The industry which since Uganda's independence had been run under the monopoly of a statutory corporation, the Uganda Electricity Board (UEB) saw the passing of the Electricity Act Cap 149 in 1999, which provided the framework pursuant to which energy ownership was unbundled through the separation of production, transmission and distribution. The move was seen as a vehicle for fostering competition and increased investment in the sector, through greater private sector participation. The Electricity Act established the Electricity Regulatory Authority (ERA) to regulate the generation, transmission, distribution, sale, export and import of electrical energy in Uganda.

[144] Electricity Act, 1999

With the legal framework for unbundling of services in place, UEB's generation assets, in particular the power plant assets at Owen falls dam were privatised in 2003 and a 20 year concession granted to a private entity, Eskom Uganda Limited. This has since been followed by the emergence of several Independent Power Producers (IPPs), who include Bujagali Energy Limited the developer of the first IPP in Uganda (the 250 MW Bujagali dam) and many other IPPs of varying generation capacity.

The unbundled transmission services were taken over by a new government owned company, Uganda Electricity Transmission Company Limited (UETCL), which remains the single operator of the transmission system and the executer of Power Purchase Agreements with power producers, while distribution was subsequently privatised in 2005 under a 20 year concession granted to a private company, Umeme Limited. Umeme Limited has remained the primary electricity distribution company in Uganda and despite being the subject of an on-going parliamentary investigation, was able to issue its IPO on the Uganda Securities Exchange and also cross list in Kenya.

The primary instruments for the regulation of the electricity sector in Uganda include the Electricity Act, the Energy Policy, the National Environment Act and Statutory instruments and Guidelines issued by ERA. The ERA, which is responsible for the regulation of the electricity sector, is established as a body corporate with capability to sue or be sued. It consists of five (5) members appointed by the Minister responsible for electricity with the approval of cabinet.

As part of its mandate, ERA is responsible for the issuance and regulation of compliance with licenses, establishment of a tariff structure, approving rates of charges and terms and conditions of electricity services of transmission and distribution companies. In the conduct of its functions, ERA is charged with the duty to be open, objective, fair, reasonable, non-discriminatory and to promote fair competition.

In accordance with the Electricity Act, the Rural Electrification Fund (REF), the Rural Electrification Board (REB) and Rural Electrification Agency (REA) were established through Statutory Instrument No.75 of 2001 to support rural electrification programmes. The purpose was to address the low level of electricity access in rural areas which was below 1% at that

time[145]. In addition to the reforms, the Government went ahead to formulate policies and strategies with the aim of increasing electricity access in the country.

In 2002 the Government of Uganda put in place the Energy policy for Uganda with the goal of meeting the energy needs of Uganda's population for social and economic development in an environmentally sustainable manner. The National Development Plans (NDP) I (2010- 2015) and II (2015-2020) prioritized investments in energy infrastructure to improve the country's competitiveness and foster accelerated socio-economic transformation. The focus was to increase electricity generation capacity and the national electricity power grid network. In the NDP II period, the sector targets to increase the percentage of the population with access to electricity to 30% and increase electricity consumption per Capita to 578kWh. The target for the Uganda Vision 2040 is to increase electricity access to 80% by 2040[146].

In view of the energy access challenges, the government prepared a Rural Electrification Strategy and Plan (RESP) covering the period 2013 to 2022 to guide the implementation of rural electrification programme in the country. The primary objective of RESP (2013- 2022) is to achieve an accelerated pace of electricity access and service penetration to meet national development goals during the planning period and beyond.

Although Government of Uganda has put in place plans and implemented several electricity access programmes, the level of electricity access in Uganda is still very low at about 20% nationwide and 10% in the rural areas for all forms of energy[147]. The emphasis of Government of Uganda has been on grid extension on the assumption that once the electricity lines are in place, potential customers would apply and get connected. The major bottlenecks to increasing access to electricity have been identified as high connection charges, high house wiring costs, and lack of incentives for service providers to make timely and cost affordable connections. But 85% of Uganda's population lives in rural communities[148] which are inaccessible by the national grid. Hence off grid systems have to be encouraged to give rural access to electricity. Without

[145]ministry of energy and mineral development (2018 – 2027): *electricity connection policy- financing and implementation for connections*. period 2018 – 2027.
[146]ministry of energy and mineral development (2018 – 2027): *electricity connection policy- financing and implementation for connections*. period 2018 – 2027.
[147] ibid
[148]uganda national housing and population census- 2014

government intervention to support connections, it is likely that the connectivity level will remain low and access targets under the government development plans will not be achieved.

4.4 Renewable Energy Support Laws

Renewable energy law also encompasses policies that relate to renewable energy and legislative instruments that further encourage its growth.

Feed-in-Tariffs

One such form of legislation is feed – in tariffs (FIT), which provide economic incentives to the developers of renewable energy projects by setting a fixed price for the sale of energy produced from renewable sources[149]. Feed-in tariff laws also provide financial certainty, are more cost effective and less bureaucratic than other support schemes such as investment or production tax credits, quota based renewable portfolio standards (RPS), and auction mechanisms. In addition, the feed-in tariff generates more competition, more jobs, and more rapid deployment for manufacturing; it also does not pick technological winners, for instance between more mature wind power technology versus solar photovoltaic (PV) technology.

Renewable Portfolio Standards

This type of law is in force in 37 of the States within the United States, as well as Australia and a minority of European nations. It works by fixing the quantity of renewable electricity that must be produced, and leaving it to the market at what price this extra renewable electricity will be produced. This form of legislation typically employs a trade-able certificates mechanism, where 1 Megawatt Hour of electricity is equivalent to 1 renewable energy certificate.

[149]uganda renewable energy feed-in tariff (refit) phase 2guidelines: revised 15th november 2012

Auctions and Tenders

This form of renewable energy incentive is established by legislation and regulations and is increasingly popular throughout the world as a policy choice for governments. The details of the auction need to be carefully designed to prevent sub-optimal outcomes.

4.5 Renewable Energy Law, Policy and Trade Regime: Challenges towards a Greener Economy

Renewable Energy Expansion is considered internationally as a key for tackling climate change and greening economy and development[150]. Rio+20 Outcome on "The Future we want" under the section on energy recognize that improving energy efficiency, increasing the share of renewable energy and cleaner and energy-efficient technologies are important for sustainable development, including in addressing climate change (para.128).Launching of the initiative by the Secretary-General on Sustainable Energy for All (SE4A), which focuses on access to energy, energy efficiency and renewable energies was a commendable effort. The Rio+20 Outcome made a declaration that they were all determined to act to make sustainable energy for all a reality and, through this, help to eradicate poverty and lead to sustainable development and global prosperity (para.129). There are possible conflicts between measures to enhance renewable energy and trade regimes: Ontario FIT case

Sustainable Development Goal (SDG) 7 strives to ensure access to affordable, reliable, sustainable and modern energy for all. In this effort it targets to ensure universal access to affordable, reliable and modern energy services, increase substantially the share of renewable energy in the global energy mix and double the global rate of improvement in energy efficiency by 2030. By 2030 to enhance international cooperation to facilitate access to clean energy research and technology, including renewable energy, energy efficiency and advanced and cleaner fossil-fuel technology, and promote investment in energy infrastructure and clean energy technology as well as expand infrastructure and upgrade technology for supplying modern and

[150]yukari takamura (2015): renewable energy law and policy and trade regime: challenges towards a greener economy; nagoya university; e-mail: takamura.yukari@g.mbox.nagoya-u.ac.jp
unep seminar on legal foundation on environmental sustainability; july 14, 2015

sustainable energy services for all in developing countries, in particular least developed countries and small island developing States.

Enhancing renewable energy has multiple benefits from local to global level including tackling climate change, enhancing self sufficiency of energy, reducing payment for fossil fuels from oversee, ensuring international competitiveness, creating employments, revitalizing rural areas and ensuring energy in case of disaster among others. Scenarios reaching atmospheric concentration levels of about 450 ppm CO_2eq. by 2100 (consistent with a likely chance to keep temperature change below 2°C relative to pre-industrial levels) are characterized by lower global GHG emissions in 2050 than in 2010, 40% to 70% lower globally, and emissions levels near zero GtCO_2eq. or below in 2100. At the global level, scenarios reaching 450 ppm CO_2eq. are also characterized by more rapid improvements of energy efficiency, a tripling to nearly a quadrupling of the share of zero-and low-carbon energy supply from renewables, nuclear energy and fossil energy with carbon dioxide capture and storage (CCS), or bioenergy with CCS (BECCS) by 2050. These scenarios describe a wide range of changes in land use.

However there are a number of cases related to renewable energy before WTO. Reflecting expanding market of renewable, increasing number of requests for consultation relating to renewable energy related measures has been brought before the WTO dispute settlement body. These include:-

- Canada – Renewable Energy case, brought by Japan (2010) (DS412) and EU (2011) (DS426): Ontario FIT case[151]. Feed-in Tariff (FIT) Scheme is a policy tool characterized by a couple of key elements including guaranteed purchase price for electricity with long-term contracts and guaranteed grid access. The province of Ontario introduced a FIT program under its Green Energy and Green Economy Act (2009) with the aim of eliminating coal-fired power generators through increasing renewable energy and creating jobs. In order to be eligible, the FIT program requires use of equipment of renewable energy generation facilities supplied from Ontario in specified amounts or proportions (Minimum Domestic Content level; “made in Ontario” provision).

[151] ibid

- Panel report circulated on 19 December 2012 and Appellate Body (AB) Report on 6 May 2013[152].
- China – Measures concerning wind power equipment, brought by the US (2011)(DS419)[153]
- EU and certain member states - Certain Measures Affecting the Renewable Energy Generation Sector, brought by China (2012) (DS452)[154]
- India – Certain Measures Relating to Solar Cells and Solar Modules, brought by the US (2013) (DS456)[155]
- United States — Countervailing Duty Measures on Certain Products from China (Complainant: China)[156]（2012）（DS437）
- EU — Certain Measures on the Importation and Marketing of Biodiesel and Measures Supporting the Biodiesel Industry (Complainant: Argentina)[157]（2013）（DS459）

4.6 Climate Change and Renewable Energy

Greenhouse gases (GHG), including CO_2 emissions are associated with the conventional provision of energy services and are a major cause of climate change[158]. Globally, coal is the second largest primary energy source used worldwide (preceded by oil), and the first source for power generation. In terms of electricity generation or supply, South Africa is highly dependent on coal-fired power plants and therefore energy supply is carbon dioxide-intensive. Studies conducted on coal usage indicated that household coal burning contributed the largest percentage followed by industrial and commercial usage. Based on 2008 fossil-fuel CO_2 emissions, South Africa was rated the 13th largest emitting country in the world and the largest emitting country on the continent of Africa.

Monitoring and reporting of GHG emissions is done by defining the specific carbon footprint, expressed in carbon dioxide equivalent (CO_2 eq.) of an activity, site or operation. GHG emissions

[152] ibid
[153] ibid
[154] ibid
[155] ibid
[156] ibid
[157] ibid
[158]department of environmental affairs (2015): eia guideline for renewable energy projects. department of environmental affairs, pretoria, south africapp 25

reporting is not currently mandatory in South Africa, however, industry and regulators broadly anticipate increasing implementation of regional and international carbon reporting and reduction requirements through various means, including mandatory reporting, carbon pricing, caps, taxes and trading. A growing number of energy producers today anticipate a future regulatory mandate for GHG emissions reporting by participating in voluntary corporate reporting. Many companies and cities participate in the voluntary reporting initiative, the not-for-profit Carbon Disclosure Project (CDP), the only global system to measure, disclose, manage and share vital environmental information. The CDP holds the largest collection of primary climate change, water and forest-risk information in the world, and use this information to assist industries and governments to collaboratively manage environmental risk (www.cdproject.net). This risk can be managed in part by increasing renewable energy sources, and reducing reliance on carbon-intensive energy provision services.

Renewable energy sources play a role in providing energy services in a sustainable manner, and in particular in mitigating climate change. Eskom, South Africa and Uganda's largest energy generating services has a comprehensive climate change strategy which is based on six pillars[159]: Diversification of the generation mix to lower carbon emitting technologies; Energy efficiency measures to reduce demand and greenhouse gas and other emissions; Adaptation to the negative impacts of climate change; Innovation through research, demonstration and development; Investment through carbon market mechanisms; and Progress through advocacy, partnerships and collaboration

Increasing the share of renewable in the energy industry is an effective way of making our energy supply more environmentally friendly, diversifying energy sources, reducing the effects of climate change as well as contributing to sustainable development.

4.7 Sustainable Development

Sustainable energy[160] can be defined as energy which provides affordable, accessible and reliable energy services that meet economic, social and environmental needs within the overall developmental context of society, while recognising equitable distribution in meeting those

[159]department of environmental affairs (2015): eia guideline for renewable energy projects. department of environmental affairs, pretoria, south africa pg. 27
[160] ibid

needs. Sustainable energy is an element of sustainable development which is defined as development that meets the present needs and goals of the population without compromising the ability of future generations to meet theirs. On the overall sustainable development is underpinned by economic development (growth efficiency), social development (culture, heritage, poverty, and empowerment) and environmental development (pollution and natural resources).

Renewable energy is considered as a contribution to sustainable development[161]. Most renewable energy sources are indigenous and naturally available, and the use of renewable therefore strengthens energy security because it is not subject to disruption by international crisis. Fuel wood, charcoal, coal and kerosene (paraffin) in the rural and peril-urban South Africa is the primary source of energy for cooking and heating. Sustainable development implies replacing firewood and charcoal with more modern energy sources, while at the same time introducing technological innovations to improve the efficiency and environmental problems associated with coal and kerosene. Sustainable development also implies the provision of electricity and other modern fuels to the commercial and industrial sectors to promote their economic competitiveness and future prosperity.

The United Nations Conference on Sustainable Development[162] - or Rio+20 - took place in Rio de Janeiro, Brazil on 20-22 June 2012. It resulted in a focused political outcome document which contains clear and practical measures for implementing sustainable development. In Rio, Member States decided to launch a process to develop a set of Sustainable Development Goals (SDGs), which will build upon the Millennium Development Goals and converge with the post 2015 development agenda

Sector Regulation

The Role of the Sector Regulator is specified in the enabling legislation. For example, regulatory oversight of feed-in tariff (TIF) programs is essential, whether the price is based on a predetermined number (and with some maximum capacity), an auction/bidding process, or

[161]united nations conference on sustainable development, rio+20; rio de janeiro, brazil, 20-22 june 2012; a/conf.216/16 - report of the united nations conference on sustainable developmentrio+20 conference website

[162] ibid

avoided cost. In each case, the regulator monitors activities to ensure abuses do not arise. How external (environmental and health) costs are factored into program evaluation is partly dependent on the enabling legislation (or executive order). If the law establishes Renewable Portfolio Standards, the energy regulator will need to oversee the system and evaluate its effectiveness in meeting RE objectives. Generally, some other agency is responsible for certifying the generators and handling the certification system.

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In addition, the sector regulator is in a position to give advice to the government regarding the full implications of focusing on climate change or energy security. Policy makers, however, may choose to delegate these decisions, or a subset of them, to regulators; on the other hand, they may choose to remain silent on such issues. In the former case, of course, regulators have the power to exercise their discretion. In the latter case, the scope of regulatory discretion depends on what the legal system provides. In either case, the internal practices followed by the regulator need to provide legitimacy for regulatory rulings related to RE. Such practices include transparency and evidence-based decision-making.

4.8 Renewable Energy laws by Technology

Renewable energy laws can either be 'technology neutral' or provide specific assistance to particular selected groupings of renewable energy technology. Other aspects of land use planning law can have particular application to the implications of particular energy technologies, such as wind power.

4.8.1 Hydroelectric Energy

Small-scale hydropower exploits the potential of falling water, converting it into mechanical power by flowing water through a turbine and generating electrical energy by means of a

generator. A micro-hydropower system is generally classified as having a generating capacity of less than 100kW. A pico-hydropower system is generally classified as a system that has a generating capacity of less than 1kW. Micro-hydro systems generally have the following components: A water turbine that converts the energy of flowing or falling water into mechanical energy that drives an electrical generator; A control mechanism to provide stable electrical power; and Electrical transmission lines and grid connection equipment to deliver the power to the user

The potential of hydropower is huge in Uganda. Irrespective of the size of installation, any hydropower development requires authorisation in terms of the National Water Act 2003[163]. Furthermore, pressure regarding the environmental impact and displacement of settlements by large storage dams may limit the exploitation of hydropower on a large scale.

Conventional hydroelectric dams in most countries are highly regulated, with environmental reviews before construction and operational limits afterwards. Operation normally places river conditions before power interest, i.e. power generation may not be needed at night while rivers are kept flowing.

Impact Mitigation of hydroelectric energy

Assuming an IPP project triggers the need for Basic Assessment (BA) or a scoping environmental Impact Assessment (S&EIR) under the EIA regulations, included in the assessment process is the preparation of an environmental management programme (EMPr). Project-specific measures designed to mitigate negative impacts and enhance positive impacts should be informed by good industry practice and are to be included in the EMP. An independent environmental assessment practitioner will be employed by the applicant to prepare the BA, S&EIR, and EMPr to applicable standards. Potential mitigation measures for hydropower energy projects include, but are not limited to: Conduct pre-disturbance surveys as appropriate to assess presence of sensitive areas, fauna, flora and sensitive habitats; Protect wetlands and watercourses as applicable by avoiding or protecting them; Minimise erosion and sediment loading; Minimise stream crossings and reduce stream bank cutting to reduce erosion and reduction in aquatic

[163]ministry of water and environment: sector strategic plan for statistics (mwe-ssps) 2007/2008-2011/12

habitat quality; Develop and implement a spill management plan; Plan re-vegetation with appropriate indigenous plants to prevent erosion introduction of alien species; Trash rack design to minimise entrapment of fish and other aquatic species at intake points; Fence sites as appropriate to ensure safe restricted access; and Ensure adequate continuous bypass flow through natural water channels.

4.8.2 Geothermal Energy

A number of laws, regulations, and Executive Orders apply to geothermal energy development activities. For the most part, laws and regulations do not apply to geothermal energy development on tribal lands

Geothermal energy is one of the possible alternative renewable energy sources in Uganda, which will supplement other sources of energy. Its major advantages are that it is environmentally friendly and multidisciplinary in uses, since it can support various development activities ranging from production to processing of raw materials, like minerals and agricultural produce. Geothermal investigations in Uganda have so far identified three potential areas for detailed exploration[164]. They are all situated in western Uganda, in the western branch of the East African Rift Valley. The three potential areas are Katwe-Kikorongo, Buranga and Kibiro. Based on recent assessments, they have all been ranked as potential targets for geothermal development. The total geothermal energy potential is estimated at 450 MW[165].

Current efforts by Government are focused on developing the above three areas to a prefeasibility stage, which would pave way for availing required data for feasibility study. The pre-feasibility study will involve drilling of deep exploration wells, which will provide information on reservoir temperature, fluid chemistry and other petrophysicalparameters. The current study results indicate that the temperature level varies between 150 C° and 200 C°.

[164]the renewable energy policy for uganda, 2007
[165]ibid

Further studies are being carried out countrywide to generate further potential geothermal sites. These geothermal areas will then be ranked.

4.8.3 Wind Energy

Onshore wind energy technology is the most commonly used and commercially developed renewable energy technology. Wind turbines are used to generate energy and they produce power over a wide range of wind speeds. Essentially, the turbine blades are designed to capture the kinetic energy in wind. When the turbine blades capture wind energy and start moving, they spin a shaft that leads from the hub of the rotor to a generator. The generator turns that rotational energy into electricity.

Wind power generates electricity without releasing toxic pollution or CO_2 emissions. Wind is abundant and inexhaustible. At the same time, however, the construction and operation of wind turbines may possibly lead to unfavourable environmental impacts on biodiversity, land-use and communities in the form of noise and visual impacts. In addition to species disturbance and mortality, the issues of habitat loss and fragmentation needs to be considered for all affected living organisms inclusive of plants, invertebrates and vertebrates including birds and bats. Potential impacts from wind energy installations must therefore be assessed and mitigated when necessary.

The National Environmental Management Act (Act 107 of 1998; as amended) defines environmental impact assessment (EIA) as the procedure which ensures that impacts of projects are identified and assessed before authorisation is considered. The main objective is to avoid or minimise negative effects from the beginning of a project rather than trying to mitigate them later.

Wind speed is moderate in most areas of Uganda[166]. The average wind speeds in low heights (less than 10 m) generally range from 2 m/s to about 4 m/s. In some areas with complex terrain, the wind may speed up due to slopes of hills and escapements and tunnelling effects. Based on wind data collected by the Meteorology Department, it was concluded that the wind energy resource in Uganda, is sufficient for small scale electricity generation and for special applications, such as water pumping mainly in the Karamoja region. More recently, low speed

[166] ibid

turbines have been developed and they have proved effective for power generation. Recent studies also confirm that electricity generation through wind is feasible, especially for small industries or in rural areas where targets for a mill range from 2.5 kV to 10 kV[167].

4.8.4 Solar Energy

South Africa experiences some of the highest levels of solar radiation in the world (between 4.5 and 6.5kWh/m^2) and therefore, possesses considerable solar resource potential for solar water heating applications, solar photovoltaic and concentrated solar power (CSP) generation. The potential uses and applications include: Active solar thermal water heating for domestic, commercial and industrial applications. This is considered a Demand Side Management intervention and is excluded from the scope of this guideline; Electricity (photovoltaic and solar thermal) generation, ranging from small/medium-scale stand-alone applications to large-scale grid-connected applications; and Solar/Heat Pump hybrid systems for water heating, space heating and cooling.

There also exists significant potential for Solar Passive building design practice for residential, commercial and industrial buildings to minimise thermal energy consumed. Furthermore, Solar Cookers have been demonstrated as an alternative to cooking with fuel-wood in rural areas throughout the continent.

Photovoltaic (PV) systems are widely applied in South Africa for powering professional niche applications such as telecommunications, microwave links, navigational aids and meteorology stations, where PV is well established as the best practical option. PV is also applied in small-scale remote power supplies for domestic use, game farms and community water pumping schemes.

PV cells are made from semi-conductor materials that are able to release electrons when exposed to solar radiation by using the photo-electric effect. Electrons from several PV cells are gathered together through conductors to make up the generation capacity of one module and many modules can be connected together to produce power in large quantities. Internationally, PV is the fastest-growing power generation technology and between 2000 and 2009 the installed capacity globally grew on average by 60% per year. Worldwide more than 35GW of PVs are

[167] ibid

installed and operating, and in South Africa as much as 8GW PV could potentially be installed by 2020.

Concentrated solar power (also called concentrating solar power, concentrated solar thermal or CSP) systems use mirrors or lenses to concentrate a large area of sunlight, or solar thermal energy, onto a small area. Electrical power is produced when the concentrated light is converted to heat, which drives a heat engine, usually a steam turbine, connected to an electrical power generator. The minimum Direct Normal Radiation (DNR) to justify a CSP plant is 1 800 kWh/m^2 per year. According to the South African RRDB, the area exceeding the minimum required DNR in South Africa covers approximately 194 000km^2. The 2003 Renewable Energy White Paper calculates that South Africa may have a CSP potential of some 65GW, capable of providing 36 000 GWh/year.

Existing solar data clearly show that the solar energy resource in Uganda is high throughout the year. The mean solar radiation is 5.1 kWh/m^2 per day, on a horizontal surface. This level of insolation is quite favourable, for the application of a number of solar technologies. These include solar water heating and solar photovoltaic systems for supply of basic electricity in rural institutions and households as well as areas not connected to the grid. The total new installed photovoltaic capacity annually is estimated at 200 kWp for households, institutions and commercial use. Solar thermal has a great potential in the form of solar water heaters in electrified areas.

Today electricity is most often used for water heating, in spite of the fact that it will in many cases be cheaper for the consumer to use solar energy. Furthermore, small solar water heaters are relevant for remote areas, where hot water is needed like in rural clinics and tourism areas, to provide a cheap, reliable and environmentally friendly, source of energy.

Solar technology can also be used for power generation; however, the prohibitive costs make it less favourable than other sources of power generation.

Environmental Impacts of Solar energy

The potential environmental impacts associated with solar power (land use and habitat loss, water use, and the use of hazardous materials in manufacturing) vary greatly depending on the technology to be used. In broad terms the range of potential impacts could include:

- Land use: Depending on their location, larger utility-scale solar facilities can raise concerns about land degradation and habitat loss. Total land area requirements estimates for utility-scale PV systems range from 1.5 to 4 hectors per megawatt, while estimates for CSP facilities are between 0.65 and 2.7 ha per megawatt[168];

- Water use: Solar PV cells do not use water for generating electricity. However, as in all manufacturing processes, some water is used to manufacture solar PV components. CSP in common with all thermal electric plants, require water for cooling. Water use depends on the plant design, plant location, and the type of cooling system;

- Hazardous materials: The PV cell manufacturing process includes a number of hazardous materials, most of which are used to clean and purify the semiconductor surface. These chemicals (similar to those used in the general semiconductor industry) include hydrochloric acid, sulphuric acid, nitric acid, hydrogen fluoride, trichloroethane, and acetone. The amount and type of chemicals used depends on the type of cell, the amount of cleaning that is needed, and the size of silicon wafer[169] and

- Other impacts in terms of noise, visual issues, electromagnetic and aircraft interference.

4.8.5 Residual Biomass & Bio fuels

Residual biomass energy is generally derived from renewable sources of organic matter and can be used to provide heat, make liquid fuels (Bio-fuels) or to generate electricity. The types of biomass include plants, residues from agriculture or forestry, and organic components in municipal and industrial wastes[170].

Bio-fuels in liquid form are produced from the conversion of biomass and when correctly utilised, can be substituted for fossil-fuel derived fuel oils. Typical applications include transportation use and the generation of power via internal combustion engines. The two most commonly encountered bio-fuels are bio-ethanol and bio-diesel. Bio-ethanol is produced through a fermentation process, whereas bio-diesel is manufactured using the chemical reactions trans-

[168] 3 www.ucsusa.org
[169]department of environmental affairs (2015): eia guideline for renewable energy projects. department of environmental affairs, pretoria, south africa
[170] http://www.altenergy.org/renewables/biomass.html

esterification and esterification. The bio-diesel manufacturing process involves vegetable or animal fats and oils being reacted with short-chain alcohols (typically methanol or ethanol).

Biogases are a sub-category of residual biomass derived from the remains of sorghum and sugarcane, and is proven to be a good renewable alternative for producing electrical power and heat. In South Africa bagasse is extensively used within the sugar-milling industry to generate process power and heat. The mills use the sugar and juices for their products and then retain the crushed stalks which are then stored in wet conditions. Because of the decomposition of the stalks, the pile starts to dry and becomes highly combustible and ready for burning. For every 100 tonnes of sugar cane harvested and milled, 10 tonnes of sugar is produced together with some 28 tonnes of solid waste in the form of bagasse. Typically, the mill uses a portion of the biogases in a low efficiency steam cycle to produce the electricity and steam which it needs for its own use.

With sugar mills currently generating a significant amount of power for own use and even limited export, biogases offers some of the best potential for IPPs in South Africa using renewable resources. It is estimated that an energy conversion rate of 120kWh/ton can be achieved using conventional steam plants running at higher pressures. Using integrated combined cycle combustion technologies the yield per ton of biogases can be increased to 200kWh/ton. Purely through increased efficiency and new technologies the potential of this resource can be increased from the current 210GWh to 1 400GWh per annum[171]

4.8.6 Energy from Waste (Landfill Gas)

As waste in landfills decomposes, different gases are continuously produced in varying proportions. Landfill gas (LFG) comprises approximately 50% CH4, 40% CO2, small quantities of oxygen and nitrogen, and over 100 other trace gases, including CO and H2S. Whilst CO2 is found in much greater quantities in the atmosphere, CH4 is a potent greenhouse gas that is a key contributor to global climate change (over 21 times more potent than CO2). In addition, typical LFG if permitted to accumulate in low lying or enclosed or confined spaces (such as buildings

[171]2003 renewable energy white paper: department of environmental affairs (2015): eia guideline for renewable energy projects. department of environmental affairs, pretoria, south africa

and houses next to a landfill), may produce an atmosphere that is both explosive and hazardous to life.

The extraction of LFG can take place once landfill cells reach capacity, at which point the landfill is covered, extraction equipment and collection pipe networks set in place, and the process of extracting the LFG can begin. In addition, the installation of LFG extraction systems can be incorporated in the landfilling process, enabling the extraction of LFG much earlier and prior to the completion of individual landfill cells. LFG is converted into electricity through the following process: LFG is extracted from the landfill via extraction wells and a centrifugal blower; Gas collection pipes collect and transport the LFG from the wells to an extraction plant; at the extraction plant the LFG is burned. The burning of the CH4 component drives a generator that produces electricity. Any surplus is flared via flare units; and the resulting electricity is then fed into the regional grid.

4.8.7 Biogas

Biogas typically refers to the gas which is produced by the biological breakdown of organic matter. Organic waste-streams such as animal manure and municipal wastewater (sewerage) can be converted into biogas using anaerobic digestion systems. Biogas consists mainly of CH4 and CO2. Biogas can be used as fuel for cooking, lighting, water heating as well as being able to run biogas generators to produce electricity.

In industrialised countries, power generation is the main purpose of biogas plants where the conversion of biogas to electricity has become a standard technology. In most cases, biogas is used as a fuel for combustion engines linked to a standard power generation arrangement. Frequently the waste heat from the engine cooling system is utilised within the digester or another local heat-sink.

For use within gas or diesel engines, biogas must fulfil certain requirements. The methane content should be as high as possible as this is the main combustible part of the gas; The water vapour and CO_2 content should be as low as possible, as they reduce calorific value of the gas; and The sulphur content (mainly in form of H2S) must be low as it is converted to corrosion-causing acids by condensation and combustion. The percentage of hydrogen sulphide content in the biogas can be addressed via a range of gas scrubbing methods.

Impacts Mitigation of biogas energy

Assuming an IPP project triggers the need for Basic Assessment (BA) or a scoping environmental Impact Assessment (S&EIA) under the National Environmental Management Act (NEMA, see section B2), included in the assessment process is the preparation of an environmental management programme (EMPr). Project-specific measures designed to mitigate negative impacts and enhance positive impacts should be informed by good industry practice and are to be included in the EMPr. An independent environmental assessment practitioner will be employed by the applicant to prepare the BA, S&EIR, and EMPr to applicable standards. Potential mitigation measures for LFG and biogas projects include but are not limited to: Conduct pre-disturbance surveys as appropriate to assess presence of sensitive areas, fauna, flora and sensitive, habitats; Protect wetlands and watercourses as applicable; Plan visual and noise impact reduction measures such as natural and engineered screens and buffers; Plan emissions reduction or sequestration as appropriate; Develop and implement waste management plan; Develop and implement spill prevention plan; Develop and implement waste management plan; and Re-vegetation with appropriate indigenous species.

4.8.8 Electrical Energy Demand

In Uganda, like in any other country, the Energy Sector plays a central role in the economy. Energy is the engine for economic growth and development, and a vital input into all the productive and social sectors of the economy. Recent forecasts as contained in the East African Power Master Plan have been updated by UETCL to reflect the actual MW and GWh in generation and have estimated the yearly growth in demand for electricity to be at 7-9 percent which confirms that increased investments in renewable energy projects are required to respond to the growth in demand[172].

4.9 Legal and Policy Framework for Compliance to Environmental Standards during Renewable Energy Production

In addition to the international and regional compliance standards which will be discussed in the later sections of this chapter, the legal regime governing the oil and gas industry in Uganda is

[172]*source: uganda electricity transmission company ltd 2006*

also constituted by locally tailored policy and legislative compliance requirements. The major policy and legislative environmental law compliance requirements were developed after 1994 with the formulation of the National Environment Action Plan. This saw the development of the major National Environment Management Policy and the National Environment Act as Uganda's framework legislation. It is under these that subsequent sartorial policy and legislation have developed. Legislation covered in this chapter includes the Constitution, major oil and gas law and other relevant environmental laws.

Compliance with these policy and legislative aspirations and standards will enable Uganda develop an environmental health and safety sound and sustainable oil and gas sector. This chapter is organized into four sections. The first section discusses the compliance standards under the National Policy Framework for oil and gas, the second section discusses the national legal framework, the third section discusses the international, regional framework and the international financial institutions for the oil and gas industry and the fourth sections analyses the institutional framework for compliance with environmental health and safety standards.

Compliance Standards under the National Legal Framework for Renewable Energy

This section contains the necessary detail of policies and legislation related to the legislative approval process. The legislation covered includes the following:

The Constitution of the Republic of Uganda (1995) (as amended)

The 1995 Constitution of the Republic of Uganda has elaborate provisions regarding environmental management. In the National Objectives and Directive Principles of State Policy, the Constitution requires the Government of Uganda to take measures to protect important natural resources, including land, water, wetlands, minerals, oil, fauna and flora on behalf of the people of Uganda[173]. The government is also required to promote and implement energy policies that will ensure that people's basic needs and those of environmental preservation are met. It is further required to promote the rational use of natural resources so as to safeguard and protect the bio-diversity of Uganda. The Constitution also requires government to promote a good water management system at all levels[174]; promote sustainable development and public awareness of

[173] principle xiii
[174] principle xxi

the need to manage land, air, water resources in a balanced and sustainable manner for the present and future generations and to prevent or minimize damage and destruction to land, air and water resources resulting from pollution or other causes[175].

In the substantive provisions, the Constitution has a specific provision for the right to a clean and healthy environment. Under Article 39, every Ugandan has a right to a clean and healthy environment. This provision is reiterated under section 3 of the National Environment Act Cap 153; and section 5(2) of the National Forestry and Tree Planting Act No. 8 of 2003 which all provide for the right to clean and healthy environment. The breach of the right entitles any person or responsible body to bring an action in furtherance of the right. The Constitution further imposes on the State and the citizens the duty to create and protect a clean and healthy environment[176] which is echoed in the Occupational Health and Safety Act of 2006.

The above provisions imply that a person whose right to clean and healthy environment is violated due to oil exploration and production may take the company responsible or government to court to seek redress[177]. The constitution vests the ownership of all minerals and petroleum in the government which is to hold the same on trust for the people of Uganda. This introduces the public trust doctrine in the management of oil and gas resources[178] and this was courtesy of the Constitutional (Amendment) Act of 2005.

This Amendment Act has significant implications for oil and gas management and control, and sharing of royalties from oil and gas. Part XIII and specifically section 43 amends article 244 of the Constitution by replacement. Accordingly, the entire property in and the control of all minerals and petroleum in, on or under any land or waters in Uganda are vested in the Government on behalf of the Republic of Uganda.

This is however subject to article 26 of the Constitution which emphasizes the need to fairly and adequately compensate surface land owners before the Government can take over the petroleum

[175] principle xxvii
[176] article 17 (i) (j)
[177] in the case of *environmental action network v. british american tobacco,* the applicant brought an application under article 50(2) of the 1995 constitution and rule 3 of the fundamental rights and freedoms (enforcement procedure) rules, for a court order compelling the respondent, a manufacturer of "dangerous products" (cigarettes), to fully and adequately warn consumers of the health risks associated with its products. although the order was ultimately denied, the court did confirm the *locus standi*of the applicant, that article 50(2) enabled individuals to bring public interest matters to court on behalf of those who were not in a position to do so.
[178] article 244

rich lands. Parliament is mandated to make laws regulating the exploitation of minerals and petroleum; the sharing of royalties arising from mineral and petroleum exploitation; the conditions for payment of indemnities arising out of the exploitation of minerals and petroleum and conditions regarding the restoration of derelict lands. Some of the laws hereinafter have therefore been enacted under this amendment.

The provisions on equitable development (Article IX), the stimulation of agricultural and industrial growth (Article XI) and promotion of energy policies for meeting people's energy needs in an environmentally friendly manner (Article XI) provides the necessary mandate in meeting the objectives of the Poverty Eradication Action Plan (PEAP) and, on a larger scale, achieving the Millennium Development Goals now Sustainable Development Goals[179].

The Electricity Act

The Electricity Act[180] sets the legal framework for reforms in the Power Sub-sector and the Rural Electrification Strategy and Plan, the regulatory framework for power generation from small renewable energy sources and the establishment of the Rural Electrification Fund.

The National Environment Act, Cap 153

The National Environment Act (NEA) is Uganda's framework environmental law and its central tenet is sustainable environmental management. It prescribes a set of environmental management principles which include:[181] to assure all people living in the country the fundamental right to an environment adequate for their health and well-being; encourage the maximum participation by the people of Uganda in the development of policies, plans and processes for the management of the environment; use and conserve the environment and natural resources of Uganda equitably and for the benefit of both present and future generations, taking into account the rate of population growth and the productivity of the available resources.

The National Environment Statute (1995), which obligates all energy projects to undergo an Environmental Impact Assessment (EIA) as a condition for licensing or implementation.

[179] the renewable energy policy for uganda, 2007
[180] Electricity Act, 1999
[181] the national environment act, cap 153 laws of uganda, 2000. section 2

Conservation of the cultural heritage and use the environment and natural resources of Uganda for the benefit of both present and future generations; maintain stable functioning relations between the living and nonliving parts of the environment through preserving biological diversity and respecting the principle of optimum sustainable yield in the use of natural resources and reclaim lost ecosystems where possible and reverse the degradation of natural resources.

Further principles include, to establish adequate environmental protection standards and to monitor changes in environmental quality; publish relevant data on environmental quality and resource use; require prior environmental assessments of proposed projects which may significantly affect the environment or use of natural resources; ensure that environmental awareness is treated as an integral part of education at all levels; ensure that the true and total costs of environmental pollution are borne by the polluter; and to promote international cooperation between Uganda and other states in the field of the environment.

It establishes the National Environment Management Authority (NEMA) as a body responsible for coordinating, monitoring and supervising all environmental matters in Uganda[182]. The NEA confers on every person has a right to a healthy environment and obligates every person to maintain and enhance the environment, and where need arises inform the authority or the local environment committee of all activities and phenomena that may affect the environment significantly[183].

In furtherance of the right to a healthy environment and enforcement of the duty to maintain and enhance the environment, the authority or the local environment committee is entitled to bring an action against any other person whose activities or omissions have or are likely to have a significant impact on the environment to prevent, stop or discontinue any act or omission deleterious to the environment; compel any public officer to take measures to prevent or to discontinue any act or omission deleterious to the environment; require that any ongoing activity be subjected to an environmental audit or require that any ongoing activity be subjected to environmental monitoring or request a court order for the taking of other measures that would ensure that the environment does not suffer any significant damage.

[182] ibid sections 4, 5 and 6
[183] section 3

NEMA or the local environment committee proceeding is entitled to bring an action notwithstanding that the person cannot show that the defendant's act or omission has caused or is likely to cause any personal loss or injury. NEMA Approval Process Schematics in general terms include the typical basic assessment and scoping & environmental impact assessment timeframes for one environmental system processes in terms of NEMA. It must be noted that the nature and location of each project will ultimately determine the requirements.

The Act further requires that Environmental Impact Assessment (EIA) be undertaken by a developer where the lead agency, in consultation with the executive director, is of the view that the project may have an impact on the environment; is likely to have a significant impact on the environment; or will have a significant impact on the environment[184].

The NEA prescribes the requirement to observe environmental quality standards. In this vein, it prohibits any person from carrying out any activity which is likely to pollute the air, the water or the land in excess of standards or guidelines prescribed or issued under Act. Thus a person requires a pollution licensee to carry out a polluting activity. A pollution license cannot be issued unless the licensee is capable of compensating the victims of the pollution and cleaning the environment in accordance with the "polluter pays" principle.

NEA requires NEMA to establish standards for air quality,[185] water quality,[186] the discharge of effluent into water,[187] the control of noxious smells,[188] the control of noise, vibration and pollution,[189] soil quality[190] and standards for minimization of radiation[191]. Section 35 prohibits any activity not being a traditional activity, in a wetland without the prior written approval of the Authority given in consultation with the lead agency responsible.

Section 49 of the National Environment Act provides for the protection of natural heritage sites. It provides that NEMA, with the assistance of Local Environment Committees, District

[184] section 19 (3)
[185] ibid section 24
[186] ibid section 25
[187] ibid section 26
[188] ibid section 27
[189] ibid section 28
[190] ibid section 30
[191] ibid section 31

Environment Committees and the lead agency, identify those elements, objects and sites in the natural environment which are of cultural importance to the various peoples of Uganda.

The National Environment Act (Section 19 (1), Chapter 153) provides clear guidelines for project developers as described in the Third Schedule of the Act, to prepare and submit to National Environment Management Authority (NEMA) project briefs (ESIA) with information on potential impacts of the proposed projects on the environment and mitigation measures for the identified impacts.

In this regard, ESIA project brief report is to provide the necessary information on the proposed project to guide NEMA and REA to ensure that the proposed project is considered for approval, and when approved, implemented in an environmentally and socially sound manner, consistent with established environmental regulations and the Environmental and Social Management Plan (ESMP). This ESIA also proposes mitigation measures to enhance positive and reduce negative impacts that have been identified. It must be noted that to avoid significant negative social impacts, the provisions of the ESMP must be fully implemented, especially by the appointed Contractor.

Environmental law[192] touches on practically every facet of society. It seeks to protect human health, manage natural resources and sustain the biosphere. This is frequently done, among other ways, through laws that set standards for environmental planning, wildlife, plant, mineral resources, land use management and other activities that can affect the air, water and soil. Given the wide range of human activities that can impact on the environment, environmental law increasingly utilises everything from tax law (which can provide incentives or disincentives) to criminal law (which punishes individuals or corporate bodies for actions that can harm human health or the environment), to corporate law (which increasingly recognizes the need to respect environmental priorities), to administrative law (setting the ground rules as to how government agencies make and implement decisions). As such, environmental law becomes as much a perspective, as anybody of law.

Religious traditions entail an evolving body of norms that govern most aspects of life. At the same time, different passages in the Bible have been invoked to justify and explain the conquest

[192]by carl bruch and john pendergrass. carl bruch is a staff attorney and director of the africa programme at environmental law institute (eli), washington, usa. john pendergrass is a senior attorney at eli.

of nature[193].The *Shari'ah*- the body of Islamic law- mentions the environment in more than 300 places. Most of these provisions are general, commanding respect for the environment. When combined with Islamic emphasis on cleanliness (and thus constraining pollution), the *Shari'ah* can be a powerful source of norms for environmental protection.

African customary or traditional tribal law frequently governs important natural resources such as water, grazing, timber and minerals. Some tribes seek to protect the quality of their drinking water by prohibiting livestock from the vicinity of wells and other sources of portable water.

The rise of large urban centres saw the development of laws seeking to allow people to live harmoniously in close proximity. Thus, medieval England saw such a development. First, there is considerable judicial unanimity in considering the precautionary principle as of sanitation ordinances for urban areas[194].And legislation requiring chimneys to be built to prevent excessive smoke or threat of fire[195]

Occupational Safety and Health Act (2006)

The Act was intended to consolidate, harmonize and update the law relating to occupational safety and health; repeal the Factories Act Cap.220 and provide for connected matters[196]. The Act makes provisions for the protection of the health, safety and welfare, and provision of appropriate training of persons employed in work places. Section 18 (1) of the Act requires the employer to monitor and control the release of dangerous substances into the environment.

Thus where there is major handling of chemicals or any dangerous substance which is liable to be airborne or to be released into rivers or lakes or soil and which are a danger to the animal and plant life, it shall be the duty of the concerned employer to arrange for equipment and apparatus

[193]genesis chapt. 1, v.27-28 ("so god created man in his own image…. and god said to them, 'be fruitful and multiply, and fill the earth and subdue it; and have domain over the fish of the sea, and over the birds of the air, and over everything that moves above the earth";
[194]robert percival et al., environmental regulation: law science, and policy(1992), 103(citing 12 rich. 2c. 13 of 1338, which prohibited" the throwing of dung, filth, or garbage into ditches, rivers, or the waters near any city or borough or town.").
[195]frank p. grad, environmental law(1971), 1.01; see also d.a.r williams, environmental law in new zealand(1980), 1 (noting that the first smoke abatement law was passed by edward i[of england] in 1273 prohibiting the use of coal as being detrimental to human health".)
[196] long title

to monitor the air, soil, and water pollution and to arrange for the actual monitoring of these mediums, with a view of rendering them safe from the dangerous undertaking.

Subs. (2) states that the records of monitoring in subsection (1) shall be kept and made available to the inspector. These provisions are applicable to all Oil Companies and Mining Companies in respect of Oil and Gas exploration and mining because of the danger they expose to the environment and human safety.

The Water Act

The Water Act is one piece of Uganda's environmental legislation with key provisions to enhance sustainable development of water resources. It provides for the use, protection and management of water use and supply. Most of its provisions have the key objective of protecting the environment and in turn ensuring all water resource-based development is sustainable. Important aspects in the Act include the following-

Rights in water are vested in government*;*

All rights to investigate, control, protect and manage water are vested in the government of Uganda[197].Government is accordingly better placed to ensure that water resources are utilized sustainably.

Planning for water use;

The Act establishes the water policy committee, an inter-sect oral body, charged with coordinating the preparation, revising and keeping up to date the comprehensive action plan for the investigation, controlling protection, management and administration of water resources for the nation. Such planning may specify types of activities, development of works, which may not be done without the prior approval of the policy committee[198].

Control on the use of water resources;

[197] see section 4
[198]see section 15 and 16

The Act provides for the use of permits to use and supply water. A person who needs to construct or operate any water works or for waste discharge[199],needs permission[200].The permit system ensures that use of water resources is environmentally friendly and promotes sustainable development. These controls also ensure that water is not treated as a free good, but as a good with a value to be paid for. This economic valuation of water is an important incentive for its conservation. The Water Act, however, excludes abstraction of small quantities of water from the operation of the water permits.

Water easements;

An easement is the right of a person over the land of another person. Under Water Act, an easement may enable a holder of a water abstraction permit to bring water to or drain water from his land over land owned or occupied by another person. In the same way, an easement may enable a holder of a waste discharge permit to drain waste from his land over the land owned or occupied by another person. The works for which an easement is granted has to be maintained and repaired so as to comply with development that is sustainable.

Control over water works and water use;

An authorized person may enter land for the purposes of inspecting works for the use of water. He may take samples and make tests to find out whether water is being wasted, misused or polluted, or whether the terms of any permit are being met[201].Non-compliance is an offence under the Act. All these aspects of the Water Act have the object of sustainable use of water resources, which runs through the entire Act. Waste, misuse and pollution, which may lead to unsustainable use of water, are prohibited.

The National Environment Management Policy (1994)

The National Environment Management Policy is an output of the National Environment Action Plan (NEAP) process. The overall goal of the policy is to establish sustainable social and economic development, which maintains or enhances environmental quality and resource productivity on a long-term basis that meets the needs of the present generation without

[199]see section 27
[200]see section 17
[201]see section 36.

compromising the ability of the future generation to meet their own needs[202]. Specifically, the policy seeks to meet the following objectives:[203]

To enhance the health and quality of life of all people in Uganda and promote long-term sustainable, socio-economic development through sound environmental and natural resource management and use; integrate environmental concerns in all development policies, planning and activities at national, district and local levels, with full participation of the people; and conserve, preserve and restore ecosystems and maintain ecological processes and life support systems, especially conservation of national biological diversity. This is geared at ensuring that there is adequate environmental health and safety.

The policy also seeks to optimize resource use and achieve a sustainable level of resource consumption; raise public awareness to understand the appreciate linkages between environment and development; and ensure individual and community participation in environmental improvement activities. Underlying these broad policy objectives are certain key principles which guide policy development and implementation strategies:[204]

Every person should have a constitutional right to live in a healthy environment and the obligation to keep the environment clean; the development of Uganda's economy should be based on sustainable natural resource use and sound management; security of land and resource tenure is a fundamental requirement of sustainable natural, resource management; and that the utilization of non-renewable resources should be optimized and where possible their life extended by recycling.

Environmentally friendly, socially acceptable and affordable technologies should be developed and disseminated for efficient use of natural resources; full environmental and social costs or benefits foregone as a result of environmental damage or degradation should be incorporated in public and private sector planning and minimized where possible; priority should be given to establishing a social and economic environment which provides appropriate incentives for sustainable natural resource use and environmental management; and an integrated and multi-

[202] chapter 2 part 2.1 of the policy
[203] part 2.2
[204] part 2.3

sect oral systems approach to resource planning and environmental management should be put in place.

Regular monitoring and accurate assessment of the environment should be carried out and the information widely publicized; increased awareness and understanding of environmental and natural resource issues by Government and the public should be promoted; social equity, particularly when allocating resource use should be promoted; and sub-regional, regional and global environmental interdependence should be recognized.

The Plan for Modernization of Agriculture (PMA), which has one of its main outcomes as "increased access to and use of electricity" to support on-and off- farm economic activities.

The Prosperity for All (BonnaBaggaggawale)Government Policy (2006),which addresses elevating standards of living through developing the economy in areas of micro-finance, marketing, production and processing. In order to achieve this, there is need to also address the energy issue, which is one of the driving forces. Uganda's ratification of the Kyoto Protocol, which provides incentives for investors in renewable energy technologies for the abatement of carbon missions.

4.10 Institutional Framework for enforcing compliance to Environmental law standards during; Renewable energy production

Ministry of Energy and Mineral Development

The Ministry of Energy and Mineral Development (MEMD) is responsible for the Energy and Minerals sector in Uganda. This is the Ministry responsible for management, regulation and development of the renewable energy in Uganda[205]. One of the main functions of the Ministry is to issue operating licenses to companies to enable them carry out exploration and production in renewable energy in Uganda.

These licenses are issued subject to fulfilment of the mandatory requirements as indicated in the Environment Act (Chapter 153) of 2013 for example the Environmental and Social Impact Assessment (ESIA) for the Proposed Construction of Rural Electrification Projects. This plan

[205]http://www.energyandminerals.go.ug/ accessed on 8th/march/2017

must be presented in accordance with other requirements in the Act (Chapter 153) to ensure that there is a plan to deal with the inevitable environmental health and safety impacts that will result from the renewable energy project for example the Government of Uganda is implementing the Energy for Rural Transformation (ERT) Project, which is funded by the World Bank[206].The primary Development Objective of the project is to increase access to energy in the rural areas of Uganda. Much of Uganda's rural population remains severely limited in terms of access to the economy, due to a lack of access to reliable and affordable electricity[207]. Uganda's Vision 2040 policy supports the modernisation of the nation. Such a national development imperative requires increased access to electricity, to stimulate local economic development, across all sectors of the rural economy; resulting in part in improving services provided by health care facilities and schools, as well as stimulating economic growth in rural trading centres (TCs).Environmental Impact Assessment (EIA) procedure ensures that environmental consequences of projects are identified and assessed before authorisation for the project is given[208] (under NEMA Act). NEMA offers schematics guidelines, in general terms, the typical basic assessment and scoping & environmental impact assessment timeframes for one environmental system processes. It must be noted that the nature and location of each project will ultimately determine the ultimate requirements[209].

Ministry of Water and Environment (MWE)

The Ministry of Water and Environment, is a cabinet-level government ministry of Uganda. It is responsible for the "sound management and sustainable utilisation of water and environment resources for the betterment of the population of Uganda". The ministry is headed by Minister Sam Cheptoris. Ministry of Water and Environment is a Government Ministry to ensure provision of quality water and environmental protection services in the country.

[206]environmental and social impact assessment (esia) report: 'project brief' standard of assessment under the national environment act (cap 153) dated july 2018

[207]the message from the recent powergen africa conference held in johannesburg (south africa), is for african nations to look at both 'centralised' and 'decentralised' options to increase access to electricity, with emphasis placed on the fact that access to electricity needs to be radically changed to promote growth and development in africa (engineering news, 20 july 2017).

[208]eia guideline for renewable energy projects– refer to the list of certified and registered environmental practitioners in uganda, 2015

[209] ibid

This Ministry is one of the key social service delivery sectors charged with management and sustainable utilization of water and environment resources for the betterment of the population of Uganda. Ministry of Water as it is commonly known has Directorates that include; Water Resources Management, Water Development, and Environmental Affairs. This Ministry has affiliated institutions like National Water and Sewerage Corporation (NWSC), National Environment Management Authority (NEMA), National Forestry Authority (NFA) to carry out its role.

The role of this Ministry is to oversee a number of areas that include: development of public sanitary facilities, promotion of good practices of hygiene and sanitation in small towns and rural growth centers, water for production both on farm and off farm, water use and management of industries, commerce, wildlife and tourism. Ministry of Water and Environment is mandated to management and sustainable utilization of water and environment resources for the betterment; to improve the quality Water resources for the population; and to ensure better access of water and environment resources in all parts of the country.

Authorities and Agencies

Electricity Regulatory Authority (ERA)

The Electricity Regulatory Authority (ERA) is responsible for reviewing and determining the required connection charges and as well it supervises the quality of connections made by the Electricity Service Providers (ESPs).

Rural Electrification Agency (REA)

The Rural Electrification Agency (REA), with its mandate to plan and implement the national rural electrification programme, acknowledging that 85% of the population which is targeted for electricity connection lives in rural areas. REA is the lead agency for ECP and it is the point of contact for all matters pertaining to the ECP implementation.

National Environmental Management Authority (NEMA)

The National Environmental Management Authority is a tool for monitoring all activities that affect the environment in Uganda provided for in the National Environment Act (NEA). This Act

defines environmental monitoring to mean the continuous determination of actual and potential effects of any activity or phenomenon on the environment, whether short term or long term. The general objective of monitoring is to establish the status of environment and to evaluate the impacts of various activities on the environment in general and natural resources in particular.

The specific objectives are: to understand the present levels of degradation by various agents so as to judge whether the abatement policies, projects and programmes are succeeding; identify environmental risks and impacts not previously known so that they can be brought under control; follow the movement of harmful agents though the environment into living creatures and man himself; and to identify activities that are beneficial to the environment and ensure sustainable use of natural resources.

NEMA is required, in consultation with a lead agency, to monitor all environmental phenomena with a view to making an assessment of any possible changes in the environment and their possible impacts; and the operation of any industry, project or activity with a view to determining its immediate and long-term effects on the environment. For this purpose, an environmental inspector appointed[210] may enter upon any land or premises to monitor the effects upon the environment of any activities carried out on that land or premises[211]. This is to ensure that there is proper use of the environment such that it is not depleted totally because there has to be sustainable development which enables future generations to use the same environment as well.

Non-Governmental Organizations

Nongovernmental organisations such as Advocates Coalition for Development and Environment (ACODE) and TEAN have contributed massively to environmental health and safety standards. ACODE for example is an independent public policy research and advocacy think tank based in Uganda but working in Eastern and Southern Africa. One of the core pillars of ACODE is to transfer evidence based research findings and alternative policy options from research papers and books into civic spaces that generate public debate to promote pro-poor policy making and effective policy implementation.

[210] section 79 nea
[211] section 23 nea

Conclusion

Uganda has certainly come a long way in developing its electricity sector. There is no doubt that with the existence of a robust renewable energy policy 2007 which aims to provide a framework to increase in significant proportions the contribution of renewable energy in the energy mix (from 4%in 2007) and legal framework, opportunities for further development and participation in the electricity industry can only grow, particularly in light of national and regional fast growing energy demands.

CHAPTER FIVE:

5.1 DISCUSSION OF THE FINDINGS AND CONCLUSIONS

Overview

Chapter Five will discuss the results of the analysis and the implications of those results in light of related research. In addition, suggestions for future research will be recommended.

The chapter will focus on the findings, recommendations, conclusions and areas of further study.

It will entail a comparative analysis of renewable energy sectors of countries like China, India and US being the countries with the highest and leading markets for renewable energy

5.2 The Way Forward – Renewable Energy Initiatives

Renewable energy technologies have an important role to play in Africa's energy sector. With the right approach, the renewable energy industry in Africa can become a major player in the energy sector, and meet the energy needs of a significant proportion of the population. Renewable energy technologies can play a major role in national development in terms of job creation and income generation as well as providing an environmentally sound energy service. Aggressive lobbying for renewable at national, regional and sub-regional levels is required.

Renewables can play complementary roles to large-scale conventional energy technologies. For example, RETs can be important alternatives for power generation in many drought-prone countries, when the conventional electricity sector (largely hydro-based) experiences deficits. Geothermal (Kenya) and cogeneration (Mauritius) ably met the energy deficit during the drought periods in Mauritius in 1999 and in Kenya between 1998-2000[212]. During the 2-year drought, the two geothermal power plants at Olkaria, Kenya offered continuous base-load power with almost 100% availability, unaffected by the prevailing weather condition[213]. In Mauritius, energy from sugarcane bagasse increased from 259 GWh in 1998 to 343 GWh in 1999.

The architects of the NEPAD energy program should ensure that the needs of the majority of Africa's population are not forgotten and are assured the requisite level of policy attention and

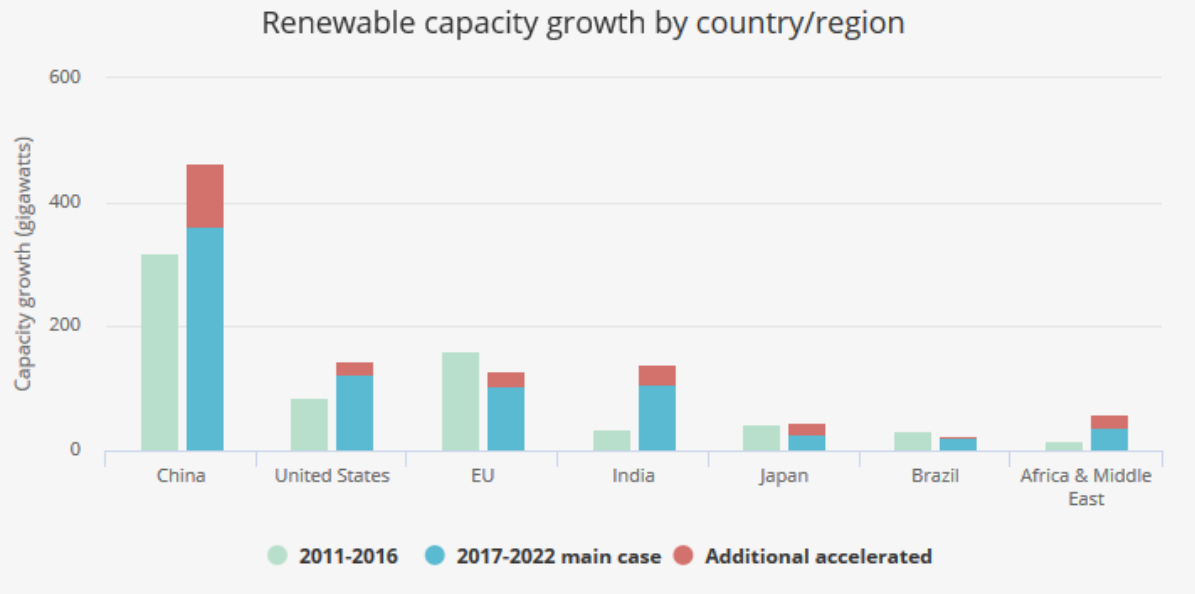
[212] kenya generation 2000

[213]bronicki, l. ormat's (2002): experience in implementing geothermal projects. the example of olkaria iii. ormat international, inc.

eventual program and project finance. Of particular interest to Africa would be renewable energy projects that promote local small and micro-level enterprises as well as provide employment to rapidly growing population of Africa. To ensure that Africa's energy community is able exploit the unique opportunity that NEPAD provides for the development of renewable in Africa, the following multi-pronged strategy is proposed: A near-term fast track program (1-5 years) that would aim to implement low-risk and low-cost near term initiatives; and A long-term track program (5-10 years) that is built around major renewable energy sector initiatives that are currently taking place.

The near-term fast track program would consider implementation of projects that have proven track records and that maximise the use of local resources, expertise and available grant finance. Some of the aforementioned barriers to RETs development could also be addressed in the near term. Typical projects that could be implemented under such a program would include the following: Biomass-based co-generation; geothermal energy; and Small-scale renewable (improved cook stoves and kilns, solar dyers, solar water heaters, wind pumps, small hydro)

The long-term track program would build on successes from the near term fast track program to develop medium and long-term initiatives. It would rely largely on ongoing and planned energy sector reform to establish an enabling environment that would attract both bilateral/multilateral as well as private finance for major investments in both national and regional RETs projects. Examples of such projects include: Large-scale wind power projects; large scale urban waste-to-energy projects; and Long-term capacity building & training, policy and financing programs



It is noteworthy that in India 90% of the growth capacity is in solar PV and wind energies with the world's lowest prices for both technologies. this will be discussed in detail and also in relation to other RE consuming states.

5.3 Discussions of the Findings

I asked one of the legal officers in the Ministry of Energy and Mineral development about government's role and plan in the promotion of renewable energy. This is what he had to say;

'*The Government of Uganda has taken a conscious effort to develop renewable energy resources as an integral part of the country's energy future. The promotion of renewable energy is specifically included in the Government's Rural Electrification Strategy and Plan (RESP) (2001 – 2010) as one of the most important objectives of the strategy. The most vivid step forward has been the inclusion of the development of renewable energy (excluding large hydropower) to increase power generation as a key indicator of achieving rural transformation in the 10-year Energy for Rural Transformation (ERT) Programme*.'

At the headquarters of Umeme , I asked the Senior Project Coordinator for the Energy sector in the ministry about the percentage of electricity distribution in Uganda. He said, '*electrification access in Uganda is still very low, standing at approximately 9% nationally and 3% in rural areas, electrification of most parts of the country through grid extension in the near future is still*

a far cry. It is, therefore, within this context that Government is promoting the decentralized (distributed), off-grid electricity supply model for remote areas. In most of these cases the required electricity needs will be met by the deployment of locally available renewable energy sources of small hydro, solar energy, wind and biomass resources. The focus on decentralized supply systems is also more likely to achieve the objective of equitable regional distribution access to electricity, than if only the grid solution was pursued.

Currently, Uganda is experiencing an unprecedented electricity deficit of about 165 MW, resulting into massive load shedding, due to the prolonged drought, inadequate investment in least cost generation capacity and a relatively high load growth. This has forced the country to resort to the installation of very expensive thermal generation, while awaiting the construction and commissioning of the 600 MW Karuma project. As one of the strategies to bridge the deficit and also for long term diversification of generation sources, Government has decided to accelerate the development of grid connected small renewable energy generation projects to reinforce the grid. This effort is being supported by the establishment of a Standardized Power Purchase Agreement (PPA) and a Feed-in Tariff, which are part of this Renewable Energy Policy framework, to help expedite transactions.

Apart from promoting accelerated power generation from renewable energy, the Energy Policy for Uganda (2002) has, among its objectives, emphasized the development, adoption and utilization of other modern fuels and technologies, including those based on renewable energy sources, in order to achieve the objectives of emission reduction, protection of the environment and energy conservation. Furthermore, the escalating prices of fossil fuels on the world market make it imperative for Government to promote the development and utilization of renewable energy resources and the associated technologies.

I interviewed the Human Resource Manager of Kirchner Solar Energy Uganda Limited about the which other modern fuels Uganda intends to use to promote sustainable renewable energy. He stated '*Apart from using the power generated, Uganda intends to use biomass fuels like ethanol, biodiesel, biogas and methanol; modern biomass technologies like efficient stoves and kilns and solar water heating.*

The Renewable Energy Policy is therefore, an elaboration of how Government will develop the necessary initiatives to create a demand for a wide range of renewable energy services.

The commitment of Government to develop the use of renewable energy sources is clearly aimed at creating the means of socio-economic development, especially by transforming the rural areas. The implementation of the policy's objectives will, therefore positively respond to the various legal and policy instruments and programmes, which Government has put in place to address poverty issues, catalyze industrialization and protect the environment. Apart from the Energy Policy for Uganda, these instruments and programmes include the following:

5.4 To ascertain the responsiveness to the Policies and Legislation to promote renewable energy usage and investment

The Renewable Energy Policy follows the commitment in the National Energy Policy 2002 to develop the use of renewable energy resources in Uganda. The Government's overarching policy vision for renewable energy is to make modern renewable energy a substantial part of national energy consumption, where modern renewable energy is understood to mean renewable energy resources that are transformed into modern energy services like electricity

5.41Greater Electricity Connection

Electricity connection in Uganda has increased in the number of Connected Customers from 103 in 2009 to 3,742 by 31st August 2019[214]. This is only 1.25% of the population of 297,700. The new Electricity Connection Policy (ECP) has commenced and to date there are 204 customers are connected using ECP. PACMECS Ltd, the sole electricity distributor in the district is seeking off grid technologies (mainly PV Solar) to boost customer connections in isolated areas.

Tackling greater electricity connection is equal to tackling poverty eradication in the district. This is because even if electricity is delivered within the household vicinity the household members are unable to connect. Off-grid solutions are emerging as an important driver of rural electricity access[215]. Emerging evidence suggests off-grid solar electricity reaches about 141 million people in rural areas in the developing world, complementing grid electrification. Uptake is highly concentrated in about a dozen pioneering countries. However affordability remains a

[214]chairman board of directors of pacmecs ltd to the annual general meeting (agm) of 31st august 2019
[215]2018 hlpf review of sdg implementation: sdg 7- ensure access to affordable, reliable, sustainable and modern energy for all

key concern[216]. Estimates suggest that, even in countries with universal access, affordability concerns affect about 30 per cent of the population; in countries working toward universal access, affordability affects 57 per cent of those who already have access.

Electricity access in Uganda still remains low at about 20%[217] for all forms of energy. This very low level of access is an impediment to achieving social and economic transformation of the country. I interrogated the Managing Director of EleQtec Technical Services Limited about the reasons as to why most Ugandans do not have electricity.

He said, '*the major obstacles to electricity access have been identified as high connection charges and yet Ugandans are poor, high house wiring costs and this has been worsened by closure of businesses during the lockdown. There is also a problem with service providers, they lack incentives to make timely and cost affordable connections. Another problem is that Previous policies and strategies adopted by the government majorly focused on putting in place the back bone infrastructure and developing the backbone of Uganda's economy which is agriculture while electricity connections have remained unsupported.'*

The primary objective of the electricity connection policy (ECP) is to increase electricity access and provide cleaner energy for Ugandans. The policy addresses the major obstacles that have hindered increasing electricity access in Uganda.

Electricity access targets, as spelt out in the Government major development plans, are to be achieved under the ECP which initially aims at achieving the 26% rural access target by 2022 as set out in the Second Rural Electrification Strategy and Plan, 30% national coverage target by 2020 as set out in the Second National Development Plan/ the ECP will also aim at accelerating access after 2020 in order to achieve 60% access rate by the year 2027, after which it will be revised to enable achievement of the 80% Vision 2040 connection target and, thereafter, universal coverage. The 60% target is the minimum and may be surpassed as more funding becomes available[218].

[216] ibid
[217] 2016 statistical abstract by ubos
[218]electricity connection policy: financing and implementation for connections, period 2018 – 2027. ministry of energy and mineral development

5.42 Increased Household Income

Access to electricity has been identified as one of the key drivers to social and economic transformation in Uganda. Electricity is a modern form of energy that has a direct effect on agriculture and economic productivity, opportunities for income generation, and more generally the ability to improve living conditions[219].

The 2016 Statistical Abstract o Uganda indicates that only 5% of the rural households are connected to grid electricity, and when all other forms of modern energy are included, electricity connectivity by rural households is only 10.3% which is far below the Sub-Saharan average of 29%. The Uganda National Housing and Population Census 2014 estimates that 85% of the population in Uganda live in rural areas and are engaged in substance economic activities with negligible value addition partly due to unavailability of electricity connection

5.43 Increased Electricity Demand

The Electricity Cooperative Society (PACMECS Ltd) has been licensed by government to operate in the Northern Service Territory (NST)[220] consisting of the districts of Aim, Agago, Kaabong, Kit gum, Kotido, Lamwo, Omoro and Pader and some portions of Lira. The 33 kV Lira – Kit gum feeder is the main source of power to the NST. As the area grows in development this needs to be upgraded to possibly 66 kV.

As a vote of confidence in PACMECS' capability in running the business, the Government of Uganda, through Rural Electrification Agency will soon hand new lines to PACMECS Ltd for management. Expected new lines are Kaabong and Kotido networks are about to be commissioned and handed over to PACMECS:td including Namukora – Kotido - Kaabong – Karenga lines.

New networks under the NST densification programme are Kona Paculu- Omot; Kalongo- Wol; Kalongo- Paimo- Omiya- Pachwa- Namokora; Kalongo- Lira Kato- Adilang[221]. This grid densification will enhance extensions of Medium Voltage (MV) lines and LV of three phase and single phase lines. A number of transformers shall be installed. The boundary metering point of Apala-Adwari - Kiru feeder have been operational zed with the help of REA it is feeding Lotukei

[219] ibid
[220]ibid
[221] ibid

- Morulem line up to Abim town; that in turn is a ring circuit access to the Kilak - Abim feeder in cases of outages from either feeder.

5.44 Social and Economic Development

Government has been implementing electricity access projects in rural Uganda. Through the implementation of these projects, it has been observed that electricity is one of major drivers of social and economic transformation[222]. Information documented under previously implemented projects shows great improvement in standards of living of the beneficiaries. Consumers have gone on to use the electricity for entertainment, refrigeration, phone charging, ironing, reading and to power their businesses, among others.

I asked the Company manager of SNAVE Agencies Limited, about their future goals for the energy Sector. *He said that the Economic and environmental benefits will be many. An average new connection of 300,000 annually will translate to US$950 million in ten years[223] as a additional revenue for the electricity service providers (ESP) hence contributing to increasing their sustainability and viability. Additionally energy consumption will increase as a result of connecting more consumers. This is expected to rise when consumers engage in productive use of energy and as well the connection of bigger industries that will result*.

The social benefits include increased personal security as a result of provision of outside lighting, increased average reading time for students and pupils which will eventually contribute to their improved academic performance. Another key social benefit is the improved delivery of health services due to the ability to power medical equipment, provision of better lighting for health centres and refrigeration of vaccines.

Poor access to energy in developing countries slows the growth of GDP. Research has shown that, for example, the under-performance of Africa's power infrastructure has restricted economic growth, reducing per capita GDP growth by 0.11 per cent per year for the continent as a whole, and by as much as 0.2 per cent in Southern Africa[224]. This is a barrier to growth for businesses in these markets as well.

[222] rea access reports 2018

[223] electricity connection policy: financing and implementation for connections; period 2018 – 2027; ministry of energy and mineral development

[224]foster, v., &briceño-garmendia, c. (2013): africa's infrastructure a time for transformation, 2013 http://bit.ly/1tkyo6n

A number of companies are taking part in public-private projects to improve energy access, one example being "Power Africa", where the governments of Ghana, Tanzania, Kenya, Uganda, Nigeria, Ethiopia and Liberia and a group of private sector firms are taking part in an initiative to improve access to clean, reliable power in Africa, and ultimately deliver electricity to more than 20 million new households and companies by 2018[225]. South Africa occupies a central position in the global debate regarding the most effective policy instruments to accelerate and sustain private investment in renewable energy. In 2009, the government began exploring feed-in tariffs (FITs) for renewable energy, but these were later rejected in favour of competitive tenders. The resulting program, now known as the Renewable Energy Independent Power Producer Procurement Program (REIPPPP), has successfully channelled substantial private sector expertise and investment into grid-connected renewable energy in South Africa at competitive prices[226].

5.45 The global challenge

The UN sees transitioning to clean, sustainable energy as fundamental to continued human prosperity over the coming century[227]. And yet, 1 in 5 people lack access to modern electricity, while 3 billion people still use kerosene, wood, coal, or even dung for cooking and heating[228]. The poorest in the world are the least likely to have access to a source of power, and are much more likely to remain poor as long as they are not connected[229].

It's not simply a question of access, it's about ensuring the quality, reliability, safety and affordability of the energy services that power homes and essential community services, such as schools and clinics, as well as economic activity[230]. The productive use of renewable energy in rural areas can often reduce the absolute costs for energy consumed[231], and help to raise incomes

[225]standard chartered press release, 30/07/14 http://bit.ly/1yv2gfk
[226]eberhard, kolker and leigland (2014): south africa's renewable energy ipp procurement program: success factors and lessons, may 2014 http://www.gsb.uct.ac.za/files/ppiafreport.pdf
[227]united nations sustainable development, goal 7: ensure access to affordable, reliable, sustainable and modern energy for all webpage http://www.un.org/ sustainable development/energy/page/3/
[228]ibid
[229]indrawati, s. (2015): what you need to know about energy and poverty, world bank blog, 2015 http://blogs.worldbank.org/voices/what-you-need-know-aboutenergy-and-poverty
[230]cafod, measuring what matters in the energy sdg, 2015 http://bit.ly/1qiiduq
[231]world economic forum and pwc, scaling up energy access through cross-sector partnerships, 2013 http://pwc.to/1pk8mxl

and improve health, providing power to pump water for irrigation, to process crops and power cottage industries, whilst at the same time reduce deforestation from logging for firewood.

People across the world are impacted by the effects of climate change, and it's the production and use of energy that makes up two-thirds of all GHG emissions. Furthermore, by 2030 global demand for energy is expected to rise by 20–35%[232]. Already, global electricity consumption per person has more than doubled since 1970s[233].

I asked one of the top managers in Margic Ugnda Limited about how best we can solve the problem of energy related emissions.
He replied that *in order to address energy-related emissions, we must invest in low carbon technologies and energy efficiency. Ultimately, to fully implement 180 plus national action plans submitted to the UN in 2015 a cumulative investment of $13.5trillion in low carbon technologies and energy efficiency until 2030 is needed. The challenge is huge: to decarbonise the global electricity supply, at least 65% must be generated from renewables by 2050[234]. Investment is also needed to improve the rate of energy efficiency gains.*

As the world heads down a path of decarbonisation, research predicts that on average the cost of electricity generation will rise by 30% to 50% by 2050. To meet a 2 degree limit to global warming (see SDG 13), we could see the cost of electricity rise at a much faster rate. To limit this cost increase we must invest in technology innovation which will lower the cost of generation and improve energy efficiency, which could in turn reduce demand in countries with high energy consumption.

[232]global commission on the economy and climate, better growth, better climate: the new climate economy - the synthesis report, 2014
http://www.eesc.europa.eu/resources/docs/nce-synthesis-report-web-share.pdf
[233]international energy agency, energy technology perspectives. harnessing electricity's potential factsheet, 2014
https://www.iea.org/media/news/2014/ etp14_factsheets.pdf
[234]international energy agency, energy technology perspectives. harnessing electricity's potential factsheet, 2014
https://www.iea.org/media/news/2014/ etp14_factsheets.pdf

5.5 To determine the nexus between Renewable Energy Utilization and Rural Development

I asked the legal adviser of **Suntopway Solar Uganda limite**d about the relationship between renewable energy and rural development. He said,

Renewable energy utilization is a catalyst to rural development[235]*. It facilitates rural development. Rural development is in fact a multi-sectorial activity that generates synergy effects. This approach includes "Integrated Rural Development," which effectively combines multiple sectors and techniques from health care service, agricultural expansion, and education, improvement of infrastructure to technical transfer, choosing specific regions and treating the local governments as counterparts. This approach has advantages when coping with multidisciplinary issues such as poverty, or tackling regional problems and in obtaining participation of the people concerned. However, despite intensive investment in a limited area, effects are not easily spread to other areas. Actually, there are a considerable number of projects that have not been applied to other areas in the past, even though they were considered "model" projects'.*

For this reason, it is important to establish a system to disseminate know-how acquired from the implementation of rural development projects and programs. This is because activities that are implemented in a limited area and have an only slight spill over effect are not suitable to from the viewpoint of equity and public interests[236]. Also, NGOs may be able to implement more cost effective activities. Coordination between concerned organizations such as governmental organizations, donors, NGOs and communities must be coordinated in multi-sectorial rural development projects. Also, it is important to implement projects with the cooperation of two or more ministries or agencies.

The definition of "rural" differs by country, though it is usually used in contrast to "urban"[237]. For instance, this word is defined based on population density in Japan, indicating an area other than "an area with over 5,000 people, which consists of each district with a population density of

[235]according to the world bank (1975)
[236]ibid
[237] ibid

over 4,000 per square kilometer". However, we cannot simply apply this definition to other countries. Moreover, due to the fact that the concept of "rural" varies from Asia to Africa, it is difficult to define it uniformly. Therefore, the use of "rural" (including fishing and mountain villages) as a relative concept to "urban", based on social, economic, and natural conditions in each country may be most adequate. The term could also be used to describe areas where a majority of the residents are engaged in agriculture in a broad sense (including livestock farming, forestry, and fisheries).The final beneficiaries of development assistance are local people in both rural and urban areas. However, their livelihoods are based on significantly different social, economic, and natural environments. Most rural residents in many developing countries (especially in the least developed countries, or LLDC) are engaged in and depend on local agriculture, forestry, and fishery resources to make a living. If the local people are final beneficiaries of development assistance, the aim of rural development can be defined as the improvement of sustainable livelihoods (especially impoverished groups); with careful attention paid to local characteristics[238].Frequently, the concept of rural development is used confusedly with "agricultural development" or "regional development".

Current Situation and Issues in Rural Development[239] is the Importance of Poverty Reduction. The overall purpose of development assistance is to improve the livelihoods of citizens in recipient countries, especially the impoverished. Poverty reduction is internationally recognized as an important assistance issue. For example, in 1996 the DAC set a clear achievement goal in its action policy to reduce poverty.

Development cooperation focusing on rural development is a very important component for poverty reduction for the following reasons: *Approximately three-quarters of the world's impoverished live in rural areas[240];Many poor people in cities are migrant workers and farmers who have left rural areas[241];Therefore, if living standards and income generations in rural areas*

[238]according to the world bank (1975), rural development is defined as "a strategy aiming at the improvement of economic and social living conditions, focusing on a specific group of poor people in a rural area. it assists the poorest group among the people living in rural areas to benefit from development".
[239]the contents of "rural development" need to be revised after coordination between "rural development" and "poverty reduction" jica thematic guidelines
[240]world bank (2001a)
[241]in many developing countries, there has been an acute population shift from rural to urban areas, and many of those who
have migrated and belong to the low-income group have no choice but to engage in the informal sector which is insecure,

are enhanced and rural immigrants to cities return to rural areas, excessive population influxes to cities should be reduced, causing poverty in the cities to decrease; and Improvement of rural areas can be a safety net when there is a lack of job opportunities in cities due to depressed economic conditions.

Also, many governments in developing countries have recently been shifting to decentralization in order to adequately deal with local needs. Due to the necessity for an active local economy within decentralization, rural development is receiving increasing attention. The main actors of development activities are also changing. Since the end of 1980s, many developing countries' governments have shifted from bureaucrat-oriented to public-oriented bodies. Therefore, bureaucrat-oriented development approaches such as "large-scale farm development and agricultural modernization" are changing to people-centered approaches to rural development with a focus on establishing a system to facilitate community participation and the effective use of local resources. This in turn requires flexible, tailored cooperation from donors based on local conditions.

5.6 International Trends in Rural Development

Many assistance organizations emphasize poverty reduction as an important international assistance goal. The number of organizations which focus on rural development as a way to reduce poverty has grown with the realization that most impoverished groups live in rural areas. The major international trends for poverty reduction and rural development are below.

The World Summit for Social Development held in Copenhagen in 1995 declared the goal to reduce absolute poverty in the world by half through people-centered social development. As a result of this conference, the goal of reducing the ratio of the poor by half between 1990 to 2015 was adopted at the DAC High Level Meeting of OECD in 1996. In addition, the UN General Assembly (Millennium Summit) in 2000 promoted this effort as one of its Millennium Development Goals (MDGs), with the World Bank and IMF also promoting the target.

As a result of this international trend towards poverty reduction, the number of organizations engaging in rural development has increased. For example, the Asian Development Bank (ADB) is shifting its development assistance focus to fighting poverty and the World Bank is developing a new strategy for rural development in addition to the Poverty Reduction Strategy Papers

low-wage, and has a poor environment

(PRSP). The Department for International Development (DFID) in the United Kingdom adopted the Sustainable Livelihood concept as an alternative development approach to existing rural development and for effective anti-poverty programs. Moreover, most NGOs regard rural development as effective in reducing poverty and have expanded their activities to include remote rural areas such as areas in Southeast Asia.

Community participation has been recognized as an essential asset in the promotion of the independence of local people with many organizations implementing multi-sectorial activities based on local conditions, such as activities in agriculture, forestry, and fisheries as well as in non-agricultural income generation, education, health care and hygiene or infrastructure improvement.

Rural development equals Improvement in livelihood of people in rural areas (poverty reduction). Rural development issues are often equated with poverty reduction. Although the definition of poverty varies[242], income poverty is used as a general guideline in defining poverty. In the case that "three-quarters of impoverished groups live in rural areas", "impoverished (poverty)" indicates conditions resulting from income poverty. Improvement of livelihood is a central component of rural development.

There also exists an opinion, which is increasingly becoming main stream, that living standards cannot be measured by income and consumption, but requires a wider view. For those who support this argument, the satisfaction of Basic Human Needs (BHN) is necessary[243] to improve living standards. Also, the United Nations Development Programme (UNDP) has been using the Human Development Indicator (HDI), which is based on life expectancy, literacy rate, gross enrolment ratio, and real GDP per capita in its Human Development Reports since 1990[244].

[242]the world bank's "world development report" (1990) defined poverty as having less than us$370 of annual income per capita, and absolute poverty as less than us$250. these indicators were calculated based on the idea that human beings require approximately us$1 a day to obtain minimum nutrition needs.

[243]in 1970, ilo (international labour organization) defined bhn as including food, shelter, clothing, safe water, health and sanitation facilities, access to public services such as education, securement of jobs for a sufficient income, a healthy and humane environment, and people's participation in the decision-making process which influences their lives and freedom.

[244]hdi is formulated based on the amartyasen's definition, "poverty indicates a lack of basic human capabilities (potential
selective capability of individuals) and development means enhancement of potential capabilities each individual has."

In the OECD/DAC Guidelines on Poverty Reduction[245], poverty is described as the lack of the following five capabilities: *Economic capabilities: to earn an income, to consume, and to have asset; Human capabilities: to have access to health care, education, sufficient nutrition, clean water, and hygienic living conditions; Political capabilities: human rights, to participate in political and policymaking process, and to be able to have an influence on decision-making; .Socio-cultural capabilities: to participate as a valued member of the community with social status and dignity' and Protective capabilities: to prevent vulnerability from food insecurity, illness, crime, war, and conflict.*

As described above, comprehensive measures are essential for a multidimensional approach to poverty reduction. The number of assistance organizations which view comprehensive rural development as an effective approach in improving the livelihoods of rural people has increased. For example, agricultural development needs an increase of consumers, industrial development, and the improvement of infrastructure, and inhabitant's productivity through expansion, education, health care services has much effect on those conditions. Also, it is important to preserve the environment through resource management and natural disaster prevention. Moreover, it is essential that governments assist a variety of activities through a cross-sectional approach. In short, rural development deals with multi-sectorial issues, such as infrastructure, health care and hygiene, education, environment and governance as well as local income generation.

Rural development requires an integrated approach. Effective Approaches for Rural Development assumes the trickle-down theory[246] based on the belief that an expanded macro economy could improve the living standards of impoverished people, its effectiveness has been questionable. However its failure does not necessarily mean that efforts should be concentrated at the grass-roots level only. This is because the development of rural areas cannot be achieved without attention to urban areas, which are the main consumers of agricultural products.

If conventional development projects were effective, rural poverty would have improved more significantly. Therefore, it is clear that the traditional rural development approach needs to be

[245]duflo (2005): refreshing perspectives on fighting poverty
[246] jica (2000)

improved[247]. Hitherto, rural development depended on external assistance from foreign countries. However external inputs have been restrained due to donors' current poor financial conditions. As a result, the promotion of rural development requires effective external inputs to generate sufficient results and is capable of engendering further improvements. Development issues must therefore be comprehensively and cross-section ally understood for this to be realized. Maximum use of human and material resources in rural areas is also necessary. Some potential approaches are described under the Improvement of Human Capabilities. The term "human capabilities" used here refers to the health conditions and educational level of the local people.

General Health Improvement

One aspect of poverty in rural areas is the unsatisfactory health conditions of local people. Unhealthy and ill people cannot perform to the best of their capabilities nor make efforts to improve their living conditions. Therefore, the promotion of rural development necessitates the improvement of health conditions for local people. Usually, impoverished people tend to have insufficient nutrition, are not vaccinated, or live in unhealthy conditions. On top of this, suitable medical treatment cannot be obtained in many rural areas due to a lack of sufficient public medical services. These inadequate medical facilities and lack of treatment in turn leads to other family members having to take care of the ill, lowering the productivity of the family as a whole. Therefore, an expansion of public medical services and improvement of sanitary conditions are essential.

In many developing countries, however, the benefits of advanced medical services centering on modern hospitals rarely reach rural areas for economic and geographical reasons. The health and medical reforms which many developing countries are promoting today as a result of severe financial situations are increasing not only effective management, but also medical payments by public medical services such as vaccinations.

Regional medical institutions can be categorized with hospitals (where several doctors are always available) at the top of the hierarchy, and health centers (where nurses and midwives are available) and health posts (run by health assistants) underneath. In this pyramid, development of a referral system becomes important in order to link regional medical institutions, in addition to

[247]based on statement by hikaruniki, jica senior advisor

the construction of institutions suitable to the local population and economy. Furthermore, several approaches including public medical services for treatment and primary health care (PHC)[248] for prevention should be combined.

Oral infections are commonly seen in rural areas where access to safe water is restricted and there is a lack of adequate sewage systems. Local people and infants who are malnourished due to poverty suffer from frequent infections and may often die of a preventable illness. Infections in rural areas can be prevented through the (a) improvement of nutrition, (b) construction of safe drinking water, and (c) a clean housing environment. Fertility in rural areas is also considered to be a problem. In developing countries, local people tend to bear many children due to high infant and child mortality rates. Fertility may not only ruin a mother's body but also cause the increase of impoverished groups. Parents frequently cannot financially cover the educational expenses of their many children. In addition, many people often leave their homes in rural areas to work in cities, but for those with low educational backgrounds, jobs do not pay well, resulting in an increase of poverty in the cities. Family planning and birth control activities are conducted to help alleviate the burden on women and to improve their health, as well as to improve the social and economic conditions of impoverished groups.

Health conditions of local people can be improved not only through the development of medical facilities but also by increasing people's knowledge regarding health care. Due to restriction of health knowledge, they may be unaware of hygiene, nutrition, and family planning issues. For example, efforts should be made to disseminate knowledge on how to keep drinking water safe, in addition to the actual construction of clean water (even if wells or springs for safe drinking water are dug or found, health will not improve if the local people cannot separate their drinking water for their livestock or if there is no custom of washing glasses with clean water). Another example may be the increase in the number of local people suffering from sexually transmitted diseases (e.g. HIV) transmitted by family members who have come back from the cities. In this case, improving people's knowledge of health care through health education becomes imperative.

[248]primary health care provides access to basic health services indispensable to good health, and to help poor people acquire and maintain good health, through the provision of eight comprehensive and participatory factors. the eight factors include the improvement of nutrition and food intake, health education, vaccination, maternal and child health, water supply and sanitation, provision of basic medicines, prevention of infectious diseases, and basic medical services.

JICA has worked on various activities for health care improvement of local people, including a) family planning and reproductive health, b) primary health care (PHC), c) prevention of infections, d) prevention of HIV and e) surveys and expansion of local health care services. Activities related to PHC for poverty alleviation have increased in particular. Such activities directly target impoverished groups and encourage community participation. PHC activities should be emphasized more in the future. Participation of local people and administrative officers in PHC activities is an important precondition for success, as focus must be converted from treatment to prevention.

Family planning and reproductive health activities should involve not only females but also males. Although family planning promotes the establishment of the rights of women, it is necessary for males to understand and participate for effective contraception. While family planning projects implemented by JICA in the past sometimes targeted only women, it is necessary to implement activities targeting both men and women in the future, since family planning is not solely a female matter.

Improvement of Educational Standards

The improvement of educational standards is a very important element for income generation. Literacy skills enable local people to read manuals on agricultural techniques and equipment, increasing agricultural productivity. Local people with literacy skills can acquire information their society needs. Moreover, as educational background is an important factor for obtaining a better job, highly educated emigrant workers tend to get jobs easier and earn a higher income.

Although assistance approach for education is detailed in the report of "Basic Education", the improvement of formal education for children and the expansion of non-formal education for adults are important elements in rural development. There are two approaches in the improvement of formal education for children: school construction and improvement of educational quality (quality of teachers, curriculum, etc.). Many developing countries face a lack of school buildings and teachers due to inadequate financial resources. In such cases, schools often employ persons without certification as substitute teachers, resulting in low-quality teaching. For educational standards in rural areas to be improved, training of substitute teachers and in-service training is necessary in addition to the construction of school buildings.

Furthermore, in spite of a strong desire for education in developing countries, even the minimum opportunities for education are neither guaranteed for all local people, nor are the people able to appropriately utilize such opportunities[249]. These situations show that there are not only educational sector problems with educational services and teaching materials, but also economic problems, restricting access to schools, and social problems stemming from customs and values, and health and nutrition conditions among others. Therefore, it is important to create an environment where children can attend school.

Literacy education for adults and citizenship education such as seminars for improvement of living conditions should also be considered in the future adult education activities. Finally, the above-mentioned educational approaches should not be implemented individually but combined to be most effective. For example, constructed school buildings can be utilized for supplementary instruction and literacy education.

Although JICA's activities for basic education are detailed in the chapter on Basic Education, JICA has recently started to assist the social dimensions of basic education through Development Study as seen in cooperation for school mapping, in addition to its previous emphasis on primary school construction by Grant Aid and Grant Assistance for Grass-roots Projects. In addition, JICA has dispatched Japan Overseas Cooperation Volunteers (JOCV) in the education field to projects on secondary science and mathematics education through.

Project-type Technical Cooperation. Although these activities have contributed to the improvement of quantity and quality in education, an increasing trend for social development in primary education is yet to be seen. On the other hand, NGOs have a long history of educational cooperation and often implement community-based activities. Cooperative activities for basic education with NGOs may be the most effective, as exemplified when some schools with NGO cooperation have engaged in formal and non-formal education on health care, environment, social disparities, and so on. As examples of JICA's assistance in non-formal education including literacy work, the various experiences under the Community Empowerment Program and JICA.

Partnership Programs are noteworthy

[249]jica (2000)

Literacy is essential for participation in modern economic activities and has a strong impact on poverty reduction, but sufficient attention to the planning stages is necessary to prevent expansion of existing social gaps (gender, ethnic minorities, the most impoverished groups, etc.) by focusing on specific groups[250].

In the *DAC Guidelines on Poverty Reduction*, "protective capabilities" are referred to as "human capabilities to protect oneself from various kinds of suffering such as a) starvation, b) natural disasters, c) conflicts, d) crimes, e) violence, f) diseases, and so on." In this chapter, measures against natural disasters are instigated, due to their importance toward rural development. Natural disasters such as floods and desertification seriously damage economic and social infrastructure such as roads, irrigation systems, cultivated lands, forests, and so on. Therefore, such issues are an important component in rural development activities. Furthermore, because impoverished people in rural areas are most vulnerable to natural disasters, as cultivated land can be easily damaged from floods, erosion and sediment control as well as the conservation of the natural environment are important measures in reducing poverty.

People in poverty cannot help depriving natural resources and also they easily worsen environment because of lack of financial and psychological afford to concentrate on environmental conservation. Their environmental aggravation then causes food shortages, worsening the poverty situation[251]. The vicious circle of poverty and environmental aggravation must be ended. For project effects to become sustainable, activities, which do not harm the environment, should be emphasized. These are some of the reasons for conservation of the natural environment within rural development projects. The protection of forests is effective in not only alleviating natural disasters such as floods but also in protecting the land from topsoil erosion and maintaining or improving productivity.

The natural environment can be conserved by preserving and rehabilitating existing natural resources (land and soil preservation and water-resource and forest-resource conservation) for improvement against natural disasters (flood, drought, etc.).JICA's activities in this field focus mainly on forest conservation, eco friendly agriculture, and flood, erosion, and sediment control.

[250]jica (2000)
[251]jica (2000)

Forestry conservation projects have an “afforestation” image, but these projects are also involved in designing afforestation from which local people can benefit, since simply planting young trees is ineffective. For this reason, the activities in which agriculture and afforestation are united and the approaches of planting fruit trees in forested areas are implemented in line with agro forestry concepts. Even in this case, if the local people do not use full-grown trees, they may cut down young trees for firewood. For this reason, forestry conservation activities are frequently implemented parallel to the diffusion of agricultural techniques and education in schools.

In cultivated areas where the land slopes, which people in rural areas often cultivate, soil runoff has an influence on productivity. Subsequently, activities that prevent topsoil erosion are incorporated in the projects to improve the productivity of small-scale farmers. Soil conservation can be achieved through terracing fields, check dams, and agro forestry.

Governments in developing countries cannot fully implement public works on flood and erosion controls due to the lack of budget and human resources. Community participation on flood and erosion controls should be promoted as well as technical transfer to local engineers. The introduction of low-cost construction techniques using local gravel and stones may also be effective.

Conclusion

Electricity access is critical for the social and economic development of Uganda. Electricity access in Uganda is still very low at about 20% for all forms of energy. This very low level of access is an impediment to achieving social and 3conomic transformation of the country. Electricity access targets, as spelt out in the government major development plans, are to be achieved under the electricity connection policy (ECP). The ECP will initially aim at achieving the 26% rural access target by 2022 as set out in the Second Rural Electrification Strategy and Plan, 30% national coverage target by 2020 as set out in the Second National Development Plan. The ECP will also aim at accelerating access after 2020 in order to achieve 60% access rate by the year 2027. The 60% target is the minimum and may be surpassed as mote funding becomes available.

The paper has analysed Integrated Rural Development Theory and Aspects of Sustainable Energy Theory have been discussed which are pre-requisites Renewable Energy Utilization.

Rural development is in fact a multi-sectoral activity that generates synergy effects. This approach includes “Integrated Rural Development,” which effectively combines multiple sectors and techniques from health care service, agricultural expansion, and education, improvement of infrastructure to technical transfer, choosing specific regions and treating the local governments as counterparts. Given that energy access is one of the main factors of development, the social aspects of sustainable energy should be a primary issue of this concept. The paper has discussed the three prominent themes of energy which can be labelled: energy security, energy sustainability, and energy poverty. Uganda generally falls in the category of energy poverty. Energy poverty can be defined as the lack of adequate modern energy for the basic needs of cooking, warmth and lighting, and essential energy services for schools, health centres and income generation.

The “classic” energy ladder places different fuels or sources of energy on consequential ladder rungs, with electricity, the most modern and ‘desirable’ fuel, at the top. This linear energy fuel ladder provides, then, the rationale for the currently dominant solution to energy poverty in the rural development literature, namely ‘rural electrification’.

According to Green, “in many less developed countries, rural electrification is consistently championed as the answer to many development policy challenges such as poverty alleviation, urban migration, economic development and even national security concerns”. In practical terms, connection of rural homes and businesses to the national electricity grid is relatively easy to measure and quantify, and is compatible with a centralised government policy framework. Primarily though, electrification of rural areas is considered essential for increased rural economic development:

Thus, while rural electrification does deviate from the dominant energy security priorities of macro-economic growth in urban and industrial areas, it is still appears to support a development agenda which prioritises modern, market-based economic development.

The answer to RQ1 is that communities are poorly responding RETs because they are poor mainly live in isolated homesteads where electricity does not reach them. They need to be lifted out of poverty before they can consume electricity. Agriculture is the main economic activity and source of livelihood in the District. Cattle keeping dominate the economic activity and trading, followed by crops like maize, cassava and sweet potatoes.

The answer to RQ2 is that there is a direct relationship between policies and legislation and renewable energy utilization. The Policy principles are the fundamental premises that Government uses to apply, develop and test policy and subsequent actions, including decision making, legislation and enforcement on renewable energy utilization Energy services such as lighting, heating, cooking, motive power, mechanical transport and telecommunication are essential for socio-economic development, since they yield social benefits, create employment and generate income. These issues are at the core of poverty eradication and national development. For renewable energy to remain relevant, the policies adopted must propel it to a level, where it provides services that will facilitate the achievement of national development goals.

To maintain and improve the responsiveness of the legal and institutional framework to facilitate renewable energy investments, Government has Publish a Standardized Power Purchase Agreement with Feed-in Tariffs for renewable energy generation projects of up to 20 MW installed capacity.

Renewable energy technologies have an important role to play in Africa's energy sector. With the right approach, the renewable energy industry in Africa can become a major player in the energy sector, and meet the energy needs of a significant proportion of the population. Renewable energy technologies can play a major role in national development in terms of job creation and income generation as well as providing an environmentally sound energy service. Aggressive lobbying for renewable at national, regional and sub-regional levels is required.

5.7 Recommendations

Legal and Institutional Framework

Strengthening enforcement of the legal and institutional framework to ensure safe and healthy working conditions to avoid occupational diseases and injuries and also provide liability for damage due to non-compliance to laws such that defaulters are held liable.

Pro-active and long-term policy-oriented renewable energy programmes aimed at senior decision-makers in both Government and the private sector should be initiated. The innovative energy policy programme of the African Energy Policy Research Network (AFREPREN/FWD)

provides a model[252]. The policy programmes should be designed to demonstrate the economic and environmental benefits of renewable technologies to Africa's poor and propose short and medium term policy initiatives that would engender large-scale dissemination of renewable. Priority should be given to highlighting the real and tangible economic benefits (such as job creation and income generation) that renewable energy programmes can deliver to the region at both the micro and macro levels. For example, renewable energy technologies are generally more labour-intensive than conventional and centralised energy projects and can help to address problems of employment of the urban and rural poor. Empirical data and information on this would possibly result in higher budgetary allocations to the development of RETs.

Of particular interest to policy-makers in sub-Saharan Africa would be revenue neutral policy and institutional measures. For example, it is possible to make the case that the loss of revenue associated with the removal of duties and taxes on renewable energy technologies such as wind pumps can be recouped from the long-term savings in imports of petroleum fuels that require scarce convertible currencies as well as from the income and sales tax remittances from a large and functional wind pump industry.

Environmental Regulation Training

Environmental regulation training and awareness for RET implementers and different bodies involved to enable the main players to acquire knowledge about environmental standards. Train the People of Uganda generally to use the resources (abundant animal products and farm products) to generate renewable energy for consumption.

The introduction of unfamiliar technologies such as RETs requires the development of technical skills. The importance of technical know-how in the increased utilization of RETs has been recognized in the region, but in spite of efforts by governments, there is a continuing shortage of qualified personnel[253]. Technical knowledge is important in order to build over the long term, a critical mass of professional African policy analysts, economic managers and engineers who will

[252]stephen karekezi and waenikithyoma (2003): renewable energy development ; the workshop for african energy experts on operationalizing the nepad energy initiative operationalizing the nepad energy initiative- novotel, dakar, senegal

[253]mosimanyane, m.t., zhou. p and kgathi, d.l., 1995. renewable energy technologies in botswana – the case of wind energy for water pumping.sei/afrepren/fwd, draft report.

be able to manage all aspects of the RET development process and to ensure effective utilization of already trained African analysts and managers[254]. Trained manpower capable of developing and manufacturing renewable energy technologies is a prerequisite for their successful dissemination.

Identification of potential hazards

Potential hazards of Renewable Energy should be identified. The scope of the identification should encompass all activities from inception through to decommissioning. Identify potential hazards and develop hazard-specific control mitigation mechanisms and strengthening civil society organizations to ensure that there is a follow up to check on non-compliance to environmental standards.

Enhance synergies between measures to promote renewable energy

There is need to enhance synergies between measures to promote renewable energy and trade law. It is crucial to design the FIT consistent with trade law that will reflect consideration of legitimate policy objectives on trade rules, especially Subsidies and Countervailing Measures (SCM agreement); Desirable to have Ex ante international rules in addition to ex post solution by dispute settlement bodies; For the sake of legal certainty and predictability.

Poverty Eradication

It is critical that the rural population be trained on poverty eradication methods so that they will be able to afford the electricity being extended to them by government. Off-grid solutions are emerging as an important driver of rural electricity access[255]. Emerging evidence suggests off-grid solar electricity reaches about 141 million people in rural areas in the developing world, complementing grid electrification. Uptake is highly concentrated in about a dozen pioneering countries. However affordability remains a key concern[256]. Estimates suggest that, even in countries with universal access, affordability concerns affect about 30 percent of the population;

[254]world bank, 1996.african development indicators 2003. washington dc: the world bank
[255]2018 hlpf review of sdg implementation: sdg 7- ensure access to affordable, reliable, sustainable and modern energy for all
[256] ibid

in countries working toward universal access, affordability affects 57 percent of those who already have access.

Financial Barriers

Financing plays a major role in the formulation of RET policies. Studies have shown that one of the main obstacles to implementing renewable energy projects is often not the technical feasibility of these projects but the absence of low-cost, long-term financing. This problem is complicated by competition for limited funds by the diverse projects and becomes critical if the country is operating under unfavourable macro-economic conditions. Governments and private enterprises must therefore seek creative ways of financing RETs projects. The challenge of financing projects for RETs is to develop models that can provide these technologies to consumers (including the very poor) at affordable prices while ensuring that the industry remains sustainable. As shown earlier, limited policy support for RETs in the region is indicated by minimal budget allocation to renewables at government level. Consequently, the private sector is left to bear the burden of financing RETs.

Most advanced and electrical RETs are not affordable to majority of the population in Africa who are poor, with national poverty levels of 50-70%. This is especially true for RETs that have high cost imported components, than for those that can be locally manufactured and assembled using locally available components. RETs with high cost imported components place an additional burden on foreign exchange reserves of Africa countries, which are often minuscule and nearing exhaustion, and require expensive financing schemes and large subsidies[257]. These subsidies are not sustainable in the long run, unless the technologies provided are designed to include income generation.

Banking institutions have unfavorable requirements for RETs financing. Banking institutions normally lay down strict conditions for RETs investors and this deters potential users. Conditions required included a feasibility study conducted at the applicant's expense, due to the limited knowledge on renewables by banks. In addition, the banks required land titles as collateral, port folios of project sponsors and managers, data on past and current operations, approximate value

[257] ibid

of existing investment, a valuation report, raw material procurement plans, and the marketing strategy for the finished product[258].

In cases where financing mechanisms are provided for end users, these are often not within the reach of the majority of the population. For example, the UNDP/GEF PV project in Zimbabwe benefited mainly affluent rural households, since over 80% of rural population could not afford the smallest system even at the cheapest rates. Stringent requirements for loan applications excluded the majority of the rural population from qualifying[259]. In another study on the viability of PV in Manicaland, Zimbabwe, 65% of the rural population could not afford to pay the solar service fee (the lowest cost possible for providing PV-based electricity), while 91.5% could not afford a credit scheme[260].

Innovative Financing Mechanisms

Priority should be given to the establishment of innovative and sustainable financing programmes for renewable energy technologies. This may range from the creation of a National Fund for renewable energy projects financed by a modest tax on fossil fuels to credit schemes specifically aimed at developing renewable energy industries and endowment funding of renewable energy agencies.

Experience has shown that most renewable energy technologies (especially those that can be locally manufactured) require subsidies only in the initial stages, and can become financially sustainable in the short to medium term after a certain level of technology dissemination has been attained. After attaining a dissemination of certain critical mass number of units and assemblers / manufacturers, the renewable energy industry can become self-sustaining and subsidies can be gradually withdrawn without any adverse effects on continued dissemination of renewable energy technologies.

In Ghana, a national energy fund has been successfully utilised to finance renewable energy projects and energy efficiency activities on a sustainable basis. An important challenge is the

[258]ward, r. f., ashworth, j,h., burril, g., 1984. renewable energy technologies in africa: an assessment of field experience and future directions. bureau for africa/agency for international development. washington.
[259]mbewe, a. (2000). renewables and energy for rural development theme group: data and statistics compilation - zimbabwe. african energy policy research network (afrepren/fwd), nairobi.
[260]chiwaya, a., 2001. energy sector reform theme group: data and statistics compilation – malawi. african energy policy research network (afrepren/fwd), nairobi, kenya.

bundling of discrete renewable energy projects into large programmes, which can be financed by major bilateral and multilateral donor and financing agencies. In order to increase access to loans, banks should find alternatives to stringent requirements e.g. the collateral requirements. But since bank policy is unlikely to change in the near future, one possibility is to encourage potential consumers to form self-help groups or cooperatives so that they can acquire loans through cooperative banks, most of which do not have stringent collateral requirements. In addition, small credit institutions (micro-finance institutions) could provide financing for RETs investors and users at affordable and accessible terms. Small-credit institutions are crucial in ensuring continuity when external support ceases. Many have a nationwide network in place and are able to provide service even to remote rural areas.

Loan for Investment.

African Development Bank has agreed to give soft loan for RETs at an interest rate of 10% or less up to a total of US$ 1 million per applicant for identified project (s) for investment[261]. Possible projects could include **Clean Renewable Energy** projects and **Carbon Finance** projects. These are projects that reduce GHG emissions. The rationale is that emissions reduction is less costly in the developing countries.

Way Forward On Oil Exploitation Impacts On Sustainable Development.

Globally, there is increasing recognition of the benefits of transparency in public data and ever greater momentum towards reform. It is essential that citizens are able to access and understand extractive contracts agreed by their governments in their names, in order to ensure that the public obtains the fullest benefit possible from exploitation of their nation's natural resource wealth. Itis also important to ensure that current requirements on politicians and public officials to declare any business interests are met and agree a process to investigate and address potential conflicts of interest. This is particularly true of the extractive sector, with civil society groups, governments and parliamentarians contributing to a growing movement against opacity and towards improved governance.

[261] rea report 2019

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APPENDIX ONE

(Among the interviews I carried out on 26 individuals as shown in chapter three, here are some of the best responses)

I interrogated the Managing Director of EleQtec Technical Services Limited.

What progress has the energy sector made in times of hydro electricity production.

Electricity connection in Uganda has increased in the number of Connected Customers from 103 in 2009 to 3,742 by 31st August 2019.

Given such progress in the electricity production, do people still use solar electricity/

Absolutely yes, people in Uganda and elsewhere in the world still use solar electricity. It is estimated that over 141 million people in rural areas use solar energy instead of Hydro electric power.

On average, what is the percentage of Ugandans that have access to Electricity.

Electricity access in Uganda still remains low at about 20%[262] for all forms of energy. This very low level of access is an impediment to achieving social and economic transformation of the country.

What is the reason as to why up to date many Ugandans do not have access to electricity? The major obstacles to electricity access have been identified as high connection charges and yet Ugandans are poor, high house wiring costs and this has been worsened by closure of businesses during the lockdown. There is also a problem with service providers, they lack incentives to make timely and cost affordable connections. Another problem is that Previous policies and strategies adopted by the government majorly focused on putting in place the back bone infrastructure and developing the backbone of Uganda's economy which is agriculture while electricity connections have remained unsupported.

So as one of the organisations operating under the Energy sector together with other stake holders that is the government and other companies under the Energy sector, do you aim at improving electricity access in the coming years.

Electricity access targets is one of the major development plans, with an aim of achieving 26% rural access target by 2022 as set out in the Second Rural Electrification Strategy and Plan, 60% access rate by the year 2027, after which it will be revised to enable achievement of the 80% Vision 2040 connection target and, thereafter, universal coverage. The 60% target is the minimum and may be surpassed as more funding becomes available.

As the ministry of energy and mineral development, what is your plan on renewable energy.

The Government of Uganda has taken a conscious effort to develop renewable energy resources as an integral part of the country's energy future. The promotion of renewable energy is specifically included in the Government's Rural Electrification Strategy and Plan (RESP) (2001 – 2010) as one of the most important objectives of the strategy. The most vivid step forward has been the inclusion of the development of renewable energy (excluding large hydropower) to increase power generation as a key indicator of achieving rural transformation in the 10-year Energy for Rural Transformation (ERT) Programme.

APPENDIX TWO

I interviewed Snave Agencies limited.

What is the percentage of electricity distribution in Uganda?

Electrification access in Uganda is still very low, standing at approximately 9% nationally and 3% in rural areas, electrification of most parts of the country through grid extension in the near future is still a far cry.

What is the government plan on increasing electricity distribution and access in Uganda?
Government is promoting the decentralized (distributed), off-grid electricity supply model for remote areas. Electricity needs will be met by the deployment of locally available renewable energy sources of small hydro, solar energy, wind and biomass resources. The focus on

decentralized supply systems is also more likely to achieve the objective of equitable regional distribution access to electricity, than if only the grid solution was pursued.

What causes low levels of Electricity production.

The causes are many and they include prolonged drought, inadequate investment in least cost generation capacity and a relatively high load growth.

Has the government planned or carried out any alternative strategy to curb this challenge?

As one of the strategies to bridge the deficit and also for long term diversification of generation sources, Government has decided to accelerate the development of grid connected small renewable energy generation projects to reinforce the grid. This effort is being supported by the establishment of a Standardized Power Purchase Agreement (PPA) and a Feed-in Tariff, which are part of this Renewable Energy Policy framework, to help expedite transactions.

Currently countries with fossil fuels are generating a lot of money. How does that affect the government and energy sector of Uganda?

The escalating prices of fossil fuels on the world market make it imperative for Government to promote the development and utilization of renewable energy resources and the associated technologies.

APPENDIX THREE

I interviewed the Human Resource Manager of Kirchner Solar Energy Uganda Limited

What is the main law / policy government is using to implement Renewable energy? The Renewable Energy Policy is therefore, an elaboration of how Government will develop the necessary initiatives to create a demand for a wide range of renewable energy services.

In developing a sustainable renewable energy sector, do you necessarily want to rely on electricity or you have an alternative.

Apart from using the power generated, Uganda intends to use biomass fuels like ethanol, biodiesel, biogas and methanol; modern biomass technologies like efficient stoves and kilns and solar water heating.

What is the aim of developing renewable energy sources.

The commitment of Government to develop the use of renewable energy sources is clearly aimed at creating the means of socio-economic development, especially by transforming the rural areas. The implementation of the policy's objectives will, therefore positively respond to the various legal and policy instruments and programmes, which Government has put in place to address poverty issues, catalyze industrialization and protect the environment.

APPENDIX FOUR

I interviewed the legal adviser of Suntopway Solar Uganda limited.

Which organs are supposed to implement the renewable energy policy.

NGOs may be able to implement more cost effective activities. Coordination between concerned organizations such as governmental organizations, donors, NGOs and communities must be coordinated in multi-sectorial rural development projects. Also, it is important to implement projects with the cooperation of two or more ministries or agencies.

What is the relationship between Renewable energy and rural development.

Renewable energy utilization is a catalyst to rural development. It facilitates rural development. Rural development is in fact a multi-sectorial activity that generates synergy effect which leads to intergrated Rural Development.

Can you explain briefly about the Integrated Rural Development,"

Integrated Rural Development is an approach which effectively combines multiple sectors and techniques from health care service, agricultural expansion, and education, improvement of infrastructure to technical transfer, choosing specific regions and treating the local governments as counterparts. This approach has advantages when coping with multidisciplinary issues such as poverty, or tackling regional problems and in obtaining participation of the people concerned. However, despite intensive investment in a limited area, effects are not easily spread to other areas. Actually, there are a considerable number of projects that have not been applied to other areas in the past, even though they were considered "model" projects'.

For this reason, it is important to establish a system to disseminate know-how acquired from the implementation of rural development projects and programs. This is because activities that are

implemented in a limited area and have an only slight spill over effect are not suitable to from the viewpoint of equity and public interests[263].

Concerning the Integrated Rural Development approach, what do you mean by Rural'

The definition of "rural" differs by country, though it is usually used in contrast to "urban"[264]. For instance, this word is defined based on population density in Japan, indicating an area other than "an area with over 5,000 people, which consists of each district with a population density of over 4,000 per square kilometer". However, we cannot simply apply this definition to other countries. Moreover, due to the fact that the concept of "rural" varies from Asia to Africa, it is difficult to define it uniformly. Therefore, the use of "rural" (including fishing and mountain villages) as a relative concept to "urban", based on social, economic, and natural conditions in each country may be most adequate. The term could also be used to describe areas where a majority of the residents are engaged in agriculture in a broad sense (including livestock farming, forestry, and fisheries).The final beneficiaries of development assistance are local people in both rural and urban areas. However, their livelihoods are based on significantly different social, economic, and natural environments. Most rural residents in many developing countries (especially in the least developed countries, or LLDC) are engaged in and depend on local agriculture, forestry, and fishery resources to make a living. If the local people are final beneficiaries of development assistance, the aim of rural development can be defined as the improvement of sustainable livelihoods (especially impoverished groups); with careful attention paid to local characteristics. Frequently, the concept of rural development is used confusedly with "agricultural development" or "regional development".