CREDC

Clarion Call for Sustainable Energy

The Proceedings of a One-Day Seminar

On

Renewable Energy: The Key to Sustainable Energy Development in Nigeria

Organized By

Community Research and Development Centre

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We thank Mr. Odigha Odigha, the Chairman of the Council for Renewable Energy of Nigeria (CREN) for making it possible for our guest speaker to attend the forum. Many thanks go to our guest speaker Mr. Ekpok Erokoro of the Citizens for Environmental Safety.

Thanks to One Sky, Canadian Environmental Network and Environmental Rights Action, the organizers of the Energetic Solution Conference which held in Nigeria in August 2004, the event that led to the birth of the Calabar Declaration and for creating the opportunity for one of us to participate in the Conference.

The contributions of Mrs. Nosakhare Queen Uyigue are greatly appreciated.

The seminar was conceptualized and implemented by the Community Research and Development Centre (CREDC).

Many inaccuracies, misquotes and misinterpretation may have occurred in the course of the seminar and the course of preparing this report. We apologize for any of such errors that may have occurred

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BACKGROUND

There are no MDGs on energy, yet energy is fundamental to all human activities and it is needed to support development. The existing MDGs cannot be achieved without access to energy. Energy is inevitable for poverty alleviation and provides services in the areas of health, communications and productivity. More than 1.6 billion people globally live without access to electricity and 2.4 billion people are without modern energy services for cooking and heating. Majority of the world poor live in Sub-Sahara Africa. It is a vital ingredient for socio-economic and technological development and there can be no development without access to energy. Many poor nations of the world have low access to energy and the richer countries consume far more energy than the poor countries, hence energy is the dividing line between the rich and the poor countries.

Nigeria operates a centralized energy system where communities and individuals are connected to a common energy source and because of the cost implication of connecting to this source many poor communities live without electricity. About 60 -70 % of the Nigeria population (total population projected as 135 million in 2005) are excluded from the national electricity grid. Furthermore, the grid electricity supply is plagued by frequent power outages that last for several hours daily in places that are connected to the grid. Still, energy is generated from unsustainable sources - large hydro power stations and a growing number of thermal gas stations.

Yet the Nigerian government has continued to invest in the traditional energy sources – especially oil - with little or no attention to renewable energy sources. These unsustainable energy sources are causing adverse social, health and environmental impacts. The burning of fuel releases poisonous gases into the air that are bad for human health. Some of the gases such as NO_2 and SO_2 cause acid rain which can destroy biodiversity and lead to the pollution of the ground water. There are visible evidences to show that the release of CO_2 and other green house gases is leading to global warming. Also, there is limited amount of fossils fuels and already the reserves of oil are starting to run out; we probably have enough oil for another 30 to 50 years.

Women and children are most affected by the low access to energy. They are exposed to huge drudgery, and the expenditure of human energy and time to fetch the wood impairs their development. This exposes them to diseases and sometime death resulting from the release of very noxious smoke due to its inefficient burning. Also, when fuels become scarcer, female children over male children are withdrawn from school to support family energy needs. Illiterate women have more children, larger and poorer families and this reinforces the cycle of poverty and under development. The provision of accessible energy options will therefore save them time and hard labour.

Nigeria lacks adequate policies that will encourage and expedite the development of renewable energy. The seminar is part of an on-going project of CREDC titled “Promoting Renewable Energy and Energy Efficiency in Nigeria (PREEEN)”. PREEEN’s objectives are to increase public awareness of renewable energy and its potential for sustainable development in Nigeria; and to develop policies and enhance civil society participation in the development of these policies to foster the development of renewable energy and energy efficiency in Nigeria. The seminar was also a follow-up to an international conference “Energetic Solutions: An International Conference on Making Renewable Energy a Reality”, which held in Abuja and the Niger Delta in Nigeria from November 21 – 27, 2004 and hosted by One Sky, Canadian

Environmental Network and the Environmental Rights Action. The conference was attended by 55 participants representing countries in Africa, the Americas and Europe, and was a follow-up to the WSSD (2002) and Bonn Renewables conference (2004) to address the Millennium Development Goals (MDGs) and issues of energy and development. The Calabar Declaration was born out of the Energetic Solutions conference.

The seminar was aimed at creating awareness on renewable energy technologies (RETs) and their potential for sustainable development and to build capacity in the civil society to enhance their participation in a forthcoming national multistakeholders' dialogue to integrate renewable energy into the policy framework of Nigeria. Also, it was planned to enhance the participation of stakeholders in the on-going global climate change mitigation process as provided by the flexible mechanisms of the Kyoto Protocol especially the Clean Development Mechanism (CDM). The other objectives were to facilitate the creation of a network of renewable energy advocates (REAs) that will front the development of RETs in Nigeria and to publicly present the Calablar Declaration.

SESSION ONE

OPENING FORMALITIES

A one-day seminar titled “Renewable Energy: The Key to Sustainable Energy Development in Nigeria”, organized by the Community Research and Development Centre (CREDC) held at the Banquet Hall, Ugbowo Campus of the University of Benin, Benin City, Nigeria on July 18, 2006.

The first session was facilitated by Dr. Mike Omoigberale of the Department of Animal and Environmental Biology, University of Benin. The meeting began at about 11:15 a.m. with the introduction of quests to the high table. The event was chaired by Prof. N.O. Eghafona, a renowned professor in the Department of Microbiology and the former Dean of the Faculty of Science, University of Benin and also patron to CREDC. The special guests of honour were the Commissioner of the Edo State Ministry of Environment, represented by Mr. Anthony Iziren, Assistant Director of Pollution Control and the Edo State Commissioner of the Ministry of Information and Orientation represented by Mr. Femi Isaac Okuo. Other dignitaries present were Dr. Fred Ekhase, the Secretary General of the Academic Staff Union of Universities (ASUU) University of Benin Chapter, the Head of Department of Animal and Environmental Biology, Dr. C.E. Okaka, the representative of the Dean of Physical Science, University of Benin, Dr. A. P. Oviawe and the Head of Department of Botany, University of Benin, Rev (Dr.) Macdonald Idu.

The opening prayer was said by Rev (Dr.) Macdonald Idu. The facilitator then called on the chairman for his opening speech. In his speech, the chairman, Prof. N.O. Eghafona welcomed the participants and enjoined them to appreciate the forum and participate actively in the course of the event. In the address delivered by the Edo State Commissioner for Environment, represented by Mr. Anthony Iziren, he said his Ministry is keen at getting information from the public to enable the Ministry initiate projects on alternative energy supply. He expressed the Ministry’s willingness to work with NGOs such as the Community Research and Development Centre (CREDC). He thanked the organizers for embarking on this seminar.

R-L: Etiosa, Ekpok, Mr. Iziren, Prof. Eghafona, Dr. Okaka, Mr. Okuo, Dr. Idu and Dr. Omoigberale (standing)

The Edo State Commissioner of Information and Orientation represented by Mr. Isaac Okuo, in his speech said that Nigeria is blessed with abundance of resources but the major problem is how these resources can be harnessed. According to him, he said the Edo State government has experimented on the use of solar energy for the generation of electricity and water supply in the government house. He however lamented that the problem of the state is the low technological development. Mr Okuo said it is paramount to encourage the youths to undergo courses in science education to enable the country concentrate on other means of generating power.

Continuing, Mr. Okuo said that the entire country can implement policies that will give scholarship to youths to be trained in technology. He opined that the private sector has to play a major role in this. He is on the opinion that technological advancement of Nigeria is dependent on the youths, thus schools need social workers and counselors that will guide Nigerian youths and educate them on the need and importance of the knowledge of science and technology, so as to equip them to become pioneering members of the development of sustainable energy in Nigeria.

The facilitator then called on the Executive Director of the CREDC, Mr. Etiosa Uyigue to give his opening speech. Mr. Uyigue formally welcomed the participants to the forum. He said that Nigeria is submerged in an energy crisis. According to him, 60-70% of Nigerians do not have access to electricity, that is, they are not connected to the national electricity grid, and even those who are connected to the grid are plagued by frequent power outages that last for several hours in a day. Mr. Uyigue said that Nigeria operates a centralized energy system, and because of the cost implication of connecting to the grid, many communities are unconnected to the grid. Also, he said the energy being generated in Nigeria is generated from unsustainable sources - fossil fuel and large hydro and they are contributing to emission of greenhouse gases. Continuing, Etiosa said the gender implication of low access of Nigerians to energy is enormous, that women and children are affected the most. He opined that the country can only achieve sustainable energy development by integrating renewable energy into her energy development strategies.

According to Mr. Uyigue, current project being embarked on by CREDC is an initiative from the civil society. He said the approach is a bottom-top approach and that the objectives of the seminar are to create awareness on renewable energy technologies (RETs) and their potential for sustainable development and build capacity in the civil society to enhance their participation in the forthcoming national multistakeholders' dialogue to integrate renewable energy into the policy framework of Nigeria. The initiative, according to him is coming from the civil society and will gradually move up to a national dialogue, but that first, awareness must be created among the civil society. He said that some of the participants will be selected to undergo training on renewable energy and advocacy skills in workshop coming up in a later date. He also said that an aspect of the project will be to conduct a research to determine Nigerian access to energy, which will be used as tools to advocate for renewable energy in Nigeria.

After the speech by Mr. Uyigue, the facilitator, concluding the opening session, shared his experience during his recent trip to Accra, Ghana. According to him, he did not experience any power outage during his stay in Ghana. Dr. Omoigberale said that the source of energy to the hotel he stayed in Ghana and the University laboratory was from the Volta Dam. He is surprised that Nigeria cannot generate enough energy that will sustain her citizens and that the lack of political will to implement policies is the barrier to energy development in Nigeria.

SESSION TWO

PAPER PRESENTATION

This session was facilitated by Dr. Macdonald. Idu,

First Paper Presentation

The first paper titled "Reducing Greenhouse Gases (GHG) Through the Clean Development Mechanism (CDM): Prospect and Challenges for the Developing Nations" was presented by Mr. Ekpok Erokoro, the Executive Director of Citizens for Environmental Safety (CES) represented the Council of Renewable Energy of Nigeria (CREN).

As an introduction, Mr. Erokoro said that researches have shown that the industrialized countries are responsible for high levels of GHG emissions while the major burden of imminent negative impacts due to geographic location, economic, political, social and environmental conditions will be borne by the developing countries. He said the United Nations Framework Convention on Climate Change (UNFCCC) provides the outline of a global action to mitigate adverse effect on the atmosphere. The Kyoto Protocol was designed to further strengthen the provisions of the UNFCCC and introduces flexible mechanisms that would allow a reduction of greenhouse gas emissions in the most cost-effective, efficient and sustainable manner. According to him, of these instruments, the Clean Development Mechanisms (CDM) allows the channeling of investment by the Annex 1 countries (developed countries) to developing nations to promote sustainable development and abate greenhouse emissions while generating certified emissions reduction units (CERs) the industrialized nations can apply towards meeting their own emissions reduction targets.

Ekpok said climatic change is caused by both natural and anthropogenic factors. Natural factors include variations in the earth orbit, variations in solar energy output and volcanic activities, which tend to cool the earth surface. Anthropogenic factors that affect global warming include industrial process which was responsible for 43% global carbon dioxide emissions in 1995; building of both commercial and private buildings accounted for 31% of carbon dioxide emissions in 1995; transportation accounted for 22 percent of carbon dioxide emissions; land use changes accounted for 4 percent of global CO_2 emissions. But over 20% of global anthropogenic GHG emissions were mainly from methane and nitrous oxide in 1995.

On the consequences of global warming, Mr. Erokoro said that the latest scientific assessment predicts global warming to rise at the pace of 1.4% to 5.8% by 2100. He said that the consequence of global warming is rise in sea levels due to thermal expansion that occurs as water is heated. The melting of glaciers and polar caps could cause sea levels to rise by 11 to 77 centimeters. The study carried out by UNEP revealed that about 50% of the world population lives by the coastal areas and stand directly or indirectly affected by such changes. Other causes of global warming are changes in weather patterns, human health, decline in overall biodiversity and implications for agricultural and food insecurity.

Mr. Erokoro said that in the year 1988, the governing council of UNEP met in Nairobi Kenya, and with help of World Meteorological Organization (WMO), created an intergovernmental body to conduct studies on the impact of global warming. The body came to be known as Intergovernmental Panel on Climate Change (IPCC). The IPCC mandate was to assess the state of existing scientific knowledge about climatic system and climate change, study the

environmental, economic and social impacts of climate change and to develop potential response strategy. The IPCC first assessment report was published and presented at the Second World Climate Conference in 1990. An Intergovernmental Negotiating Committee (INC) was created and charged with the task of negotiating a Framework Convention on Climatic Change as well as associated protocols designed to counter climatic change.

Ekpok said the United Nation Framework Convention on Climate Change (UNFCCC) was presented for signature at the Earth Summit in Rio de Janeiro in 1992. According to him, the convention was signed by 154 countries including the European Union. The UNFCCC entered into force on March 21st 1994, ninety days after the 50th signatory state ratified the document. The UNFCCC distinguishes between two groups of countries - Annex 1 countries which include industrialize countries and those of economic transition. The rest countries fall under non Annex - 1 category. Under the convention, Annex 1 countries agreed to bring their emission levels down to the 1990 levels while the non Annex 1 agreed to adopt GHG reduction policies contributing to climate change mitigation. After its 11th session, the INC was dissolved in 1995 and the conference of parties (COP) became the convention ultimate authority. The first conference of parties (COP-1) took place in Berlin, march 28th to April 7th 1995. COP-3 was attended by about 10,000 delegates, observers and journalist in December 1997 at Kyoto, Japan. The result was the Kyoto Protocol adopted by consensus.

The CES boss said that countries listed under Annex 1 to the Convention appear under Annex b of the Protocol, while the Non-annex 1 countries are now listed in the Protocol as the Non-annex b countries. The Protocol commits Annex b countries that ratify the Protocol to reduce GHG emissions below the 1990 levels by the first commitment period (2008 to 2012). Ekpok giving an example said Canada being one of the high emitters of GHG is to reduce to less than 5 percent of its 1990 level. Despite signing the Protocol, the United States withdrew in March 2001. In February 2003, the USA announced an alternative to curb carbon emission based on carbon intensity. The USA is responsible for 22% of current global emissions. The protocol approves various mechanisms that would allow industrialize countries to use cost effective international opportunities to reduce GHG emissions. Australia did not ratify the Protocol.

According to Ekpok, three mechanisms were adopted to allow reduction of GHG under the Protocol, which are Emissions Trading (Article 17), Joint Implementation (Article 6) and the Clean Development Mechanism (Article 12). Under the Emission Trading, parties included in the Annex b can purchase assigned amount units (AAUS) from other Annex b countries in other to fulfill their emission reduction commitments, this must be supplemental to domestic action. The Joint Implementation allows Annex b countries to purchase emission reduction units (ERUS) resulting from emission reducing or emission avoiding project activities implemented by any other Annex b country. The Clean Development Mechanism allows Annex b countries to acquire certified emission reductions (CERS) resulting from project activities implemented in the Non-annex b countries. Annex b countries can use these CERS to partially comply with their reduction commitments.

Mr. Erokoro said the CDM was adopted on the 11 December 1997 by the third conference of parties under Article 12 of the Kyoto Protocol .The CDM is to assist parties not included in Annex 1 to the convention in achieving sustainable development and in contributing to the ultimate objective of the convention and to assist parties included in Annex 1 in achieving compliance with their emission reduction commitments. CDM helps to achieve global climate change mitigation through a market based instrument. It is cost effective in promoting sustainable development in developing countries and also by assisting parties listed as Annex 1

in achieving compliance to meet their target of reduction of GHG within the commitment period. It also facilitates transfer of fund from the Annex 1 countries to the developing nations.

He said that Article 12 of the Protocol states that the emission reduction has to be real, measurable and must be additional to any that would have occurred in the absence of the CDM projects. The additional funds generated by the CDM for the developing nations can be channeled into economic, social, environmental and developmental objective. The project apart from satisfying environmental additionally must be real, measurable and have long-term benefits related to the mitigation of climatic change. On the characteristic of the CDM projects, Ekpok said that CDM projects must result in net reduction in GHG emissions. He said CDM projects have two parallel income flows. The first flow refers to income generated from the project for example sales of wood from reforestation project. The second income stream is the carbon flow. These are tonnes of carbon dioxide abated or reduced in the case of energy efficient projects or tonnes of carbon dioxide fixed in biomass in the case of land use projects.

The carbon component of a mitigation project can only acquire value in the international market if it is submitted to a verification process designed to measure and audit it. According to the Marrakech accord, the CDM project has five stages: Identification and formulation; national approval; validation and registration; monitoring; verification/certification. The first three stages are pre-implementation of project while the last two are during the lifetime of the project. By the definition of the Protocol, two bodies will govern the CDM. They are the conference of parties (COP/MOP) and the Executive Board. The COP/MOP, serving as the meeting of the parties is the supreme body of the CDM and it is constituted by countries that have ratified the Kyoto Protocol. The COP/MOP will provide guidance to the Executive Board and elaborate the modalities and procedures with the objective of ensuring transparency, efficiency and accountability. The COP/MOP also reviews the regional distribution of Designated Operational Entities (DOE) in other to promote an equitable distribution. The Executive Board will supervise the CDM and be fully accountable to the COP/MOP. It will be responsible for accrediting Operational Entities, an entity accredited by the Executive Board and consequently designated by the COP/MOP to validate proposed CDM projects, defining modalities and procedures for the CDM, approving new technologies and guidelines related to baseline, monitoring plans and project boundaries, and maintaining the CDM registry and database.

Ekpok revealed that the Prototype Carbon Fund (PCF) was established on the 20th of July 1999 by the Executive Directors of the World Bank. The mission of the PCF is to pioneer the market for project based greenhouse gas emission reductions within the framework of the Kyoto Protocol and to contribute to sustainable development. The PCF is a partnership of 6 governments and 17 multinational companies. The fund has financed 32 projects under preparation with an emission reduction potential of US $165 million. The six Governments involved in the initiative are Canada, Netherlands, Finland, Japan, Norway and Sweden. Project Developers in Nigeria can access these funds for the purpose of avoiding or reducing emissions of GHG.

On the challenges facing the developing nations, Ekpok noted with regret that the official offset market represents approximately US$371million of which nearly 75 percent is controlled by just three countries namely China, Brazil and South Korea. In the UN list of 50 least developed countries (LDCs), only 3 countries namely Bangladesh, Bhutan and Nepal have registered projects with the CDM. This implies that Nigeria is yet to register a project. The LDCs' share of the carbon market is just 0.33 percent of the CDM financing or US $1.2million while two third of CDM projects is initiated by just three countries namely the Netherlands, Britain and Japan. Of

the 176 registered projects with the UN's climate office, biomass projects initiated by industries such as sugar refineries have huge environmental impact.

Mr. Erokoro presented a case study of a small hydro project that was carried out at Obudu Cattle Ranch, Cross River State, Nigeria. Concluding, he said that entry into the carbon market is still the prerogative of the advanced nations who initiate the process and that the cost of putting the project documentation in the registration process is high. He recommended that the Federal Government of Nigeria through the Presidential Implementation Committee (PIC) on CDM should get more Nigerians involved in the climate change mitigation process especially NGOs and private developers; NGOs should carry out sensitization of the general public of the essence and benefit of CDM; the non profit sector should network with other international network to attract more funding and registration of projects in the developing nations; capacity of project developers should be developed taking a cue from Pembina Institute through the Canada Small Project Fund (SPF); and enhance partnership between the PIC, CDM, Private sector and the NGOs.

Paper presentation by Ekpok

Questions/Comments
After the presentation, the facilitator called for questions and comments on the presentation made by Mr. Erokoro.

Comments: Mr. Etiosa Uyigue
The Kyoto Protocol is a treaty that was signed by many countries to cut down on emission of GHG. The developed countries are the major emitters of GHG. The United state is highest emitter of GHG followed by the United Kingdom, Pakistan and so on. The United state alone emits over five million metric tonnes of carbon dioxide. The Annex 1 countries are the developed countries, while the Non-annex 1 countries are the developing countries. With the Kyoto Protocol, the developed countries are under obligation to cut down their GHG emission within a time frame. The developing countries do not have targets because of their relatively low emission, for example the whole of Africa only contribute about 3.5% of global emission of GHG. The Protocol will achieve this through three flexible mechanisms - the Joint Implementation, Emission Trading and the Clean Development Mechanism.

The one that concerns us as a developing nation is the Clean Development Mechanism. The Joint Implementation allows a developed country to claim emission reduction credit by investing in low-emission technologies in another industrialized country. For example, if you have two developed countries A and B. Country A can buy emission credit by investing in clean technologies in country B. For Emission Trading, a developed country that has reduced emissions more than is required by their specified target can sell excess emission reduction credits to another developed country that is struggling to meet their own target. For example, if you have two countries A and B and both countries are to reduce their emission by 10% each. If country A has been able to reduce emission lets say by 15%, country A can then sell excess emission reduction credits to country B. The Clean Development Mechanism gives credit to developed countries for financing projects which reduce or avoid emissions in developing countries, which have no targets. The CDM helps to reduce emissions in developing countries which have no targets, and as a result credits are gained by developed countries.

Comment: Dr. Aigbokhan
On the Kyoto Protocol, the Annex 1 countries are refusing to fully implement the Protocol and considering the inabilities of these institutions to sustain the credits that are given to us.

Question: Tom Aneni
The CDM is supposed to be mutually beneficial. What is the government doing to take advantage of these benefits available to us?

Answer: The government is doing all it can, but the NGOs and the private sector have to come in.

Question: Fred Chiazor
Is there a role the NGOs in Nigeria have to play in the CDM in Nigeria?

Answer: Yes. NGOs have to create awareness of the process among the civil society to enable them participate. NGOs will also have to call on government to take advantage of the process to achieve sustainable development and to register CDM projects.

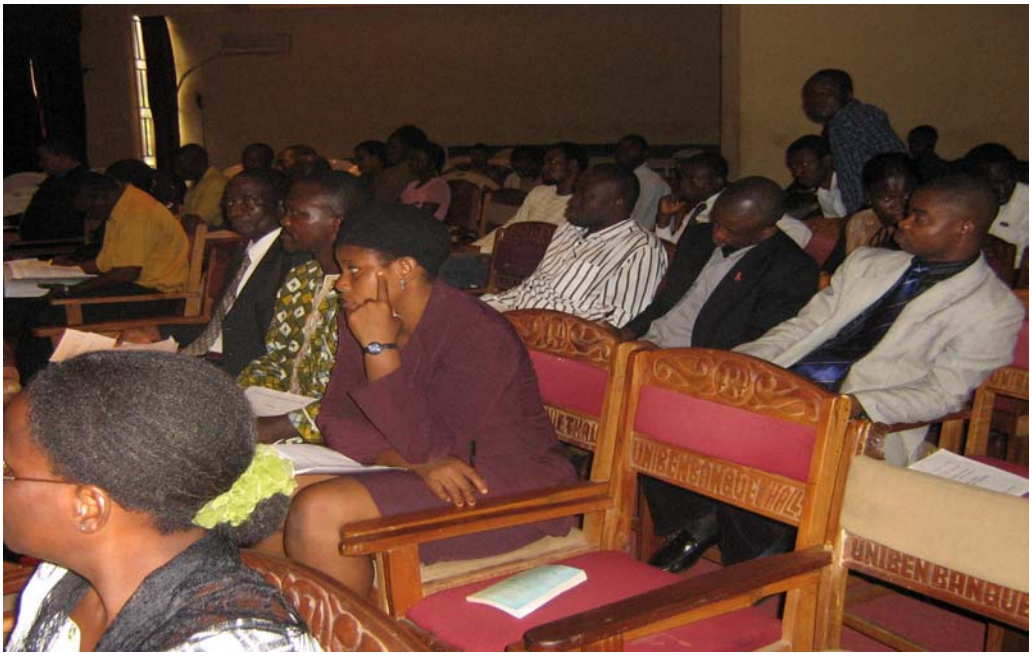
Question: Mr. Ikhisemojie
Building accounts for 32% of emission rate. What effort is being made to involve those in the building industry to reduce emission? Are there current statistics of greenhouse gas emission in Nigeria?

Answer: We do not have any statistics on greenhouse gas emission in Nigeria. For global statistics, you can find them on pages 11 and 12 of the hand out in your files.

At the end of the first paper presentation, the facilitator called on the participants for group photographs

Second Paper Presentation
The second paper titled “Renewable Energy and Sustainable Development in Nigeria” was given by Mr. Etiosa Uyigue, the Executive Director of Community Research and Development Centre.

Etiosa lamented that about 2 billion people globally live without access to electricity and that low or no access to energy is pandemic in Africa and Asia, and majority of the world's poor live in sub-Sahara Africa. He said the richer countries consume far more energy than the poor countries, hence access to energy is the dividing line between the poor and the rich countries. On the Nigerian context, he said 60-70% of Nigerians do not have access to electricity, that is they are not connected to the national grid. Even those connected to the grid are plagued by power outages which last for several hours a day. Moreover, the grid electrical energy is generated from unsustainable sources (large hydro power stations and a growing number of thermal gas stations).



Some participants listening with keen interest

Mr. Uyigue said there are three large hydro dams in Nigeria generating electricity and the three dams are located in Niger State. They are Kainji, Shiroro and Jebba Dams. The three dams are designed to produce an aggregate of 1900 Megawatts of electricity. There are six thermal stations located in different places, in Lagos, Rivers states etc. The thermal stations are driven by gas produced during oil exploitation. The total expected energy produced by the six thermal stations is equal to 4100 Megawatts. The three hydro power stations and the six thermal stations are supposed to produce a total of 6000 megawatts, but generation fluctuates between 3000MW and 4000MW, while the average demand for electricity is about 5000MW. The setback is attributed to lack of major overhaul of plants; Federal Government funding to the sector decreased continually; most of the generating units have broken down as a result of lack of maintenance.

Etiosa noted with disappointment the government's continuous investment in the traditional energy sources – coal, gas, and oil- with little or no attention to renewable energy sources. These unsustainable energy sources are causing adverse social, health and environmental impacts that are currently not acknowledge or paid for by those who use the energy or profit from them. Also the gender implication of unsustainable energy sources is enormous. The burden of procuring wood-fuel used for household cooking, lighting and heating falls on women and children. Worldwide, 1.6 million people die each year due to health and respiratory effects

from indoor air pollution. When fuels become scarcer, female children over male children are withdrawn from school to support family energy needs. Illiterate women have more children, larger and poorer families and this reinforces the cycle of poverty and under development. The provision of accessible energy options will therefore save them time and hard labour.

According to the CREDC Chief Executive, renewable energies include wind, ocean wave and tides, solar, biomass, geothermal (heat of the earth), etc. They are 'renewable' because they are regularly replenished by natural processes and are therefore in endless supply. Technologies developed to harness these energies are called renewable energy technologies (RETs). Their rate of use does not affect their availability in future, thus they are inexhaustible. The resources are generally well distributed all over the world, even though wide spatial and temporal variations occur. Thus all regions of the world have reasonable access to one or more forms of renewable energy supply. They are clean and pollution-free, and therefore are sustainable natural form of energy. They can be cheaply and continuously harvested and therefore sustainable source of energy.

Highlighting further on the advantages of renewable energy sources, Mr. Uyigue said that renewable energy can be set up in small units and is therefore suitable for community management and ownership. The problem with grid electricity is that it is a centralized system, and because of the cost implication of connecting to the grid, many communities are unable to connect to the grid. Through the RETs, skill transfer and manufacturing opportunities for small businesses would be injected into rural communities. RETs are labour intensive, and can produce more jobs than fossil fuel or nuclear industries. Renewable energy can substantially reduce greenhouse gas emission and simultaneously increase employment. It can also enhance energy security by reducing reliance on fossil fuel.

Drawing the participant's attention to a closely related concept to renewable energy, Etiosa defined energy efficiency as improvement in practices and products that reduce the energy necessary to provide services. Energy efficiency products essentially help to do more work with less energy. For example, to light a room with an incandescent light bulb of 60 W for one hour requires 60 W/h (watts/hour). A compact fluorescent light bulb would provide the same light at only 11 W/h. This means that 49 W is saved for each hour the light is turned on. Energy efficiency is essential because they Reduce electricity bills; allows more energy to be made available for supply to all parts of the population; increase the efficiency and resilience of the economy – including reduced reliance on oil and thus improve balance of payments; improve industries' competitiveness internationally; minimize the building of new power stations and thus free up capital for other investments like health and welfare; reduce the negative environmental and human health impacts from energy production and use; increase employment through interventions e.g. in industry, housing, transport etc.

On wind energy, Etiosa said that the energy contained in the wind can be captured to generate electricity, using wind turbines, which are suitable for power generation in remote places where energy is needed but costly to connect to a central source. He said wind energy is clean and renewable and Europe has 70% of the grid-connected wind capacity, North America about 19% and Asia about 10%. About 45% of the European wind capacity is installed in Germany. He said a wind turbine is made up of three components – the tower, the rotor and the generator. The tower helps to elevate the blade to a height where the wind is strong. The blades capture kinetic energy from the wind and turns the rotor in turn turns the generator. One wind turbine can produce about 4 megawatts of electricity which is enough to

supply electricity to many communities. One or two is sufficient to supply the energy need of the Ugbowo Campus of the University of Benin.

He continued, saying that wind turbines can be installed singly or in cluster of about ten or in array of several thousands called a wind farm. An example is a wind farm in California, which contain a total of 6000 wind turbines. When installed in array, the energy from individual wind turbine are aggregated and delivered to an electric utility network. In some cases, wind turbines are installed offshore, where the strength of the wind is stronger. Many of these wind turbines use two generators, a small generator for times of light winds and a large generator for periods of strong winds. Other wind turbines use a single generator that contains dual electric windings. These dual electric windings accomplish the same task as the combination of a small and a large generator. Wind turbines come in various sizes, which include small, medium and large turbines. Germany is the leading country in renewable energy, about 75% of the country's energy is generated from renewable energy sources.

Etiosa said that solar energy can be collected using artificial devices called solar collectors. The energy collected is used either in a thermal process or a photoelectric (photovoltaic) process. When used in a thermal process, solar energy is used to heat a gas or liquid. In the photovoltaic process, solar energy is converted directly to electrical energy without intermediate mechanical devices. Flat Plate Collectors are used in thermal process while concentrating collectors are used to run applications such as air conditioning, central power generation, and industrial heating etc that flat plate collectors cannot provide sufficient energy. Nigeria has high potential to harness energy from the sun. The country falls within the tropics of Cancer and Capricorn where the abundance of sunlight is inevitable. Solar panels can be used in houses to heat up fluids or generate electricity or can be installed in array called solar farm. A solar farm can produce up to 3 megawatts of electricity.

On other forms of renewable energy, Etiosa said biofuel and biodiesel have been developed in many parts of the world and that they will compete with fossil fuel in future. Biofuel is produced either directly from plants or indirectly from industrial, commercial, domestic, or agricultural wastes. Nigeria has a high potential to develop bioenergy. Nigeria has all the vegetational regions of West Africa except that of the desert. Agriculture is the dominant economic activity, which contributes 41% of Nigeria's GDP and employs the highest labour in Nigeria. Other renewable energy sources are Geothermal Energy, fuel Cells and tidal energy. Geothermal energy involves using heat in the subsurface to heat houses or run a turbine. There are places where natural hot water comes to the surface while in other places it will be needed to dig down to tap the energy. Fuel cell involves the use of hydrogen to generate energy; in future cars may run on water, this is still being developed. For tidal energy, the movement of water during high and low tide have been used to turn turbine to generate electricity.

Mr. Uyigue said that despites Nigeria position as the sixth oil producing nation in the world with the oil reserve estimated to last for 37 years at current rate of production, the gas reserve to last for 110 years, the country is submerged in an energy crisis. About 80% of gas produced in Nigeria is being flared while 20% are used to drive thermal stations to generate electricity. He said the oil companies previously were flaring gas vertically, but because of the growing opposition to the activities of the oil companies, they now flare gas horizontally which is less conspicuous. Solar radiation intensity of up to 1.0KW/m2 peak is attainable in the northern part of Nigeria. Wind energy is available at an annual average speed ranging from 2.0 m/s near the coast to 4.0 m/s at the northern borders, which is suitable for wind energy development in Nigeria.

Concluding, Etiosa quoted “Take joint actions and improve efforts to work together at all levels to improve access to reliable and affordable energy services for sustainable development sufficient to facilitate the achievement of the Millennium Development Goals, including the goal of halving the proportion of people in poverty by 2015, and as a means to generate other important services that mitigate poverty, bearing in mind that access to energy facilitates the eradication of poverty”. He recommended that the Calabar Declaration be fully implemented and integrated into the policy framework of Nigeria. He said he was one of the 55 participants who drafted the Calabar Declaration during an international conference which held in Nigeria in 2004 organized by One Sky, a Canadian organization and co-hosted by the Canadian Environmental Network and the Environmental Rights Action. The participants came from Europe, North America, South America and Africa.

SESSION THREE

Plenary Session

The plenary session was facilitated by Dr. C. E. Okaka.

Question: Charles Omonaide

This Seminar has been enlightened because I heard a lot of things that I was not aware of formerly. How do you get people to start using renewable sources of energy as alternative source of energy? Who are the people that can help us access these sources of power supply?

Answer: This is what we are trying to do. The concept is still poorly developed in Nigeria and the products that are available in Nigeria market are still very expensive. What we are saying is that the government can help develop the renewable energy sector by removing import tariff from the products or even subsidize them. Part of the fund budgeted for energy can be spent on renewable energy. What we are trying to do is to create awareness among the civil society to enable them advocate for renewable energy in Nigeria. We need the right policies to be put in place for renewable energy development. The government should also send people outside the country to be trained on the technology.

Dr. Okaka facilitating the Plenary Session

Question: Dr. A. P. Oviawe

If generators are wiped out, Power Holdings Corporation of Nigeria (PHCN) will be more effective. Generating energy from coal has been left out in this seminar. The quality of coal in Nigeria is the 5th in the world. Why do we neglect coal and want to import ideals from other countries.

Answer: The use of coal to generate electricity is unsustainable and unrenewable. It leads to the emission of greenhouse gases; hence will contribute to climate change. Also, to meet the energy needs of many Nigerians, especially those in the rural communities, a decentralize system of generating energy is necessary. This we can get using renewable energy sources.

Question: Dr. F. I. Aigbodion

This issue that we are still flaring gas in the Nigeria is a thing of concern. Why should multinationals be flaring gas? Are there is no way to generate electricity without using a generator? Why not use the gas we are flaring for generating energy? We lack focus in this country that is why we do not know that gas can be used for cooking, generating energy etc. We don't need to depend on the Annex 1 countries for power supply.

Answer: The gas being flared can be put into other use. It can be converter to alcohol which can be used as fuel to run vehicles. All that is needed is for the government or the multinationals to install a plant that will convert the gas to alcohol. Alcohol stoves have been developed and it burns neatly. Electricity can be generated without generators. This can be done using renewable energy source such as solar panels.

Question: Mrs. B. Udogu

I wish the audience was much larger than this, because this seminar has been very enlightening. How affordable and available are these renewable energy products? It will be good if we can have an alternative source of power supply, because we can no longer depend on PHCN for energy supply.

Answer: The one that is available in Nigeria are solar components. They are very expensive. That is why we are saying that the right policies have to be put in place to encourage the development of renewable energy in Nigeria. Currently they are not affordable to many Nigerians.

Question: Tom Aneni

The pictures showed to us during the presentation, where were the pictures taken from? Renewable energy equipment, how long can they continue to work? Is there any local action?

Answer: Pictures shown during the presentation were not taken in Nigeria. They are photographs from Europe and other African countries. The life spans of renewable energy equipment are quite high. Wind turbines can last for generations. Some wind turbines have been working for 300 years.

Question: Fred Chiazor

What are the NGO's doing to stop gas flaring in communities, that is, diverting if for other use? What are the NGO's doing to sell the idea of alternative power supply to state governments?

Answer: The problem with many NGOs is the problem of documentation. Many NGOs do not have the capacity to do research. So when they are campaigning, and do not have facts or documents to back them up, government and the companies hardly take what they are saying serious. That is where our organization fits in, we combine research and development.

The best way to sell the idea of alternative power supply is through forum like this. That is what we are doing today. We are going to gradually take the process upward to the federal level.

Question: Mr. Ikhisemojie

See page 4 of the paper by Mr. Uyigue "Why Energy Efficiency?" Buildings are poorly designed when there is poor ventilation and poor lighting. For example the hall we are using for this seminar, without the air conditional you can see many of us are fanning ourselves.

Because of ignorance and poverty, people patronize unqualified personnel to design their houses.

On gas flaring issue, I saw the gas flaring sites sometimes ago when I was traveling, in another occasion as I was traveling on that same route, it appears the flaring sites have disappear. I now know that oil companies now use the horizontal flaring method. Are there no way of converting this gas into a useful source of energy supply? I saw a solar panel being used to pump water here in Benin.

Answer: The gas flared can be converted to alcohol.

Question: Udobor Festus

The problem of Nigeria is monoeconomic system. What will happen to us when the River Niger is dammed by some other countries? Are we sure of the longevity of the solar panels and wind turbines, the safety of these equipments used to generate these renewable energy and to know and be sure that they will not be of harm to us in the future. What is the efficiency?

Answer: Dam affects the flow regime of rivers. When constructing a dam, they block the river channel and excavate a portion of land behind the dam so that water coming upstream is stored. That excavated portion where water is stored is the reservoir. The reservoir can be very large, for example I have been to Challawa Gorge Dam and Tiga Dam in Kano State. It is so wide that I could not see the other side of the reservoir. When River Niger is dammed at the upstream section, it will affect the amount of water reaching the Kainji Reservoir, which will affect the efficiency of the energy generating capacity of the dam. Plans by the Niger Republic to dam the river at the upstream section were opposed.

Wind turbine can last for generations. Some have been running for 300 years. Renewable energy products are quite efficient and no adverse environmental impacts have been documented except that the blades of wind turbine are known to kill birds. But this is being taken care of.

Comment: Ekpok Erokoro

In China, we have seen that generators have been running for about 60 years at low cost because of the presence of a small hydro plant that can produce 20 mega watts. The people are concerned about how they use electricity because they pay for it. The cost of a small hydro project is about 2000 dollars per kilowatt.

Concluding this session, the facilitator Dr. C.E. Okaka said that we have heard all that has been discussed and have all gained from it. He said the problem in Nigeria is not availability of alternative sources but management. This is because we have observed that anything that involves the government does not work well, but on individual basis, it does. Let us endeavor to sensitize people about how to manage the sources of energy that we have and to also know about the alternative sources that we have.

Mr. Uyigue told participants that because the time is far spent, the drafted communiqué will be sent to them through their email addresses for them to make inputs. This was accepted by the participants. The facilitator made the vote of thanks on behalf of the participants and called the CREDC Director for the vote of thanks on behalf of CREDC. After the vote of thanks by the Director of CREDC, the closing prayer was said by Dr. C. E. Okaka and the forum came to an end at about 3.30 pm.

Appendix 1: Communiqué

Communiqué Issued at a One-Day Seminar Titled "Renewable Energy: The Key to Sustainable Energy Development in Nigeria" Organized by the Community Research and Development Centre (CREDC)

Preamble

A one-day seminar titled "Renewable Energy: The Key to Sustainable Energy Development in Nigeria" , organized by the Community Research and Development Centre (CREDC) held on the 18th July, 2006 at the Banquet Hall of the University of Benin, Benin City, Edo State, Nigeria. The event was attended by sixty-three participants drawn from the government, academics, NGOs, private sectors, student bodies, Nigerian Union of Teachers, and the Academic Staff Union of Universities (ASUU). Among the government officials present were the Commissioner of the Edo State Ministry of Environment represented by the Assistant Director of Pollution Control and the representative of the Commissioner of Edo State Ministry of Information and Orientation. The event featured paper presentations, observations, discussions and resolutions.

Observations

1. Despite Nigeria's position as the sixth oil producing nation in the world, about 60-70% of Nigerians do not have access to electricity.

2. Even those who are connected to the national grid experience power outages that last for several hours in a day.

3. Energy generation fluctuates between 3000MW and 4000MW, while the average demand for electricity is about 5000MW.

4. Nigeria's energy sources are generated from unsustainable sources – large hydro, fossil fuel and gas thermal stations, which are causing environmental degradation and pollution.

5. The 123 gas flaring sites in the Niger Delta region are contributing to climate change, making Nigeria one of the major emitter of greenhouse gases in Africa.

6. That the low energy generation in Nigeria is due to poor maintenance of the generating facilities, inadequate funding of the agencies by the Federal Government and bad management practices.

7. Renewable energy and energy efficiency concepts and products are poorly developed in Nigeria.

9. Poor building quality account for 32% of emission rate.

10. That the private sectors are more efficient in delivery their services more than the public sectors.

11. Low access to energy have more impart on women and children.

12. There is low awareness in Nigeria on the Kyoto Protocol and it mechanisms especially the Clean Development Mechanism.

Having observed these, our **concerns** are:

1. The poor development of renewable energy technologies in Nigeria.
2. The extremely low access to energy in Nigeria, especially the rural populace
3. Poor management of the hydroelectric dams and other power generating facilities.
4. Insufficient energy generation in Nigeria.
5. Low investment by the government in renewable energy technologies in Nigeria.
6. Inadequate policies to develop renewable energy and energy efficiency in Nigeria.

7. The adverse social and environmental impacts of gas flaring on rural populace in the Niger Delta.

Resolutions

We therefore make the following resolutions:

1. The sensitization of the civil society to build their capacity to advocate for renewable energy at all levels of government to increase their political will

2. The Nigerian government should commit larger percentage of energy fund to renewable energy.

3. Integrate the Calabar Declaration into the policy framework of Nigeria

4. The government should increase access to energy especially in the rural areas using renewable energy.

5. The government should encourage the importation of renewable energy and energy efficiency products by making them duty-free.

6. The government should develop good management practices of energy generating facilities.

7. Stop the flaring of gas in the Niger Delta of Nigeria and convert them to other useful products.

8. Increase awareness on the Kyoto Protocol and it mechanisms especially the Clean Development Mechanism.

9. Non-governmental organization should increase the awareness on climate change and the on-going climate change mitigation process.

10. That the Nigerian government should take advantage of the provision in the Clean Development Mechanism to achieve sustainable development.

Conclusion

After all deliberations, the vote of thanks was made by the participants and organizer and the forum came to an end.

Signed:

Etiosa Uyigue
For the Organizer

Prof. N. O. Eghafona
Conference Chair

Appendix 2: List of Participants

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Appendix 3: First Paper Presentation

REDUCING GREENHOUSE GASES EMISSIONS (GHG) THROUGH THE CLEAN DEVELOPMENT MECHANISM (CDM): PROSPECT AND CHALLENGES FOR THE DEVELOPING NATIONS

BY

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REPRESENTING

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PRESENTED AT

A ONE DAY WORKSHOP ORGANIZED BY COMMUNITY RESEARCH AND DEVELOPMENT CENTRE (CREDC), BENIN

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DISCOVERY OF CLIMATIC CHANGE

INTRODUCTION

The industrial countries from research are responsible for high levels of GHG emissions while the major burden of imminent negative impacts due to geographic location, economic, political social and environmental conditions will be assumed by the developing countries.

The United Nations for framework convention on climatic change (UNFCCC) provides the outline of a global action plan to mitigate adverse effect on the atmosphere.

The Kyoto protocol was designed to further strengthened the provisions of the UNFCCC and introduces flexible mechanisms that would allow a reduction of greenhouse gas emissions in the most cost effective, efficient and sustainable manner. Of these instruments, the CDM allows the channeling of foreign investment by the annex 1 countries to developing nations to promote sustainable development and abate greenhouse emissions while generating certified emissions reduction units (CERs) that the industrialize nations can apply towards meeting their own emissions reduction targets.

CLIMATE CHANGE MECHANISMS

Climatic force was caused both by natural factors and anthropogenic. Natural factors include variations in the earth orbit, variations in solar energy output and volcanic activity, which tend to cool the earth surface. Anthropogenic factors that affect global warming includes:

1. Industrial process which is responsible for 43% global carbon dioxide emissions in 1995
2. Buildings both commercial and private accounts for 31% of carbon dioxide emissions in 1995.
3. Transportation accounts for 22 percent of dioxide emissions while
4. Land use changes accounts for 4 percent of global carbon dioxide emissions but over 20% of global anthropogenic ghg emissions are mainly from methane and nitrous oxide in 1995.

CONSEQUENCES OF GLOBAL WARMING

The latest scientific assessment predicts global warming of 1.4% to 5.8% by 2100 relative to 1990.

Consequences of global warming include:

1. Rise in sea levels: due to thermal expansion that occurs as water is heated, melting alpine glaciers and melting polar caps could course sea levels to rise by 11 to 77 centimeters (0.27 ft to 2.64ft) by 2100.

According to UNEP study, about halve of the world population live by the coastal areas and stand directly or indirectly affected by such changes.

2. Changes in weather patterns: global warming is likely to increase the frequency and severity of extreme weather events such as storms and hurricanes, heat waves and

droughts. Warming will be greater in high latitude than the tropics during winter and fall seasons while mid-latitudes would experience more summer dryness.

3. Human health: warming temperature will result to severe drought and severe flooding and would create problems with irrigation, drainage and ground water salination.more people would be exposed to vector borne (e.g. malaria) and water born (e.g. cholera) diseases and increase in heat stress mentality.
4. Decline in overall biodersity: coastal areas, which contains diverse and productive ecosystems such as mangrove forest, coral reefs, salt marshes and wetlands will be affected by rising levels and increase in ocean temperatures. flora and fauna might not be able to adapt to rapid climatic change.
5. Implications for agricultural and food security: studies have shown that as little as 1 degree centigrade of global warming could promote produce a 161 –kilometer shift in temperature zones. This will result to regional shift and agricultural productivity. There will be reduction in crop yields in tropical and sub tropical regions. Currently one billion people are starving. There would be loss of human lives in least developed countries.

UNFCCC /IPCC/KYOTO PROTOCOL

In the year 1988, the governing council of UNEP met in Nairobi, Kenya and with help of world meteorological organization (WMO) created an inter governmental body to conduct on going studies of global warming. The body came to be known as intergovernmental body to conduct on going studies of global warming. The body came to be known as Intergovernmental Panel On Climatic Change (IPCC). The IPCC mandate was to assess the state of existing scientific knowledge about climatic system and climatic change, to look at the environmental, economic and social impacts of climatic change and to develop potential response strategy. The IPCC first assessment report was published in and presented at the second world climate conference in 1990.An intergovernmental negotiating committee (INC) was created and charged with the task of negotiating an Framework Convention On Climatic Change (FCCC) as well as associated protocols designed to counter climatic change. UNFCCC was presented for signature at the earth summit in Rio De Janeiro in 1992.the convention was signed by 154 states plus the EU, and the UNFCCC entered into force on march 21,1994,90 days after the 50th signatory state actually ratified the document. The UNFCCC distinguishes between two groups of countries. Annex 1 of the convention list 41 countries, including industrialize countries and those of economy in transition. The rest fall under non-annex 1 category. Under the convention, annex 1 countries agree to bring their emission levels down to the 1990 levels while the non annex 1 agreed to adopt GHG reduction policies, contributing to climatic change mitigation. After its 11th session, the INC dissolved in 1995 and the conference of parties (COP) became the convention ultimate authority .The first conference of parties (cop) took place in Berlin march 28th to April 7th 1995.COP-3 was attended by about 10,000 delegates, observers and journalist in December 1997 at Kyoto, Japan. The result was the Kyoto protocol adopted by consensus.

Countries listed under annex 1 to the convention appear under annex b of the protocol, while the non-annex 1 countries are now listed in the protocol as the non-annex b countries.
The protocol commits annex b countries that ratify the protocol to reduce GHG emissions below 1990 levels by the first commitment period (2008 to 2012). Example Canada being one of the high emitters is has to reduce to less than 5 percent of its 1990 level, which is 571 MT/yr from its current emission level of 607 MT/year during its commitment period. Despite signing the protocol, the United States withdraws in March 2001.in February 2003 the US announced an alternative to curb carbon emission based on carbon intensity. US is responsible for 22% of current global emissions. The protocol approve various mechanism that would allow industrialize countries to use cost effective international opportunities to reduce GHG emissions.austrilia did not ratify the protocol.
Three mechanisms of adopted are:

1. Emissions Trading (article 17). Parties included in the annex b can purchase assigned amount units (AAUS) from the annex b countries in other to fulfill their emission reduction commitments, which must be supplemental to domestic action.
2. Joint Implementation (article 6): this allows annex b countries to purchase emission reduction units (ERUS) resulting from emission reducing or emission avoiding project activities implemented by any other annex b.
3. Clean Development Mechanism (article 12): this allows annex b countries to acquire certified emission reductions (CERS) resulting from project activities implemented in the non annex b countries. Annex b countries can use these CERS to partially comply with their reduction commitments.

CLEAN DEVELOPMENT MECHANISM (CDM)
The clean development mechanism (CDM) was adopted on the 11 December 1997 by the third conference of parties under article 12 of the Kyoto protocol .The CDM is to “assist parties not included in Annex 1 to the convention in achieving sustainable development and in contributing to the ultimate objective of the convention and to assist parties included in Annex 1 in achieving compliance with their quantified emission limitation and reduction commitment |”1
CDM helps achieve global climatic change mitigation through a market based instrument .It is cost effective in promoting sustainable development in developing countries and also by assisting parties listed as annex 1 in achieving compliance to meet their target of reduction of GHG within the commitment period. It also facilitates transfer of fund from the developed or annexes countries to the developing nations.2.
Article 12 of the protocol states that the emission reduction has to be real, measurable and the reduction must be additional to any that would have occurred in the absence of the CDM project. The additional funds generated by the CDM for the developing nations can be channel into economic, social, environmental and development objective.

The project apart from satisfying environmental additionally (emission reduction must be certify on the basis of real, measurable and long term benefit related to the mitigation of climatic change), must satisfy financial additionality, which refers to whether the investment would have taken place in the absence of the credit gaining CDM provision. Example a solar company investing in a developing country expects a return of 15 percent on investment. Without CDM credit the return is 10 percent but with CDM credit the return is 20 percent, the project is additional but if the return is 15 percent with out the CDM credit, it means the project is not financially additional.

CDM PROJECT CHARACTERISTICS

CDM projects must result to net reduction in GHG emissions. CDM projects have two parallel income flows:

1. The first flow refers to income generated from the project e.g. sales of electricity or wood from reforestation project. The project goes through prefeasibility, feasibility and development .the project must have an acceptable level of risk and an acceptable IRR because project financing will mostly be undertaken by banks, multilateral banks and other specialize funds.
2. The second income stream is the carbon flow. This are tones of carbon dioxide abated or reduced in the case of energy efficient projects or tones of carbon dioxide fix in biomass in the case of land use projects.

Certified Emission Reduction (CER)=1 ton Carbon dioxide equivalent Unit=1 global warming potential

CDM LIFE CYCLE

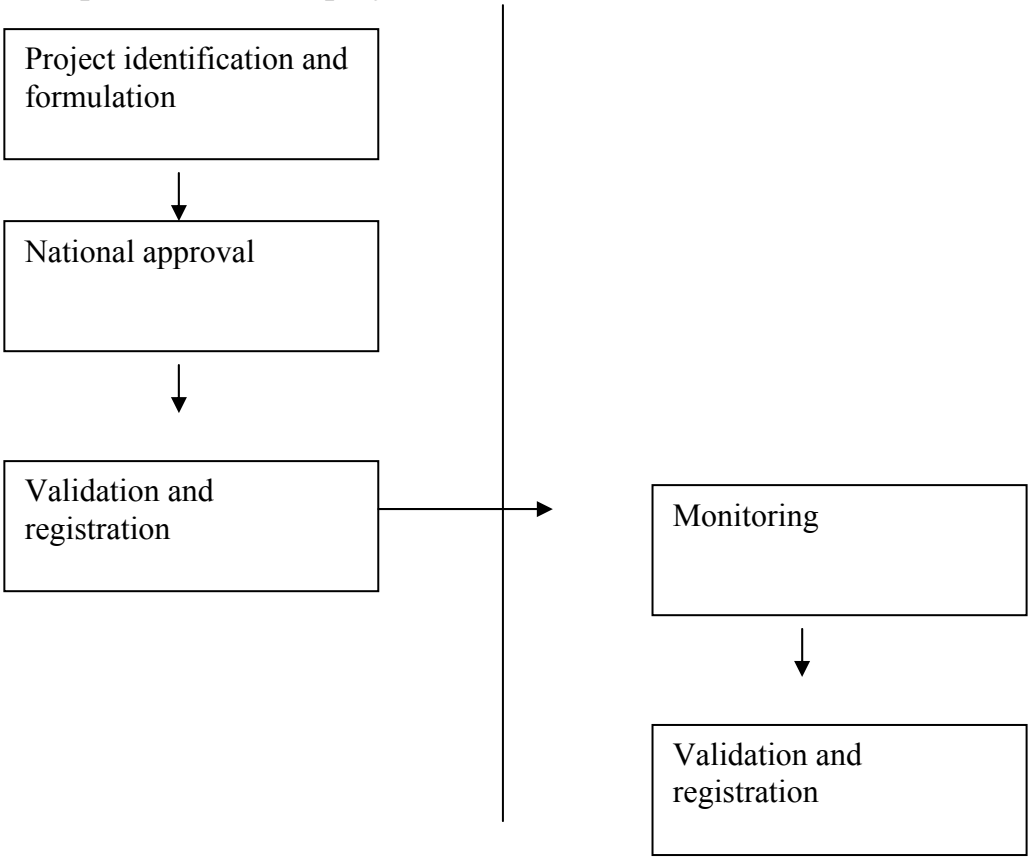
The carbon component of a mitigation project can only acquire value in the international market if it is submitted to a verification process design to measure and audit the carbon component of the project.

According to the Marrakech accord, the CDM project has five stages:

1. **Identification and formulation**
2. National approval
3. Validation and registration
4. Monitoring
5. Verification/certification

The first three stages are preimplimentation of project while the last two are during the lifetime of the project.

Pre-implementation of project



GOVERNANCE

As define by the protocol, two bodies will administer the CDM: The COP/MOP and the executive board.

COP/MOP

The conference of the parties serving as the meeting of the parties is the supreme body of the CDM and it is constitute by countries that have ratified the Kyoto protocol. The COP/MOP will provide guidance to the executive board and elaborate the modalities and procedures with the objective of ensuring transparency, efficiency and accountability. The COP/MOP also reviews the regional distribution of Designated Operational Entities (DOE), in other to promote an equitable distribution.

EXECUTIVE BOARD

The executive board supervise the CDM and fully accountable to the COP/MOP. It will be responsible for accrediting Operational Entities (an entity accredited by the executive board and consequently designated by the COP/MOP to validate proposed CDM projects), defining modalities and procedures for the CDM, approving new technologies and guidelines related to baseline, monitoring plans and project boundaries, and maintaining the CDM registry and database.

PROSPECT FOR THE DEVELOPING NATIONS

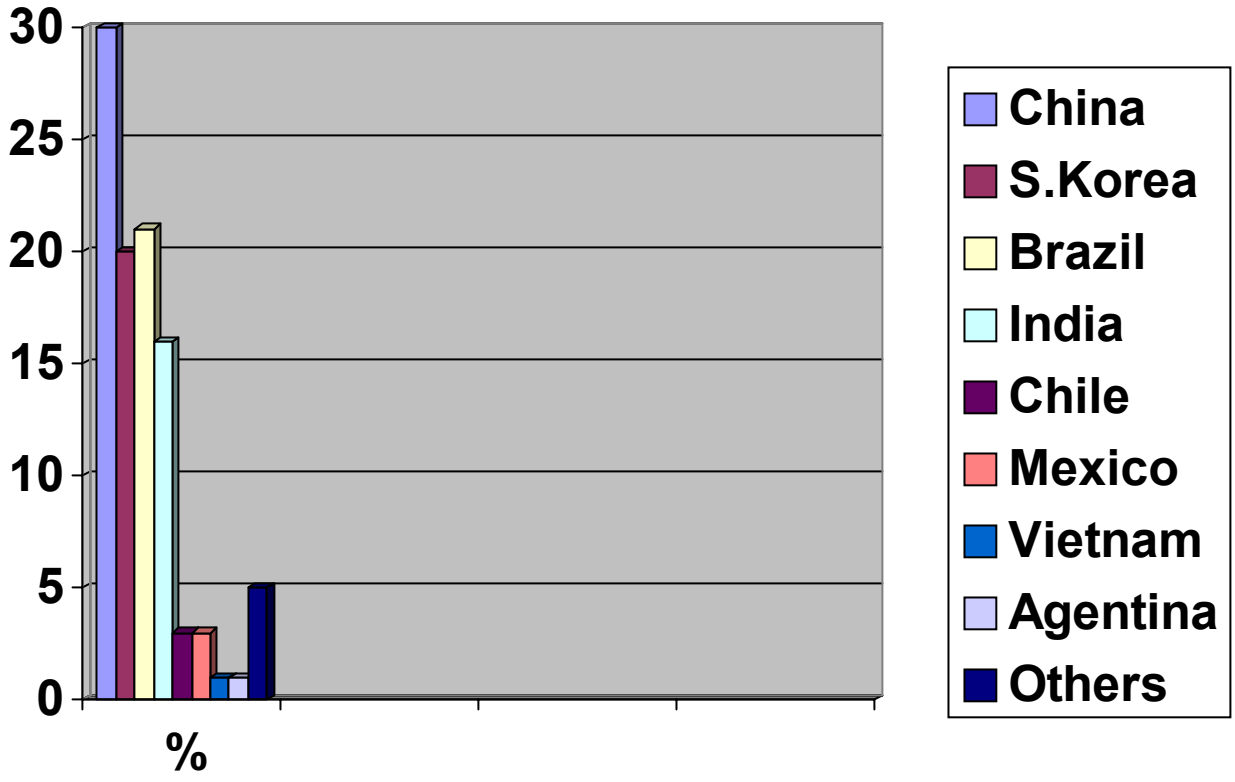
The prototype carbon fund (PCF) was established on the 20th of July 1999 by the executive directors of the World Bank. The mission of the PCF is to pioneer the market for project based greenhouse gas emission reductions within the framework of the Kyoto protocol and to contribute to sustainable development .the PCF is a partnership of 6 government and 17 multinational companies. The fund has financed 32 projects under preparation with an emission reduction potential of US $165 million according to the PCF Annual report, 2004 The six Government involve in the initiative are: Canada, Netherlands Finland, Japan, Norway and Sweden. Project Developers in Nigeria can access these funds for the purpose of avoiding or reducing emissions of CHG.

CHALLENGES FACING THE DEVELOPING NATIONS

According to the New Internationalist (2006), the current situation identified in the carbon-offset market is as follows:

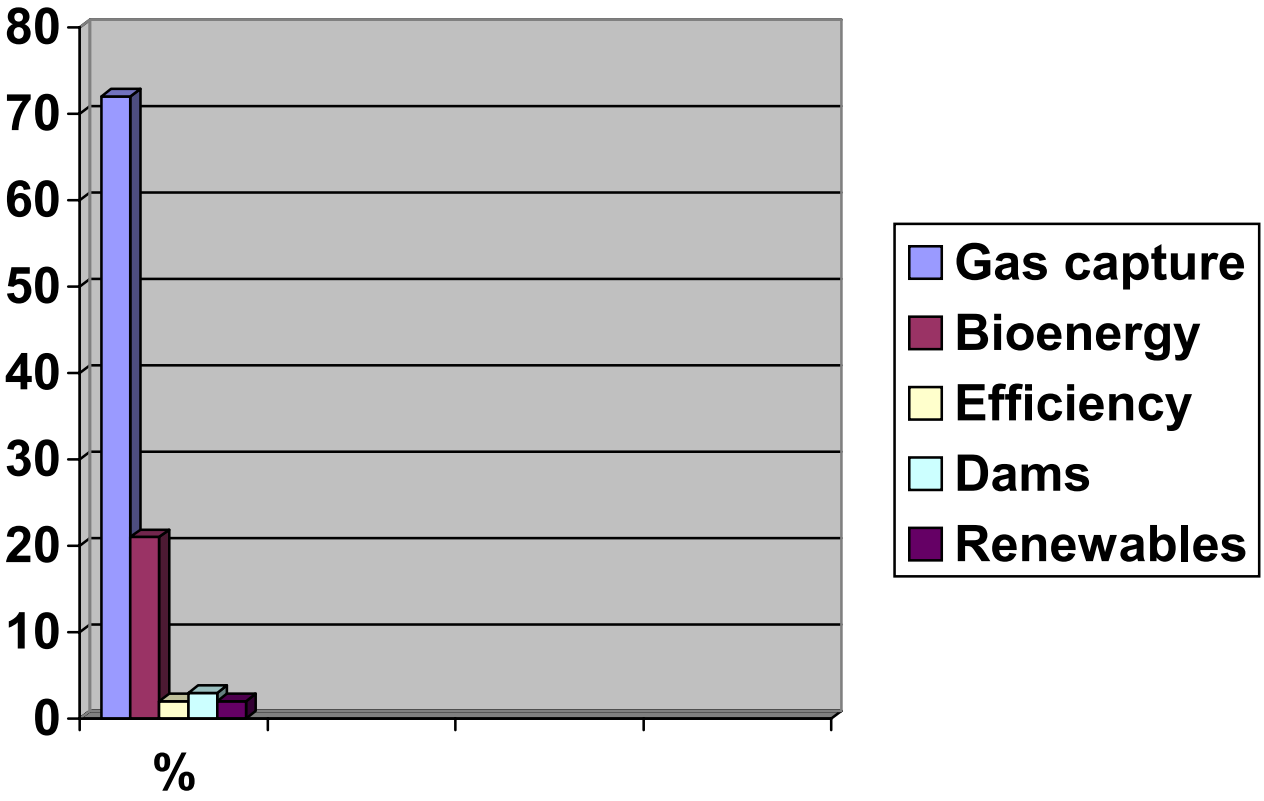
- The official offset market represents approximately US$371million of which nearly 75 percent is controlled by just three countries namely china, Brazil and South Korea.
- In the UN list of 50 least developed countries (LDCs) only 3 countries namely Bangladesh, Bhutan and Nepal have registered projects with the Clean Development Mechanism (CDM). The projects are 3 biomass and 1 small hydro .This implies that Nigeria is yet to register a project.
- The LDCs share of the carbon market is just 0.33 percent of the CDM financing or US $1.2million while two third of CDM projects is initiated by just three countries namely: the Netherlands, Britain and Japan.
- Of the 176 registered projects with the UN's climatic office,according to the New Internationalist,99 are biomass projects initiated by industries such as sugar refineries that have huge environmental impact.

Estimated annual carbon credit from registered CDM projects



Source: Adapted from the New Internationalist (2006)

SHARE OF TOTAL CARBON CREDIT BY PROJECT TYPE UNDER THE CDM



Source: Adapted from the New Internationalist (2006)

DEVELOPING OBUDU CATTLE RANCH SMALL HYDRO AS A CDM PROJECT

PROJECT SUMMARY

1	Project name	Obudu plateau small hydro
2	Scale	Small scale of 1MW type
3	Power produced (KWH)	7,920,000
4	Project Revenue: present value of sales of electricity over 25 years using 10 percent as cost of capital	N649, 633,620.00
5	Emissions abated (using Em of 0.8) per year Is 7008t CO2 equ Present value of sales of carbon credit (10yrs crediting period) using 10% as cost of capital	N36, 139,303.00
6	Projected cost of project	N280, 000,000
7	Project life	25yrs
8	Projected cash flow: • 10 yrs crediting period • 25 yrs of electricity generation	N36, 139,303.00 N649, 633,620.00

CONCLUSION AND RECOMMENDATIONS

The issues raised in this paper borders on using the CDM as an incentive to reduce GHG emissions especially in the developing nations .The statistics on ground does not give cause for joy as entry into the carbon market is still the prerogative of the advance nations who initiate the process. The cost of putting the project documentation in the registration process is high. Small scale projects project that abate emission by less than 15KT per year could cost about $12,000 the prepare business plan, PDD and PIN .

In view of the above scenario, we recommend that:

1. **The federal Government of Nigeria through the Presidential Implementation Committee CDM get more Nigerians involve especially NGOs and private developers**
2. NGOs should carry out sensitization of the general public of the essence and benefit of CDM
3. The Non Profit sector should network with other international network to attract more funding and registration of projects in the developing nations
4. Capacity of project developers should be developed taking a cue from Pembina Institute through the Canada Small Project Fund (SPF) through the CIDA developed 6 projects that are currently undergoing national approval and
5. Partnership between the PIC CDM, Private sector and the NGOs

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Preliminary investigation report on the potential of the obudu hydro power potential prepared by MC Nwanchukwu

Appendix 4: Second Paper Presentation

CREDC

RENEWABLE ENERGY AND SUSTAINABLE DEVELOPMENT IN NIGERIA

BY

ETIOSA UYIGUE

FOR

COMMUNITY RESEARCH AND DEVELOPMENT CENTRE

JULY 2006

CHAPTER ONE

INTRODUTION

Energy is central to all human activities. It needed to support development and it is inevitable for poverty alleviation. Energy provides major benefits in the areas of health, communications and productivity. It is vital if we are to achieve developmental targets and more essentially to meet the millennium development goals (MDGs). Reports show that about 2 billion people live without access to electricity[1]. Low access to energy, and in many places, no access at all is epidemic in the developing countries of the world, which are mainly in Africa and Asia. Moreover, majority of the world poor live in sub-Sahara Africa.

There are apparently links between poverty and access to energy. If we need to cook our food, heat our homes and water, keep our food and medicine fresh in the fridge, light our homes, and access education and entertainment by radio or TV, we need energy. Energy is a vital ingredient for socio-economic and technological development. There can be no development without access to energy. The citizens of many poor nations of the world have low access to energy and the richer countries consume far more energy than the poor countries, suggesting that access to energy is the dividing line between the rich and the poor countries. Thus, access to energy is directly proportional to good living standard.

What operates in many parts of the world is a centralized energy system where communities and individuals are connected to common energy source. In the developing countries, because of the cost implication of connecting to the grid, many poor communities are cut off from energy source. More also, because of the lack of political will of the governments in these countries, many communities are unconnected to the grid. Such centralized system favours the urban communities more than the rural communities, since in many parts of world governments pay more attention to the urban areas.

In Nigeria, centralized energy system exists. Many communities, especially in the rural areas are not connected to the national grid. Irrespective of Nigeria's position as the sixth largest petroleum oil exporter and a leading gas exporter, the nation suffers enormous energy crisis manifesting in various forms: about 60 -70 % of the nation's population (projected at 103 million for 2002) are excluded from the national electricity grid[2]. Moreover, the grid is plagued by rather frequent power outages that last for several hours daily in places that are connected to the grid. Still, the grid electrical energy is generated from unsustainable sources (large hydro power stations and a growing number of thermal gas stations).

The Nigerian government and many governments in the developing world have continued to invest in the traditional energy sources – coal, gas, oil and nuclear - with little or no attention to renewable energy sources. These unsustainable energy sources are causing adverse social, health and environmental impacts that are currently not acknowledge or paid for by those who use the energy or profit from them. The burning fuels releases poisonous gases into the air that are bad for human health. Some of the gases such as NO_2 and SO_2 cause acid rain which can destroy biodiversity and lead to the pollution of the ground water. There are visible evidences to show that the release of CO_2 and other green house gases is leading to global warming. More over, there is a limited amount of fossils fuels and already the reserves of oil are starting to run out - We probably have enough oil for another 30 to 50 years[3].

The gender implication of unsustainable energy sources is enormous. The burden of procuring wood-fuel used for household cooking, lighting and heating falls on women and children. Women and children are exposed to huge drudgery, and the expenditure of human energy and time to fetch the wood impairs their development. This exposes them to diseases and sometime death resulting from the release of very noxious smoke due to its inefficient burning.

Most rural woodlands have been depleted, and women and children have to spend so much time and energy collecting wood, because they have to walk long distances carrying heavy loads.

Women and children become vulnerable to respiratory disorders and other adverse health conditions. Worldwide, 1.6 million people die each year due to the health and respiratory effects from indoor air pollution[4]. When fuels become scarcer, female children over male children are withdrawn from school to support family energy needs. Illiterate women have more children, larger and poorer families and this reinforces the cycle of poverty and under development. The provision of accessible energy options will therefore save them time and hard labour. Time previously used for wood collection and related chores can then be applied in other productive activities such as adult literacy and skills training.

CHAPTER TWO

RENEWABLE ENERGY AND ENERGY EFFICIENCY

Renewable Energy

Renewable energies include wind, ocean wave and tides, solar, biomass, rivers, geothermal (heat of the earth), etc. They are 'renewable' because they are regularly replenished by natural processes and are therefore in endless supply. They also can operate without polluting the environment. Technologies have been developed to harness these energies and such technologies are called renewable energy technologies (RETs) or sometime also called "clean technologies" or "green energy". Because renewable energies are constantly being replenished from natural sources, they have security of supply, unlike fossil fuels, which are negotiated on the international market and subject to international competition, sometimes may even resulting in wars and shortages. They have important advantages which could be stated as follows:

- Their rate of use does not affect their availability in future, thus they are inexhaustible.
- The resources are generally well distributed all over the world, even though wide spatial and temporal variations occur. Thus all regions of the world have reasonable access to one or more forms of renewable energy supply.
- They are clean and pollution-free, and therefore are sustainable natural form of energy.
- They can be cheaply and continuously harvested and therefore sustainable source of energy.

Unlike the nuclear and fossil fuels plants, which belong to big companies, governments, or state owned enterprises, renewable energy can be set up in small units and is therefore suitable for community management and ownership. In this way, value from renewable energy projects can be kept in the community. In Nigeria, this has particular relevance since the electricity grid does not extend to many rural areas and it is prohibitively expensive to extend the grid to remote areas. This presents a unique opportunity to construct power plants closer to where they are actually needed. In this way, much needed income, skill transfer and manufacturing opportunities for small businesses would be injected into rural communities.

Transition from fossil fuels to renewable energy will not result in net job losses or cause harm to the economy. Renewable energy technologies (RETs) are labour intensive, and can produce more jobs than fossil fuel or nuclear industries. When RETs are properly integrated into national development plans and implemented, they can substantially reduce greenhouse gas emission and simultaneously increase employment.s. Moreover, it will also enhance energy security by reducing reliance on oil, preserve the competitiveness of energy, lead to savings for consumers and provide transitional assistance to workers in negatively affected industries and communities. With the right approach, the interests of working families and the environment can come together.

Energy Efficiency

Energy efficiency means improvement in practices and products that reduce the energy necessary to provide services like lighting, cooling, heating, manufacturing, cooking, transport and entertainment. Energy efficiency products essentially help to do more work with less energy. The efficiency of an appliance or technology is determined by the amount of energy needed to provide the energy service. For instance, to light a room with an incandescent light bulb of 60 W for one hour requires 60 W/h (that is 60 watts per hour). A

compact fluorescent light bulb would provide the same light at 11 W and only use 11 W/h. This means that 49 W is saved for each hour the light is turned on.

Why Energy Efficiency?

A lot of industries, power companies, offices and households use more energy than is actually necessary to fulfill their needs. This is because they use old and inefficient equipment, production processes and buildings that are poorly designed or because of bad practices or habits. Using energy more efficiently would:

- Reduce electricity bills;
- Leave more energy available to extend energy supply to all parts of the population;
- Increase the efficiency and resilience of the economy – including reduced reliance on oil and thus improve balance of payments;
- Improve industries' competitiveness internationally;
- Minimize the building of new power stations and thus free up capital for other investments like health and welfare;
- Reduce the negative environmental and human health impacts from energy production and use;
- Increase employment through interventions e.g. in industry, housing, transport.

Wind Energy

The energy contained in the force of the winds blowing across the earth's surface can be harnessed. Such energy can be converted into mechanical energy for performing various works such as generating electricity, pumping water, grinding grain, etc. Modern wind turbines are being used to generate electricity in countries such as Germany, Denmark, India, China, and the United States to supplement more traditional sources of electric power. Design improvements such as more efficient rotor blades combined with an increase in the numbers of wind turbines installed, have helped increase the world's wind energy generating capacity by nearly 150 percent since 1990[5].

Modern wind energy systems are made up of three basic components - tower, rotor and generator.

The Tower

This is the structure on which the wind turbine is mounted. Advancements in structural design and construction materials have led to the construction of taller towers, allowing rotors to be mounted farther off the ground, where winds are typically stronger. Wind turbine towers can be constructed from metal, reinforced plastics, and concrete. The towers also house the cables that conduct electricity from the generator.

The Rotor

The rotor is the component that is turned by the wind. It spins when driven by the wind and supports blades that are designed to capture kinetic energy in the wind. Most modern wind turbines have rotors that spin about an axis parallel to the ground. The spinning rotor turns

a shaft which converts the wind's energy into mechanical power. In turn, the shaft drives the generator, which converts mechanical energy into electricity.

The Generator

The generator converts the mechanical energy of the spinning rotor into electricity. Many of these wind turbines use two generators, a small generator for light winds and a large generator for strong winds. Other wind turbines use a single generator that contains dual electric windings. These dual electric windings accomplish the same task as the combination of a small and a large generator. Some wind turbines use another type of specially designed generator that is driven directly by the rotor without a transmission.

Wind Turbine Size

Wind turbines can be arbitrarily divided into three classes: small, medium, and large. Small wind turbines are capable of generating between 50 watts and 60 kilowatts of power, and use rotors ranging in diameter from less than 1 to 15 m (3 to 50 ft). Small wind turbines are installed primarily in remote areas where access to conventional sources of electricity is either too expensive or too unreliable. Some small turbines, known as micro-turbines, are so compact they can be carried to remote locations. Medium-size turbines use rotors spanning diameters between 15 and 60 m (50 and 200 ft), and have a generating capacity ranging from 50-1500 kilowatts. Most commercial wind machines are medium-size turbines and have a generating capacity in the range of 500 kilowatts to 750 kilowatts. Large wind turbines have rotors spanning in diameters between 60 and 100 m (200 to 330 ft), and are capable of generating 2 to 3 megawatts of power.

Wind Turbines Installation

A vital factor to consider when installing wind turbines is location that is finding suitable terrain and wind conditions. Location is critical for maximizing the electricity wind turbines can generate. The amount of kinetic energy available in the wind is a cubic function of wind speed. When wind speed increase doubles, there is a corresponding eight-fold increase in available energy. This exponential relationship between wind speed and wind energy makes location extremely important.

Advantages of Wind Energy

Wind turbines are suitable for power generation in remote places where energy is needed but costly to connect to a central source. They are particularly suitable for development of energy in rural communities in developing countries. Wind turbines can be installed in single units, in clusters (of two to ten turbines), and in large arrays, called wind power plants or wind farms. Wind farms are an assemblage of multiple independent wind turbines, and may number up to several thousands. Wind power plants in the Altamont Pass, California contain a total of 6000 wind turbines. Although each wind turbine in a wind power plant operates independently, the turbines are typically connected to a central monitoring system, where the power they generate is aggregated and delivered to an electric utility network.

Wind energy is a clean and renewable. However, wind energy is an intermittent resource. At windy sites, wind turbines operate 60 percent of the year. Sometime, the wind may be insufficiently strong for wind turbines to generate at full capacity. The intermittent nature of wind energy does not affect consumers when wind turbines are tied to an electrical network, or power grid. People located in remote sites that rely on electricity from wind turbines often use batteries or a backup generator to provide auxiliary power during extended periods

without sufficient wind. In the mode of operation, modern wind turbines are as reliable as conventional power plants. Most commercial wind turbines are down for maintenance or repair less than 3 percent of the time. Wind turbines are also known for their longevity. Many American farm windmills have been in continuous use for generations, while some traditional European windmills have been working for almost 300 years.

Wind Energy and the Environment

With the rising concern about global warming, the use of wind energy will continue to increase. Wind power is a cost-effective source of electricity, thus the market for wind power will continue to expand. Some environmental and political factors, however, will also influence the growth of wind energy. Although wind energy is a relatively clean means of generating electricity, there are associated impacts. One of these is the potential for a wind farm to alter the visual quality of the landscape, especially when located in a scenic area. Noise associated with spinning wind turbine rotors has generated complaints from the public. Another environmental concern associated with wind energy is the impact on wildlife. Wind turbines in some areas are responsible for killing birds that are accidentally caught in the rotor blades. However, some of these environmental concerns are being addressed.

Wind Energy and Other Conventional Energy Sources

Wind power is the fastest growing of the renewable energy options and is competitive with other conventional options when aback-up generation source is available and when government support is provided as an incentive. Global annual growth in installed capacity of wind turbines averaged 40% between 1994 and1998. In 2000, installed capacity stood at more than 13 000 MW in 50 countries. Europe has 70% of the grid-connected wind capacity, North America about 19% and Asia about 10%. About 45% of the European wind capacity is installed in Germany[5].

Solar Energy

Solar energy can be collected using artificial devices called solar collectors. The energy collected is used either in a thermal process or a photoelectric (photovoltaic) process. When used in a thermal process, solar energy is used to heat a gas or liquid. In the photovoltaic process, solar energy is converted directly to electrical energy without intermediate mechanical devices. There are two types of solar collectors:

Flat Plate Collectors

Flat plate collectors are used in thermal processes. They intercept solar radiation on an absorber plate in tubes carrying fluid. The carrier fluid (liquid or air) passing through these flow channels has its temperature increased by heat transfer from the absorber plate. Flat plate collectors are capable of heating carrier fluids up to 82° C (180° F) with efficiencies between 40 and 80 percent. They have been used efficiently for water and comfort heating in residential houses. Typical residential applications employ roof-mounted fixed collectors. The optimum angle at which to mount collectors relative to the horizontal plane depends on the latitude of the installation.

Concentrating Collectors

To run applications such as air conditioning, central power generation, and industrial heating, flat plate collectors cannot provide sufficient energy for these. More complex and expensive concentrating collectors can be used. Concentrating collectors are devices that

optically reflect and focus incident solar energy onto a small receiving area resulting in the concentration of the intensity of the solar energy, which is magnified, and the temperatures that can be achieved can approach several hundred or even several thousand degrees Celsius. The concentrators must move to track the sun if they are to perform effectively, and the devices used to achieve this are called heliostats. To use solar energy for cooling, concentrating collectors are more suitable than flat plate collectors.

Photovoltaic Process

Solar cells have been developed which convert solar radiation directly into electricity. Cells with conversion efficiencies in excess of 30 percent are now available. Large numbers of these cells can be connected into modules. Due to the intermittent nature of solar radiation as an energy source, excess solar energy during periods of small demand are stored in order to meet demands when solar energy availability is insufficient. Batteries are used as storage devices for excess electric energy produced from photovoltaic devices.

Solar Energy Development

Africa is well endowed with sunshine all year round. Solar resources are by far the most abundant and readily accessible in the African continent. In recent years, the numbers of households in developing countries using solar cookers and heaters tripled to more than 10 million, and in mainly rural areas, the number of households serviced with “solar home systems” grew from zero in the early 90s to one million today. Thousands of communities receive clean drinking water by using solar-powered pumps and purifiers. The cost of solar photovoltaics (PV) has dropped by 80% in the past two decades and will need to fall by a further 50-75% in order to be fully competitive with conventional energy sources. Photovoltaic technologies have reached a global production level of 120 MW[5].

Geothermal Energy

The earth is hotter the deeper one drills below the surface. Water and steam circulating through deep hot rocks, if brought to the surface, can be used to drive a turbine to produce electricity or can be piped through buildings as heat. Some geothermal energy systems use naturally occurring supplies of geothermal water and steam, whereas other systems pump water down to the deep hot rocks. The cheapest and best form of geothermal energy comes from the ground in the form of dry steam. In most habitable areas of the world, this subsurface energy source lies so deep that drilling holes to tap it is very expensive. Presently, many nations of the world have begun tapping these subterranean resources to generate electricity, such as Iceland, France, Hungary, and New Zealand. A fundamental advantage of geothermal energy is that it is relatively clean, free energy source, and the reserves are thought to be long lasting. On the contrary, the capital investment for developing geothermal energy is high, and prospecting is somewhat limited

Bioenergy

Biomass is the short form for biological mass, which is the amount of living materials provided by a given area of the earth's surface. Biomass energy is the fuel energy that can be derived directly or indirectly from biological sources. Biofuel is any solid, liquid, or gaseous fuel produced from organic matter. Biofuel is produced either directly from plants or indirectly from industrial, commercial, domestic, or agricultural wastes. Biomass energy

from wood, crop residues and dung remains the primary source of energy in many developing regions. In a few instances, it is also a major source of power, as in Brazil, where sugarcane is converted to ethanol fuel, and in China's, where fuel gas is obtained from dung. Biodiesel has been developed in some parts of the world and may compete with fossil fuel in the near future.

Fuel Cells

Fuel cells are electrochemical devices that convert hydrogen and oxygen directly into electricity and heat. A number of companies are currently investing significant amounts in fuel cell research and development and expect the commercialization of the technology for use in vehicles and in grid and off-grid electricity supply. While natural gas is expected to be the main source of hydrogen initially, in the future hydrogen could be produced at remote hydropower sites, wind farms, solar stations and ocean power plants.

Tidal Energy

The energy of tides has been harnessed to produce electricity. In the summer of 1966, a tidal power plant with a capacity of 240,000 kw went into operation on the Rance River, an estuary of the English Channel in northwestern France. The incoming tide of the river flows through a dam, driving turbines, and then is trapped behind the dam. When the tide ebbs, the trapped water is released and flows back through the dam, again driving the turbines. Such tidal power plants are most efficient if the difference between high and low tide is great. The highest tides in the world occur in the Bay of Fundy in Canada, where the difference between high and low tide is about 18 m (about 60 ft).

CHAPTER THREE

CLIMATE CHANGE MITIGATION

Convincing evidence supporting the theory of global warming or climate change was lacking until the late 1980s. As a result of this, politicians were adopting a 'wait and see' attitude. In 1988, at a conference in Toronto, the issue was so disturbing that climate change was pushed firmly onto the political agenda[6]. Today climate change is a universally accepted fact, with scientists declaring it to be not just possible but inevitable. The world is already experiencing the effects of rising temperatures and, as the Intergovernmental Panel on Climate Change (IPCC) predicts, these effects will intensify over the next few decades. The predictions of the Intergovernmental Panel on Climate Change (IPCC) is a warning to policy makers and NGOs alike; unless these warnings are heeded and climate change impacts are factored into local, national, regional and global policy, planning and practice, development will not be sustainable[7].

Climate change has been perceived as an enormous environmental concern and the issue is being increasingly taken up by the development community. IPCC's assessments revealed that the impact of climate change is largely on the poor. Climate change has been linked to the dramatic increase in extreme weather events witnessed by the developing world in recent years. Disasters such as floods and droughts have already killed and affected millions, and these are predicted to escalate in frequency and intensity. Other effects of climate change include food insecurity, ill health, loss of forests and biodiversity, social and political instability and economic decline, all of which will be hardest on the poor. Climate change, therefore, is one of the greatest threats facing the poor.

The Evidence of Climate Change

Evidence presented by the IPCC reveals that the world's climate is changing. The strength of the evidence presented by the IPCC is such that very few policy makers or academics now deny the realities of global warming. The following global statistics, produced by the IPCC in 2001, reveal how the world's climate has changed over the last 200 years[7]:

1. The global average surface temperature has increased since 1861. Over the 20th century, there was an increase in temperature of around 0.6°C.

2. Since 1950, it is very likely that there have been fewer extreme low temperatures and an increase in the frequency of extreme high temperatures.

3. It is very likely that globally, the 1990s was the warmest decade and 1998 the warmest year since 1861.

4. It is very likely that there have been decreases in snow cover by around 10% since the late 1960s. In non-polar regions, there has been a widespread retreat of mountain glaciers in the 20th century.

5. Global average sea level rose between 0.1 and 0.2 metres during the 20th century, and global ocean heat content has increased since observations began in the late 1950s

6. Warm episodes of the El Nino-Southern Oscillation have been more frequent and intense since the mid-1970s in comparison with the previous 100 years

In Latin America, changes in climate over the last 100 years have included a rise in the average surface temperature (especially at middle and high latitudes), and changes in the rate

and intensity of precipitation in several countries, such as southern Brazil, Paraguay and Argentina. Southern Africa temperatures have risen by over 0.5°C over the last 100 years, with noticeably less rainfall over the past 20 years. While in Tropical Asia, average surface temperatures have increased in the range of 0.3- 0.8°C over the last 100 years. Many countries in this region have shown a decreasing trend in rainfall in the last three decades. Temperate Asia annual average temperature has increased by over 1°C, this increase being most noticeable since the 1970s. Increases and decreases in rainfall have been witnessed in this sub-region. Central Asia has witnessed I-2°C temperature increase over the last century[8].

Observational evidence exists to support climate change. Climate change has already had an effect on physical and biological systems throughout the world. Examples of these observed changes include lengthening of mid to high-latitude growing seasons, poleward and altitudinal shifts of plant and animal ranges, declines of some plant and animal populations, and earlier flowering of trees, emergence of insects, and egg-laying in birds[9]. Moreover sea levels have shown signs of rising, and in some regions, including within Africa and Asia, floods and droughts have been observed to increase in recent years. Many rural farmers in developing countries are already seeing the effects of climate change daily in the reduced availability of water for their agriculture.

The Causes of Climate Change

Strong evidences strongly suggest that climate change is caused by anthropogenic (human-induced) activities. The IPCC asserts that the warming of the last 100 years was unusual and unlikely to be natural in origin[7]. Particularly, IPCC has attributed the warming of at least the second half of the century to an increase in the emission of greenhouse gases (carbon IV oxide, methane and nitrous oxide) into the atmosphere. Human activity is largely responsible for the emission of these gases into the atmosphere: carbon IV oxide (CO_2) is produced by the burning of fossil fuels (coal, oil and gas) as well as land-use activities such as deforestation; methane is produced by cattle, rice agriculture, fossil fuel use and landfills; and nitrous oxide is produced by the chemical industry, cattle feed lots and agricultural soils. As humans have increased their levels of production and consumption, greenhouse gas emissions have also increased; since 1750, at the time of the Industrial Revolution, CO_2 has increased by 31 %, methane by 151 % and nitrous oxide by 17%[8]. Moreover, anthropogenic emissions continue to rise steadily.

Global Greenhouse Gases Emission

CO_2 accounts for over 80% of the pollution leading to global warming[10] and statistics reveal that collectively, industrialized countries are its largest emitters[8]. Without doubts, the industrialized countries produce 25 times more CO_2 per head of population than developing countries. The Hadley Centre for Climate Prediction and Research shows that in 1996, the United States produced 5,300,990 metric tonnes of CO_2, the United Kingdom produced 556,983 metric tonnes, while Pakistan produced 94,333 metric tonnes and Bangladesh 22,959 metric tones[11]. The disparity is also revealed by the fact that approximately 20% of the world's population lives in industrialized nations, yet they consume almost 80% of global energy[12].

The five largest emitters of CO_2 per capita are the USA, the UK, Japan, Germany and Canada[10], with the USA alone emitting one-quarter of global greenhouse gas emissions. In reality, the USA with a population of 300 million produces as much CO_2 as 135 developing countries with a combined population of 3 billion[12]. As for Latin America and Africa, their contribution to global warming is very small when compared with that of the USA and the UK. The whole of Latin America contributes only around 4% of global emissions, equal to the amount produced by the UK while the entire continent of Africa contributes 3.5%. India is home to 17% of the world's population yet it only emits 4.2% of global greenhouse gases[12].

The Unite Nation Framework Convention on Climate Change (UNFCCC)
The UNFCCC was adopted in 1992, and it was the first step taken by governments to tackle the problem of global warming. The Convention was initiated after the IPCC's First Assessment Report, which was presented in 1990 confirming that climate change was a reality and potentially a very serious problem. Having accepted the IPCC's findings, almost all countries signed the UNFCCC at the Rio Earth Summit in 1992 and subsequently ratified it. The objective of the UNFCCC is to ultimately stabilize emissions of greenhouse gases at a level that would prevent dangerous anthropogenic interference with the world's climate[8].

The Kyoto Protocol
The developing countries have contributed the least to global warming yet they suffer most from its effects. It is expected therefore that rich, industrialized nations should be the first to address their patterns of trade, production and consumption and take the lead in reducing greenhouse gas emissions. One way the developed countries are taking responsibility to address this issue is through the Kyoto Protocol. The Kyoto Protocol was a follow-up to the UNFCCC. The Protocol was adopted in 1997 and signed by 186 countries in 2001. It established the long-term structure for global participation in emissions cuts. The treaty defined emission targets for industrialized countries for an initial period of 2008 - 2012, committing them to reduce their greenhouse gas emissions from 5 - 8% below their 1990 levels within this period[13].

The Protocol included a requirement that negotiations for a second period must begin by 2005. However, the emissions reduction demanded by the Kyoto Protocol is far below the level of cuts required to prevent dangerous interference with global climate. The IPCC estimates that to prevent interference with global climate, 60-80% cuts would be necessary. Nevertheless, the Protocol carries in-built mechanisms that allow for stronger action in the future as well as the inclusion of developing countries. The Kyoto Protocol will enter into force and become legally binding when it has been ratified by a minimum of 55 countries, including countries that represent 55% of industrialized nations.

Mechanisms of the Kyoto Protocol
There are three flexible mechanisms of the Kyoto Protocol through which parties to the treaty can offset their greenhouse gas emissions. These are Joint Implementation (JI), Emissions Trading and the Clean Development Mechanism (CDM). Under the Joint Implementation, countries can claim credit for emission reductions by investing in other industrialized countries. For example, an industrialized country can be credited for reducing the emission of greenhouse gases by investing in low-emission technologies in another industrialized country. Emissions trading allow countries that reduce emissions more than is required by their specified target to sell excess emissions credits to countries that struggle to meet their own target. Both JI and Emissions Trading reduce pressure on industrialized nations to make domestic cuts.

The Clean Development Mechanism gives credit to developed countries for financing projects which reduce or avoid emissions in developing countries. The CDM helps to reduce emissions in developing countries which have no targets, and as a result credits are gained by developed countries by investing in CDM projects. This enable industrialized countries to avoid domestic emissions reductions. The main advantage of the CDM is that through encouraging the transfer of clean technology, it enhances the capacity of developing countries to make the transition to cleaner energy production, and as such it promotes sustainable development.

One controversial aspect of the CDM is the role of 'carbon sinks'. A sinks could be natural facilities such as forests that absorb CO_2 from the atmosphere. Articles 3 and 12 of the Kyoto

Protocol allow countries to enhance or create a sink in a developing country as a means of meeting their emission reduction requirements. This means that, for example, a rainforest could be sold for its sink capacity to a developed country in exchange for cash. Theoretically, the polluter can emit CO_2 equal to the amount of CO_2 the sink can absorb, so that the emission has no impact on the atmosphere. Many countries are already considering options in forest management, including reforestation, agro forestry and urban forestry as a means to store carbon rather than reducing their emissions at source. However, there are considerable uncertainties associated with sinks. In addition to their capacity to remove CO_2, sinks also have the potential to become CO_2 sources. Including the use of sinks within the CDM also creates the danger that indigenous forests will be deforested and replaced by fast growing plantations with a greater capacity to absorb CO_2. Consequently, it seems wise to delay decisions on the use of sinks until further research has been undertaken.

The argument for including these three mechanisms in the Kyoto Protocol was that they would allow countries to cut their emissions in the cheapest ways possible and so reduce the cost of compliance, as well as stimulate international investment and support for cleaner economic transition and development. The Protocol stipulates that Joint Implementation and Emissions Trading must be supplemental to domestic action. However, the inclusion of these mechanisms has proved controversial. Many NGOs fear the mechanisms may be exploited, and undermine the objectives of the UNFCCC and the Protocol.

Opposition to the Kyoto Protocol

Although many countries have ratified the Kyoto Protocol, some have raised argument against it. Its primary opponent is the USA. President Bush of the United States said on the 13th of March, 2001 "...I oppose the Kyoto Protocol because it exempts 80 per cent of the world; including major population centers such as China and India, from compliance, and would cause serious harm to the US economy"[14]. Contrary to the perception of the US president is fact that the Protocol is a global agreement and therefore does not, in fact, exempt major parts of the world. The 186 countries that signed the Protocol, which included the USA agreed to its principle of common but differentiated responsibilities for industrialized and developing countries.

The other argument against the Protocol is that the emissions of developing countries will shortly surpass those of industrialized ones, thus the notion of 'common but differentiated responsibilities' is unfair. Industrialized countries produce around two thirds of the world's CO_2 emissions while accounting for less than a quarter of the world's population, and it is predicted that their emissions will continue to be far higher than developing countries. A further argument by opponents of the Kyoto Protocol is that the long-term cost of reducing greenhouse gas emissions as requirements of the UNFCCC is very high, and industrialized nations would make a better investment by securing economic growth in developing countries. This argument has been refuted by other analysts saying that if the process is carefully planned will cost much less than the likely cost of damage and adaptation would be if there was no action.

Climate change mitigation processes are underway and NGOs, CBOs, and other stakeholders have a part to play in urging their governments to ratify the Protocol as soon as possible and also to make a more realistic attempt to mitigate climate change through even greater emissions cuts. NGOs and other stakeholders should initiate processes that will promote renewable energy and energy efficiency in their countries. Such processes may include advocacy for renewable energy and energy efficiency practices and products. The developing countries should take advantage of the enormous opportunities under the Clean Development Mechanism to foster sustainable development in the developing countries. Reducing greenhouse gases, however, is not just a governmental responsibility. Individuals must also

address their own consumption patterns and ensure that the choices they make are environmentally sustainable. Again, NGOs can assist with this by educating their supporters about the effects of climate change and how their choices affect the poor.

CHAPTER FOUR

ENERGY DEVELOPMENT IN NIGERIA

Nigeria is the most populous country in Sub-Saharan Africa, nearly one quarter of Sub-Saharan Africa's population, and it is estimated that one in every six black persons in the world is a Nigerian. The spatial distribution of the population is uneven and the population is predominantly rural, with about 36 per cent living in urban areas. The country has a population of 126,635,626 and population growth rate of an estimated 2.61% in 2001. GNP per Capita in 2003 was US$ 320. Nigeria has a disappointing level of economic development with a GDP of about $45 billion in 2001 and a per capita income of about $300, ranking her one of the poorest countries in the world[15]. Thus the Human Development Index (HDI) ranks Nigeria 152nd out of 175 countries in 2001. Other statistics include:

Human Development Index (HDI) Level, 2001:	0.46
Population below $1 a day, 2001:	70.2%
Life expectancy, 2001	58.1 years
Population growth, 2002:	3.1%
GDP growth rate, 2002:	3.3%

Source: UNDP Nigeria Development Profile, 2004

Natural Resources

The country's proven oil reserves located mainly in the southeast and coastal area, amount to an estimated proven 32 billon barrels, sufficient to last for about 37 years at the current rate of production, with the production of 2 million barrels per day. Nigeria is the sixth largest producer in OPEC. Proven natural gas reserves are estimated at 174 trillion cubic feet (equivalent to 30 billion barrels of crude oil). These gas reserves are comparable to those of Algeria, and will last for 110 years at current production levels[16]. Nearly 80 percent of the natural gas produced is presently being flared and most of the remaining 20 percent is used for electricity generation. It is expected that the export of gas will be substantial in the future. Nigeria's rivers also constitute a substantial energy resource, providing the country with nearly half of its electricity.

Nigeria is also blessed with abundant solid mineral deposits including coal, tin ore, kaolin, gypsum, columbite, gold, gemstones, barites, graphite, marble, tantalite, uranium, salt, soda, and sulphur. The main non-oil exports include: cocoa, coffee, copra, cotton, ginger, groundnut, groundnut oil, gum Arabic, palm oil, rubber, soya-bean and timber. Efforts are already being made to export cassava. Moreover, Nigeria has all the vegetational regions of West Africa except that of the desert. The vegetational zones of Nigeria include the forest zone, the swamps, a variety of savannah lands and the mountain vegetation.

Energy Development

Nigeria is endowed with a wide range of both renewable and non-renewable energy sources. The non-renewable resources include crude oil, natural gas, coal, lignite, tar sands and nuclear fuels. The renewable ones include solar energy, wind energy, and biomass. There is strong controversy as to whether or not hydropower is a renewable energy. More recent estimates by the Federal Ministry of Petroleum revealed that Nigeria's crude oil stood at 33.35 billion barrels and natural gas was put at 5300 billion m^3 in 2004. Coal and lignite were estimated at 2.7 billion tones, tar sands at 31 billion barrels of oil equivalent, large scale hydropower at 10000MW and biomass at 187.33 million tonnes per year. Solar radiation intensity of up to 1.0KW/m^2 peak is attainable in the northern part of Nigeria. Wind energy is

available at an annual average speed ranging from 2.0 m/s near the coast to 4.0 m/s at the northern borders

Electricity generation in Nigeria began in 1896 when the Nigerian Electricity Supply Company (NESCO) commenced operations as an electric utility company with the construction of a hydroelectric power station at Kura falls near Jos. The Electricity Corporation of Nigeria (ECN) was established in 1951. As at 1962, 132kv line was constructed linking Ijora Power Station to Ibadan. It was that same year that the Niger Dams Authority (NDA) was established with the mandate of developing hydropower potential of the country. In 1972, however, the ECN was merged with the NDA to form the National Electricity Power Authority (NEPA). Again in 1998, NEPA ceased to have the exclusive monopoly over electricity generation, transmission, distribution and sales. Today NEPA has now been privatized and it is now called Power Holdings Corporation of Nigeria (PHCN).

Aggregate capacity of installed power plants under NEPA was 6,000 MW (1,900 of hydro and 4,100 of thermal). Out of the 6,000 MW capacities, only about 4,000 MW have been made available due to major breakdowns in plants, machinery and equipment. Quite often, hydropower plants of Kainji and Jebba on the Niger River suffer from decreases in reservoir inflows due to the effect of Sahelian drought and anticipated use by upstream riparian countries as well as invasion by water hyacinth. The national electricity grid presently consists of nine generating stations, three of which are hydro and the remaining six are thermal. The hydro plants are located in:

1. Kainji – 8 generating units with an installed capacity of 760 MW.
2. Jebba – 6 generating units with an installed capacity of 560MW.
3. Shiroro – 4 generating units with an installed capacity of 600MW.

The thermal stations produce the bulk of energy consumed in Nigeria. They are located at:

1. Afam Station located in the Rivers State, uses natural gas and has an installed capacity of 709.6 MW.
2. Delta Station located in Delta State also uses natural gas and has an installed capacity of 912MW.
3. Egbin Station is located in Lagos and has an installed capacity of 1320MW
4. Sapele with an install capacity of 1020MW.
5. Ijora with an installed capacity of 60MW and
6. Oji with an installed capacity of 30MW.

Nigeria's power system is inadequate and it has held back socio-economic progress of the people. The officials of the responsible government agencies attribute the setback to lack of major overhaul of plants between 1990 and 1999; only 19 out of 70 generating units were operating in 1999 and actual daily generation fell to less than 2000MW in 1999; no transmission lines were built since 1987 and; Federal Government funding to the sector decreased continually between 1980 and 2000. Moreover, most of the generating units have broken down as a result of lack of maintenance. The transmission lines are overloaded; the switchgears are obsolete, while the transformers are not maintained. Generation fluctuates between 3000MW and 4000MW, while the average demand for electricity is about 5000MW.

Renewable Energy Potential in Nigeria

Nigeria has high potential to harness energy from renewable sources. The country falls within the tropics of Cancer and Capricorn where the abundance of sunlight is inevitable. This energy whose reservoir is the sun is one of the energy resources whose availability is infinite if it is developed. Furthermore, unlike the conventional energy resources, solar energy development

is not as capital intensive. Therefore, it is fundamental to proffer the strategy of diversifying energy resource development outside the conventional energy resource. This means that, the proceeds of the sale of the conventional energy resources which are in high demand should directly be channeled towards the development of other non-conventional, less capital intensive and non-hazardous energy resources in Nigeria. With the abundance supply of solar energy in Nigeria, efforts need to be geared towards research and development of solar electricity conversion by both direct and indirect methods.

Wind energy is a secondary form of solar energy. Experts reported that approximately 2.5% of solar energy captured by the atmosphere is being converted into wind. The development of wind power plants is being undertaken by many countries for the generation of electricity in their quest to exploit renewable energy sources and Nigeria should not be left out. With wind energy available at an annual average speed of 2.0 m/s near the coast to 4.0 m/s at the northern borders, the country possess enormous potential to develop and utilize energy from the wind for electricity generation. The coastal regions of the south and the northern part of the country are possible suitable sites for wind energy exploitation. There is need to embark on research to determine actual values for wind energy potential.

Table 1: Nigeria's Non-Conventional Energy Resources

Resource	Reserves	Reserves (billion Toe)
Fuel Wood	43.3 million tonnes/year	1.64 (over 100 years)
Animal Waste and crop residue	144 million tonnes per year	4.032 (over 100 years)
Small scale hydropower	734.2MW	0.143 (over 100 years)
Solar Energy	5.25kw/m^2 /day (average)	39490 (over 100years)
Wind	2.0 – 4.0 (19.8W/m^2 average)	772.7 x 10^{-9} (over 100 years)

1 Toe = 2.63 tonnes of fuel wood; 3.57 tonnes of Agric. Residue; 4.76 tonnes of dung cakes.

(Federal Republic of Nigeria: National Assessment Report-World Summit on Sustainable Development-2002)

The potential for bioenergies development is high. As mentioned earlier, Nigeria has all the vegetational regions of West Africa except that of the desert. Agriculture is the dominant economic activity, which contributes 41% of Nigeria's GDP and employs the highest labour in Nigeria. Roughly 75 percent (74 million hectares) of Nigeria's total land (98 million hectares) is arable and about 40 percent of this is cultivated, leaving the remaining 60% of arable land idle. Nigeria's farmland is cultivable and would have medium for good productivity if properly managed. Policy, institutional and technological approach is inevitable to harness bioenergy potential in Nigeria.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATION

The World Summit on Sustainable Development (WSSD) in Johannesburg in 2002 took an important step in recognising the important role of energy for reaching the Millennium Development Goals (MDGs). Access to affordable, reliable and sustainable energy is essential to sustainable development. An adequate attention to energy problems will contribute to achieving progress across all pillars of sustainable development: economic, social and environmental and in meeting the UN Millennium Goals. Although there is no specific MDG on energy access, the WSSD recognised that inadequate access to energy is vital for poverty alleviation, and recommended the following:

"Take joint actions and improve efforts to work together at all levels to improve access to reliable and affordable energy services for sustainable development sufficient to facilitate the achievement of the Millennium Development Goals, including the goal of halving the proportion of people in poverty by 2015, and as a means to generate other important services that mitigate poverty, bearing in mind that access to energy facilitates the eradication of poverty".

The United Nations Declaration on the Rights to Development of 1986 recognizes that the human person is the central subject of the development process and that development policy should therefore make the human being the main participant and beneficiary of development. So the human rights approach to development promotes participatory development in policy making, project conception and implementation. The domestic energy crisis in Nigeria cannot truly be attributed to the expansion of domestic consumption. The problem at this time may be attributed to Government policy conflicts in the energy sector and the overall macro economy. And also, the energy crisis could be attributed to obstacles in the nation's energy planning, management and conservation strategies.

For development to be sustainable and to expedite developmental processes, it must be participatory. Various policies and commitments have been made by governments, at national and international levels and for these policies and commitment to be translated into action, the involvement of the civil society inevitable. For example, the National Economic Empowerment Development Strategies (NEEDS) document clearly stated that Nigeria will explore alternative sources of energy such as coal, solar, wind and hydropower. Participatory approach to development will allow the civil society to decide what they want and how they want it since development is targeted at them. Even in the formulation of policies, the beneficiary of development should be involved.

Civil society based initiatives are fundamental for development. Policies and commitments by governments in many cases are forgotten and abandoned. It will require action or pressures from the civil society for these commitments to be awaken and subsequently translated into action. This bottom-top approach to development, if properly practiced and managed will bring about sustainable development. The first step to such approach is usually to build capacity in the civil society. This is where the current project takes its root. To engage government in dialogue require certain level of skills, and such skills are lacking in the civil society. The civil society needs to be properly knowledgeable on the issue at stake before embarking on dialogue with government officials. This will enable the civil society to speak with one voice and be united in their developmental pursuit.

As previously stated, many Nigerians do not have access to electricity, especially those in the rural communities. It is expensive for these communities to connect to the national grid, hence a larger percentage (60-70%) of Nigerian are yet to benefit from grid electricity. Even those who

are connected to the grid experience frequent power outage that last for several hours in a day. Nigeria and many developing countries found themselves in an "energy crisis", and sustainable energy development can only be achieved by replacing the traditional sources of energy with renewable energy sources. We there recommend that the Calabar Declaration be fully implemented and integrated into the policy framework of Nigeria.

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APPENDIX 5: Calabar Declaration

The Calabar Declaration – A Declaration on Sustainable Renewable Energy

I) PREAMBLE

This international declaration was written by the 55 participants of the conference *Energetic Solutions: An International Conference on Making Renewable Energy a Reality* held in Calabar, Abuja and the Niger Delta in Nigeria from November 21 to 27, 2004. This conference included representatives from countries from Africa, the Americas and Europe, and was a follow up to the WSSD and Bonn Renewables conference to address the Millennium Development Goals (MDGs) and issues of energy and development, and is based on the following:

II) Recognizing global energy inequity is extreme with over 2 billion people having insufficient access to energy systems and is most prevalently felt in sub-Saharan Africa;

Whereas the developed world needs to increase their energy efficiency and reduce their fossil fuel consumption, and whereas most countries in the South need increased access to energy;

Whereas petroleum is a conflict resource and has the potential to become more so with depleting supplies (fossil fuel estimated to run out by 2050 and prices continuing to rise);

Whereas the fossil fuel economy has been unjust and is generating a serious climate change that is threatening our civilization;

Whereas the disparities between the rich and poor are increasing:

- the four richest men at this point in time control more resources than the poorest 75 countries
- of the largest 100 economies in the world economy, 51 are corporations;

Whereas access to basic, clean and affordable energy services is essential for sustainable development and poverty eradication and that renewable energy is a pre-requisite to achieving the Millennium Development Goals (MDGs);

Whereas the acute energy shortage in the developing world presents opportunities for the introduction for sustainable, renewable energy technologies (RETs)[1], and sub-Saharan Africa has great bio-mass potentials due to their dependence on agriculture.

III) Nigeria resembles other countries in the South: more than 70% of Nigerians are living in absolute poverty; the environment is under increasing pressure due to a rapidly growing population and access to traditional energy systems is becoming increasingly difficult; and fossil fuels are unaffordable to about 60% of Nigeria's impoverished people.

IV) Recognizing that there is a gross energy shortage amidst abundant renewable energy potential in sub-Saharan Africa, including Nigeria;

Whereas Nigeria is an economic driver in West Africa because of its international status as a petroleum exporter;

Whereas Nigeria's over-dependence on oil has been an obstacle to democracy and the cause of distorted social and economic institutions in the country;

Whereas 50% of energy consumption in Nigeria is fuel wood that adversely affects the health of women and children and leads to high levels of deforestation;

Whereas there are regional as well as urban and rural disparities in pricing and access to fossil fuels;

Whereas only 45% of Nigerians have access to the national grid out of which 80% live in urban areas and only 20% in rural areas; women and children are the most negatively affected by the current energy situation;

Whereas Nigeria has suffered recurrent strikes and conflicts arising from fossil fuel price fixing since the 1980s;

Whereas 123 gas flaring sites in the Niger Delta is responsible for most of Nigeria's GHG emissions and leads to acid rain, environmental degradation, poor air quality and adverse health effects;

[1] *Renewable Energy technologies as discussed in this Declaration comprises hydro-power, solar energy for heat and power, wind energy for mechanical and electrical power generation, and geothermal and biomass energy for power generation and heat.*
Energy Efficiency refers to support for energy efficient technologies and processes including efficiency in business and finance mechanisms to reduce energy consumption.
Sustainable Energy refers to the combination of renewable energy and energy efficiency

V) Noting that while the government of Nigeria has set a target for 85% rural electrification by 2010, promises stable energy supply by 2007, plans to achieve between 5 to 10% of renewable energy contribution to the national demand or capacity by 2007, and to stop gas flaring by 2008, these targets can not be achieved without the massive adoption of RETs.

BE IT RESOLVED THAT:

VI) For Capacity Development -

A sectoral strategy for capacity development should target end users and strengthen the capacity of agencies that include community organizations, policymakers, agencies, RETs entrepreneurs, trade and professional associates to support RETs development. The approach should be unique to the sector and participatory, with consideration of culture, and local and transferable skills, to meet the needs of end users;

Clear strategic directions should be facilitated by community, civil society organizations, policy makers, agencies, and trade associations for renewable energy deployment;

A renewable energy network or coalition of Nigerian stakeholders is created to promote renewable energy projects and policy advocacy, and act as a focal point for consultations. The national network should be sustainable by building the capacity of all members and beneficiary communities;

Several renewable energy technology demonstration projects and learning centers, such as solar or ecological villages, are developed in each state through multistakeholder partnerships that will facilitate community learning and take into consideration the relevant culture and local transferable skills;

The Ministry of Education of Nigeria has RETs integrated into primary and secondary school curriculum as well as into tertiary and professional institutions in the next five years, and develops a separate renewable energy department at tertiary institutions;

Immediate implementation and consistent support for RETs sensitization, information, education and communication for development activities targeted toward youth in the formal and informal sectors;

In order to create general awareness, a RETs association, non-governmental organizations (NGOs) and the private sector will employ the mass media, centers of worship and local groups to target RETs capacity development activities targeted toward men, women and children;

By 2010, capacity building initiatives (including but not exclusive to symposia, exchange visits, technical assistance, systems improvement) implemented for 50% of policy makers to all sectors of government (local, state, federal), traditional leaders and relevant NGOs/CBOs;

Multilateral institutions should sponsor international exchanges between RETs research and development centers and the private sector;

Financial and technical support mechanisms for RETs civil society organizations be established by the government in collaboration with the private sector in order to meet targets set out within this document.

VII) **Financing**

Recognizing the threat of corruption, it is recommended that a national multistakeholder RETs forum or council that includes NGOs, independent power producers, industry, community members and all levels of government to create policy around renewable energy from the planning stage to implementation and to oversee how RETs funding is used.

1. Government

A. The federal government should do the following:

Establish a RETs development bank (similar to the Agricultural and Industrial development banks);

Develop policies to enable feed-in tariffs and green power purchase agreements with all levels of government being required to purchase 50% of their power from green energy by 2007;

Provide incentives to RETs power producers to make getting onto the power grid easier;

Immediately remove import and export duties for RETs (to 0 to 5%) and provide appropriate subsidies for RETs that are reviewed 5 years after implementation;

Set timelines and targets for the deployment of RETs, because these are needed to encourage investment;

Provide small low interest loans for RETs buyers and provide grants for RETs research and development particularly to educational institutions;

Recognizing that the Clean Development Mechanism (CDM) projects need to address the twin goals of climate change mitigation and sustainable development, Nigeria's CDM national authority should establish sustainable development criteria for CDM projects such that half of CDM funds go to small-scale RET projects;

Create a special fund for RETs to Nigeria's 36 states and federal capital territory;

Incorporate RETs into existing government programs (such as NEEDS – National Economic Empowerment and Development Strategy and NAPEP-National Poverty Eradication Program);

About 50% percent of the proposed rural electrification fund should be set aside for RETs by 2010. Likewise, the RETs development fund bill before the National Assembly should be hastened and passed as an Act.

B. The state governments should:

Dedicate part of their statutory allocation from the federal distributable pool account to RETs and RETs education in primary and secondary schools;

Join the federal government in setting up a RETs development bank.

C. The local government should:

Fund RETs demonstration projects to mobilize communities to adopt RETs which address local needs;

Mobilize communities to form cooperatives to find funding to integrate RETs;

Enhance and finance RETs research at grassroots level e.g. identification of RETs potential;

Collaborate with NGOs as a source of funding for RETs.

2. The Oil and Gas Industries and other fossil fuel industries must:

Pay a percentage of their profit to compensate for the social and environmental degradation the oil and gas industry causes as compensation to impacted communities and includes funding of RETs projects.

Form a consultative body that mediates development initiatives between communities and the fossil fuel industries;

3. International and National Financing Institutions (such as the World Bank, IMF, African Development Bank) need to:

Phase out funding of fossil fuel investments/loans/projects and channel 5% of their annual profits to developing and implementing small-scale RE projects;

Target 20% percent of their portfolio to be allocated to developing and implementing RETs projects;

Provide sustainable micro-finance schemes;

Develop internal policies for promoting investments in RE ventures;

Provide cost-sharing agreements and grants for RETs research and development, and low-interest loans for RETs businesses and users;

Collaborate to draw on their banking experience to form a RETs Development Bank.

4. Donor agencies (such as UNDP, Unido, CIDA, GTZ, GEF, UNESCO):

Should provide grants for RETs R&D and loans for RETS businesses and users;

Recognize the centrality of RETs to issues such as health, child welfare and environmental protection – to ensure that funded projects that deal with these issues have a RETs component;

Overseas Development Agencies, such as CIDA and GTZ, stop funding large-scale dams, nuclear and other similar projects and divert funds into RETs.

5. NGOs and CBOs need to:

Access and distribute funding for RETs projects;

Undertake advocacy on RETs financing;

Act as an interface between donor agencies and communities ensuring that all facets of community are fairly represented in all RETs projects.

VIII) **Renewable Energy and Markets**

The RETs sector should promote a decentralized and competitive entrepreneurial base;

Multinational companies are obligated to spend a significant percentage of their energy budget on RETs research and development appropriate for Nigeria and other countries in the South;

Tax rebates given to companies involved in manufacturing and assembling of RETs;

Facilitation of RETs consumer cooperatives in order to achieve full benefits of government RETs finance programs.

IX) **Multilaterals and Donor Agencies**

Provide policy instruments to enable maximum access to the opportunities provided by World Bank facilitations like BioCarbon Fund, Community Development Carbon Fund, and other international financial instruments such as the Global Environment Fund (GEF) and CDM.

X) **Gender Policy**

Immediate incorporation of gender equity in RETs policy making and implementation;

Economic empowerment for women for RETs through micro-credit financing;

Provide a legal framework for protection of women's rights to sustainable energy programs;

To involve women in appropriate mechanisms for relieving and/or resettling victims of environmental disasters (such as oil spills and flooding from dams) and communal conflicts as well as those affected by climate change;

Gender equity in accessing RETs by 2015.

XI) **Youth Policy**

Youth should be integrated into energy policy making and implementation process;

Economic and social empowerment of youth through entrepreneurship capacity development;

The provision of a legal framework for the protection of resources for the appropriate and sustainable use of energy should include youth.

XII**) Implementation Strategies**:

A comprehensive strategy should include all the energy uses (for power, transport, household and commercial use) and be implemented in conjunction with energy efficiency measures;

We encourage the electric power reform bill to include the promotion of renewable energy, whereby 25% of all new on-grid energy generating projects should be RETs by 2010 with incremental increases thereafter (35% by 2020, 50% by 2030, 100% by 2050);

5% of government revenue at all levels should be dedicated to renewable energy development;

All rural communities should be considered for renewable energy with a minimum target of 20% by 2010;

Steps to achieve these targets, include:

- To coordinate a renewable energy capacity building conference for community leaders
- Recommend that multi-lateral institutions finance feasibility studies to identify RETs technologies to be implemented in these communities
- Request that the government develop databases and geographic information systems (GIS)
- Ensure that the RET is selected according to the locally available energy resources and implemented in accordance with a shared vision developed through a participatory process that includes various stakeholders and representatives from the communities.

Develop a renewable energy map for all RETs by 2006;

The Standards Organization of Nigeria creates a specific department to develop renewable energy technology standards and certify RETs technicians/installers;

To set up a Federal Ministry of Renewable Energy Technologies by 2006;

Recommend that the Energy Centres focus on research and development of bio-fuels for cooking, transportation and electrification in all regions of Nigeria;

Provide tax incentives for investment in such fuels and efficient or alternative cooking, transportation and electrification technologies;

Recommend that adequate funding be provided for R&D on biofuels for household, commercial and industrial use in Nigeria.

XIII) **Monitoring**

Recommend that the Energy Commission of Nigeria include a participatory monitoring and evaluation committee that includes representatives from the NGO community, energy research centers, academia, youth, women, the RETs private sector, financial institutes, and other relevant stakeholders to evaluate the performance of current RETs projects in Nigeria.

The proposed Ministry of Renewable Energy Technologies should make participatory budgetary design to ensure that set goals and objectives for RETs are achieved with sufficient financial backing;

All aspects of the RETs project from initial feasibility studies to post-project monitoring will be carefully recorded and consolidated so that this information will guide the research and development of future projects.

Be it resolved that RETs will significantly improve the living conditions of Nigerians through participatory community energy planning and the implementation of appropriate projects.

Signed by the conference organizers on behalf of the Energetic Solutions participants who agreed to the above by consensus.

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