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RENEWABLE ENERGY AS A PANACEA FOR PROMOTING ENVIRONMENTAL STABILITY: LEGAL AND INSTITUTIONAL CHALLENGES IN NIGERIA

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Abstract

The concept of Environmental Sustainability is an offshoot of the concept of Sustainable Development. According to the Brundtland Report, Sustainable Development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. In Nigeria, it appears that the essence of Brundtland Report has been defeated as evidence abound to show that the continuous dependence on the use of fossil fuel as a major source of energy consumption in Nigeria and other developing countries has adversely affected the environment, thus, making it unsustainable for future generation. The study probed how effective regulation of renewable energy could achieve a balance between economic needs and environmental concerns in Nigeria. The claim of the paper was that positioning Nigeria energy policies, laws and regulations to encourage and promote the use of renewable energy resources for the production and consumption of energy is essential for ensuring environmental sustainability. The study discovered that Nigeria's economy is crude oil dependent, making environmental pollution control difficult. Also, most laws and institutions in Nigeria, even though they have made sufficient provisions on the protection of the environment, such laws and institution are not fully implemented or empowered to dispense their functions. No doubt, Nigeria is endowed with abundance of renewable energy potentials; ranging from average degree of sunshine for solar energy; average wind speed for wind energy, agricultural materials and animal wastes for bioenergy, rocks and fluids beneath the earth surface for geothermal energy, rivers, streams, and canals for conversion into hydro energy. That these energy sources are not effectively utilised, coupled with the lack of effective legal and institutional mechanisms for the promotion of renewable energy put in place have made the Nigerian environment more deteriorating. Sidewise, other challenges such as financing and investment barriers, technological barriers, limited public awareness of the potential of renewable energy, poorly established standard and quality control of locally manufactured and imported technologies, and corruption are also identified as the challenges inhibiting the actualization of a sustainable environment. The doctrinal research methodology was adopted; where both primary and secondary sources were used. The primary sources examined are statutes, case laws, regional and international legal instruments that are relevant to the study. The article recommended that, in order to achieve environmental sustainability, Nigeria should introduce renewable sources into her energy mix through strategies that discourage carbon energy.

Keywords: Renewable Energy, Non-Renewable Energy, Fossil Fuel, Environment and Environmental Sustainability.

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1. Introduction

The basis of environmental policy in Nigeria is contained in several Nigerian Laws. For instance, pursuant to section 20 of the Constitution,[2] the State is empowered to protect and improve the environment and safeguard the water, air and land, forest and wildlife of Nigeria. In addition to the above, the Environmental Impact Assessment Act 1992[3] provides that the public or private sector of the economy shall not undertake or embark on or authorise projects or activities without prior consideration of the effect on the environment in any part of Nigeria. Against this backdrop, it is without doubt that fossil fuel is and has remained the mainstream of energy supply and consumption across the globe due to the high level dependence of many countries on fossil fuel as their major sources of energy and foreign exchange earnings with corresponding oil booms. More pathetic is the fact that, despite the various extant laws, the exploration and production of fossil fuel are done with little or no recourse to the provisions of the laws or its effects on human lives. Oniemola and Sanusi while commenting on the above position remark that 'the use of fossil fuel as a source of non-renewable energy has led to emission of greenhouse gases which are unsustainable globally'.[4] As stated above, when fossil fuels are burned, they release large amounts of carbon dioxide or greenhouse gas into the air. The negative effect of this is that, greenhouse gas or gases trap heat in our atmosphere, thereby causing global warming. Apart from fossil fuel, the environment is under sombre threat by crude oil explorations, exploitations and the usage of oil, thus, there is gradual warming up of the earth's atmosphere and depletion of the ozone layer resulting from increase in greenhouse gases emitted into the air. As a result of these activities, man, the flora and fauna have suffered greatly due to environmental pollution and degradation resulting from the incidence of oil exploration activities.[5]
Simply define, renewable energy does not include energy resources derived from fossil fuels, waste products from fossil sources or waste products from inorganic sources.[6] It is any energy source that is naturally regenerated over a short time scale and derived directly from the sun (such as thermal, photochemical, and photoelectric), indirectly from sun (such as wind, hydropower, photosynthetic energy stored in biomass), or from other natural movements and mechanisms of the environment (such as geothermal and tidal energy).[7] It also includes energy sources and technologies that have minimal environmental impacts, such as less intrusive hydro's and certain biomass combustion.[8] Conversely, non-renewable energy are energy derived from sources that have the propensity to run out or will not be replenished after used.[9]

The environment is being variously defined to include 'the water, air, land and all plants and human beings or animals living therein and the inter-relationships which exist among these or any of them'.[10] A more comprehensive and an all-encompassing definition was offered by Efobi, who defines the environment as:

> ***total set of circumstances that surrounds an individual or a community, these circumstances are made up of physical conditions such as air, water, and climate and landforms; the social and cultural aspects such as ethics, economics, aesthetics and such circumstances which affects the behavior of an individual or a community.***[11]

While environmental sustainability according to Chukwuma, is the process of making sure current processes of interaction with the environment are pursued with the idea of keeping the environment as

[2]Constitution of the Federal Republic of Nigeria, 1999(as amended).
[3] EIA Act 1992, s. 2
[4]P K Oniemola and G Sanusi, The Nigerian Bio-Fuel Policy and Incentives: A Need to Follow the Brazilian Pathway. (2009) In Energy, Economy, Environment: The Global View: Proceedings of the 32nd IAEE International Conference
[5]J O Olujobi and A E Oyewunmi, 'Oil Spillage in Nigeria's Upstream Petroleum Sector: Beyond the Legal Framework [2018] 8(1) *International Journal Energy Economics and Policy* 220-226
[6]Texas Renewable Energy Industries Alliance, Definition of Renewable Energy <http://www.treia.org/renewable-energy-defined> Accessed 24 August 2021
[7]*Ibid.*
[8] (n4)
[9]J.P. Blair, *Non-renewable Energy*<https://www.nationalgeographic.org/encyclopedia/non-renewable-energy>. Accessed 24 August 2021
[10]The National Environmental Standard Regulation Enforcement Agency (Establishment) Act of 2007 s. 37
[11]K O Efobi, *Studies in Urban Planning* (Enugu: Fidelity Publishers and Printers Co. Ltd 1994) 1

pristine as naturally possible on ideal-seeking behaviours.[12]An analysis of the above no doubt seeminglysupports the naturalist theory. What is distinctive to the natural law position is the insistence that the direction provided by law must be towards rationally or objectively good. Law must direct behaviour toward the common good of man, environment and everything therein. When summed up in the context of the environment and its sustainability, the natural theorists argued that any law or policies on the environment must be such that aims at directing the behaviour of people toward achieving a better and sustainable environment.

No doubt, the Constitution of the Federal Republic of Nigeria,[13] National Environmental Standard Regulation Enforcement Agency (Establishment) Act,[14] Energy Commission of Nigeria Act, Renewable Electricity Policy Guidelines and many others as shall be discussed, must be such that aim at controlling the behaviour of people towards achieving energy sufficiency and environmental sustainability. In ours, Nigeria is among countries that are naturally endowed with renewable energy sources. The Nigeria's National Renewable Energy and Energy Efficiency Policy of 2015,[15] reveals that Nigeria is endowed with large rivers and some natural falls which are together responsible for high hydropower potential of the country. The source[16] also reveals that the country is rich in organic, non-fossil material of biological origin called biomass. For instance, the biomass resources which can be converted into energy generation through several methods include wood fuels and by-products from crops such as forage grasses and shrubs, rice husks, and animal wastes and wastes arising from forestry, agricultural, municipal and industrial activities, such as saw dust, as well as aquatic biomass.[17]In terms of sunlight, the country has the highest degree of sunlight particular in the north which if harnessed can be converted to solar energy to solve the country's power generation problem.[18] However, it is quite unfortunate that unlike countries such as China, Brazil, Chile, India, South Africa, Germany and other countries that has tapped into the benefits of renewable energy sources, Nigeria's huge renewable energy potentials have not been fully utilised as the country still rely heavily on fossil fuel as one of its major sources of energy generation. This may not be unconnected to factors such as Nigeria's overdependence on the crude oil revenue, lack of implementation of the legal framework that articulates a comprehensive strategy for promotion of renewable energy and political will to drive, enforce and implement the extant laws and policies on renewable energy sources.

At this juncture, it is most pertinent state that Nigeria is signatory to several regional and international agreement and treaties which support the use of renewable energy. For instance, the Kyoto Protocol to the United Nations Framework Convention on Climate Change of 1998, United Nations Framework Convention on Climate Change 1992, International Renewable Energy (IRENA) Statute 2009, and many others. Unfortunately, some of these treaties have not being domesticated, so lack enforceability.[19] At the national level, the country has established and enacted several energy policies such as Renewable Energy Master Plan (REMP) 2012, National Renewable Energy and Energy Efficiency Policy 2015, Nigerian Bio-fuel Policy and Incentives 2007 and many others. Despite all these treaties and policies, the country's renewable energy usage is still low compared to other climes. The thrust of this paper is to bring out the benefits of using renewable energy. The paper argues that, the use of renewable energy is efficient, environmental friendly, reliable, costless, and constitutes a solution for environmental sustainability. Also, utilizing and maximizing the use of renewable energy accounts for the conformity with the World Summit on Sustainable Development resolutions convened in Johannesburg, South Africa in 2002 where, over 30 nations declared their obligations in

[12]S. Chukwumaand others, Biotechnological Tools for Environmental Sustainability: Prospects and Challenges for Environments in Nigeria – *A Standard Review* [2012] 2
[13] (n 1)
[14](n 8)
[15]National Renewable Energy and Energy Efficiency Policy of 2015. 2.1
[16]*Ibid.*
[17]*Ibid*
[18]A S Sambo and E J Bala, *'Penetration of Solar Photovoltaic into Nigeria's Energy Supply Mix* (2012) At the World Renewable Energy Forum (WREF)
[19] (n 1), s. 12

boosting renewable energy sources usage and in positioning their energy agenda in accomplishing this objective. Research has shown that electricity or energy generated from the use of renewable energy sources is more eco friendly and generate no emissions and no air pollution. Renewable Energy can be used for the production of heat, electricity, and vehicles fuels. This paper will critically examine the legal and institutional framework on the subject matter; making suppositions from national, regional and international legal frameworks and policies on renewable energy and the level of it usage in Nigeria.

2. LEGAL AND INSTITUTIONAL FRAMEWORKS ON RENEWABLE ENERGY

This segment examines the effectiveness of the laws and institutions created for the purpose of promoting environmental sustainability and promotion of the use of renewable energy potentials rather than continuous reliance on the use of fossil fuel. It considers the legal and institutional framework kept in place for the protection of the environment generally, and the ones created to regulate the energy sector of the economy.
These are;

2.1 Constitution of the Federal Republic of Nigeria, 1999(as amended).

The question to be considered here is whether the Constitution of the Federal Republic of Nigeria, 1999 (as amended)[20] guarantees Nigerian citizens right to clean and healthy environment. In providing answer to this question, there is the need to consider some relevant sections of the said Constitution[21] which include its sections 13, 17 and 20. Section 13 provides that; it shall be the duty and responsibility of all organs of government, and of all authorities and persons, exercising legislative, executive or judicial powers, to conform to, observe and apply the provisions of this chapter of the CFRN 1999.
Talking about exploitation, the environment and the good of the citizens section 17 (2) (d) provides that; exploitation of human or natural resources in any form whatsoever for reasons, other than the good of the community, shall be prevented.

The above provisions imply that the government of Nigeria should always take necessary steps and precautions to protect the rights of the people in all attempts and in policies formulated to exploit the natural resources of the State. Naturally, such steps should inter-alia include taking positive measures against environmental hazards and harmful activities of man capable of destroying the environment. Furthermore, section 20[22] provides that; the State shall protect and improve the environment and safeguard the water, air and land, forest and wild life of Nigeria.

Regrettably, it is important to note that the above provision is not justiciable as same forms part of the Fundamental Objectives and Directive Principle of State Policies, implication which is that no Nigerian citizen can go to court to enforce his/her rights in respect of a violation or threatened violation of any section of this provision.

2.1.2 National Environmental Standard Regulation Enforcement Agency (Establishment) Act 2007

The National Environmental Standards and Regulations Enforcement Agency (Establishment) (NESREA) Act 2007[23]was enacted to holistically address environmental challenges and achieve environmental protection in every sector, including energy.[24]The Act[25] provides for an impressive range of enforcement mechanisms. These include: issuance of permits, licences, certificates for environmental compliance, inspections, searches, seizures, arrests, sealing, notice of violation, notice of revocation of permit, revocation order, recourse to courts for civil penalties for violation, injunctive relief to require compliance, criminal sanctions for violations, citizen's suits to enforce the statutes in

[20] CFRN 1999(as amended)
[21] *Ibid.*
[22] *Ibid.*
[23] NESREA Act, No 25, 2007.
[24] *Ibid* s 2
[25] *Ibid.*

the absence of effective government enforcement[26]. Though, it is quite unfortunate that the Act[27] did not mention renewable energy which is now seen as a panacea for sustainable environment. It did not also define the concept of sustainable development which is key for the protection of the environment for the present and future generation.

2.1.3 Electric Power Sector Reform (EPSR) Act of 2005

The Electric Power Sector Reform Act of 2005(EPSR)[28] was enacted by the National Assembly in 2005. Creating this law was borne out of the need to effect a far reaching reforms in the power sector. Amongst which was to ensure compliance with all the rules, regulations and procedures laid out in the Act.[29] The Act establishes the National Electricity Regulatory Commission (NERC)[30] as the principal regulatory institution in Nigeria in charge of the activities of the generation, transmission and distribution companies and granting of licences for electricity generation, transmission, distribution, system operation and trading.[31]

The Act[32] more importantly provides for a platform for private electricity producers to make commercial arrangements with the now privatized distributors or even the end user for the sale of power generated by the private producers and licensing of electricity generation, including renewable electricity, exceeding IMW. Any renewable electricity generation,[33] distribution or transmission project will therefore be carried out only under the appropriate licence granted by the commission.[34] Also, Unlike the other existing policies and rules, the EPSRA is a legislative instrument that carries with it the force of law and can be enforced in any court of law in Nigeria.[35] Thus, the government or any relevant stakeholder in the industry can be taken to court for the enforcement of various rights and obligations entrenched in the Act from time to time, without any inhibition whatsoever. The enforceability of the Act presents a beacon of hope for the development of the renewable energy subsector in Nigeria, and is the right legislative instrument in the right direction.

2.1. 4 Energy Commission of Nigeria Act, Cap E10 LFN 2010

The Act[36] was first promulgated in 1979 and later amended in 1988 and 1989. It established the Energy Commission of Nigeria.[37] The Act confers on the commission the responsibility of coordinating and general surveillance of the systematic development of the various energy resources in Nigeria[38]. The Technical Advisory Committee[39] of the Commission is mandated by the Act[40] to carry out functions such as the gathering and dissemination of information regarding Government's policy on energy development, serving as a trouble-shooting centre for technical issues in energy development, advising states and federal government on energy development issues, including funding for energy research and development[41] and others.

The Act sought to align with the policy of the Government on developing, harnessing and distributing renewable energy and protecting the environment from the harmful effects of fossil fuel. Though, no specific reference is made to the renewable development in the Act, the commission, pursuant to this mandate, has developed the National Energy Master Plan and the Renewable Energy Master Plan which provides for detailed policies towards meeting Renewable Energy Targets as shall be seen later.

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[26]*Ibid,* ss 30,32 and 32
[27]Ibid
[28] EPSR Act2005
[29]*Ibid.*
[30]*Ibid,* s 31
[31]*Ibid*ss 32, 33 and 62
[32]*Ibid*.
[33]*Ibid,* s 88 (9) (c)
[34]*Ibid.*
[35]EPSR Act, s 13
[36]Energy Commission of Nigeria Act, Cap E10 LFN 2010
[37]*Ibid*, s 1(1)
[38]*Ibid,* Preamble
[39]*Ibid* s 3
[40]*Ibid.*
[41] Ibid, s.5

Other national instruments and policies include; the National Energy Policy (2003), the National Electric Power Policy (2001), Electric Power Sector Reform Act (2005), the Renewable Energy Master Plan (2005), the draft Rural Electrification Policy and the National Economic Empowerment and Development Strategy (NEEDS), Nigerian Bio-fuel Policy and Incentives, National Renewable Energy and Energy Efficiency Policy, National Energy Policy (NEP) 2003, 2006 and 2013 and others. Internationally, the following instruments exist on renewable energy;

2.1.5 International Renewable Energy Agency (IRENA) Statute 2010

Nigeria signed the IRENA statute in 2009 and ratifies her membership in 2010.[42] The International Renewable Energy Agency (IRENA) Statute is a treaty level intergovernmental organisation that some stakeholder countries have adopted to promote the widespread and increased adoption and sustainable use of all forms of renewable energy technologies.[43]

The objectives of the Agency is to promote the widespread and increased adoption and the sustainable use of all forms of renewable energy, taking into account the national and domestic priorities and benefits derived from a combined approach of renewable energy and energy efficiency measures,[44] including the contribution of renewable energy to environmental preservation, through limiting pressure on natural resources and reducing deforestation, particularly tropical deforestation, desertification and biodiversity loss; to climate protection.

In, Nigeria is a member of IRENA,[45] and as a member State, IRENA monitors the development of renewable energy in Nigeria.[46] The data it provides creates a Renewable Energy profile for Nigeria, making it easy for investors especially from the international community to plan their investments. This paper finds that this has had positive effects on the development of renewable in Nigeria. However, a significant weakness of IRENA is that it cannot issue legally binding renewable energy targets.

2.1.6 United Nations Framework Convention on Climate Change 1992

The United Nations Framework Convention on Climate Change 1992[47]came into force on 21 March 1994.[48] The Convention has over 197 nations that have signed and ratified their membership to the convention, including Nigeria.[49]The ultimate objective of the Convention is to stabilize greenhouse gas concentrations "at a level that would prevent dangerous anthropogenic (human induced) interference with the climate system." It states that "such a level should be achieved within a time-frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened, and to enable economic development to proceed in a sustainable manner.[50] The convention defined climate change thus; *"Climate change" means a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods"*[51]

One interesting thing about this convention is that, it provides that the developed country parties should take the lead in combating climate change and the adverse effects thereof. This is based on the principle of common but differentiated responsibilities in terms of combating climate change by States. The developed countries through their industrial activities have contributed to the depletion of

[42]International Renewable Energy Agency (IRENA) Statute 2010<https://www.auswaertiges-amt.de/blob/248452/19327d7c59c304fca131211c2ebc5476/statusliste-en-data.pdf>Accessed 3 September 2021
[43]*Ibid.*
[44](n 50), article 11
[45](n70)
[46] Renewable Eenergy Country Profile: Nigeria. IRENA <http://www.irena.org/renewableenergymaps/countryprofiles/africa/Nigeria.pdf> accessed 4 August 2021
[47] UNFCC 1992
[48]United Nations Framework Convention on Climate Change 1992<https://unfccc.int/process-and-meetings/the-convention/what-is-the-united-nations-framework-convention-on-climate-change. >Accessed 4 September 2021
[49]*Ibid*
[50]*Ibid*, article 2
[51]*Ibid*. article 1

ozone layer and greenhouse gases emission which resulted in adverse effects of climate change. One of the major shortcomings of the convention is that it does not provide for institution that will drive home its objectives and ensure effective implementation of the convention.

2.1.7 Kyoto Protocol to the United Nations Framework Convention on Climate Change 1998

The protocol operationalizes the United Nations Framework Convention on Climate Change KPUNFCCC by committing industrialised countries and economies in transition to limit and reduce greenhouse gases (GHGs) emissions in accordance with agreed individual targets.[52] The UNFCCC is the international treaty which extends the 1992 United Nations Framework Convention on Climate Change that commits State parties to reduce greenhouse gas emissions, based on the scientific consensus that, firstly, global warming is occurring and secondly, it is extremely likely that human-made Carbon dioxide emissions have predominantly caused it.

The protocol[53] represents a landmark accomplishment on the reduction of greenhouse gases in the atmosphere, its success was far from assured. Reports issued in its first few years of its implementation shows that most participants failed to meet up their emission reduction targets. Some critics posit that even if the targets were met, the impacts in mitigation of climate change would not be significant. The protocol though was the first legally binding treaty, it did not compel developing countries including major carbon emitters, China and India to take action.

2.1.8 National Electricity Regulatory Commission (NERC)

The National Electricity Regulatory Commission (NERC) is established by the Electricity Power Sector Reform (EPSR) Act 2005 [54] with the functions and objects to create, promote, and preserve efficient energy market structure for optimal utilization of energy resources for electric services.[55] The commission is to boost access to energy services by encouraging and enabling consumer connections to distribution systems in both countryside and city areas and to guarantee stable supply of electricity to consumer, however, according to Olujobi[56], the commission has not been efficient in this regard as communities in Nigeria have not been able to enjoy constant power supply and some have not been connected to the national grids for electricity supply.

2.1.9 Federal Ministry of Power and Steel.

The Federal Ministry of Power and Steel is the policy-making organ of the federal government of Nigeria, tasked with the power to recommend policy and to make recommendations to the Federal Government of Nigeria on laws, strategies and financing on renewable energy.[57] It is authorized to monitor and appraise the application and performance of the policy within governmental agencies and in the electricity markets.[58] To also evaluate the performance of renewable electricity policy through increased access to electricity in rural areas in Nigeria is fundamental to boost the economy. In other to create some innovations and impacts, the ministry in 2006 came up with the initiative of Renewable Electricity Action Program (REAP) with the overall objective of establishing a framework for achieving the objectives of the Renewable Electricity Policy and Regulatory Guidelines by setting measurable targets, strategies and implementation plan for the contribution of renewable electricity to the national economy.[59]

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[52]UNFCCC 1998

[53]*Ibid.*

[54]Electricity Power Reform Act 2005. S 31

[55]*Ibid*. s 32 (1) and (2)

[56]OlujobiOlusola Joshua and others, 'The Legal Regime of Renewable Energy as Alternative Sources of Energy in Nigeria's Power Sector: The Impacts and the Potentials' [2020] 19 (3) *Academy of Strategic Management Journal*9

[57]Y M Ganda and others, The Role of Renewable Energy in Improving Energy Access to Rural Nigeria, [2013] Being a paper submitted for World Energy Council 2013 Congress 13-17 <file://c:/users/hp/downloads/theroleofrenewableenergyinimprovingenergyaccesstoruralareasinnigeria.pdf> accessed 4 August 2021

[57]https://www.enel.it/en/supporto/faq/differenza-tra-energie-rinnovabili-non-rinnovabili. Accessed 7 September 2021

[58]*Ibid.*

[59]Renewable Electricity Action Program 2006. 1.5

2.1. 10 Federal Ministry of Environment

The Federal Ministry of the Environment (FME) was created in 1999 to replace FEPA.[60] The Ministry was established to ensure effective coordination of all environmental matters, which hitherto were fragmented and resident in different Ministries.[61] Its creation was intended to ensure that environmental matters are adequately mainstreamed into all developmental activities.[62] The Ministry has the mandate to create a National Policy for the protection of the environment and conservation of natural resource, including the environmental impact assessment of all developing projects, and periodic master plans for the redevelopment of environmental science and technology.[63]

3. TYPES AND SOURCES OF RENEWABLE ENERGY

Fundamentally, there are two types of energy; renewable and non-renewable energy. Some of the distinguishing factors between these two types of energy include the ability to replenish naturally, impact on the environment and human health[64], and energy efficiency. While renewable energy can easily replenish naturally after use, more environmentally friendly and have less negative impact on human health, non-renewable energy lacks these qualities. They are; solar energy.

3.1 Solar Energy

This is one of the most promising renewable energy sources because of its apparent limitless potential.[65] Solar energy is harnessed and gotten through the conversion of sunlight into electricity through the use of solar cells in solar panels. This system is called photovoltaic (PV) system.[66] This solar photovoltaic is particularly useful in areas that grid electricity cannot easily get to, such as rural areas and deserts.[67] Solar energy may be used for power supply to remote villages and location not connected to the national grid. It may also be used to generate power for feeding into the national grid.[68] The enormous benefit of solar energy in power generation cannot be overemphasized.

3.1.1 Wind Energy

Wind energy is the energy contained in the movement of air in form of wind, which can be used to turn the blades of windmills or wind turbines, which in turn could drive electrical generators to produce electricity.[69] This source of energy relies on wind for the production of energy.[70] Wind energy is a veritable, competitive and virtually pollution-free technology widely used in many areas of the world.[71] This is perhaps why it is the commonest source of generating electricity,[72]

3.1.2 Geothermal Energy

The term Geothermal is derived from the word geo (which means ground) and thermal which means (heat energy).[73]To produce power from geothermal energy, wells are dug a mile deep into

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[60]Federal Ministry of Environment.Federal Ministry of Information < http://www.nigeria.gov.ng/2012-10-29-11-06-51/executive-branch/94-federal-ministry-of-environment/182-federalministry-of-en.> Accessed 6 August 2021

[61]*Ibid*

[62]*Ibid*

[63]*Ibid*

[64]https://www.enel.it/en/supporto/faq/differenza-tra-energie-rinnovabili-non-rinnovabili. Accessed 7 September 2021

[65]Sunday OlayinkaOyedepo, Renewable and Sustainable Energy Reviews: On Energy for Sustainable Development in Nigeria [2012] 2590

[66]N A Basri and others, Malasysia Energy Strategy Towards Sustainability: A Panoramic Overview of the Benefits and Challenges [2015] *Renew Sustain Energy Review* 105

[67] J A McNeely, *Energy and Biodiversity: Understanding complex relationships. Energy Law and Sustainable Development.* (Switzerland and Cambridge 2003) 35 <http://www.un.org/esa/sustdev/sdissues/energy/op/parliamentarian_forum/ottinger_promotion_re.doc> accessed 7 August 2021

[68]Sunday (n16)

[69] National Renewable Energy and Energy Efficiency Policy (NREEEP) 2015 <http://admin.theiguides.org/Media/Documents/NREEE%20POLICY%202015-%20FEC%20APPROVED%20COPY.pdf.> Accessed 8 August 2021

[70]*Ibid*

[71]R L Ottinger, 'Experience with Promotion of Renewable Energy: Successes and Lessons Learned [2005] Parliamentarian Forum on Energy Legislation and Sustainable Development Cape Town, South Africa 5-7 <http://www.un.org/esa/sustdev/sdissues/energy/op/parliamentarian_forum/ottinger_promotion_re.doc> Accessed 8 August 2021

[72]O Awogbemi and C A Komolafe 'Potential for Sustainable Renewable Energy Development in Nigeria [2011] 12 (1) *The Pacific Journal of Science and Technology* 161-169 at 163

[73] N. Vidadili and others, Transition to Renewable Energy and Sustainable Energy Development in Azerbaijan [2017] 80 *Renewable and Sustainable Energy Reviews* 1160

underground reservoirs to access the steam and hot water there, which can then be used to drive turbines connected to electricity generators. [74]Nigeria has not developed geothermal energy but the country has geothermal energy potentials. The National Renewable Energy and Energy Efficiency Policy (NREEEP) encourages the use of geothermal energy as one of the sources of energy available in large quantity in Nigeria, but it has not been in use for energy supply and consumption because there is no legal framework to drive home its implementation.

3.1.3 Hydro Energy

Hydro energy is the form of energy which could be harnessed through movement of water to power machinery or create electricity.[75] Hydro energy production is the most extensively exploited form of renewable energy all over the world, especially in the subtropical climate belt.[76]Some hydroelectric power plants are located on rivers, streams, and canals; but for a regular, steady, reliable, and sustainable energy generation, water storages behind dams are necessary.[77]Additional sources of energy include Biomass/Bioenergy, coal, crude oil, natural gas, nuclear energy and others.

4. Benefits of Using Renewable Energy

The need for the development of renewable energy among other benefits is anchored on the twin pillar of reducing or mitigating global warming associated with Climate change and promoting energy security.[78] Other benefits are the economic, environmental, improving of public health and others.

Aside the above benefits, there are also so many obstacles inhibiting the development of renewable energy in Nigeria. The work briefly highlights some of the challenges confronting the effective development and utilization of renewable energy sources in Nigeria. They therefore include but not limited to policy and regulatory barriers, finance and investment barriers, technological barrier, limited public awareness of the potential of renewable energy, poorly established standard and quality control of locally manufactured and imported technologies and corruption.

5. CONCLUSION/RECOMMENDATIONS

There is no doubt that renewable energy is already part of the Nigeria's energy agenda; as this is evident in the policies and plans the country has initiated with a view to promoting alternative sources of energy. But as usual, implementation remains the biggest challenge. The argument in this study is not only that renewable energy offers a doubtless potential for achieving environmental sustainability but also, that, what this energy source offers is far beyond mitigation of carbon footprints and greenhouse gases emission into the atmosphere. It alsostands to offer other benefits such as employment generation through viable RE industries, increase in energy generation and energy efficiency. It also promotes public health, and above all generates huge revenue for the country. As this paper has also clearly pointed out, the promises of RE are already yielding fruits in many jurisdictions that give priority to RE development.

It is found that Nigeria is endowed with enormous Renewable Energy Potentials ranging from solar energy, wind energy, biomass, hydro-energy and many others. These energy sources are environmentally friendly and if effective policies are put in place for their development, can help solve the environmental and energy crisis the country is currently facing. It is therefore recommended firstly, the establishment of a special Renewable Energy Research Institute that will train Nigerians on the development and use of renewable energy technologies.

Secondly, the enlightenment and education of Nigerians and local communities on the potential benefits of using renewable energy. Some Nigerians are oblivious of the environmental consequences of fossil fuel, and thus, regular enlightenment programme is required. Thirdly, the integration of renewable energy into the energy system by making use of renewable energy as a matter of national priority to meet electricity demands with supplies by the federal government.

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[74](n 77)

[75] Z. Şen, Comprehensive Energy System (Elsevier Inc, 2018) <https://www.sciencedirect.com/referencework/9780128149256/comprehensive-energy-systems#book-description> accessed 8 August 2021

[76]*Ibid.*

[77]*Ibid*

[78]A. J Bradbrook, 'International Law and Renewable Energy: Filing the Void' in HanSchel D and others (eds) *Mensch und Recht*(Dunker and Humboldt 2013) 237-238.

Lastly, that Nigerian laws in various sectors should indirectly promote renewable energy through measures aimed at disadvantaging conventional fossil-fuel energy, such as removing fossil-fuel subsidies and increasing taxes on fossil-fuel production and use. Tax, subsidies and other incentives can have a substantial influence on the economic order. The government should design laws governing them in a way that will reduce the support currently given to conventional energy. This will consequently boost the economies of scale of renewable energy.