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RENEWABLE ENERGY UTILIZATION AND SOCIO-ECONOMIC DEVELOPMENT IN NIGERIA: CHALLENGES AND PROSPECTS

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Abstract
Provision of clean sustainable energy plays a vital role in socio-economic development of country and citizens. Renewable energy (RE) resources present an excellent means of achieving clean and sustainable energy for domestic, industrial, commercial and other public uses when optimally harnessed. With a relatively high potential for renewable energy such as solar, biomass and small hydropower, Nigeria is positioned to be in forefront in clean and sustainable energy provision. This could influence socio-economic development and livelihood of citizens. Among prominent RE resources with high potentials in Nigeria, only solar energy is given a significant prominence while biomass for instance, is mostly used in crude form leading to indoor pollution and desertification. A number of policies and plans have been put in place including the National Renewable Energy and Energy Efficiency Policy 2015, National Development Plan 2021–2025, and Electricity Act 2023, to improve lives of the population via provision of affordable and sustainable energy. However, lack of implementation strategies and poor renewable energy infrastructure have hampered the utilization of Renewable Energy. This paper discusses renewable energy utilization via various technological innovations, and its potentials contribution to Nigeria's energy mix with focus on analysis of 1kW solar capacity. The analysis shows the feasibility and viability of solar as a renewable energy with significant potentials contribution to energy security and environmental sustainability. This paper equally examines the influences of environment on RE utilization using PESTELS. Political will is observed a major influence on RE utilization towards improved socio-economic development in Nigeria

Keywords: Sustainable development; Electricity generation; Renewable energy technology; Economic analysis; Greenhouse gas emission.

NOMENCLATURE

tCO_2	Tons of Carbon Dioxide	IRR	Internal Rate of Return
NPV	Net Present Value	IEA	International Energy Agency
OTEC	Ocean Thermal Energy Conversion	RET	Renewable Energy Technology
CSP	Concentrated Solar Power	NERC	Nigerian Electricity Regulatory Commission
GHG	Greenhouse Gas	TJ	Terrajoule

1. INTRODUCTION

Secure energy supply is pivotal to the overall development of communities and human inhabitants as well as the economic competitiveness of nations. Indicators of socio-economic development and human development index (HDI) are not unconnected with sustainably affordable clean energy supply. The 7^{th} of the goal of the United Nations sustainable development goals (SDGs) hinges on supply of clean sustainable energy. Attainment of the affordable clean energy is however becoming a major challenge for most of the global communities in the recent times. This is due to the complexities of increase in energy demand and environmental issues surrounding the fossil-based energy supply. Aside its irreversible declining supply, conventional energy exploitation comes with a number of environmental issues such as indoor pollution and global warming. Renewable energy does not only guarantee clean energy supply but also aids the achievement of indicators of HDI and socio-economic development. In the recent past decades, there have been increased research interests in exploitation of

renewable energy (Belaïd,et al 2023). The energy crises between the Arab countries and the Western World in the 1967 and 1973 with its worldwide consequences on economy also constituted to intensified quest for alternative energy sources (Haqeem and Zulkifli, 2022; Nwaezeigwe, 2021). A similar situation is currently being experienced in the Europe due to Russia-Ukraine war.

As ways forward, series of measures were taken by the affected countries. For instance, in addition to other measures such as fuel rationing, and reduced driving habits, Federal Energy Administration was established to research into exploitation of renewable energy resources including wind, solar and geothermal in the United State of America (ERDA, 2018; J and A, 2015). In addition to ensuring less reliance on fossil based energy that is mostly imported (Solangi *et al.*, 2011), European Energy Policy was formulated to increase the shear of renewable energy in the supply mix and to mitigate the environmental impacts of conventional energy sources. In promoting utilization of renewable energy, each of the member states employs different incentivizing instruments such as feed-in tariffs, tax reduction and quotas among others (Buchinger *et al.*, 2012; Menges and Pfaffenberger, 2015). A major turning point in the development of renewable energy was the formation of the International Renewable Energy Agency (IRENA) in 2009 with 154 member countries and with the main objective of utilizing renewable energy to mitigate climate change and increase economic growth, create employment, and guarantee clean energy security (Harjanne and Korhonen, 2019). In Asia region, renewable energy is understood to be capital intensive with low internal rate of return, hence the provision of incentives such as tax exemptions and concession agreement between government and investors in order to improve the IRR and significantly reduce market risk (Wang, 2010). This is with the aim of achieving national electricity supply security and sustainable socio-economic development through enhanced utilization of indigenous renewable energy sources (Chua and Oh, 2012). It also aims at improving the renewable energy proportion of the national power generation mix, enhance development of renewable energy industries, and conserving the environment (Solangi *et al.*, 2011). In order to address the challenge of energy trilemma (energy security, energy poverty, and climate change mitigation), Indonesia government focuses on energy transition and shifted to regionally produced and decentralized renewable energies (Langer *et al.*, 2021)

Considering its contribution to mitigation of climate change and socio-economic development, number of African countries have come up with policies targeted at overcoming the perceived challenges of sustainable development of renewable energy sector (Aliyu *et al.*, 2017). As part of the efforts towards resolving energy crisis, and fossil-based energy issues, Nigerian government established the Energy Commission of Nigeria (ECN) in 1979. The commission is mandated to conduct research and development on renewable energy technologies as well as to facilitate the adoption of its applications all over the country (Ilenikhena, 2010). Various other government's efforts include the Renewable Energy Master Plan (2005), National Renewable Energy and Energy Efficiency Plan (NREEEP), establishment of Rural Electrification Agency, Nigerian Electricity Regulatory Commission (NERC) and NASENI Solar Energy limited among others. With vast renewable energy potential (Table 1),

Table 1: Total Energy Potential in Nigeria (Ibrahim et al., 2021; REMP 2005)

Energy Source		Estimated potential
Crude oil		36 billion barrels
Natural gas		185 trillion cubic feet
Coal		40 billion metric tons
Hydropower (Large & Small)		14750 MW
Solar radiation		3.5 – 7.0 kWh/day/m^2
Wind		2.0 – 4.0 m/s
Biomass	Fuel wood	13,071,464 ha
	Crop Residue	83 million tons/year
	Animal waste	61 million tons/year
Wave and tidal energy		150000 TJ/year (16.6×10^6 ton/year)

Nigeria is in position for better utilization of renewable energy to improve its energy supply. However, despite the aforementioned efforts, energy crisis still persists and renewable energy utilization has been

significantly low. More than 40% of the population is still with no access to clean energy from electricity which resulted in spending of $2.4 billion on generators from 1996 to 2019 with its attendant health and environmental hazards (Somoye 2023). This has equally led to low pa capita energy consumption, increase in unemployment rate and low HDI. Past studies on renewable energy utilization in Nigeria did not focus on the analysis of its viability with respect to cost and social-economic consideration as well as frameworks and environmental perspectives of its application. The objectives of this paper therefore include; to assess the status and influence of the renewable energy utilization in Nigeria, to identify the potentials of RE penetration, to examine the applicability of the existing framework towards improved utilization of the RE in Nigeria, to analyse the viability as well as environmental influence on renewable energy utilization in Nigeria. This paper also presents additional basis for renewable energy viability

2. Energy Exploitation and Potentials of Renewable Energy in Nigeria

Nigerian government did Power Sector Reform in 2005 with a target of achieving 40,000 MW of electricity generating capacity from renewable end non-renewable sources by the year 2020. This would require an annual investment of $10 billion in the sector for 10 years (Elum et al., 2020). However, the achievement of this had been a huge task as both the installed and generating capacities are far below the target even after the expiration of the target date.

Furthermore, Nigerian energy supply had historically been dominated by fossil-based sources (Fig.1), with renewable gradually (and slowly) coming up except biomass that is used mostly in unprocessed form with resultant indoor pollution and deforestation (Schwerho and Sy, 2016; Eweka et al., 2022). Meanwhile, there exists abundant renewable energy sources such as solar, biomass, wind, and small hydro that are largely untapped. From these sources, the Nigerian Electricity Regulatory Commission (NERC) made a commitment of stimulating the achievement of a minimum of 2,000 MW of energy to be added to national supply mix by the year 2020 through a number of incentivizing mechanisms. It is of note that the commitment by NERC is yet to be met as only the thermal and hydro significantly make up for the energy mix in the electricity generation (Table 2) with renewables contributing mostly through the off grid and other home lighting systems. Only about 40% of the entire country's total population is electrified through connection to the national power grid while the remaining (more than 50%) of Nigeria's population is left with either off grid or other means of access to powering their daily energy needs (Aliyu et al., 2017). In addition to its location in the tropics that gives it relatively high potential for solar energy utilization, Nigeria is one of the countries with substantial potential for ocean energy resources, having the required temperature differential between the surface and the ocean depth (Rauchenstein et al., 2011) throughout the year with less risk from storms and hurricanes. Ocean Thermal Energy Conversion (OTEC) is a renewable and clean energy technology, utilizing difference in temperature between the warm sea surface and the ocean depth to generate electrical power. Exploitation of OTEC technology equally gives rise to spring-off of other activities resulting to multi-products and multi-nutritional by products. Among these are the district cooling system (through chilled water), aquaculture, and portable mineral water, thereby creating more jobs in addition to 24 hours base load power supply.

3. Renewable Energy for Decentralized Electricity Supply

Losses due to transmission and distribution via the national grid and aged facility have led to persistent system collapse (Fig 2) and power failure. This is coupled with the prevalence of difficult terrains in most of the rural areas that has also made investment in power supply through the central grid system a huge task. With more than 50% of the total population, these are areas where renewable energy is most useful as a decentralized system (Dehghan, 2020). Decentralized energy systems also promote energy harvest at the point of use (Oladipo et al., 2018; Oh et al., 2010), thereby stimulating the socioeconomic activities in the remote areas of the country. According to the renewable energy master plan, there are plans to increase the proportion of renewables in the nation's electricity supply by 13%, 23%, and 36% in the year 2015, 2025, and 2030 respectively. Achieving this will require investment of $10 million annually on facility development with the target of propelling Nigeria electricity coverage to about 80% general access to energy (REMP 2005).

3.1 Policy and Institutional Frameworks for Renewable Energy Utilization

There are quite a number of policies and institutional frameworks intended to promote the utilization of renewable energy in Nigeria. Some of the institutions and policies with their renewable energy related objectives are as shown in Table 3 However, there is no leading institution with a clearly defined functions regarding the coordination of harnessing the renewable energy, hence most agencies are working at cross mandate. This however affects the overall objectives of achieving energy security in Nigeria at affordable cost and with minimum impacts on the environment.

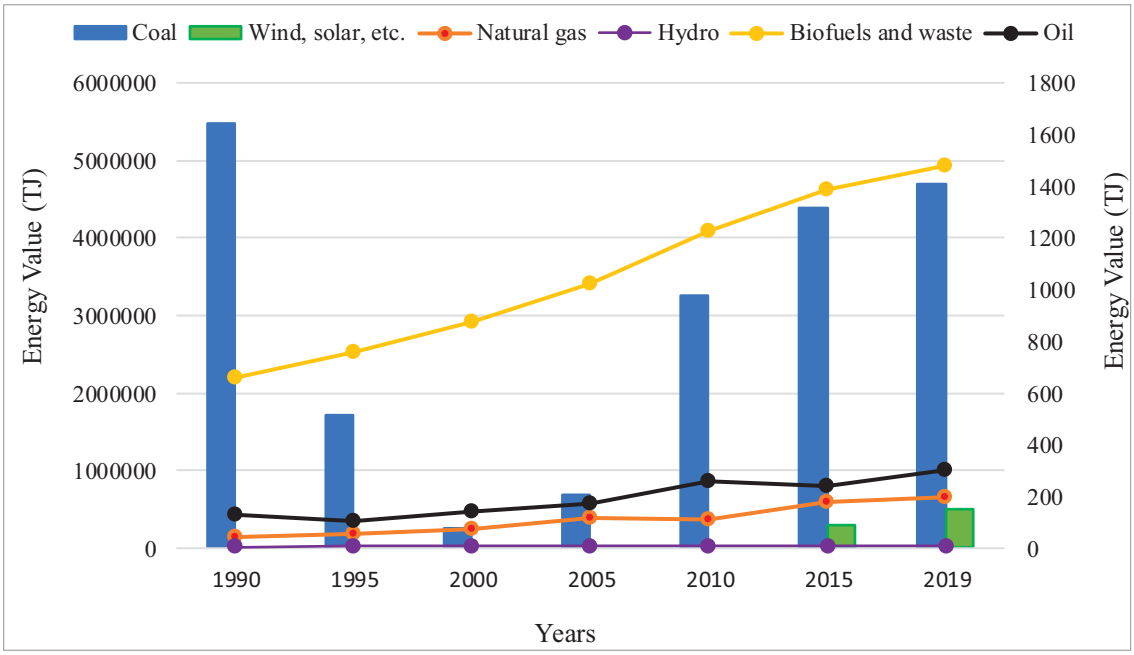

Fig. 1: Nigeria total energy supply by source 1990-2019 (Data source: IEA 2022)

Table 2: Electricity Generating Capacity including the privately generated (NERC 2022; IEA 223; Statista 2023)

Energy source	Installed capacity (MW)	Generating capacity (MW)	Performance (%)
Thermal	8,457	4,996	59.08
Hydro	1,938.4	1,060	54.68
Renewables		2.16	
Total	10,396	6,058.16	58.25

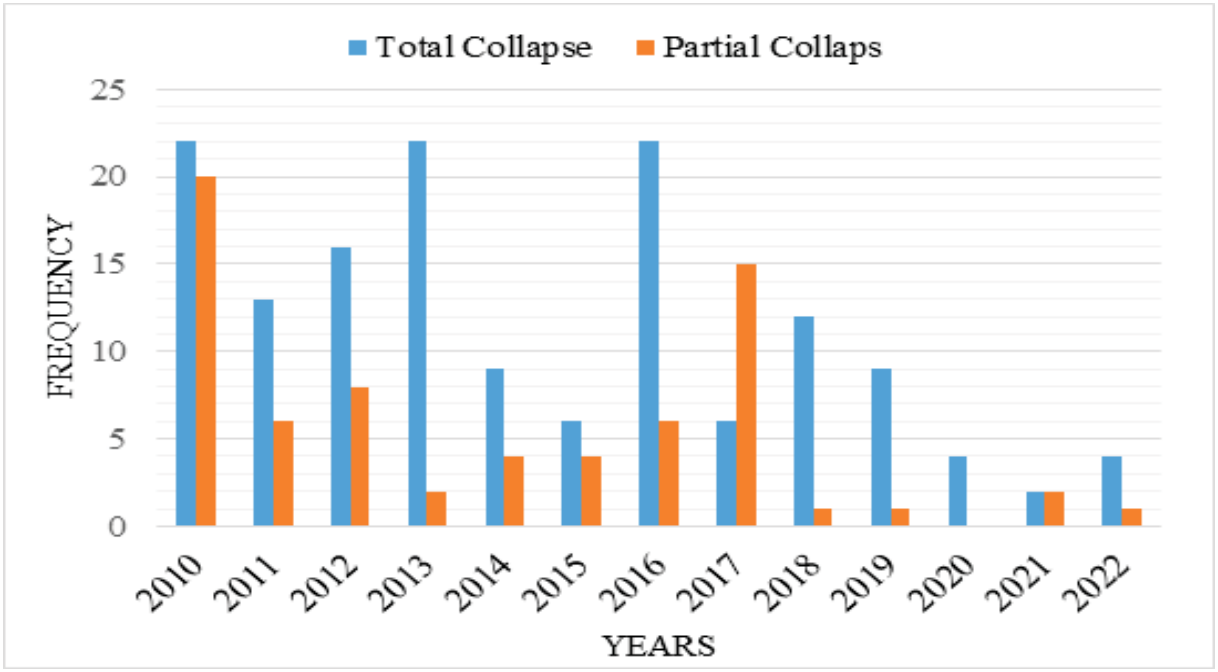

Fig. 2: Nigerian Electricity System Collapse (Eweka et al., 2022)

Table 3: Existing Frameworks on Renewable Energy Utilization in Nigeria

Policy/Act	Institution	Policy Objectives
National Energy Policy (NEP) 2003, 2006, 2013	Energy Commission of Nigeria	i. To ensure energy security via robust energy supply mix using "an energy economy" principle, from which the share of renewable energy will be increased at affordable cost throughout Nigeria ii. To ensure energy security via robust energy supply mix using the principle of "*an energy economy"* from which the share of renewable energy will be increased at affordable cost throughout Nigeria. iii. To contribute to sustainable development and environmental sustainability through reduction of greenhouse gas emission
Renewable Energy Master Plan (REMP), 2005 and 2012	Energy Commission of Nigeria (ECN)	i. To set out the roadmap to increase the role of renewable energy towards the achievement of sustainable development in Nigeria ii. To facilitate implementation of national energy policy, and other national and international development agendas and conventions. iii. To set out modality for achieving the targets of renewable contribution of 13%, 23%, and 36% in the Nigeria energy mix by the year, 2015, 2025, and 2030 respectively.
Renewable Electricity Policy Guidelines (REPG) 2006	Federal Ministry of Power and Steel	i. To see to expansion of electricity generation from renewables to at least 5% of the total electricity generated. ii. To achieve a minimum of 5TWh of electricity generation in the country
Renewable Electricity Action Programme (REAP) 2006	Federal ministry of Power and Steel	i. To develop roadmap for the implementation of renewable electricity policy guideline (REPG)
Nigerian Biofuel Policy and Incentives (NBPI), 2007	Nigerian National Petroleum Corporation	i. To develop and promote domestic ethanol industry via utilization of agricultural products ii. To gradually reduce the nation's dependence on imported gasoline, reduction in environmental pollution, and to promote creation of jobs and tax base revenue for government
Multi-Year Tariff Order (MYTO) 2008 and 2012	Nigerian Electricity Regulatory Commission	i. To provide necessary incentives for power producers and investors to operate and maintain electricity infrastructure.
Rural Electrification Strategy and Implementation Plan (RESIP) 2014	Power Sector Reform Team	i. To expand access to affordable and cost-effective electricity through the use of on-grid and off-grid means of electricity supply
National Renewable Energy and Energy Efficiency Policy (NREEEP 2015	Federal Ministry of Power	i. For promotion of renewable energy and energy efficiency
Energy Transition Plan (2022)	Presidency	i. Lifting 100 million Nigerians out of poverty and driving economic growth ii. To bring modern energy services to the population iii. To Manage the expected long-term job loss in the oil sector due to the reduced global fossil-fuel demand iv. To play a leadership role for Africa through the promotion of a fair, inclusive and equitable energy transition in Africa, using

		gas as a “transitioning fuel” v. To streamline the existing and new government related energy transition initiatives
Electricity Act 2023	NESI, NERC, N-HYPPADEC, REA, NEMSA	i. Provision of framework for stimulating the development and utilization of renewable energy sources as well as creating enabling environment to attract investment in renewable energy sources ii. Promotion of local capacity in technology for renewable energy through a framework for local content in the NESI iii. Enactment of laws for the security of electricity infrastructure, to include effective punitive measures against electricity theft and other offences peculiar to the NESI as well as strengthening the relationship between the national and sub-national electricity markets

3.2 Renewable Energy Potential Utilization Areas

The strategic importance of energy to human daily activities and the potentials of its utilization for stimulating social and economic development underscore the need for the continuous exploitation of energy sources (Menges and Pfaffenberger, 2015; Shoaib *et al.*, 2016). Therefore, for sustainable socio-economic development, the potentials of recurring energy sources such as solar, wind, biomass, geothermal, hydropower, and ocean energy are assessed in this paper. The appropriate technologies for harvesting these vast energy resources and the status of their maturity are presented in Table 4.

Table 4: Renewable energy technology potentials

RE Source	Technology	Output	Technology maturity	Reference
Solar	Solar Thermal	Sorption cooling systems Solar dryers Domestic hot water Concentrated Solar Power Process heating systems	Up to commercial stage	(Shirazi et al., 2016; Wang et al., 2009; Shaaban and Petinrin, 2014; Tsoutsos et al., 2009; Ullah et al., 2013; He et al., 2015)
	Solar PV	Lightings Light electrical load	Up to commercial stage	(Lowitzsch et al., 2021; Aliyu et al., 2017)
Hydro	Run-off-river hydro, Storage hydro, Pumped hydro	All electrical applications	Up to commercial stage	(Limmeechokchai and Suksuntornsiri, 2007; Ortner and Totschnig, 2019)
Ocean	Salinity gradient, Tidal, Ocean wave and Current energy	Suitable for a number of electrical applications	Development stage, mostly on demonstration stage	(Wang et al., 2011) (Ismaeel et al., 2016)
	OTEC	Electricity District cooling Aquaculture Other spin off activities	Pilot stage nearing full scale	(Syamsuddin et al., 2015; Yuan et al., 2015; IRENA, 2014)
Bio energy	Solid biomass	Electricity, Process heating, drying,	Up to commercial stage	(Saygin et al., 2015; Ortner and Totschnig, 2019)
	Bio fuels (Gasification, Pyrolysis, etc	Electricity. Automobile, Industrial heating process,		

4. Renewable Energy Analysis

Nigeria has a relatively higher solar energy utilization potential due to its location and the maturity of solar energy technology(Aliyu *et al.*, 2017). Using the average of the global unit cost of electricity from renewable energy technologies as presented by IRENA (2022) in Table 5, cost analysis of 1 kW solar power is carried out and presented in Table 5. From the table, solar PV presents the most promising potential for utilization. This is evident in significant reduction in unit cost per kW and levelized cost of electricity, and appreciable increase in capacity factor from 2010 to 2021. This present solar energy as a viable renewable energy in Nigeria.

Table 5: Table 5: Global average of total installation cost, capacity factor, and levelized electricity cost by technology in 2010 and 2021 (IRENA (2022)

Energy Source	Total installed costs (2021 USD/kW)			Capacity factor (%)			Levelized cost of electricity (2021 USD/kWh)		
	2010	2021	Percent change	2010	2021	Percent change	2010	2021	Percent change
Bioenergy	2 714	2 353	-13%	72	68	-6%	0.078	0.067	-14%
Geothermal	2 714	3 991	47%	87	77	-11%	0.05	0.068	34%
Hydropower	1 315	2 135	62%	44	45	2%	0.039	0.048	24%
Solar PV	**4 808**	**857**	**-82%**	**14**	**17**	**25%**	**0.417**	**0.048**	**-88%**
CSP	9 422	9 091	-4%	30	80	167%	0.358	0.114	-68%
Onshore wind	2 042	1 325	-35%	27	39	44%	0.102	0.033	-68%
Offshore wind	4 876	2 858	-41%	38	39	3%	0.188	0.075	-60%

4.1 Analysis of the Scenario Using RETScreen®

RETScreen® (Fig 3) is a renewable energy technology projects pre-feasibility and feasibility analysis tool with. The robust locations data base inbuilt in it makes it suitably applied for renewable energy projects at any reference locations. The feasibility study of the 1 kW solar power system is carried out via its economic analysis by comparing all its associated cost with a conventional system (base case) having the same capacity and compared over the same project life. The project cost and savings is as presented in Table 6. The project cost of $857 per kW is based on IRENA (2022) global rate of solar PV power generation. With a total initial cost of $1,060 and annual operating and maintenance cost of $1, the annual cost saving of $147 is achievable from the project. This saving corresponds to the fuel cost of operating a conventional 1kW power under similar condition.

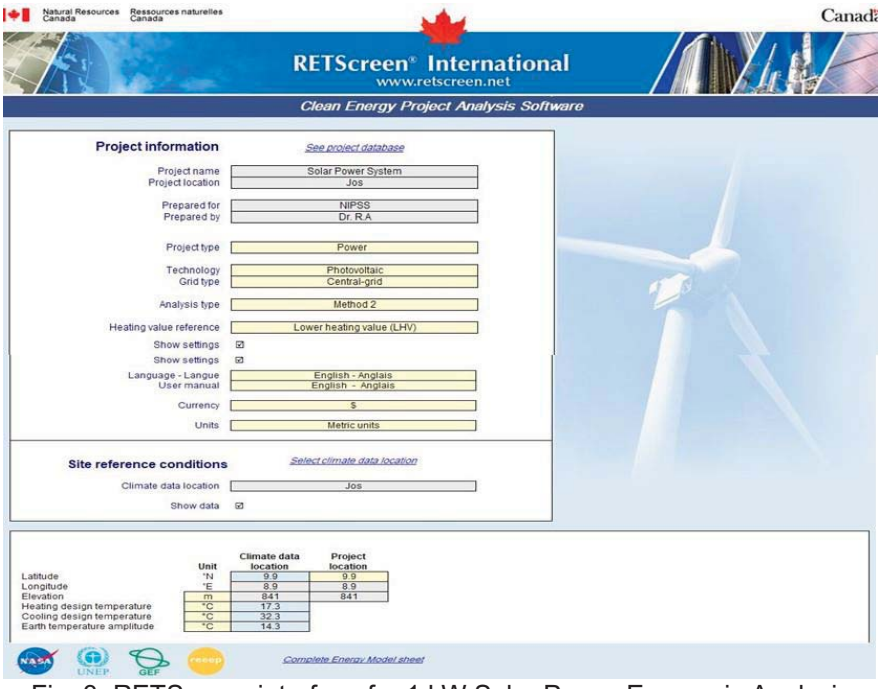

Fig. 3. RETScreen interface for 1 kW Solar Power Economic Analysis

Table 6: Project costs and savings/income summary

	A. Initial costs	(%)	US$
1	Engineering	18.9%	200
2	Power system	80.9%	857
3	Balance of system & misc.	0.2%	3
	Total initial costs	**100.0%**	**1,060**
	B. Annual costs and debt payments		
4	O&M		1
	Total annual costs		**1**
	C. Annual savings and income		
5	Fuel cost - base case		148
	Total annual savings and income		**147**

Furthermore, the project financial viability in Table 7 shows that the project has internal rate of return on of 10.8% with a payback period of 7.1 years. With a projected life span of 15 years, the project's net present value (NPV) is $1,120, while the annual life cycle saving is $75 per year. The project has benefit-to-cost (B-C) ratio of +2.06 indicating its viability, and its net GHG emission reduction of 1.1tCO_2 further strengthens its potentials for reduction of global warming resulting from harmful emission into the atmosphere via exploitation of fossil-based energy resources. The cumulative cash flow of the project (Fig 4) over the life span of 15 years shows its potential for breaking even after 7.2 years. Upon breaking even after 7.2 years, the cash flow is expected that reach about $1,120 which also indicate its financial viability.

Table 7: Financial viability

After-tax IRR – equity (%)	10.8
Equity payback (yr)	7.2
Net Present Value ($)	1,120
Annual life cycle savings ($/yr)	75
Benefit-Cost (B-C) ratio	2.06
Energy production cost ($/MWh)	55.58
GHG reduction cost ($/t$CO_2$)	(67)
Net annual GHG emission reduction	1.1 tCO_2, equivalent to 2.6 Barrels of crude oil not consumed

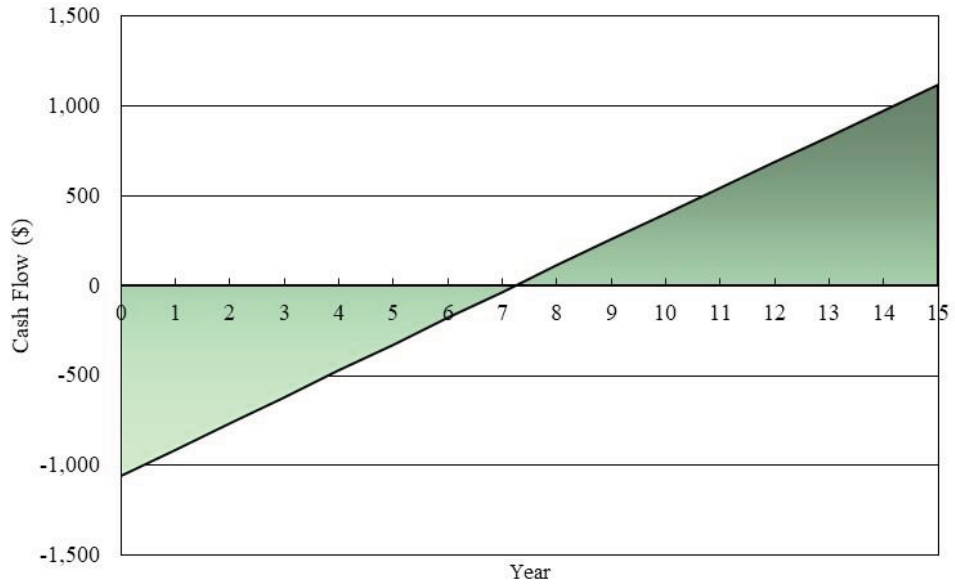

Fig. 4: Project Cumulative Cash Flow Graph

4.2 Strategic Analysis of Renewable Energy Utilization in Nigeria

Renewable energy offered a number of benefits and exploiting it could facilitate Nigeria's quest for energy security and transitioning from the conventional (non-renewable) energy sources to cleaner sources. However, renewable energy utilization is still very low. Major factors that influence renewable energy adoption are as highlighted in the following sections using PESTELS analysis.

4.2.1 Political environment

Since 1999, Nigeria has been enjoying uninterrupted democratic governance with the central political power being rotated from two major political parties. Each of the successive administration had come up with different policies and plan towards energy security through renewable energy exploitation. However, sustainable implementation of such programmes after the expiration of the administration has always been an issue as the succeeding government comes with its own programmes. Consistency in renewable energy related policies and programmes would enhance its adoption and popularize the utilization of renewable energy in Nigeria.

4.2.2 Economic environment

Investment in renewable energy is usually capital intensive with low internal rate of return (Schwerho and Sy, 2016), making its utilization a bit challenging for the masses unless it is subsidized. Low incentives to encourage renewable energy entrepreneurs and local manufacturers are some of the challenges against renewable energy utilization in Nigeria Thus, provision of incentives such as tax exemptions and concession agreement between government and investors would help to improve the IRR and significantly reduce market risk (Wang, 2010; Chua and Oh, 2012).

4.2.3 Social Cultural Environment

Nigeria is a country with a very diverse culture. In most rural areas, the cultural practices affect consumer awareness and understanding of benefit of renewable energy such as solar PV and acceptance of new technologies. The socio-cultural setting influences general access to resources resulting to preference for use of energy from unclean resources with health implications on women and children (Schwerho and Sy, 2016).

4.2.4 Technical/Technology Environment

Renewable energy technologies are at different stages of development; from pilot stage such as OTEC and Salinity gradient, to full commercial scale such as solar, small hydro and wind (IRENA, 2014). The energy efficiency technologies have also been well developed across the world (Olaniyan *et al.*, 2018). Lack of skilled personnel, poor maintenance, lack of training facilities and entrepreneur's development mechanism among others are some of the challenges against renewable energy utilization in Nigeria. Addressing these challenges would stimulate the efficient and effective exploitation of abundant renewable resources towards energy secured Nigeria.

4.2.5 Physical environment

Nigeria is located in the tropics (between Latitude 23.5 ºN and 23.5 ºS) and characterized with hot and humid climate (Parameshwaran et al., 2012; Mekhilef et al., 2012). This gives it a high potential for exploitation of some renewable energy resources including solar, hydro, biomass, and Ocean energy. Nigeria's solar energy potentials ranges from 3.5 $kWhm^2$ in the South and 7.0 kWh/m^2 in the North and this can be harnessed for industrial, domestic, agricultural, as well as public and commercial sectors use. Nigeria could leverage these potentials to achieve its much-desired energy security while reducing greenhouse gas emissions.

4.2.6 Legal Environment

Grid supply of energy has been on the exclusive legislative list in Nigeria, thereby limiting the intervention of sub-national government and other individuals to off-grid energy supply. However, the recent signing of Electricity Act 2023 has led to resolution of this issue, giving opportunities to sub-national governments and individuals to contribute to energy security through renewable energy sources.

4.2.7 Security Environment

The security ecosystem of Nigeria is faced with challenges such as insurgency, banditry, herder-farmer clashes, and ethnic conflicts, kidnapping and armed robbery, among others (Ojewale, 2021). The security challenges have affected several energy facilities both in rural and urban areas. It therefore becomes necessary to adopt a Whole-of-Society approach to addressing the security challenges across the country in order to create an enabling environment renewable energy investment.

5. CONCLUSION AND RECOMMENDATIONS

Nigeria is no doubt facing energy supply deficit and its associated poor socioeconomic development due to its inability to optimally harness its abundant renewable energy resources. Meanwhile, there are quite a number of enablers (resources, technology, and framework) for harnessing the huge renewable energy resources to improve the energy supply and

the livelihood of Nigerians. Investment in renewable energy, though requires high initial cost, but with a better levelized cost. Analysis of a 1 kW solar power in this paper shows that in addition to better levelized cost, renewable energy utilization offers solutions to environmental sustainability and other long time advantages over the conventional types. This is evident by its potential greenhouse gas reduction of 1.1 tCO_2, equivalent to 2.6 Barrels of crude reservation. There are a number of challenges against Nigeria renewable energy utilization, however, strong political will could help in overcoming most of the challenges.

For optimal utilization of renewable energy towards energy security in Nigeria, Federal government of Nigeria through relevant agencies should invest in capacity development in the form of increased research and development, and technical and vocational training tailored towards renewable energy utilization and development of its infrastructure. Currently existing energy and renewable energy policies and plans contain required financial reliefs that if well implemented could encourage renewable energy players and improve its share of contribution to energy mix while aiding the socio-economics and human development index through increases pa capita energy consumption in Nigeria. Strong and purposeful political would aid the implementation of existing policies and plans. Creation of good synergy among renewable energy related agencies, development and implementation of beneficial legal framework between national and sub-national governments on energy matter would help in popularizing the awareness of the renewable energy across the socio-cultural boundaries in Nigeria.

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