Journal of Energy Research and Reviews

12(3): 1-5, 2022; Article no.JENRR.92294
ISSN: 2581-8368

Overview of the Benefits and Drawbacks of Renewable Energy in Nigeria

Tochi Andrew Owunna [a#] and Emmanuel Ifeanyi Obeagu [b*]

[a] Babcock University Teaching Hospital, Ilishan, Remo, Ogun State, Nigeria.
[b] Department of Medical Laboratory Science, Kampala International University, Western Campus, Ishaka, Uganda.

Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

Article Information

DOI: 10.9734/JENRR/2022/v12i3238

Open Peer Review History:
This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: https://www.sdiarticle5.com/review-history/92294

Mini-review Article

Received 12 July 2022
Accepted 22 September 2022
Published 28 September 2022

ABSTRACT

Fossil fuels (crude oil, natural gas, coal, and lignite) have historically been Nigeria's main energy source. Unfortunately, all of these factors combined with additional factors—including an increase in industrial activity, an increase in national population, and worldwide climate changes—could no longer support us. As a result, our houses and businesses now face significant energy demands. There must be a different source of energy that is not exhaustible in order to keep up with the rush. Given that Nigeria is a resource-rich nation, the article aims to provide an overview of renewable energy, list its benefits and drawbacks, and make recommendations for how to use it more effectively in order to compete favorably with other nations.

Keywords: Renewable energy; benefits; drawbacks; effective use.

1. INTRODUCTION

Nigeria ranks among the top countries in the world for exporting and producing petroleum. Before the commercial discovery of oil in 1956, Nigeria relied on its agricultural output and more than 2.7 billion tons of coal reserves. From a peak of 0.91 million tons in 1959 to zero in 1997, coal production dropped. Despite being Africa's top oil producer, the nation imports a greater

[#] *Maintenance;*
**Corresponding author: E-mail: emmanuelobeagu@yahoo.com;*

proportion of its domestic oil requirements. Studies indicate that at the beginning of 2004, the world's oil and gas reserves were roughly 1.27 trillion barrels of oil and 6,100 trillion cubic feet of natural gas [1]. Nigeria is the 17th most populous nation in the world with about 150 million people. This population is expected to grow to roughly 170 million by the end of 2023. About 60% of her population lacks access to electricity. The dearth of electricity in the country's 924,000 km2 geographical region is mostly caused by low power output from the few hydro dams that are now in operation (Kainji, Jebba, and Shiroro) and expensive distribution costs. This situation has made many homes and companies reliant on fossil fuel power plants, with all the associated noise and air pollution. The biggest and most populous black nation in the world shouldn't have to rely on fossil fuel electric generators for 60% of her energy requirements [2]. Nigeria as a nation still struggles with power supply, fuel scarcity, vandalism, etc. despite the increased usage and demand of fossil energy caused by the epileptic power supply. Alternately, renewable energy sources are employed in addition to conventional energy sources; yet, even if they contribute significantly to the generation of energy in several developed countries, they still do not dominate the energy sector [3].

Determining whether the renewable energy project makes financial sense is therefore vital. The economic viability of renewable energy can be assessed using a variety of formulas, including SWOT analysis, net present value, simple payback, and annual energy savings. To find out whether natural resources are available and whether it is possible to manufacture and export to other countries as desired, it is first necessary to study the general infrastructure of the country. This initiative focuses on evaluating renewable resources [4].

1.1 Renewable Energy

The sun, wind, water, heat from the soil, and plants are all examples of renewable energy sources that are replenished by nature on a regular basis. Utilizing renewable energy methods, most frequently electricity but also heat, chemicals, or mechanical power, these fuels are transformed into usable energy sources [5]. Energy may be produced utilizing naturally occurring resources that are limitless by using renewable energies [6]. These resources are either always available or their replenishment happens faster than their rate of consumption.

The capacity of renewable energy sources to create sufficient primary energy or electricity to meet our nation's demands is shown in Table 1. However, it is required to have the technological know-how, suitable legislation, financing, and infrastructure in place in order to ensure access to the abundant energy source with little to no fuel and maintenance costs. Unfortunately, Nigeria's present energy production cannot keep up with her need for energy, as seen in Table 2.

1.2 European Union Policy

The goal of EU policy is to shift the production of electricity away from fossil fuels (coal, oil, gas, and nuclear) and toward renewable energy sources, such as biomass and waste, hydropower, geothermal power, solar power, wind power, and, sporadically, cogeneration heat plants [7]. However, this transformation is not immediately obvious due to the variations in energy legislation across the 27 EU nations and the perceived high costs of employing renewable energy sources to generate electricity [8]. After the 2008 crash in the oil price cycle, renewable energy became more expensive to use. Making policy in the EU is tough because of how to encourage the change in the oil price cycle [9].

Table 1. Renewable energy sources to create sufficient primary energy or electricity to meet nation's demands

Resource	Capacity	Remark
Big hydro power	11,500MW	Only 1972 MW exploited
Small hydro power	3,500MW	Only about 64.2 MW exploited
Solar	3.5KW/m/day to 7.0KW/m/day	
Sunshine hours	4 to 7.5 hrs. / day	
Wind	2 to 4 m/s at 10m height mainland	
Biomass	fuel wood	11 million hectares of forest & woodland
	Animal waste	245 million assorted (2001)
	Energy crops & agric residue	72 million hectares of agric land

Source: central bank of Nigeria (2007)

Table 2. Nigeria's present energy production scenario

S/N	Sector (%)	2005 Base year	2010	2015	2020	2025	2030
1	Industry	13.81	28.92	37.01	40.75	44.69	48.78
2	Transport	30.80	27.62	24.56	22.92	22.27	21.62
3	Household	49.29	38.16	33.05	30.62	27.27	24.12
4	services	6.13	5.30	5.39	5.72	5.78	5.49
	Total Mtoe	32.14	49.92	76.45	112.67	158.95	224.54

Source: Energy commission of Nigeria (2008)

The EU's policies may be anticyclical. It could benefit renewable energy during a time when oil prices are low. With this help, significant expenditures in technology that reduces costs would continue, and high oil prices would be expected even in the absence of help. Such an anticipatory tactic, however, has societal repercussions because it boosts electricity prices above the rates that would be based on the lower input prices on global markets.

2. WHAT RENEWABLE ENERGY OPTIONS ARE THERE IN NIGERIA?

Renewable resources are unlimited natural resources that can be unplenished in a short period of time. This paper will focus on the following renewable energy sources:

2.1 Hydro Power

Nigeria has access to pure, flowing water through nature. There are laws in place that permit the private sector to take part in hydropower production. Technical expertise and financial constraints are the key challenges we encounter in this situation. Between 1968 and 1990, this nation could only be proud of having three large hydroelectric facilities in operation: Kainji, Jebba, and Shiroro. It is regrettable to note that due to technological and political factors, including the reliance on foreign companies for the maintenance of these dams and the hiring of unqualified management staff due to ethical or political affiliations, all of these plants are operating below their installed capacities. These have led to a severe energy shortage throughout the nation. The primary source of electricity for domestic and commercial use in Nigeria is hydropower. Although it will be expensive to implement, the economic benefits will be substantial (Adeyemi, 1997).

2.2 Wind Energy

It has been established that wind energy is a clean, renewable energy source that does not contribute to global warming, has no known harmful emissions, or wastes. Studies on public perceptions in Europe and Canada indicate that there is substantial public support for the use of wind energy. In Ontario, the Ontario Power Authority has emphasized the purchase of what it refers to as "renewable and cleaner sources of electricity," such as wind energy. Wind energy has been included in provincial energy programs across Canada [10].

Although wind energy has been used to generate electricity for some time, Ontario has only lately made it a significant source of energy. As with the introduction of any new technology, worries regarding the possible harm that wind power installations could do to human health have been expressed. The design and infrastructure of wind turbines (including electromagnetic frequencies from transmission lines, shadow flicker from rotor blades, ice throw from rotor blades, and structural failure), as well as wind turbine noise (i.e., levels of audible noise [including low frequency noise] and infrasound), are the two main issues that are connected to these concerns [11].

2.3 Bio Energy

Biodiesel and biomass have recently been recognized as two of the most environmentally friendly energy sources. Biomass makes up about 10% of the main energy sources in the world. In addition to meeting our social and economic needs, agriculture gains from the biodiesel industry's natural reclamation of land. Nigeria has vast uncultivated agricultural land that can be used to produce the green fuel it requires, helping to employ the country's sizable unemployed working-age population. The 2003 Federal Government Renewable Energy Strategy provides a favorable climate for both public and commercial renewable energy investors [12].

Table 3. Nigeria's renewable energy industry

Energy Source	Advantages	Disadvantages
Hydro Power	• Abundant, clean and safe • Easily stored in reservoir • Relatively inexpensive way to produce electricity • Offers recreational benefits like boating, fishing, swimming etc	• Can cause the flooding of surrounding and communities and landscapes • Dams have major ecological impacts on local hydrology. Can have a significant environmental impact • Can be used only where there is a water supply • Best sites for dams have already been developed
Wind Energy	• Is a free source of energy • Produces no water or air pollution • Wind farms are relatively • inexpensive to build • Land around wind farms can have other uses	• Requires constant and significant amounts of wind • Wind farms require significant amounts of land • Can have a significant visual impact on landscapes • Need better ways to store energy
Bio Energy	• Abundant and renewable • Can be used to burn waste products	• Burning biomass can result in air pollution • May not be cost effective
Solar Energy	• Potential for an endless source of energy • Has little impact on water or air pollution	• It might not be economical. • Backup and storage are essential. • Sunlight availability affects reliability.

2.4 Solar Energy

Adoption of solar energy is the process of producing power from sunshine. The direct utilization of this energy is made possible by photovoltaics (PVs), which utilise the sun's photons to strike surfaces and transport electrons (photo-electric effect). When the sun's energy is focussed on heating water or enclosed areas (solar collectors), it is possible to refer to this indirect method as concentrating solar power (CSP) [13].

2.5 Nigeria's Renewable Energy Industry: Pros and Cons

Renewable energy can provide so many advantages and some disadvantages according to [14]. The Table 3 shows both in a more concise way and forms:

2.6 Difficulties with Renewable Energy Sources

Renewable energy sources may become the primary energy source in economies with minimal carbon emissions. Radical modifications are needed if all energy systems are to use the readily accessible renewable energy sources. The coordination of the energy transition from non-sustainable to renewable energy is usually cited as the biggest problem of the first half of the twenty-first century [15]. It is obvious that the utilization of renewable energy sources is significantly hampered by a nation's policy and policy instruments, which in turn influence costs and technological improvements. Additionally, as a result of market failures and a limited uptake of the technology, technological developments have an impact on the cost of renewable energy solutions [16,17]. Given this, an effective strategy for using renewable energy should consider how many factors affect sustainability and the availability of renewable energy sources [18].

3. CONCLUSION

Many people are still unaware of the benefits that renewable energy sources offer, despite the fact that fossil fuels have long been a key source of energy. An epileptic power supply has caused Nigeria as a whole to regress. However, a lot of the issues are caused by bad policies, the economy, and politics. But like many other wealthy nations throughout the world, Nigeria as a country would fare better if a paradigm shift in the field of renewable energy is allowed. Background information about Nigeria's heavy

reliance on fossil fuels, their issues, the advantages of renewable energy, and their few limitations were all mentioned in the paper.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Chilakpu KO. Renewable Energy Sources. Its Benefits, Potentials and Challenges in Nigeria. Journal of Energy Technologies and Policy; 2015.
2. Arent D. Energy and National security program. Washington DC: Center for Strategic and International Studies; 2019.
3. Maradin D. Advantages and Disadvantages of Renewable Energy Sources Utilization. International Journal of Energy Economics and Policy; 2021.
4. Hasret B, Mohamed ES. Renewable Energy - Background. Reserach Gate; 2017.
5. Renewable. Renewable Energy: An Overview. DOE/GO; 2001.
6. Youmatter. Renewable Energy: Definition, Examples, Benefits and Limitations; 2020.
7. EU. Commission Staff Working Document, Energy Sources, Production Costs and Performance of Technologies for Power Generation, Heating and Transport. Commission of European Communities, Brussels; 2008.
8. Steger UW. Sustainable Development and Innovation in the Energy Sector. Springer. 2005:211-222.
9. Krozer Y. Cost and benefit of renewable energy in europe. ResearchGate. 2011: 8-13.
10. Knopper LD. Health Effects and Wind Turbibes: A review of the literature. Environmental Health; 2011.
11. Al B. The effect of a noise abatement program on reading ability. Environ Psychol; 1981.
12. Douglas A. Energy and National security program. Center for Strategic and International Studies; 2012.
13. Agbo EP. Solar energy: A Panacea for the Electricity Generation Crisis in Nigeria. Heliyon; 2021.
14. Ellabban O. Renewable energy resources: Current status, future prospects and their enabling technology. Elseview. 2014: 748-764.
15. Verbruggen AF. Renewable energy costs, potentials, barriers: Conceptual issues. Energy Policy. 2010:850-861.
16. Lakeh HK. What Are the Advantages and Disadvantages of Renewable Energy? GreenMatch; 2022.
17. Omar E, Haitahm AR. Renewable and Sustainable Energy Reviews. Elsevier. 2014:748-764.
18. BAS. Estimation of Direct Solar Radiation Intensities" Nigeria society of Engineers Technical Transaction. 1997:1-9.

Peer-review history:
The peer review history for this paper can be accessed here:
https://www.sdiarticle5.com/review-history/92294