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Clean Energy Utilization in Public Secondary Schools in Federal Capital Territory (FCT), Abuja, Nigeria

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Abstract: This study aimed at investigating the use of clean energy in public secondary schools in the Federal Capital Territory (FCT), Abuja, Nigeria. The study specifically aimed at determining the level of the use of clean energy in public secondary schools and proffering possible solutions on how to enhance the use of clean energy in public secondary schools. The increased demand has been a necessity as a result of the challenges of unstable electricity supply, high energy prices and increasing environmental concerns in Nigeria. The researcher used descriptive survey research design. The study was conducted in public secondary schools of FCT, Abuja, with the teachers and school administrators as the target population. The simple random sampling technique was used and the number of respondents that were sampled was 185. The data was collected using a structured questionnaire called Clean Energy Utilization Questionnaire (CEUQ). The data gathered were analysed in terms of mean scores and descriptive statistics. The findings indicated that the use of any clean energy technologies (CET) in public secondary schools (PSS) in FCT is still low because of lack of adequate funding, the lack of government support, high installation cost, and lack of technical manpower. The study also revealed that proper funding, involvement of the government, training of staff members, installing renewable energy facilities in schools, and establishing collaborations with private entities will enhance the use of clean energy in schools. The study finally found that the use of clean energy in public secondary schools will help to enhance teaching and learning in public secondary schools, solve the electricity problems and ensure environmental sustainability. The study suggested that government should be more supportive in investing in clean energy infrastructure and incorporate clean energy policies in school development programmes.

Keywords: Clean energy, Clean Energy Utilization, Environmental sustainability, Public Secondary Schools.

1. Introduction

Energy in any educational institution, anywhere in the world, is a key element in its effective performance. Stable electricity supply is important in schools for teaching and learning in classrooms, laboratories, information and communication technology services, security operations and administration. Nigeria's public secondary schools are facing critical electricity issues caused by power instability, exorbitant electricity bills, and poor electricity infrastructure. All these issues have an adverse effect on teaching and learning activities in schools [1].

Clean energy is energy produced using renewable sources that are not harmful to the environment, or with minimal environmental impact and includes solar energy, wind energy, hydropower and a variety of other renewable energy technologies that do not

pollute the environment significantly. The importance of clean energy utilization has become a global concern due to climate change, environmental degradation, and the demand for sustainable development.

In many public secondary schools in the Federal Capital Territory (FCT), Abuja, power supply from the national grid is still erratic and the schools rely on fuel-powered generators for power supply. This has led to the impact on the use of educational technologies, internet facilities, science laboratories, and administrative services in schools [2]. Some schools in the satellites of Bwari, Gwagwalada, Abaji, and Kuje, have been facing problems in providing adequate electricity for students because of high pump price of fuel and poor infrastructure.

As environmental sustainability has become a major worry, governments and educational institutions around the world are turning to the adoption of renewable energy technologies. Energy efficiency, carbon emissions and sustainable development goals in educational institutions are some of the benefits of renewable energy systems as per IEA [3], [4]. Likewise, the United Nations Educational, Scientific and Cultural Organization (UNESCO) noted that schools need to embrace sustainable energy management practices to enhance the learning environment for pupils and raise awareness about energy and climate change. Although renewable energy has its own advantages, many public secondary schools in Nigeria still haven't adopted renewable energy technologies because of financial constraint, poor policy implementation, lacking of technical skills, and poor government support. This was the reason of the need for this present study on clean energy utilization in public secondary schools in FCT, Abuja, Nigeria [5].

1.2. Objectives of the Study

The study was guided by the following objectives:

The purpose of the study is to examine clean energy utilization in public secondary schools in the Federal Capital Territory (FCT), Abuja, Nigeria. The specific objectives include;

1. To examine the extent of clean energy utilization in public secondary schools in FCT, Abuja, Nigeria.
2. To identify strategies for improving clean energy utilization in public secondary schools in FCT, Abuja, Nigeria.

1.3. Research Questions

The following questions were formulated to guide the study:

1. What is the extent of clean energy utilization in public secondary schools in FCT, Abuja, Nigeria?
2. What strategies can improve clean energy utilization in public secondary schools in FCT, Abuja, Nigeria?

2. Materials and Methods

Descriptive survey research design was used in the study. The design was considered to be appropriate as it will allow the researchers to gather opinions from the teachers and school administrators regarding the level of clean energy utilization and strategies towards the adoption of renewable energy in public secondary schools in Federal Capital Territory (FCT), Abuja, Nigeria. The study was conducted in public secondary schools in Federal Capital Territory (FCT), Abuja in six Area Councils namely: Abuja Municipal Area Council (AMAC), Bwari, Kwali, Kuje, Gwagwalada and Abaji. FCT was chosen because of the increase in need for sustainable energy solutions in public educational institutions, the lack of renewables energy infrastructure and the unstable electricity supply.

The population of the study consisted of all teachers and school administrators of public secondary schools of FCT, Abuja. Teachers and administrators were identified as

appropriate respondents as they are directly involved in the administration of schools, energy management, teaching in classrooms, and maintenance of school facilities. Simple random sampling technique was used in selecting 185 respondents and equal opportunity of participation among respondents selected for the study was given to them. The data collection tool used was a structured questionnaire which was named as Clean Energy Utilization Questionnaire (CEUQ). The questionnaire consisted of two sections. Section A was designed to elicit information about the demographic characteristics of the respondents and Section B had items developed according to the research questions of the study. The questionnaire items were set in a four-point Likert scale of Strongly Agree (SA), Agree (A), Disagree (D) and Strongly Disagree (SD).

The instrument was validated by two Educational Management experts and one expert in Environmental Education from a recognized higher institution in Nigeria. They provided feedback to the instrument by making observations, corrections and suggestions to ensure content, clarity and relevance of items in the instrument, and these were subsequently taken into account in the final version of the instrument. A pilot study was carried out to validate the instrument with 20 teachers from the public secondary schools outside the sampled schools but within FCT, Abuja. The Cronbach Alpha reliability method was used in analyzing the data obtained from the pilot test and the result of the reliability coefficient was 0.82. This coefficient showed that the instrument was reliable in collecting data.

The researchers personally conducted the interviews with the respondents with the help of trained research assistants. Of the 185 copies of the questionnaire distributed, 176 copies were correctly completed and returned (95.1 percent return). To answer the research question, the data collected were analyzed using mean scores and descriptive statistics. A criterion mean of 2.50 was used as the basis for decision making. An item that scored 2.50 or higher was accepted and those that scored less than 2.50 were rejected.

3. Results

Table 1. Extent of Clean Energy Utilization in Public Secondary Schools in FCT, Abuja (N = 176).

S/N	Items	SA	A	D	SD	Mean	Decision
1	Solar power systems are available in public secondary schools	32	40	65	48	2.30	Rejected
2	Schools use solar-powered streetlights for security purposes	35	42	60	48	2.35	Rejected
3	Energy-saving electrical devices are commonly used in schools	38	45	58	44	2.42	Rejected
4	Public secondary schools have renewable energy facilities for classrooms	30	43	62	50	2.29	Rejected
5	Solar-powered ICT laboratories are available in schools	28	40	67	50	2.25	Rejected
6	Schools use clean energy technologies to reduce electricity costs	34	44	61	46	2.36	Rejected
7	School administrators encourage renewable energy practices	40	46	56	43	2.45	Rejected
8	Public schools receive government support for renewable energy projects	31	42	63	49	2.30	Rejected

9	Students are exposed to practical renewable energy education in schools	36	43	59	47	2.37	Rejected
10	Clean energy facilities are adequately maintained in schools	33	41	63	48	2.32	Rejected

Grand Mean = 2.34

Table 1 revealed that all the items recorded mean scores below the criterion mean of 2.50. This indicates that the extent of clean energy utilization in public secondary schools in FCT, Abuja is low [6], [7], [8]. The findings showed that many schools lack solar power systems, renewable energy facilities, solar-powered ICT laboratories, energy-saving technologies, and adequate government support for clean energy projects [9].

Table 2. Strategies for Improving Clean Energy Utilization in Public Secondary Schools in FCT, Abuja (N = 176).

S/N	Items	SA	A	D	SD	Mean	Decision
1	The government should provide funding for renewable energy projects in schools	96	62	17	10	3.32	Accepted
2	Solar power systems should be installed in public secondary schools	98	60	17	10	3.33	Accepted
3	School administrators should partner with private organizations on clean energy projects	94	65	16	10	3.31	Accepted
4	Teachers and technicians should receive training on renewable energy management	92	67	16	10	3.30	Accepted
5	The government should formulate policies supporting clean energy in schools	95	64	16	10	3.31	Accepted
6	Energy-saving devices should be introduced into public secondary schools	91	68	16	10	3.29	Accepted
7	Schools should establish environmental and renewable energy clubs	93	66	16	10	3.31	Accepted
8	Renewable energy education should be integrated into the curriculum	90	69	16	10	3.29	Accepted
9	International organizations should support renewable energy development in schools	92	67	16	10	3.30	Accepted
10	Regular maintenance of clean energy facilities should be encouraged	94	65	16	10	3.31	Accepted

Grand Mean = 3.31

Table 2 showed that all the items recorded mean scores above the criterion mean of 2.50. This implies that respondents agreed that increased funding, installation of solar power systems, partnerships with private organizations, personnel training, government

policies, curriculum integration, and regular maintenance of facilities are effective strategies for improving clean energy utilization in public secondary schools in FCT, Abuja [10], [11], [12].

3.1 Findings

The study revealed the following findings:

1. The extent of clean energy utilization in public secondary schools in FCT, Abuja is low.
2. Many schools lack solar-powered facilities, renewable energy infrastructure, and energy-saving technologies.
3. Inadequate funding and poor government support hinder clean energy adoption in schools.
4. Lack of technical manpower and maintenance culture affects renewable energy utilization in schools.
5. Government funding, policy support, personnel training, and partnerships with private organizations can improve clean energy utilization in schools.
6. Integration of renewable energy education into the curriculum can promote environmental sustainability among students [13], [14].

4. Discussion

The study revealed that the extent of clean energy utilization in public secondary schools in FCT, Abuja is low. This result aligns with the International Energy Agency report that many developing countries are still encountering problems with the incorporation of renewable energy technologies into public institutions as a result of financial and infrastructural constraints [15]. On the practical side, a lot of public secondary schools in Abuja remain largely reliant on unreliable public electricity and electric generating sets using fuel for administrative offices and laboratories.

The study also found that inadequate funding and poor government support affect clean energy utilization in schools [16]. This is consistent with the findings of United Nations Educational, Scientific and Cultural Organization; Eze, and Ekpo, & Aiyedun, which indicated that sustainable energy projects in educational institutions necessitate good support and investment from the Government. In some schools in the satellite towns like Kuje and Kwali, the school principals have difficulties in ensuring the continuity of electricity supply due to the absence of renewable energy facilities in the schools and lack of funds [17].

The other finding was that there is a lack of technical manpower and poor maintenance culture which affects the utilization of renewable energy systems in schools. This discovery is in line with the International Renewable Energy Agency which emphasized that sustainability of renewable energy technologies depends on the availability of skilled workers and maintenance services. Previously, some schools that had solar installations from intervention agencies had experienced a failure of the solar system as a result of the unavailability of the technicians for maintenance.

Having solar power systems, training teachers, government support and private organization partnerships were also identified as factors that can increase clean energy utilization in schools [18]. This is true in some model schools in Abuja where solar powered facilities have improved electricity supply, enhanced the use of ICT in learning and reduced dependence on fuel generators. The results of the study indicated that incorporation of renewable energy education in school curriculum can help in promoting the environmental sustainability and energy consciousness among the students. This is germane as it is assumed that students who are equipped with knowledge on renewable energy will support renewable energy practices in future [19].

5. Conclusion and Recommendations

The study concluded that the level of clean energy utilization in public secondary schools in FCT, Abuja is still low even with the relevance of the use of renewable energy in the current educational system. Most schools have a small number of renewable energy equipment, which is caused by the lack of funds, government support, maintenance culture, technical manpower, and maintenance technical level. The study, however, identified that better funding, installation of solar energy systems, training of personnel, effective government policies and collaboration between private organizations can have a great impact on better utilization of clean energies in schools. Renewable energy technologies would enhance the teaching and learning environment, lower the cost of energy and contribute to environmental sustainability in schools. Considering the results, it was suggested that the following policy measures be taken:

- 1) Public secondary school renewable energy projects need to be funded sufficiently by government. Public secondary schools in FCT-Abuja should be targeted for solar energy installations. Engage school administration to participate in renewable energy projects with private entity and/or donor agencies.
- 2) Regular training should be provided to teachers and technicians on Renewable energy management and maintenance. Renewable energy education to be a part of the secondary education curriculum. There is a need to set up environmental clubs in schools for the awareness of clean energy. There is a need to make policies that will encourage use of renewable energy in educational institutions.

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