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An Examination of Energy Conservation Practices in Private Student Hostel Buildings in Awka, Anambra

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Abstract: The study aimed to examine energy conservation practice in private student hostel building in prince and princess hostel Agu-Awka, Anambra state with a view to recommend alternatives to achieving more efficient energy solutions. The descriptive survey design was adopted. The design was typically employed the use of questionnaire to get response opinion, preference and perception to this study. The demographic background information of the respondents as well as personal and environmental status was analysed and presented using descriptive statistics in form of frequency and percentage. The need for energy conservation in private student hostel is necessary to the management of such hostel as it will lead to spending less for maintenance of energy. (Table 4.4), During the course of this research it was observed that the management of Prince and Princess Hostel conserves energy by using energy sufficient bulb, use of smart power strips, use of energy efficient appliances etc. (Table 4.5) when energy are not properly observed it tends to have a negative impacts on users. (Table 4.6) and Energy conservation can be enhanced properly when the right appliances and technology are put in place. (Table 4.7). The study suggest that energy can best be conserved by making provision to smart climate control by providing air source heat pumps, by providing smart lighting technology, solar panel technology and automatic shut-down sockets. The management of Prince and Princess Hostel should develop a system whereby the occupants are properly informed of the need of conserving energy and Occupants of prince and princess hostel should consider energy conservation.

Keywords: Energy Conservation, Private Student Hostel, efficient energy solutions, management and smart power

1.0 Introduction

The significance of energy availability in the economic growth, social and political development of any nation cannot be understated. Energy plays the most vital role in the economic growth, progress, and development, as well as poverty eradication and security of any nation. Uninterrupted energy supply is a vital issue for all countries today. Large Tertiary institutions facility housing, such as the Nnamdi Azikiwe off campus private hostel as prince and princess hostel Agu-Awka, consume large amounts of energy on a daily basis. In general, energy efficiency in Nigeria tertiary institution is very poor both in domestic and commercial usage (Awah and Okoro, 2010).According to Oyedepo, Adekeye, Leramo, Kilanko, Babalola, Balogun, and Akhibi, (2015), hostel energy potential studies involve an energy auditing process that provides an opinion of the availability of energy efficiency resources on a campus and allows the development of cost and savings strategies. Private Hostel energy potential study offers many of the same benefits as standard energy studies, such as an understanding of how efficient the campus is in energy utilization and a plan for energy reduction projects. Energy conservation is the effort made to reduce the consumption of energy by using less of energy services. This can be achieved either by using energy more efficiently; using less energy for a constant service or by reducing the amount of service used (by house hold gadgets). Energy can be conserved by reducing wastage losses, improving efficiency through technological upgrades and improved operation and maintenance. Therefore, this study targets to bring balance to the problem in conserving energy by increasing the magnitude of energy efficiency saving, diversifying the sources of energy efficiency savings. Measuring and ensuring the persistence of energy efficiencysavings must become a common place, so that energy efficiency outcomes areintegrated with carbon reduction frame work. Energy efficiency must be understood and valued as part of an evolving grid with utility-scale renewables distributed energy resources and significant load variability.The aim of this study is to examine the energy conservation practices in private student hostel building, a case study of prince and princess hostel Agu-Awka, Anambra state with a view to recommend measures to enhance it's adoption. This study will be of importance to students ,hostel owners or principals to cut down on cases of fire outbreak recorded in other hostels due to high voltage out flow, save cost spent on maintenance, utility bills and other energy bills and to manage energy consumption it will help private hostel management team to reduce its reliance on non-renewable energy resources like petroleum.

The study will be guided by the following research questions

1. What are the need for energy conservation in prince and princess hostel in Prince and Princess Hostel?
2. What are the present energy conservation practices in the study area?
3. What are the impact of the identified energy conservation technique on building user and stakeholder in the study area?
4. What are the standard measures for enhancing energy conservation practice in Prince and Princess Hostel?

2.0 Literature Review

2.1 Need for Energy Conservation in Private Hostels

The importance of energy availability in the economic growth, social and political development of every nation cannot be overemphasized. According to Oyedepo, (2012) energy plays the most vital role in the economic growth, progress, and development, as well as poverty eradication and security of any nation. Uninterrupted energy supply is a vital issue for all countries today. The objective of the energy system is to provide energy services. According Energy Information Administration, (2008) energy in its forms as work, heat and electrical power, provides such services as powering a car or providing light. It can come from renewable sources, such as the sun, wind; from chemical reactions, such as combustion of fossil or renewable fuels; or from nuclear reactions.

2.2 Existing Energy Conservation practices in Private Hostels

The efficiency of the appliances and equipment used in homes and businesses has increased greatly over the past three decades. However, there is still much that can be done to reduce the amount and slow the growth of energy consumption in residential and commercial buildings. According to alliance to saving energy, (2012) energy conservation lowers energy cost by preventing future resource depletion. Chattopadhyay, (2014) opined that energy can only be transformed from one form to another, such as heat energy to motive power in cars, or kinetic energy of water flow to electricity in hydroelectric power plants.

1. **Consumer Products:** Consumers are often poorly informed of the savings of energy-efficient products. A prominent example of this is the energy savings that can be made by replacing an incandescent light bulb with a more modern alternative. When purchasing light bulbs, many consumers opt for cheap incandescent bulbs, failing to take into account their higher energy costs and lower lifespans when compared to modern compact fluorescent and LED bulbs
2. **Energy Conservation Behaviour:** Energy is inevitable in the life of students. It is described as the "golden thread" that bonds economic growth, social equity, and environmental sustainability (Ki-moon, 2012; World Energy Council, 2013).Energy Conservation Behaviour (ECB) would best be observed by off-campus students in Nigeria through improving or changing behaviour towards energy and its conservation
3. **Energy Conservation Awareness:** The energy conservation awareness package (ECAP) is intended to create energy conservation awareness and to correct the negative energy conservation behaviour of the off campus undergraduate students to rational energy conservation behaviour. It is a package designed for positive behaviour change towards energy conservation as affirmed by Bird and Legault, (2018).The likelihood of students to engage in energy conservation practices influences the supply of electricity in the study area.

2.3 Impact of Energy conservation in Private Hostels

There are many reasons why students should consider energy conservation, from the clear environmental and financial benefits of cutting energy use to potential improvements in mental and physical health.Here are the top benefits of energy conservation for private hostel according to U.S. Department of Energy (2008):

1. Significantly Reduce Your Utility Bills
2. Earn a Great Return on Your Investment
3. Increase in Your Property Value
4. Enhance your Quality of Life
5. Protects the Environment
6. Energy Saving Tips Help You Easily Cut Costs
7. Earn Incremental Returns on Energy Efficiency Investment
8. Insulate Yourself from Rising Electricity Prices

2.4 Standard Ways for Enhancing Energy Conservation in Private Hostels

Seven ways that properties of all sizes can start saving money and energy using technology:

1. Smart Climate Control
2. Air Source Heat Pumps
3. Smart Lighting Technology
4. Solar Panel Technology
5. Automatic Shutdown Socket
6. Predictive Monitoring
7. Smart Water Management

2.5 Identified Literature Gap

From the research works used for this study, it is observed that nothing has been done in the study area on energy conservation practices in prince and princess private student hostel buildings for achieving more efficient energy solutions. This would have saved energy and reduce costs for private hostels.

3.0 Methodology

In this study, the descriptive survey design was adopted. The design typically employed the use of questionnaire to get response opinion, preference and perception to this study. The research population are occupants of Prince and Princess Hostel Agu-Awka, Awka, Anambra state. These residents are classified into both male and female.

Table 3.1 Population Size

Occupants	**Population Size**
Male	296
Female	444
Total	**740**

Source: Management Prince and Princess Hostel

Questionnaire was chosen for this research work to ensure simplicity and accuracy. Random sampling techniques was adopted to select the sample frame. Seven hundred and forty (740) questionnaires was be shared to the occupants of Prince and Princess Hostel Agu-Awka.The population of students in princes and princess hostel, was seven hundred and forty (740), but due to the large population, I used Taro Yamane's formula to two hundred and fifty nine. Therefore the population size will be two hundred and fifty nine.This study are both survey and descriptive in nature and involves the Examination of Energy Conservation Practices in Prince and Princess Private Student Hostels Buildings in Awka, Anambra State. This assessment was carried out through structured questionnaires, this was the means of data collection. The data for this study was analysed using descriptive and inferential data analysis.

3.0.1 Questionnaire Administration and Respond Rate

The target population is the same as sample size. A total of two hundred and fifty nine (259) questionnaires were prepared and administered to various respondents. A total of two hundred and thirty (230) questionnaires were retrieved, but only two hundred and twenty five (225) were useful.

Table 3.0.1 Questionnaire Administration and Response Rate

Questionnaire	Frequency	Percentage (%)
Number of questionnaire shared	259	100%
Number of questionnaire retrieved	230	88.83%
Number of useful questionnaires	225	86.87%
Total		**100**

Source: Researchers Field Survey (2022)

Two hundred and fifty nine (259) questionnaires were administered among various students of various department in Prince and Princess Hostel. Two hundred and thirty questionnaires (230) i.e. 88.83% were retrieved back while only two hundred and twenty five (225) i.e. 86.87% were found valid/useful. According to Fincham (2019) as cited in Chioma (2019) stated that the acceptable responds of a survey question should be greater or equal to 80%. It therefore means that this high response is hence adequate for study.

3.1 Need for energy conservation in prince and princess hostel, Anambra State.

Note: Table 3.1 are ranked in descending order, in accordance with the responses given by the respondents.

Given that; **A** = Economic, social and political growth, **B** = Reduce energy conservation, **C** = Provide power for work, heat and other, and **D** = Poverty eradication and security

Table 3.1 Need for energy conservation in prince and princess hostel, Anambra State

	5	4	3	2	1	MEAN	SD	RANKING
A	100	50	10	45	20	3.75	7.72	3
B	115	75	0	25	10	4.15	8.88	1
C	125	30	5	35	30	3.82	8.70	2
D	75	50	0	75	25	3.3	7.58	4
AVERAGE	3.75	8.22						

Source: Researchers Field Survey (2022)

From table 3.1 respondents were question on the need for energy conservation in prince and princess hostel, Anambra State. The respondent ranked reduced energy conservation (8.88) followed by provide power for work, heat and other (8.70), Economic, social and political growth (7.72), Poverty eradication and security (7.58) This implies that reduced energy conservation and provide power for work, heat and other are the most important need for energy conservation in prince and princess hostel.

3.2 The various existing energy conservation practices in Prince and Princess Hostel.

Note: Figure 3.1 are ranked in descending order, in accordance with the responses given by the respondents. Given that; **A** = Use of energy efficient bulb, **B** = Use of smart power strips. **C**= Use of energy efficient appliances, **D** = Upgrade of HVAC system and **E** = Use of natural light

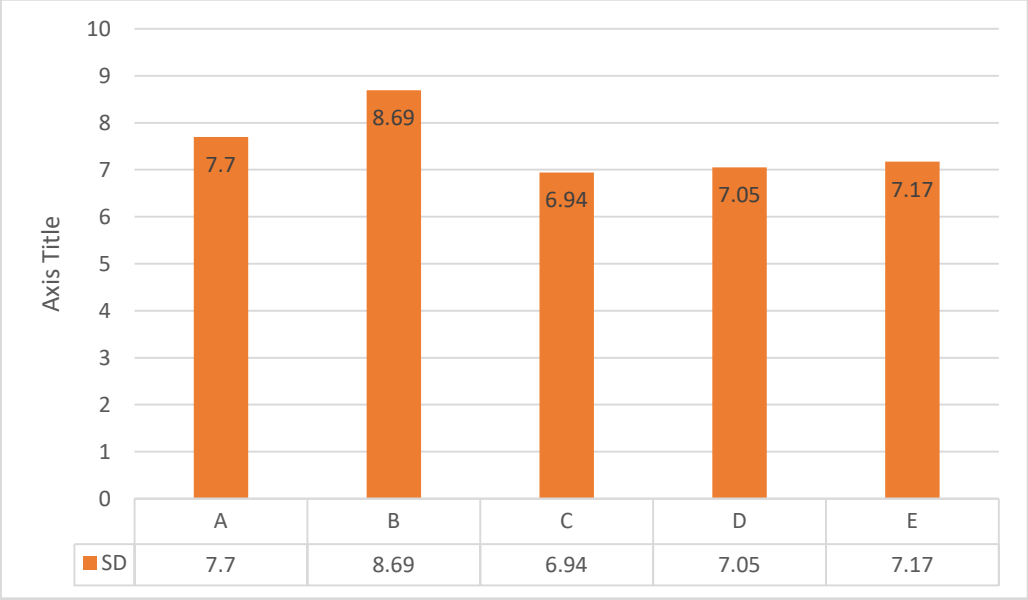

Figure 3.1 The various existing energy conservation practices in Prince and Princess Hostel.

Source: Researchers Field Survey (2022)

From Figure 3.1 respondents were questioned on the various energy conservation practices in the study area. The various existing energy conservationpracticeswere: Use of smart power strips (8.69), Use of energy efficient bulb (7.70), and Use of natural light (7.17), Upgrade of HVAC system (7.05) and Use of energy efficient appliances (6.94). It shows that the Use of smart power strips is the major existing energy conservation practices in prince and princess hostel, this is also directly related to the second.

3.3 The impacts of energy conservation on building users in Prince and Princess Hostel.

Note: Table 3.3 are ranked in descending order, in accordance with the responses given by the respondents. Given that; **A** = Reduces utility bills, **B** = Gain return of investment, **C** = Increase property value, **D** = Enhance life quality, **E =** Protects the environment and **F** = Reduces electricity price

Table 3.3 The impacts of energy conservation on building users in Prince and Princess Hostel.

	5	4	3	2	1	MEAN	SD	RANKING
A	120	69	4	22	10	4.19	8.94	1
B	85	92	9	15	24	3.88	8.14	2
C	57	60	41	49	18	3.39	6.59	6
D	14	59	24	55	73	2.49	7.15	5
E	61	95	30	28	11	3.74	7.58	4
F	109	80	0	34	2	4.16	8.85	2
AVERAGE	3.64	7.88						

Source: Researchers Field Survey (2022)

From table 3.3 respondents were questioned on the impacts of energy conservation on building users in Prince and Princess Hostel. The Impacts identified were Reduces utility bills (8.94), Protect the environment (8.85) and Gain return of investment (8.14). Other impacts were protects the environment (7.58), Enhance life quality (7.15) and Increase property value (6.59). The implication of these is, the most ranked impacts are Reduction in utility bills, Protect the environment, and Gain in return of investment. While least ranked impacts are, protection to the environment, Enhancing the quality of life and Increase in property value.

3.4 The Measures to Enhance Energy Conservation practices in Prince and Princess Hostel.

Note: Figure 4.2 are ranked in descending order, in accordance with the responses given by the respondents. Given that; **A** = Smart climate control, **B** = Air source heat pumps, **C**= Smart lighting technology
D = Solar panel technology and **E =** Automatic shutdown socket

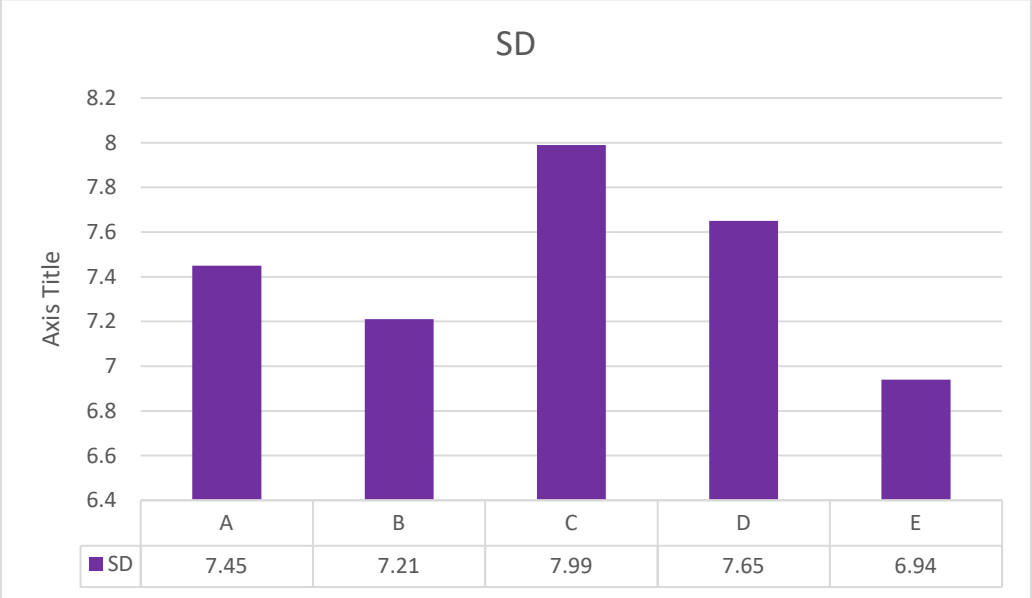

Figure 4.2 The measures to enhance energy conservation practices in Prince and Princess Hostel.
Source: Researchers Field Survey (2022)

From Figure 4.2 respondents were questioned on measures toenhance energy conservation practices in Prince and Princess Hostel. The measures identified were Smart lighting technology(7.99), Solar panel technology (7.65), Smart climate control (7.45) and Air source heat pumps (7.21), and Automatic shutdown socket (6.94). The implication of these is, the most ranked mitigating measures are Smart lighting technology, Solar panel technology and Smart climate control. While least ranked measures are Air source heat pumps and Automatic shutdown socket.

3.5 Findings

1. The study reveals in Table 3.1 the need for energy conservation in prince and princess hostel, Anambra State, it shows the vital role reducing energy conservation and providing power for work, heat and other uses plays in the economic growth, progress. Oyedepo (2012).

2. The study pointed in Figure 3.1 the various existing energy conservation in the study area. This shows energy conservation practices like use of smart power strips and of energy efficient appliance as cited by Ohajianya, etal (2014).
3. The study highlights in Table 3.3 the impacts of energy conservation on building users in the study area. This shows that effective energy conservation practices brings about reduction in utility bills, protecting the environment and gain return on investment as cited by U.S. department of energy, (2008).
4. The study Figure 3.2 reveals that smart lighting technology like (source heat pumps, smart lighting technology) solar panel technology and smart climate control are essential measures to promote the practice of energy conservation practices (Attala, 2018).

4.0 Summary of Key Findings

1. The need for energy conservation in private student hostel is necessary to the management of such hostel as it will lead to spending less spending for maintenance of energy. (Table 3.1)
2. During the course of this research it was observed that the management of Prince and Princess Hostel conserves energy by using smart power strips and energy efficient appliances etc. (Figure3.1)
3. When energy are not properly observed it tends to have a negative impacts on users. But in its adoption, it reduces cost and offer great return (Table 3.3)
4. Energy conservation can be enhanced properly when the right appliances and lighting are put in place. (Figure 3.2)

Conclusion

In line with the findings in the course of the study, the following conclusion could be drawn. Energy conservation is essential in private students hostel by both the management and building users using smart power strips and other energy efficient appliance in order to reduce cost and achieve great return; This practice of energy conservation can be enhanced when such appliance and lighting smart technology are put in place and enhanced in such private hostel.

Recommendations

1. The study suggests that energy can best be conserved by making provision for smart or efficient energy saving appliances and power strips.
2. The management of prince and princess hostel should develop a system whereby the occupants are properly informed of the need of conserving energy through due education on its positive impact.
3. Occupants of prince and princess hostel should consider energy conservation, by adhering to measures put in place.

Compliance with Ethical Standards

Conflicts of Interest: The authors declare that there is no conflict of interest regarding the publication of this manuscript.

Ethical Approval: Ethical approval is not required.

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