INTERNATIONAL JOURNAL OF BUILT ENVIRONMENT AND SUSTAINABILITY
Published by Faculty of Built Environment, Universiti Teknologi Malaysia
Website: http://www.ijbes.utm.my
IJBES 5(2)/2018, 155-162

Investigation of the Use of Energy Efficient Bulbs in Residential Buildings in Ile-Ife, Osun State, Nigeria

Wahab Akeem Bolaji
Department of Building, Obafemi Awolowo University, Ile-Ife, Nigeria
Email: wahabak2002@yahoo.com

History:

Received: 15 March 2018
Accepted: 08 May 2018
Available Online: 30 May 2018

Keywords:

Buildings, Electrical supply, Energy, Lighting bulbs, Management, Occupants, Spaces

DOI:

10.11113/ijbes.v5.n2.269

ABSTRACT

The use of incandescent bulbs by the majority of building occupants in Nigeria has complemented high cost of electrical energy consumption and this has informed prevalence of different types of energy efficient lighting bulbs. The study, therefore, identified and examined types of lighting bulbs used, assessed the rate of use of energy efficient bulbs in selected residential buildings and examined factors influencing its use. The study was carried out in Ife Central Local Government Area of Osun State, Nigeria. Residential settlements in core wards in the study area were considered and four wards in the core zone of the Local Government were randomly selected from the total of eleven while data collection was done with the use of primary and secondary data techniques. Simple random sampling technique was used to select 5% sample size from the entire population and systematic sampling procedure was further employed by selecting every 10th building in the direction of movement which indicated selection of 123 houses. A total of 123 structured questionnaires were administered on the respondents on issues associated with the use of lighting bulbs. Data collected were analysed by both descriptive and inferential statistical techniques. The study found that 90.53% and 72.63% of the respondents used incandescent and energy saving bulbs respectively; variation existed in the wattages of different brands of energy saving and non-energy saving bulbs used in the selected buildings: A major proportion of the respondents used an average number of 1-5 lighting bulbs in buildings and its spaces therein; while quality and cost-saving benefit, energy saving benefit and durability of bulb influenced the choice of fluorescent tubes, compact fluorescent bulbs and light emitting diodes with a mean score value of 2.20, 2.29 and 2.85 respectively. In view of the need to enhance visual performance and comfort of buildings and its occupants respectively, efforts must be made by government to ensure that consumers awareness and enlightenment be increased on the types of lighting bulbs to procure and there is also need to strengthen mechanisms through the importation and sales of energy efficient bulbs only so as to enhance its cost-saving and environment–related benefits amongst others.

1. Introduction

Energy is an essential ingredient for socio-economic development and economic growth and its central objective is to provide energy services that are needed for lighting and other benefits in an environment (Sambo, 2005). According to Oyedepo (2012), energy is an important production factor that should be managed in parallel with factors like land, labour and capital. In order to achieve energy efficiency, the modes of utilizing sustainable energy resources play an important role. The industrial revolution heralded the unprecedented use of energy which has brought about massive increases in productivity and changes in lifestyles (Nag, 2004). This involves the practice of energy efficiency through the services and components used in buildings. Energy efficiency does not necessarily

mean that we should not use energy, but it should be used in a way that it will minimize the amount needed to provide services and comfort of building occupants (Johnson, Odekoya and Umeh, 2012).

In any country, energy efficiency practice has become the key driver required to achieve sustainable energy management in buildings. Building design and modes of use equally offer major opportunities for improved energy efficiency (Oyedepo, 2012; Dineen and Gallachoir, 2011). Usually, there are two important ways that can be explored in achieving efficient use of energy in a given environment. According to Community Research and Development Centre (2009), the first is the technological approach while the second is the behavioural approach. The technological approach involves the process of changing the type of technology we use to a more efficient one, while behavioural approach entails the mode of changing the way things are done. The transition in the type, pattern and use of lighting bulbs in buildings has been a global issue and this causes paradigm shift from incandescent to low energy efficient bulbs.

In Nigeria, what are mostly used are the incandescent bulbs (IBs) (IEA, 2006), but there are also energy efficient bulbs. Energy efficient bulbs that we have in Nigeria include halogen incandescent, compact fluorescent lamps (CFLs) and lighting emitting diodes (LEDs) (www.wikipedia.org). One unique thing about all the energy saving lamps mentioned above is that they consume lesser energy compared to incandescent bulbs which upholds the principle of sustainable energy management. In Nigeria, residential buildings account for 65% of the total consumption of electricity, and lighting being one of its major uses, the country stands to make a lot of savings from the use of energy efficient bulbs but there is still high rate of sale and use of incandescent bulbs and this is contrary to what obtains in developed countries (Johnson et al., 2012).

The technical benefits of retrofitting incandescent bulbs have been shown when compared with the energy saving bulbs. Natalie and Yi (2012) opined that by increasing the prevalence of CFLs, it is expected that households will save energy and cut utility bills as CFLs provide significant energy savings over IBs. It further showed that large-scale switch to CFLs can aid in reducing carbon emissions or help in closing the gap between electricity supply and demand which is an issue that is specially crucial in most developing countries. Casillas and Kammen (2011) stipulated that the use of CFLs provided the most attractive financial investment, with an internal rate of return (IRR) of 52.80%. Bertoldi and Atanasiu (2006) also reported that the payback for switching from IBs to CFLs depends on the initial purchasing costs, cost of electricity and the rate of use. Xing, Hewitt and Griffiths, (2011) opined that replacement of inefficient lamps is usually the first choice for low carbon refurbishment due to significant reduction in energy usage with relatively cheaper means. Equally, CFLs, consume 1/4th to 1/5th of the energy used by incandescent light bulbs to provide the same level of light (Kumar, Juain and Bansal, 2003; IEA, 2006; Waide, 2006). CFLs also have much longer lifetimes with rated life spans of 5,000 to 25,000 hours when compared to 1,000 hours on average for incandescent lamps (IEA, 2006).

In developing areas, having access to electricity has become a major challenge and investing in energy saving practices would help to entrench sustainability. In view of the importance attached to the savings attached to energy consumption, a number of past studies have been carried out on the lighting bulbs used in buildings because having access to electricity has been seen as a major challenge (Johnson et al., 2012). Community Research and Development Centre (2009) showed that less than 40% of the population of the country used energy savings bulbs as shown by its rate of sales and usage. Otegbulu, Odekoya and Johnson (2012) showed varying percentages of the use of incandescent bulbs and CFLs in parts of Ikorodu and Magodo areas of Lagos State, Nigeria based on various indices. Lebot (2009) also found that a paltry 29.69% of the respondents in Ikorodu area of Lagos state employed the use of incandescent bulbs exclusively while a higher percentage (56.10%) of the respondents used combinations of CFLs and incandescent bulbs for lighting in their homes. The use of incandescent bulbs by the majority has complimented the high cost of electrical energy supply in various residential buildings in Nigeria. In view of the awareness of the benefits of energy efficient bulbs, there is a rising adoption for its use by building occupants in the study area, hence the need for this study. The study was limited to the perception of respondents on the use of incandescent bulbs and lighting emitting diodes based on the state of development of the study area. The study was therefore carried out to identify and examine types of lighting bulbs used, assess the rate of use of energy efficient bulbs in the selected residential buildings and examine factors influencing its use.

2. Research Methodology

The study was carried out in Ife Central Local Government Area of Osun State, Southwestern Nigeria. It consists of multi-ethnic nationalities predominantly dominated by the

Yorubas. The target population consisted of residential buildings in the core ward of the study area. The selection of the core zone was based on its population density, historic and antecedent backgrounds. Demographically, the core zone of Ife Central Local Government had 11 wards and 4; which were core-based, were selected for this study. Preliminary survey and NPC (2009) showed that there were 482, 506, 635 and 835 residential buildings in each of Ilare III, Iremo IV, Iremo V and Moore/Ojaja ward of the study area respectively and these were adopted for this study.

With regards to this study, the sample frame was the total number of residential buildings in the core zone of Ife Central Local Government Area which were 2,458 houses. According to Richard and Anita (2008), the process of sampling or selection of part of the population from which the characteristics of the larger population can be inferred has long been accepted as a legitimate and important method of research. A simple random sampling technique was used to select 5% sample size from the entire population, which indicated selection of 24, 25, 32 and 42 houses in Ilare III, Iremo IV, Iremo V and Moore/Ojaja ward respectively and thus totaling 123 houses. Also, systematic sampling procedure was employed by selecting every 10th building in the direction of movement along major roads and streets in the study area (Table 1). Assessment of facilities used indoor can be carried out by either or both objective and subjective approach which involve the use of field measurement and questionnaire/ interview respectively. Based on the emerging use of LED lights in the study area, the method of data collection employed was the subjective method to establish and verify perception of the occupants of buildings on the lighting bulbs used. Hence, data for the study was collected by using structured questionnaire administered on the respondents of the selected buildings. It was complemented by conducting interview on the respondents to get information on the type and mode of use of lighting bulbs in the study area and issues associated with the factors that influenced various brands and types of lighting bulbs used by the respondents. Data collected was analysed by using descriptive and inferential statistics.

Table 1: *Number of Buildings Sampled in the Study Area*

Study Area	Wards in the Core Zone	Number of Residential Buildings in the Core Zone	No of Resi-dential Buildings Selected
Ife Cental Local Govern-ment	Ilare III	482	24
	Iremo IV	506	25
	Iremo V	635	32
	Moore/Ojaja	835	42
	Total	2,458	123

Table 2: *Profile of the Respondents*

Sex Category of Respondents Sampled		
Sex	Frequency	%
Male	41	43.20
Female	54	56.80
Total	95	100.00
Age Limits of the Respondents		
Age	Frequency	%
20-25	47	49.50
26-30	21	22.10
31-35	6	6.30
36-40	5	5.30
Above 40	16	16.80
Total	95	100.00
Marital Status of the Respondents		
Marital Status	Frequency	%
Single	48	50.50
Married	47	49.50
Total	95	100.00
Occupational Status of the Respondents		
Occupation Status	Frequency	%
Employed	14	14.70
Self-Employed	56	58.90
Unemployed	6	6.30
Student	14	14.70
Others	5	5.30
Total	95	100.00
Educational Qualifications had by the Respondents		
Education Level	Frequency	%
Primary	8	8.40
Secondary	60	63.20
Tertiary	27	28.40
Total	95	100.00
If Tertiary:		
ND	8	29.60
HND	8	29.60
B.Sc	9	33.30
M.Sc	2	7.40
Total	27	100.00
Occupancy Pattern of the Buildings		
Occupancy Type	Frequency	%
Single room	23	38.30
Room and Parlour	22	36.70
Self-contain	10	16.70
Others	5	8.30
Total	60	100.00
Type of the Building Occupied		
Building Typology	Frequency	%
Bungalow	27	77.14
Multi-Storey building	8	22.86
Total	35	100.00

3. Results

Through the adoption of 5% of the occupants of residential buildings in the study area, a total of 123 questionnaire was administered on them while 95 were returned, and this indicates a response rate of 77.23%. The rate of return of the questionnaire administered ought to be adequate to substantiate results of the study based on Babies (2005) which states that a response rate of 40% ought to be adequate for researches in built environment studies. The profile of respondents sampled in the study area is shown in Table 2. The results show that 56.80% of the respondents were females while 49.50% were males; 49.5% of the respondents' age limit was 20-25 years, 22.10% were 26-30 years and 16.8% were above 40 years old. The respondents have an almost similar proportion of marital status as 49.50% were married and 50.50% were single and a sizeable number, 60 (63.20%) had secondary school education while 28.40% had tertiary education level. The occupancy pattern of respondents of the study area indicated that 63.20% of them occupied rented apartment, 38.30% lived in a room apartment, 36.70% in room and parlour and majority of them (77.14%) were in bungalow buildings.

4. Identify and Examine Lighting Bulbs Used in the Buildings

The study shows that according to past studies examined in the literature review, lighting bulbs used by building occupants can be categorized into either incandescent and energy efficient bulbs. Thus, as shown in Table 3, it was found that a large proportion of the respondents in the selected buildings (90.53%) used incandescent bulbs while a fairly reduced proportion, 72.63% used energy efficient bulbs. Past works of Otegbulu et al., (2012) indicated that awareness on the use of energy efficient bulbs in selected areas of Lagos state accounted for the rate of its adoption by the occupants. The results of this study also indicated further classification of bulbs used in residential buildings sampled classified as energy inefficient and efficient bulbs respectively. Thus, Table 4 shows that a sizeable number of the occupants of the buildings, 57.90% used incandescent bulbs, 10.59% used fluorescent tubes, and 56.47% used compact fluorescent lamps. This indicated that socio-economic characteristics of the occupants and level of availability of the various types of lighting bulbs affected its rate of use by the building occupants.

The study also examined wattage of the types and brands of lighting bulbs used in the buildings sampled. As shown in Table 5, it was revealed that amongst the respondents that used incandescent bulbs in the study area, 41.82% used 100 watts, 40.00% of them used 60 watts and 7.28% used 40 watts bulbs. This implied that the use of 100watts incandescent bulbs was most prevalent in the buildings. It

Table 3: *Types of Lighting Bulbs Used in Selected Buildings*

Types of Bulbs	Response		Total Frequency/ (%)
	Yes Frequency/(%)	No Frequency/ (%)	
Incandescent bulbs	86(90.53%)	9(9.47%)	95(100.00%)
Energy efficient bulbs	69(72.63%)	26(27.36%)	95(100.00%)

Table 4: *Varying Brand of Lighting Bulbs Used by Selected Building Occupants*

Brand of Lighting Bulb	Frequency	%
Energy Inefficient:		
Incandescent	55	57.90
Halogen	10	10.53
Others	30	31.57
Total	95	100.00
Energy Efficient:		
Fluorescent tubes	9	10.59
Compact fluorescent lamps	48	56.47
Light emitting diodes	2	2.35
High intensity discharge	1	1.18
Others	25	29.41
Total	85	100.00

Table 5: *Response on the Wattage of Lighting Bulbs Used in Selected Buildings*

Incandescent Bulbs		
Wattage of Types of Bulbs Used (Watts)	Frequency	%
40	4	7.28
60	22	40.00
100	23	41.82
200	3	5.45
No response	3	5.45
Total	55	100.00
Compact Fluorescent Bulbs		
Wattage of Types of Bulbs Used (Watts)	Frequency	%
8-12	4	8.33
13-18	2	4.17
18-30	7	14.58
30-60	18	37.50
No response	17	35.42
Total	48	100.00
Lighting Emitting Diode (LED) Bulbs		
Wattage of Types of Bulbs Used (Watts)	Frequency	%
4-5	1	50.00
6-8	1	50.00
9-20	0	0.00
25-28	0	0.00
Total	2	100.00

was also shown that amongst those that used compact fluorescent bulbs, 30-60 watts was mostly used by 37.50% of the respondents and 14.58% used 18-30 watts bulbs. However, 50.00% of the respondents used 6-8 and 4-5 watts of the lighting emitting diodes bulbs respectively.

5. Assessment of the Rate of Use of Energy Efficient Bulbs

The study equally assessed the distribution and rate of use of incandescent and energy savings bulbs in the building spaces used by respondents in the study area. As shown in Table 6, it was revealed that 1-5 number/range of bulbs was mostly used by the respondents in all the buildings sampled; 1-5 number of 100 watts of incandescent bulbs was used by 91.30% of the respondents; 1-5 number of 8-12 watts and 13-18 watts of compact fluorescent bulbs respectively were mostly used by 100.00% of the respondents while 85.70% used 18-30 watts of 1-5 number of the compact fluorescent bulbs; and 4-5 watts and 6-8 watts of 1-5 number of lighting emitting diodes were mostly used by the occupants of the buildings respectively.

Table 6: *Proportion of Watts of Lighting Bulbs Used in the Selected Buildings*

Incandescent Bulbs					
Watts of Bulbs Used (Watts)	**Range of Number of Lighting Bulbs Used**				
	1-5	6-10	11-15	>15	Total
	F (%)	F (%)	F (%)	F (%)	F (%)
40	2(50.00)	2(50.00)	0(0.00)	0(0.00)	4(100)
60	17(77.27)	5(22.73)	0(0.00)	0(0.00)	22(100)
100	21(91.30)	2(8.70)	0(0.00)	0(0.00)	23(100)
200	0(0.00)	3(100.00)	0(0.00)	0(0.00)	3(100)
Compact Fluorescent Bulbs					
Watts of Bulbs Used (Watts)	**Range of Number of Lighting Bulbs Used**				
	1-5	6-10	11-15	>15	Total
	F (%)	F (%)	F (%)	F (%)	F (%)
8-12	4(100.00)	0(0.00)	0(0.00)	0(0.00)	4(100)
13-18	2(100.00)	0(0.00)	0(0.00)	0(0.00)	2(100)
18-30	6(85.70)	1(14.30)	0(0.00)	0(0.00)	7(100)
30-60	10(55.55)	5(27.78)	1(5.56)	2(11.11)	18(100)
Lighting Emitting Diodes (LED)					
Watts of Bulbs Used (Watts)	**Range of Number of Lighting Bulbs Used**				
	1-5	6-10	11-15	>15	Total
	F (%)	F (%)	F (%)	F (%)	F (%)
4-5	19100.00)	0(0.00)	0(0.00)	0(0.00)	1(100)
6-8	1(100.00)	0(0.00)	0(0.00)	0(0.00)	1(100)
9-20	0(0.00)	0(0.00)	0(0.00)	0(0.00)	0(0)
25-28	0(0.00)	0(0.00)	0(0.00)	0(0.00)	0(0)

The study further showed the prevalence and number of either incandescent or energy saving bulbs used in different spaces of the buildings sampled based on their typology which was either personally-owned or self-rented apartment. As shown in Tables 7 and 8, an almost similar pattern of the 1-5 number of lighting bulbs of either incandescent or energy efficient bulbs were used in the various spaces of either personally-owned or self-contained buildings occupied by the respondents in the study area. It further showed that in the living room of personally-owned or self-rented buildings, 86.40% of incandescent bulbs were used while the rate of use of energy saving bulbs was comparably higher (100.00%). The same pattern on the prevalence and pattern of use of both incandescent and energy saving bulbs were found in other spaces of the buildings sampled.

6. Factors Affecting the Use of Lighting Bulbs

The study equally examined factors that influenced the use of different lighting bulbs by the respondents in the study area by taking note of the factors that existed in the body of literature. It is shown in Table 9 that quality of bulb and cost saving benefit of bulb were rated as the most significant factors that influenced the use of fluorescent bulbs with mean score values of 2.20 respectively while durability was rated third with an index value of 2.10. It was shown that energy saving benefit of bulb with a mean value of 2.29 was ranked as the most important factor that influenced the use of compact fluorescent bulb, durability of bulb with value of 2.28 was ranked second and quality of bulb with mean value of 2.24 was ranked third. Equally, durability and quality of bulb mostly influenced the use of light emitting diodes bulbs in the study area with a mean value of 2.85.

7. Discussion of Findings

The profile of the respondents based on their characteristics indicated that the proportion of female respondents (56.80%) that responded to the questionnaire administered was significantly higher than the male (43.20%). This disparity was observed to be due to the fact that the study was carried during the day as most men respondents would have left for their places of work compared with the female that stay more at homes based on their occupational status This was also observed to be a reflection of socio-economic characteristics of the respondents in the core zone of the study area. The result showed that bulk of the respondents (49.50%) were within the age limit of 20-25 years and 22.10% between 26-30years. A fairly large proportion,

Table 7: *Proportion of Number of Lighting Bulbs Used Inside Personally-Owned Buildings*

Building Space	Incandescent Bulbs					Energy Saving Bulbs				
	Range of Number of Bulbs Used					Range of Number of Bulbs Used				
	1-5	6-10	11-15	>15	Total	1-5	6-10	11-15	>15	Total
	F (%)	F (%)	F (%)	F (%)	F (%)	F (%)	F (%)	F (%)	F (%)	F (%)
Living room	19 (86.40)	3 (13.64)	0 (0.00)	0 (0.00)	22 (100.00)	19 (100.00)	0 (0.00)	0 (0.00)	0 (0.00)	19 (100.00)
Bedroom 1	19 (86.40)	3 (13.64)	0 (0.00)	0 (0.00)	22 (100.00)	18 (100.00)	0 (0.00)	0 (0.00)	0 (0.00)	18 (100.00)
Bedroom 2	14 (1000.00	0 (0.00)	0 (0.00)	0 (0.00)	14 (100.00)	16 (100.00)	0 (0.00)	0 (0.00)	0 (0.00)	16 (100.00)
Dinning	9 (100.00)	0 (0.00)	0 (0.00)	0 (0.00)	9 (100.00)	16 (100.00)	0 (0.00)	0 (0.00)	0 (0.00)	16 (100.00)
Kitchen	17 (100.00)	0 (0.00)	0 (0.00)	0 (0.00)	17 (100.00)	14 (100.00)	0 (0.00)	0 (0.00)	0 (0.00)	14 (100.00)
Store	10 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	10 (100.00)	13 (100.00)	0 (0.00)	0 (0.00)	0 (0.00)	13 (100.00)
Lobby	11 (1000.00	0 (0.00)	0 (0.00)	0 (0.00)	11 (100.00)	11 (100.00)	0 (0.00)	0 (0.00)	0 (0.00)	11 (100.00)
Terrace	10 (100.00)	0 (0.00)	0 (0.00)	0 (0.00)	10 (100.00)	9 (100.00)	0 (0.00)	0 (0.00)	0 (0.00)	9 (100.00)
Toilet	12 (100.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	12 (100.00)	0 (0.00)	0 (0.00)	0 (0.00)	12 (0.00)
Bathroom	11 (100.00)	0 (0.00)	0 (0.00)	0 (0.00)	11 (100.00)	10 (100.00)	0 (0.00)	0 (0.00)	0 (0.00)	10 (100.00)
Surrounding	12 (100.00)	0 (0.00)	0 (0.00)	0 (0.00)	12 (100.00)	17 (100.00)	0 (0.00)	0 (0.00)	0 (0.00)	17 (100.00)
Others	3 (100.00)	0 (0.00)	0 (0.00)	0 (0.00)	3 (100.00)	0 (0.00)	0 (0.000	0 (0.00)	0 (0.000	0 (0.00)

50.50% were married and the occupational status of the respondents revealed that majority of the respondents, 58.90%, were self-employed. It was observed that in view of geographic location of the study area (a core zone), and occupational status of the respondents, a sizeable proportion of them, 63.20%, had up to secondary school education. This characteristic, occupancy pattern and type of building where they lived as 38.30% lived in single-room buildings and 77.14% were in bungalow buildings. Thus, the socio-economic characteristics of the respondents served as the prime issues that affected the type and mode of use of lighting bulbs in the selected buildings of the study area.

Responses on the types of lighting bulbs used indicated that 72.63% made use of energy efficient bulbs in the building; most of which are in combination with incandescent bulbs which is 57.90% of use by the respondents. Also, the results showed that compact fluorescent bulbs is the mostly used type of energy efficient bulbs in the study area with a response rate of 56.47% compared to 10.59% and 2.35% that used fluorescent tubes and light emitting diodes respectively. The study has shown that 1-5 number proportion of lighting bulbs was mostly used in the spaces of buildings sampled in the building typologies sampled. Responses on the various factors that affected the use of lighting bulbs used by the building occupants sampled indicated that in the case of fluorescent tubes, quality and cost saving benefit of bulb respectively were the most significantly ranked factors that influenced its use; energy saving benefit was the mostly ranked factor that influenced the choice of compact fluorescent bulbs followed by the durability of bulb while durability and quality of bulb respectively influenced the choice and use of light emitting diodes by the respondents. Variation in the factors that affected the use of different lighting bulbs by the respondents was observed to be due to the awareness on their performance based on the operating factors.

8. Conclusion and Recommendations

The study was carried out to depict information on the awareness and adoption of the types of lighting bulbs used by the occupants of buildings in the core zone of Ife Central Local Government, Osun State, Nigeria in order to foster visual comfort needed to enhance performance of tasks indoor. The varying performance of the types and brands of lighting bulbs has affected the procurement and use of

Table 8: *Proportion of Number of Lighting Bulbs Used Inside Self-Contained Apartments*

Building Space	Incandescent Bulbs					Energy Saving Bulbs				
	Range of Number of Bulbs Used					Range of Number of Bulbs Used				
	1-5	6-10	11-15	>15	Total	1-5	6-10	11-15	>15	Total
	F (%)	F (%)	F (%)	F (%)	F (%)	F (%)	F (%)	F (%)	F (%)	F (%)
Living room	11 (100.00)	0 (0.00)	0 (0.00)	0 (0.00)	11 (100.00)	6 (100.00)	0 (0.00)	0 (0.000	0 (0.00)	6 (100.00)
Bedroom 1	10 (100.00)	0 (0.00)	0 (0.00)	0 (0.00)	10 (100.00)	6 (100.00)	0 (0.00)	0 (0.000	0 (0.00)	6 (100.00)
Bedroom 2	2 (100.00)	0 (0.00)	0 (0.00)	0 (0.00)	2 (100.00)	5 (100.00)	0 (0.00)	0 (0.000	0 (0.00)	5 (100.00)
Dinning	5 (83.33)	1 (16.67)	0 (.00)	0 (0.00)	6 (100.00)	2 (100.00)	0 (0.00)	0 (0.000	0 (0.00)	2 (100.00)
Kitchen	12 (100.00)	0 (0.00)	0 (0.000)	0 (0.00)	12 (100.00)	1 (100.00)	0 (0.00)	0 (0.000	0 (0.00)	1 (100.00)
Store	1 (100.00)	0 (0.000	0 (0.000	0 (0.00)	1 (100.00)	1 (100.00)	0 (0.00)	0 (0.000	0 (0.00)	1 (100.00)
Lobby	3 (100.00)	0 (0.00)	0 (0.000	0 (0.00)	3 (100.00)	1 (100.00)	0 (0.00)	0 (0.000	0 (0.00)	1 (100.00)
Terrace	3 (100.00)	0 (0.00)	0 (0.000	0 (0.00)	3 (100.00)	2 (100.00)	0 (0.00)	0 (0.000	0 (0.00)	2 (100.00)
Toilet	8 (100.00)	0 (0.00)	0 (0.000	0 (0.00)	8 (100.00)	2 (100.00)	0 (0.00)	0 (0.000	0 (0.00)	2 (100.00)
Bathroom	9 (100.00)	0 (0.00)	0 (0.000	0 (0.00)	9 (100.00)	2 (100.00)	0 (0.00)	0 (0.000	0 (0.00)	2 (100.00)
Surrounding	7 (100.00)	0 (0.00)	0 (0.000	0 (0.00)	7 (100.00)	3 (100.00)	0 (0.00)	0 (0.000	0 (0.00)	3 (100.00)
Others	2 (100.00)	0 (0.00)	0 (0.000	0 (0.00)	2 (100.00)	1 (100.00)	0 (0.00)	0 (0.000	0 (0.00)	1 (100.00)

either energy inefficient and efficient bulbs respectively over the years in the country. Thus, the study was carried out to identify and examine types of lighting bulbs assessed rate of use of types of energy efficient bulbs and the factors influencing its use. The study established that amongst energy inefficient bulbs used by the respondents, incandescent type was mostly used while compact fluorescent bulb was the most prevalent type of energy efficient bulb mostly used in the study area. It also showed that different watts of types and brands of lighting bulbs were used by the respondents. This was largely due to different operating factors that informed the choice of the type of either energy inefficient or efficient bulbs used. The study also depicted that there was variation in the wattages and number of the types of lighting bulbs used in the types of buildings and spaces occupied by the respondents sampled. The limitation of the study involved the adoption of subjective approach which allowed the use of questionnaire as the data collection instruments based on the emerging use of LED lights in the study area, and further studies on the assessment of types of lighting bulbs be carried out to depict the comparative energy savings potentials obtainable from the different types and brand of lighting bulbs through the use of appropriate field measurement devices.

In view of the importance attached to the dependence of building occupants on the performance of building occupants on lighting bulbs to give visual comfort, the study recommended that there is need to foster consumers awareness on the types of lighting bulbs to procure and government should also strengthen mechanisms through importation and sales of energy efficient bulbs only so as to enhance its cost-saving and environment–related benefits amongst others.

References

Babies, E. (2005). The Basics of Social Research, 3rd Edition, Belmont, C.A., USA, Thomson Wordsworth Learning.

Bertoldi, P., Atanasiu, B. (2009). Electricity Consumption and Efficiency Trends in the Enlarged European Union. Status Report 2009. European Commission, Directorate-General Joint Research Center. Institute for Environment and Sustainability. Ispra, Italy.

Casillas, C.E., Kammen, D.M, (2011). The Delivery of Low-Cost, Low-Carbon Rural Energy Services. *Energy Policy*, 39(8), 4520-4528.

Table 9: *Factors Affecting the Use of Lighting Bulbs*

Fluorescent Tubes		
Factors	**Mean Score**	**Rank**
Quality of bulb	2.20	1
Cost saving benefit of bulb	2.20	1
Durability of bulb	2.10	2
Environmental friendliness of bulb	2.05	4
Energy saving benefit of bulb	2.00	5
Source of electricity	2.00	5
Trust in bulb performance	1.95	7
Awareness of bulb	1.90	8
Availability of bulb	1.65	9
Compact Fluorescent Bulbs		
Factors	**Mean Score**	**Rank**
Energy saving benefit of bulb	2.29	1
Durability of bulbs	2.28	2
Quality of bulbs	2.24	3
Trust in bulb performance	2.21`	4
Cost saving benefit of bulb	2.07	5
Awareness of bulb	2.06	6
Source of electricity	1.85	7
Environmental friendliness of bulb	1.66	8
Availability of bulb	1.54	9
Light Emitting Diodes (LED)		
Factors	**Mean Score**	**Rank**
Durability of bulb	2.85	1
Quality of bulb	2.85	1
Trust in bulb performance	2.54	3
Energy saving benefit of bulb	2.45	4
Awareness of bulb	2.20	5
Source of electricity	2.11	6
Cost saving benefit of bulb	2.09	7
Availability of bulb	2.05	8
Environmental friendliness of bulb	2.03	9

Community Research and Development Centre (2009). Energy Efficiency Survey in Nigeria, A Guide for Developing Policy and Legislation.

Dineen, D., Gallachóir, B.P. (2011). Modelling the Impacts of Building Regulations and a Property Bubble on Residential Space and Water Heating. *Energy and Buildings*, 43(1), 166-178.

IEA (2006). Light's Labour's Lost: Policies for Energy Efficient Lighting, IEA/OECD, Paris.

Johnson, O.O., Odekoya, A.J. and Umeh, O.L. (2012). Factors Influencing Usage of Compact Fluorescent Lamps in Existing Residential Buildings in Lagos, Nigeria, International Journal of Energy and Economics, 2(2), 63-70.

Kumar, A., Jain, S.K., Bansal, N.K. (2003). Disseminating Energy-Efficient Technologies: A Case
Study of Compact Fluorescent Lamps in India. Energy Policy. 31, 259-272.

Lebot, B. (2009). Energy Efficiency and Market Transformation: A Short Overview of Best Practices. A paper presented during the Inception Workshop of the UNDP-GEF Project to Promote Energy Efficiency in Residential and Public Building in Nigeria, 14th July 2009.

Natalie, C. and Yi, J. (2012). Adoption of CFLs and Electrical Lighting Usage in Pakistan, ADB Economics Working Paper Series 305, Asian Development Bank.

Nag, P.K. (2004), Power Plant Engineering (2nd Ed.), Tata McGraw Hill.

National Population Commission (2009). Notice on the Publication of 2006 Census for Final Results, Federal Republic of Nigeria.

Otegbulu A, Odekoya A.J., Johnson O. (2012) Determinants of Investments in Energy Efficient Light Bulbs in Lagos Residential Buildings. *Elixir Project Management, 51*, 11159-11163.

Oyedepo, S.O. (2012). Energy Efficiency and Conservation Measures: Tools for Sustainable Energy Development in Nigeria, *International Journal of Energy Engineering*, 2(3), 86-98.

Richard, F and Anita, L. (2008). Research Methods for Construction, 3rd Edition, Wiley-Blackwell Publishing Ltd., USA, 46-183.

Sambo, A.S (2005). Renewable Energy for Rural Development: The Nigerian Perspective, ISESCO Science and Technology Vision, 1, 12 – 22.

Waide, P. (2006). Light's Labour's Lost – Policies for Energy-Efficient Lighting. International Energy Agency: Paris.

Xing, Y., Hewitt, N., Griffiths, P. (2011). Zero Carbon Buildings Refurbishment–A Hierarchical pathway, Renewable and Sustainable Energy Reviews, 15(2011), 3229–3236.

www.wikipedia.org/wiki/Incandescent_light_bulb