



NIGHTINGALE PUBLICATIONS AND RESEARCH INTERNATIONAL

ASSESSING RENEWABLE ENERGY PRACTICE IN TURAKI ALI HOUSE KADUNA-NIGERIA

***HABIBU SANI **BILKISU ADAMU
ALIYU**

**Department of Estate Management and
Valuation Kaduna Polytechnic Kaduna*

***Department of Estate Management and
Valuation Nuhu Bamalli Polytechnic Zaria*

Introduction

There is a growing apprehension and numerous scientific predictions on how our misuse of the planet's resources impact present and future generations in terms of climate change and resource allocation resulting to fundamental macroeconomic crisis looming thus the primary driver for global interest in sustainable property development and management. This has informed the promotion of investment approaches that help drive increasingly responsible use of resources, including those in the built environment (UCEM 2018).

It is however projected by the United Nations (2014) that by 2050, our global population will increase by as much as 30%, translating to an additional two billion consumers of finite resources, thereby increasing global demand for food, energy, accommodation and water

Abstract

The research investigated tenant understanding and preparedness to embrace renewable energy practice as alternative to public power supply during outage from national grid. International standards of sustainable building occupation from BREEAM and LEED were adopted to form parameters of investigation. The study covered knowledge and utilization of solar energy system amongst tenant and their preparedness to embrace alternative energy systems as well as incentives from the management Company of Turaki Ali House to encourage sustainable occupation. Qualitative and quantitative technique was employed; interview was conducted with two of the tenants' representative and a member of staff from the management company

Who has been the desk officer responsible for the property for twenty years. Fifty six questionnaires were distributed among tenants between the floors; forty one questionnaire was returned and used for the analysis. Results from the research revealed limited knowledge of the advantages in solar energy system over generators; in addition, there were apprehension to embracing solar system due to higher initial cost of acquisition and substandard solar systems and components. Managers of the property are reported not have been performing their contractual obligation of the lease thus justifying the action of tenant in littering everywhere with generators despite the inherent dangers associated with the practice. The research concluded with recommendation to create awareness, encourage utilization of sustainable energy sources through a review in the content of tenancy agreement to ensure compliance to sustainable building occupation standards.

Keywords: Renewable energy, sustainability, Property Management, BREEAM & LEED.

by 2030 between 35% and 50%. Consequently, infrastructure development and enhancement is required to keep up with the growth projected in the region of trillions of dollars of investment. Most of those developments will have either a negative or positive impact on the planet. Majority of this development has the capacity to be created, utilized and maintained using a socially responsible investment approaches that would guarantee sustainability in the entirety of real property sectors and investment lifespan. This study is focused on sustainable practice in energy utilization within the commercial real estate sector in emerging developing nations like Nigeria. Energy requirement is on geometric increase due to increasing demand from various sectors as real estate, while the channel of supply is getting slimmer thereby necessitating individual effort to close the gap. These individual efforts do not only result in sharp practices but also diminishes the popularity of available sustainable sources (Joseph and Abraham, 2010) as can be seen in the case of Turaki Ali house used as the research case study.

Turaki Ali House is a 5 storey commercial building located within the New Nigeria Development Company Head office Complex along Ahmadu Bello Way in Kaduna CBD. It has over time grown to become a hub for private practitioner offices choice due to advantage of complimenting professional services and proximity to city center. Office operation is ineffective without an uninterrupted energy supply (Addy, et al 2017) while the national power holding company performance in energy provision is weak. The company has proven to be incapable of providing adequate energy to teeming users. This necessitated personal effort by individual occupants to provide alternative supply. Alternative energy source within the building is wholly through mini generators ranging from 1kva to 5kva depending on individual requirement and abilities. Providing alternative energy by individual tenant is never friendly to the environment and superficially costlier than collective arrangement, but cheaper in the long run to embrace cleaner renewable energy alternative as solar and wind energy sources since they are naturally abundant in supply (Abdullahi, 2014).

These sources are detrimental to global environmental health and sustainability as they increase green house gases through carbon dioxide emission from smokes, and causing noise pollution to immediate environment by making the entire premises noisy thereby negating the requirement of sustainable building occupation. Sustainable building occupation is trending world over with clear objective of limiting green house emission; the research adopted a definition advanced by the LEED and Nigerian environmental standards regulatory agency (NESREA). The agencies defined sustainable building occupation as the usage of a building without causing harm to other users and the environment.



Figure 1 & 2: Rear and Side View of Turaki Ali showing individual Generators

The study sought to determine tenants understanding and preparedness to accept renewable energy practice, thus collected both qualitative and quantitative data to determine compliance to sustainable occupation and management of the property by answering some pertinent questions as

1. What perception do the tenants holds about alternative energy sources
2. To what extent are the tenants and management prepared to embrace renewable energy
3. What effort is in place by the management of Turaki Ali House to regulate tenants occupation and utilization to achieve sustainable building occupation

Review of literature

The proliferation of new buildings for various uses including office accommodation is associated with attendant increasing energy demand beyond what is available (Addy et al, 2017). Generation of energy require exploration and utilization of environmental resources with glaring environmental consequences capable of not only affecting present generation, but unborn generations. This necessitated the search for alternative renewable energy sources intended to achieve sustainability. Researches were severally conducted by scholars as Abdullahi (2014) who conducted a study in Nepal and concluded that renewable energy sources do not only provide alternative energy but aid in climate change mitigation.

Alternative energy provision depends largely on availability of resources as sunshine, wind or biomass which is evidently available in Nigeria albeit underutilization due to heavy reliance on fossil fuel to generate power for the past 45 years. All sources could be productive, but some are most viable thus requiring choice and prioritization based on needs, resource availability, and technological abilities as well as environment friendly option, since the market for renewable energy is prime in Nigeria (Ibrahim 2008, Jailani, Reed & James 2015, and Global legal insight 2018).

Energy provision is symbiotic to climate change and adaptation while the use of renewable energy reduces vulnerability to climate change and variability, associated with attendant socio-economic and health repercussions (Perera, Wikins & Phillips 2015). In recent times, Nigerian government has declared solar energy as a viable alternative due to the nature of our climate thereby

investing about \$20 billion to build mini solar grids for rural areas, to reduce reliance on hydro and coal. This concept is to be expanded by 2023 to produce 10,000 mega watts from solar using a World Bank loan of \$350 billion to cater for hospitals, schools and households in rural areas, to achieve a set target of 90% access to uninterrupted energy by 2030 (Kawuwa, Sani, Mustafa & Ishak 2015).

Renewable energy concept and practice is relatively new to most Nigerians, mostly at exploration stage due to associated high cost, limited technical expertise and skilled labor to propel the operation of renewable energy practice especially at large scale. Awareness of its existence and comparative advantage among Nigerians remain scanty and scary of financial implication for individual users to procure, this is evident in the country's power generation profile having solar as the least contributor followed by thermal and nuclear power in ascending order (Environment Agency, 2018).

It is worthy of note however, renewable energy source can be cost effective when it is properly harnessed as reported by Malaudzi, Muchie & Makhado (2012), Roman, Votteler & Brent (2016) who conducted a study on potentials of renewable energy sources in south Africa's mining operation, it concluded that cost of energy from photovoltaic and wind generation are considerably lower than diesel generators in addition to lowering carbon emissions. The study further posited that self generation of energy from renewable sources proved positive thus encouraging on-site own investment to generate energy. Alternative energy sources as solar and wind are adjudged sustainable, having limited negative environmental consequences when compared with coal, gas flaring and hydro whose level of carbon emission is considerably high (Perera et al, 2015). Solar and wind sources are natural provisions requiring only a sustainable system to harness using some regulatory frameworks to avert possible mis-use (Kawuwa et al, 2015)

Adoption of solar as alternative renewable energy source by Nigerian government ought to reduce noise and air pollution caused by the use of petrol and diesel generators, which has become order of the day even with public agencies including power distribution company offices. Available literatures to me suggest no specific study conducted to establish volume of pollution associated with the use of diesel and petrol generators in the study area, generalization could be deduced from Jailani et al (2015) thus concluding that presence and use of individual diesel and petrol generators

in Turaki Ali House for the purpose of generating power possesses danger of air and noise pollution.

This study therefore intends to study tenants' understanding and preparedness to accept renewable energy practices, in conformity with existing policies to facilitate and promote renewable and sustainable energy consumption (legislative research commission, 2009). Major international rating standards as Leadership in Energy and Environmental Design (LEED), BREAM and Australia's Green Star guide lines are used as a guide to measure sustainable energy practice in Turaki Ali house Kaduna.

Legislations to promote Renewable Practice in Nigeria

A national renewable energy action plan was unveiled in 2016 by the Honorable minister of work, power and Housing (Babatunde Raji Fashola), in attendance were all ministries, allied agencies, parastatal and state government representatives to promote the use of alternative energy as solar, wind and biomass at a larger scale. The plan proposed an alternative energy source contributing up to 16% of national energy requirement by 2030 to improve on the 0.8% contribution in 2012. Achieving such improvement may be difficult without incentive thus the rationale behind prioritizing energy purchase from alternative source by energy distribution companies, in addition to tax incentives, financial aids, loans and grants for renewable energy projects (Global legal insight, 2018). The action plan for renewable energy practice may not be unconnected to clarion call for environmental sustainability aimed at reducing green house gaseous emission. Building industry and building occupation accounts for 40% of world energy demand (IEA, 2018) thus making building industry sector a priority sector to curb the menace of green house gaseous emission.

Efficient utilization of energy is of paramount concern, requiring policies and regulations to maintain appropriate environmental quality (Environment Agency 2018) especially in emerging economies like ours where the demand is high relying on a narrow non-sustainable source (Kawuwa, Sani, & Mustafa, 2015), such policies, codes and standards on sustainable energy provision and utilization merely exist on paper without actual implementation as reported by Tamaraukuro, Jibril & George (2017), and are not holistic but selective such as the National energy policy declaration in 2003 by the energy commission of Nigeria which specifically targeted industry, agriculture and

transport sectors thereby neglecting other sectors as the construction and built environment, which is the focus of this study and a consumer of 40% of global energy generated (IEA, 2018). Other legislation as the building codes of 2006 principally set minimum building standards from pre-design, design, construction and post construction stages to ensure quality, safety and proficiency without considering energy efficiency and sustainability (Global energy insight, 2018). Energy efficiency and sustainability is a global clarion objective promoted by international agencies as Building Research Establishment Environmental Assessment Methods (BREEAM) and the Green Building Council Leadership in Energy and Environmental Design (LEED). These concepts holistically address issues of sustainability from building design through construction, operation and maintenance.

BREEAM

Breeam concept was first introduced in the 1990 in the UK and later some part of Europe before extending to other parts of the world, the concept was severally updated up to the most recent being that of 2014. Focus of BREEAM centers on health, wellbeing, energy, transport, water, waste, land use, pollution control, ecology, innovation and management to achieve sustainable building occupation (Tamaraukuro, Jubril & George, 2017).

LEED

Leed concept was founded in the US eight years after establishing BREEAM with its recent version being that of 2014, recognized as the most widely used system of building assessment and certification on reducing carbon dioxide [CO₂] emission, energy saving, water efficiency, improving indoor environmental quality as well as stewardship of resources and sensitivity to their impacts (Tamaraukuro, Jubril & George, 2017 and Chatzimouratidis, 2015). LEED is intended to provide owners and operators a workable framework for design, construction, operation and maintenance solution in a sustainable manner for all manner of buildings use for commercial, residential, industrial etc throughout their life cycle. Achieving LEED certification signifies healthier productive places, minimal stress on the environment, capable of attracting tenants/higher lease rates and decrease utility cost thus lower operating cost and happier occupants (<http://www.bu.edu/sustainability/what-were-doing/green->

[buildings/leed/](#)). BREEAM and LEEDS are different systems promoting the same principal objective of sustainability using varying interrelated components presented in a table as thus adapted from (Tamaraukuro, Jubril & George, 2017).

Table 1: Areas of coverage by BREEAM and LEED

Categories	BREEAM	LEED
Ecology		
Biodiversity protection Contaminated Land	*	*
Enhancing site Ecology	*	*
Ecological impact	*	*
Construction site		
Site protection	*	*
Site selection	*	*
Site Development	*	*
Energy		
Natural Resources	*	*
Renewable energy strategy	*	*
Energy performance		
HVAC		
Lighting (internal)	*	*
Lighting (external)	*	
Ventilation	*	*
Heat transmission	*	*
Operational	*	*
Energy monitoring	*	*
Optimizing energy	*	*
CO2 reduction strategy	*	

Insulant GWP		
Water and Waste management		
Water	*	*
Water consumption		*
Indoor water reduction		*
Outdoor water reduction Irrigation system	*	*
Rain water harvesting	*	*
Water conservation/metering Grey water	*	*
recycling	*	*
Waste water technology		
Waste	*	*
Construction waste management	*	*
Waste treatment	*	*
Recycling Activities		
Materials		
Low environmental impact materials	*	*
Renewable natural materials	*	*
Insulation	*	*
Source of raw material	*	*
Re -use of structural material	*	*
Use of non- structural frame material	*	*
Use of finishing material	*	*
Efficient use of material over if life cycle	*	*
Economic Aspect		
Operation and maintenance cost	*	*
Pollution		
Prevention of refrigerant leakage	*	
NOx emission	*	*
Co2 emission	*	*
Night light	*	*
Noise pollution	*	*
Watercourse pollution	*	*
Natural disasters	*	*
Indoor Environment & Health		

Ventilation		
CO2 monitoring	*	*
Provision of natural ventilation	*	*
Ventilation system	*	*
Fresh air supply	*	*
Lighting and Illumination		
Daylight	*	*
View out and Glare control	*	*
Lighting control	*	*
Illumination level		
Noise and acoustics		
Noise level	*	*
Sound insulation		
Contaminate level		
Volatile organic compounds (VOC)	*	*
Microbiological contaminate level		
Thermal comfort	*	*
Cooling/heating and humidity control	*	*
Proper zoned control		

Source: (Tamaraukuro, Jubril & George, 2017)

Methodology

The research was conducted on a mix mode design taking both the qualitative and quantitative approach. Purposive sampling techniques was adopted in the qualitative aspect of the research with a view achieving depth understanding of the issue from participants/occupants, thus respondents were selected on the basis of occupation in the property and those involved in the day to day management of the property thereby complying with the principles of qualitative sampling in (Merriam & Associates, 2002).

Respondents were interviewed using a semi-structured interview method for the managers of Turaki Ali house and some of the long sitting tenants to achieve elaborate and rich findings until a saturation level was attained. Tentative findings were presented to respondents for validation before it was finally transmitted as the research finding in line with interview protocol presented in (Merriam & Associates, 2002). According to Steinar 2007, Cresswell 2014 and Johnson 2002 'researcher seeking to gather valid information on past and present practices should better consult those in actual operations', this solidified researchers' choice of property managers handling Turaki Ali house as interviewees.

Quantitative aspect of the research used questionnaire instrument administered on the study population using simple random sampling based on systematic arrangement of floor to floor. Questionnaire items were developed from interview findings and from literature search. The questionnaire was prepared on a four point rating scale to guide respondent decision on items. Questionnaire item was structured on the Likert scale pattern using a four points rating structures with four point being the highest and one being the lowest signifying weakest position on each item as thus; strongly agreed (SA=4); Agreed (A=3); Disagree (DA=2) and Strongly Disagree (SD=1).

Fifty six questionnaires were distributed personally by the researcher. Forty one filled questionnaires were collected and used for analysis. Findings were deduced according to research question/objectives and discussed in section 4 of the research.

Empirical results

Qualitative Results

Interviews were conducted with two representative members of the tenants' committee representing the tenants occupying office lots in the building, and one interview with desk officer responsible for managing Turaki Ali house.

Table 2: Transcript of interview

s/n	Item	Interviewee (property manager)	Interviewee (tenant)	Interviewee (tenant)	Themes from interview
1	Knowledge and awareness about renewable energy	Have superficial idea but have reservations to its use	Aware but Thought it is only for industrialize nation thus know little	Fully aware but not practicable in Nigeria	There is limited awareness of renewable energy concept among interviewees
2	Need to regulate carbon emissions	Our practice have insignificant contribution thus	There is the need to regulate emissions	We are not stable on hydro what more of solar	Interviewees appreciate the

		necessary for developed nations only			need to regulate emission
3.	Cleanliness of generators as alternative source of energy	Generators are the only alternative we have though not clean to ozone layer	Generators emit smokes but we have to use them	Generators may not be clean but is my only option even though harmful to environment	Interviewees unanimously agreed that generators deplete ozone layer
4.	How about the noise from generators	It truly disturbs	The noise is more in the ground while my office is second floor	Well mine is sound proof but there is noise from others	Interviewees agreed that generators are element of noise pollution
5	Consent of property manager to usage of the generator	Silence is an acceptance	They failed in maintaining central generator thus must to allow us	It is impliedly agreed	Using generators is allowed by the property owners
6	What is your average cost of using generator per annum	N120,000 (USD 320)	N180,000 (USD 480)	N210,000 (USD 560)	Maintaining a generator cost an average of 170,000 per annum
7	Availability of solar systems within your reach	It is available as they said	You can find it around but not sure of the quality	The quality of what you have in the market is poor	Solar systems are not readily available at the requisite quality
8.	How do you compare the price of a solar system to that of running generator	I never used solar so I cannot say	Of course solar is more expensive though I have not tried but people says they are inferior compared to what you have in developed nations	I believe solar is more expensive and the quality of products is not commensurate	Interviewees do not have experience of using solar but concluded it is more expensive than maintaining generator
9.	Would you embrace solar system against generator?	Yes if the cost is affordable	Until it becomes common that can be maintained easily	I have always preferred it to generators but it is not common	Interviewees have preference for solar but maintain reservations to using it
10.	Could you mention some of the environmental disasters you commonly know?	Desertification, flooding, drought and water borne diseases	Industrial pollution, flooding, global warming	Air and water pollution, rising temperature, desert encroachment	Interviewees generally have basic idea on environmental consequences of human action

11	How do you assess the content of your tenancy agreement on environmental sustainability and occupation	I believe when we effectively manage our property is also part of the environmental management	Well, my understand is that they are only concerned about their property not even the occupants let alone environment	My understanding of environmental sustainability is never captured anywhere in the tenancy agreement	There are no clear provisions of ensuring environmental sustainability in the tenancy contract
----	--	--	---	--	--

Source: field interview 2019

Quantitative Data

This section involves analysis of questionnaire distributed among occupant of Turaki Ali, the distribution was done in a systematic manner by stratifying the population based on floor level as presented table 3 below to give equal opportunity to occupants in all the floors to stand the chance of being selected at random, this conforms to quantitative sample selection methods in Bryman (2012). Questionnaires were administered in the following distribution

Table 3: Distribution of questionnaire administered

S/N	Item	Distributed	Returned	Percentage Response
1.	Ground floor	8	7	12.5%
2.	First floor	10	10	17.86%
3.	Second floor	10	7	12.5%
4.	Third floor	10	5	8.9%
5.	Fourth floor	10	6	10.71%
6.	Fifth floor	8	6	10.71%
	Total	56	41	73.18%

Source: survey 2019

Table 4: Source of power to compliment public power supply during outage

S/N	Item	SA	A	DA	SD	Mean	Ranking
1.	Solar system	2	3	30	6	2.02	3 rd
2.	Central generator	38	2	0	0	3.85	2 nd
3.	Individual Generator	36	5	0	0	3.88	1 st
4.	Biomass	0	0	28	13	1.68	5 th
5.	Wind energy	2	1	32	6	1.81	4 th

Source: survey 2019

Response from the survey in table 4 above revealed higher mean in favor of using individual and central generators as alternative sources of power, thereby affirming the themes generated from interview. Biomass and wind energy sources emerged the least slightly lower to solar energy. All the three alternative sources falls within the class of disagreement based on the four point rating scale adopted in the analysis of questionnaire thereby supporting Cicelsky (2009)

Table 5: Knowledge on solar system operations

S/N	Item	SA	A	DA	SD	Mean	Ranking
1	Have adequate knowledge on solar system operation through	3	1	29	8	1.98	4 th
2.	Through Formal Learning	3	1	37	0	2.17	3 rd
3.	Public campaign (Government and NGO)	0	9	30	2	2.17	3 rd
4.	Landlord briefs/strategies	0	1	21	19	1.54	6 th
5.	Production/Marketing companies	25	7	4	5	3.27	1 st
6.	Environmental practices	2	3	31	5	1.95	5 th
7	Media campaign	11	7	19	4	2.61	2 nd

Source: survey 2019

Table 5 above shows preference to using individual generators by most occupants and can be related to limited knowledge about the operation of solar energy system as seen table 5, thereby having limited confidence on the concept as reported thus supporting the findings in Limmeechokchai (2017) and likely to remain until proper enlightenment on the subject matter is pursued as a panacea to encouraging sustainable energy utilization. Such mobilization is currently handled by marketing and promotion companies with low participation from government and NGO despite the government recent pronouncement to encourage solar energy consumption. Landlord's brief and strategies towards embracing solar energy source is reported the least thereby portraying poor environmental management awareness and practice.

Table 6: Consequences of using generators

S/N	Item	SA	A	DA	SD	Mean	Ranking
1	Using central generator is cheaper than individual generator	13	10	7	10	2.59	4 th
2	Using solar system is more convenient than generator	22	7	9	3	2.20	8 th
3	Generators pollute the air	17	17	3	4	3.15	2 nd
4	Generators causes noise pollution	22	12	5	2	2.34	6 th
5	Generators are not environment friendly	5	15	11	10	2.37	5 th
6	Using individual generator negate sustainable building occupation concept	6	9	10	16	2.12	9 th
7	Protecting the earth is a collective responsibility	14	22	5	0	3.22	1 st
8	Global warming is caused by gaseous emission	16	16	8	1	3.15	2 nd
9	Our individual generators contribute to global warming	3	10	11	17	1.98	10 th
10	The use of individual generators is harmful to the property	5	7	22	7	2.24	7 th
11	Individual generators supply cables can ignite fire to the property when there is electric voltage leakage	4	32	3	2	3	3 rd

Source: survey 2019

Table 6 above report overwhelming agreement to protecting the earth by ranking first amongst variables, and have agreed that global warming is caused by gaseous emissions from various emission agent. Dangers of dandling cables conveying power from individual generators to offices is

ranking third among non-sustainable practices. Use of central generator is ranking fourth thus agreeing to central generating system as a means of reducing emission compared to individual generators. All generators are adjudge unfriendly to the environment by causing not just air pollution but noise pollution thus reporting that the use of generators is harmful to the property even though not strongly agreeing to the notion that the use of solar is more convenient than generators, and the use of individual generator is harmful to the property.

Table 7: Reasons for using generators against solar system

S/N	Item	SA	A	DA	SD	Mean	Ranking
1.	Cost of acquisition is low	29	9	4	0	3.68	1 st
2.	Cheaper Operating/maintenance Cost	8	12	14	7	2.51	3 rd
3.	Availability of Technology	15	16	7	3	3.05	2 nd
4.	Availability of technical support	10	31	0	0	1.78	5 th
5.	Environment friendly	7	5	20	9	2.24	4 th

Source: survey 2019

Table 7 above shows individual preference to using generator due to low cost of acquisition in addition to availability of technology for routine maintenance, availability of product and cheaper operational /maintenance cost compared to solar technology. Availability of technical support is reported as the least of reasons behind their decisions to use generators, while occupants of turaki Ali house rejected the assertion that using generators is influenced by availability of technical support and are environment friendly by ranking 5th and 4th respectively, this position may be related to their limited knowledge on pollution consequences as reported in Li and Yu (2016)

Table 8: Management effort towards achieving sustainable occupation

S/N	Item	SA	A	DA	SD	Mean	Ranking
5	There exist regulations guiding occupation of the premises as management policy	7	5	22	7	2.29	3 rd
6	The property managers undertake routine inspection to check user breach	2	4	12	23	1.63	7 th

7	Punishment are mated against breach during occupation as contained in agreement	3	11	21	6	2.27	4 th
8	Property managers do comply to their service agreement	3	3	18	17	1.80	6 th
9	Management is not proactive in embracing advancing solar system as alternative to solar	30	7	3	1	2.88	1 st
18	The tenancy agreement permits the use of individual generator	7	22	7	5	2.76	2 nd
19	Concept of sustainable building occupation is reflected in the tenancy agreement	3	5	30	2	2.17	5 th

Source: survey 2019

Table 8 above reports that managers of the property are agents to the landlord and therefore responsible as if they are owners. Respondents accepted the existence of regulation guiding their occupation but rejected that managers undertake routine inspection to check user breach; this can be corroborated by the presence of multiple dandling supply cables to various offices without minding the associated risk with it, no wonder the hesitation to supporting punishment on erring practice capable of subjugating sustainable occupation. The situation may be connected to the fact that the property managers themselves do not conform to their service agreement and would therefore have no moral justification to insist on total compliance by the occupants.

Management should take the lead and coordinate amongst the tenant but have not been proactive especially on solar system power supply knowing fully the central generator is out of use, yet, have failed to procure or introduce solar system as alternative energy supply. Respondent three of the interview conducted reported limited or no effort towards embracing the solar technology. Although there was a proposal from a solar technology company which never went beyond proposal. The use of individual generator in the building is not exclusively allowed by the tenancy agreement but is impliedly allowed by way of silence thus the rationale behind the responses from respondents that it is allowed in the tenancy agreement even though not in the real content of the agreement. Provision for sustainable building occupation in the tenancy agreement is almost rejected by the responses because the mean stood at 2.17 of the 4point rating scale thus tenants leveraging on lapses in the agreement and poor management practices by the management agent to promote ill-practices that are consequentially harmful to the property and users/occupants

Conclusion

Effort in seeking to establish knowledge and understanding of respondents about renewable energy source revealed that respondents have limited knowledge of renewable energy especially the solar system and the need for it, this has affected their practices as evidenced in their occupation of Turaki Ali House by littering around the premises with all kind of generators despite acknowledging the offensive noise and air pollution from generators during the day time, this finding supports the finding in (Tong & Zhang, 2015)

Acceptance and readiness to embrace the use of solar was queried by cost comparison between generator and solar system from acquisition through operation, all pointers from respondents geared towards generators without clear vigor to accepting solar systems as a better alternative source of power supply. Although, readiness to embracing solar system was shown, it was not without a condition being the need for qualitative solar systems components at comparatively affordable price or slightly cheaper than a generator of corresponding capacity, otherwise readiness cannot be backed by action especially that it is seen as moving from known to unknown.

Attempt to identify efforts made by the property managers to regulate tenants' occupation in line with sustainable building occupation standard revealed limited and vague guide having heavy reliance on tenancy agreement that is not explicit on sustainable building occupation guide, in fact related provisions to achieve sustainable building occupation are implied relative to individual interpretation and understanding. Breach of service responsibility by the property managers has negatively affected sustainable building occupation in the property due to failure in carrying out routine inspection, to identify faults and breaches in real property occupation which the managers are reportedly ineffective by the questionnaire responses this practice have fallen short of commercial property management requirement stated in (UCEM, 2018)

References

- Abdullah M A (2014) Climate change mitigation with integration of renewable energy resources in the electricity grid of New South Wales - Australia, *Renewable Energy*, 66: 305-313.
- Addy M. Nii., Adinyira E. & Ayarkwa Joshua. (2017) Developing a Building Energy Efficiency Assessment Tool for Office Buildings in Ghana: Delphic Consultation Approach, *Energy Procedia* 111 (2017) 629 – 638

- Bryman A., (2012) *Social Research Method* (4th edn), Oxford: Oxford University Press
- Chatzimouratidis A I (2015) Technological, economic and sustainability evaluation of power plants using the Analytic Hierarchy Process , *Energy Policy*, 37: 778–787.
- Cresswell J. W., (2014) “Research Design: qualitative, quantitative and mixed method Derringer B., Iyer M and Yu Joe Huang Y J (2004) “Transferred Just on Paper? Why Doesn’t the Reality of Transferring/Adapting Energy Efficiency and Standards Come Close to Potential”. *Proceedings of 2000 ACEEE Summer Study on Energy Efficiency in Buildings*, Pacific Grove.
- Environment Agency (2018) The state of the Environment: air quality. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/729820/State_of_the_environment_air_quality_report.pdf
- Felix Groba and Barbara Breitschopf (2013) Impact of renewable energy policy and use on innovation. <http://www.ssrn.com/link/DIW-Berlin-German-Inst-Econ-Res.html>
- Global Legal Insight Energy (2018). <https://www.globallegalinsights.com/practice-areas/energy-laws-and-regulations/nigeria>
- Ibrahim Y (2008) Global warming and renewable energy sources for sustainable development in Turkey, *Renewable Energy*, 33: 802.
- International Energy Agency (2018) “*Energy Efficiency Requirements in Building Codes, Energy Efficiency Policies for New Buildings*”, *Guidance Note*.
- Jailani J, Reed R, James K (2015) ‘Examining the perceptions of tenants in sustainable offices buildings’, *Property Management*, 33(4): 386-404.
- Johnson J (2002) *Indepth Interviewing: Hand book of Qualitative Research*. (pp. 103–119). California: Thousand Oaks.
- Joseph, I and Abraham, M. (2010). Implications of Building Energy Standard for Sustainable Efficient Design in Buildings, *International Journal of Energy and Environment*. Vol.1 /5, Pp 745-756.
- Kawuwa A.S, Sani A A, Mustapha S & Ishaku D D (2015) Development of Strategies for Sustainable Energy Efficient Building Codes in Nigeria, *International Journal of Scientific and Research Publications*, Volume 5, Issue 4.
- LEED <http://www.bu.edu/sustainability/what-were-doing/green-buildings/leed/>
- Legislative Research Commission (2009). “Energy-Efficiency Building Design and Construction. Research Memoranda 503”. Kentucky, USA
- Li C. & Yu W. (2016) Techno-economic comparative analysis of off-grid hybrid photovoltaic/diesel/battery and photovoltaic/battery power systems for a household in Urumqi, China *Cleaner Production*, 124 (2016), pp. 258-265
- Meir I. A., Garb Y., Jiao D. & Cicelsky A. (2009) Post-occupancy evaluation: an inevitable step toward sustainability. *Advances in Building Energy Research* 2 (3) 189–220.
- Merriam S B & Associates (2002) *Qualitative Research in Practice: Examples for Discussion and Analysis*. San francisco: Jossey Bass Publishers.

- Mulaudzi S K, Muchie M & Makhado R (2012) Investigation of the solar energy production and contribution in South Africa. *African Journal of Science, Technology, Innovation and Development*, 44:233–254.
- Nipunika Perera, Emily Boyd Gill Wilkins & Ruth Phillips Itty (2015) Literature Review on Energy Access and Adaptation to Climate Change. www.ICFSecretariat@DFID.gov.uk
- Prachuab Peerapong, Bundit Limmeechokchai (2017) Optimal electricity development by increasing solar resources in diesel-based micro grid of island society in Thailand, *Energy Reports*. www.sciencedirect.com/science/article/pii/S2352484716300634
- Roman Günter Votteler & Alan Colin Brent (2016) A literature review on the potential of renewable electricity sources for mining operations in South Africa, *Journal of Energy in Southern Africa Vol 27 No 2*
- Steinar K (2007) *Doing Interviews (First Edit.)*, London: Sage Publication.
- Tamaraukuro T. A., Jubril A. & George B. (2017) Development of a building performance assessment and design tool for residential buildings in Nigeria, *International High- Performance Built Environment Conference – A Sustainable Built Environment Conference 2016 Series (SBE16), iHBE 2016*, www.sciencedirect.com
- UCEM (2018) Commercial Property Management, Reading: The College of Estate Management.
- United Nations (2014) World Population to 2030. www.un.org/esa/population/publications/longrange2/longrange2.htm.
- Zheming Tong, K. Max Zhang (2015) The near-source impacts of diesel backup generators in urban environments, *Atmospheric Environment* 109 (2015) 262e271 [www. http://scholar.harvard.edu/files/ztong/files/final_paper.pdf](http://scholar.harvard.edu/files/ztong/files/final_paper.pdf)