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The Use of Polyvinylchloride (PVC) Claddings and Polystyrene Wall Panels as Alternative Building Materials to Wood: A Strategy to Combat Climate Change

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Abstract

Unprecedented variations in climate are currently being experienced all over the world and Nigeria is not an exemption from this global trend. Generally, researchers have pointed to human activities as the major contributor. The paper evaluates occupants' perception and acceptability of Polyvinylchloride (PVC) claddings and Polystyrene wall units as substitutes for wood based products at Royal Estate in Lagos. This paper also examines alternative building materials as a remedy to deforestation in building construction activities in Nigeria with a view to highlighting their mutilating effect on climate change. A total of 20 dwelling units were studied; using Post Occupancy Evaluation (POE) research method. Results show that 90% of respondents rated as "good" their level of acceptability and awareness of these materials while quality and durability were rated equally as "good" by 75% of total respondents. From the general high level of acceptability of Polyvinylchloride (PVC) claddings and Polystyrene wall units, if popularized could serve as alternative building materials. This may reduce the dependence on wood, which could therefore mitigate against the negative impact of climate change. Government has been advised to make and implement reforestation policies so that trees could serve as carbon sink.

Key words: Alternative building materials; Climate change; PVC; Polystyrene; Human factors

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INTRODUCTION

Climate change sounds like an abstract phenomenon to Africa some years back, but latest trend of events have shown that it is real and it is a threat to the human environment. According to Akinola (2012) in West Africa, in 2010, the number of people that died due to flood resulting from climate change was highest in Nigeria with (118), followed by Ghana (52), Sudan (50), Benin (43), Chad (24), Mauritania (21), Burkina Faso(16), Cameroon (13), Gambia (12), with other countries reporting less than 10 dead. Similarly, about 1.5milion people were affected: most of them in Benin (360,000), followed by Nigeria (300,000), Niger (226,611), Chad (150,000), Burkina Faso (105,481), Sudan (74,970) and Mauritania (50,815). Other countries had less than 50,000 people who suffered from floods. The floods resulted in cholera epidemics which claimed 1,182 lives in Nigeria, followed by Cameroon, Niger and Chad (UN Office for the Coordination of Humanitarian Affairs, 2010). The floods of 26th and 27th August 2011 that devastated most of the city of Ibadan and environs claiming over 100 lives, rendered thousands homeless and destroyed property worth billions of Naira is another consequence of climate change. The major areas affected include; Odo-Ona, Odo-Ona Elewe, Orogun, Agbowo, Apata, Ajibode, University of Ibadan, Ogbere-Babanla, Ogbere- Moradeyo, Onipepeye and Eleyele Dam/Water Works (OYOSG, 2011). Similarly, the floods of July 2011 that swept across Lagos and claimed over twenty lives, rendered many homeless and ravaged other parts of Southwestern Nigeria is another

pointer to the eminent threats of Global climate change (Oladele, 2011; Vanguard, 2011; Thisday, 2011, Akinola, 2012). Akinola (2012) noted further, that the National Emergency Management Agency (NEMA) described the floods that emanated from the rainfall in Lagos as the most devastating in recent times. NEMA carried out on the spot assessment and noted that the devastation resulted from the down pour, exacerbated by blockage of water channels and drainages, indiscriminate dumping of refuse and building of houses on the flood plains (Stearns, 2011). Kalu (2011) reported that it rained for 17 hours while the Nigerian Institute of Oceanography and Marine Research also corroborated that the 264 milimeters rainfall recorded in a day was equal to the volume expected for one full month (Akinola, 2012).

Research holds human activities responsible for climate change and its consequences on the human environment (Gasu, Gasu, & Ntemuse, 2010a). Man through his activities in the quest for survival and technological advancement has engaged various environmental planning and developmental strategies which have altered the state of equilibrium in the environment. These activities make use of environmental resources as raw materials and they change the ecosystem which ultimately changes the climatic settings of the environment. Researchers have noted that urban populations in Africa are growing at 3.6 % per year (the highest among world regions) (United Nations, 1994; Cohen, 2004). Urbanisation leads to the erection of structures such as houses and roads as well as the replacement of greenery with concrete, asphalt and steel at the expense of agricultural land and forest. These surfaces are known for their heat conduction, radiation and reflection which increase global temperatures which build up in addition to other human activities which generate carbondioxide and methane which induce climate change (Akinola, 2012).

Global concerns such as environmental protection, climate change, poverty alleviation and sustainable development have been identified by scholars to be the consequence of the growing disparity between population growth (at geometric rate) and resources dvelopment (at arithmetic rate). The quest to develop has increased the tempo and magnitude of degradation of the earth's resources due to the intensified activities of drivers of technological advancement, civilisation and economic development that legitimately demand the mining and burning of fossils fuels, the destruction of forest and agricultural land for highway and industries, and the release of effuellents from industrial and agricultural processes. The uncontrolled and unregulated drives to fufill these developmental agenda has resulted in the release of large quantities of greenhouse gases into the atmosphere. Most researchers have intricately linked environmental degradation with poverty as industrial impacts represent socio economic sponges that soak the welfare of people at local level (Geist & Lambin, 2001; 2004; Williams, 2003; Seto & Kaufman, 2003; Akinola, 2012).

According to Minter and Wheeler (2009) quoted in Akinola (2012), estimate, shows that the entire African continent was responsible for only 3.7% of the worlds annual CO_2 emmission, compared to China with 21.5%, the United States with 20%, and the European Union with 14%, inspite of the fact that African forests absorb 20% of world's carbon. Comparatively, from 1980 to 2005, sub-saharan Africa had 18.5% of the world's population growth and contributed just 2.6% of CO_2 emissions, the United States and Canada had 4% of world's growth but its share of CO_2 emissions was 13.9% while China had 15.3% of world's population growth and contributed 44.5% of CO_2 emissions, though the contribution of high-income nations is under stated (Satterthwaite, 2009).

The United Nations Framework Convention on Climate Change 1992 defines CC as "a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time period" (UNEP, 2002). Nigeria is not left out of the countries facing the threat of climate change; effects of climate change include disruption in rain seasonal cycles which affects agriculture, water needs and supply, flooding and food production. Global warming has also led to sea-level rise with its attendant consequences, which includes; fiercer weather, increased frequency and intensity of storms, floods, hurricanes, droughts, increased frequency of fires, poverty, malnutrition and other health and socio-economic consequences (Gasu et al., 2010a; Fadare, Gasu, Gasu, & Eleghasim, 2010; Akinola, 2012). Global warming refers to an increase in average Global temperature above the normal variations as a result of the greenhouse effect, while Climate Change (CC) is the consequence of the release of greenhouse gases into the atmosphere by inconsiderable activities of man on the environment, which in turn create the enhanced greenhouse effect by an increase in the earth's average temperature (Gasu et al., 2010a). It has a cumulative effect on natural resources and the balance of nature. As the atmosphere absorbs heat energy it warms the oceans and surface of the earth (Schneider and Londer, 1984). According to Pachler (2007) for us to understand why global warming occurs, it is important to know that our atmosphere, which is made up of gases like nitrogen, oxygen and carbon dioxide as well as water vapour has a profound influence on earth surface temperatures. These greenhouse gases; 'blanket' heat, thus reducing the amount of heat (long wave radiation emitted by the earth's surface) that escapes back to space (Gasu et al., 2010a).

The concentration of greenhouse gases in the atmosphere needs to be reduced if we want to reduce the impact of climate change. Deforestation is one of the factors contributing to global warming, and is often cited by researchers as one of the major causes of the enhanced greenhouse effect. According to the Intergovernmental Panel on Climate Change, deforestation mainly in

tropical areas, could account for up to one-third of total anthropogenic carbon dioxide emissions (Schneider, 2009). Trees and other plants remove carbon (in the form of carbon dioxide) from the atmosphere during the process of photosynthesis and release oxygen back into the atmosphere during normal respiration. The amount of carbon removal by photosynthesis is affected by deforestation. Tropical deforestation is responsible for approximately 20% of world greenhouse gas emission (The Guardian, 2010).

The proposition that housing suffers deficit qualitatively and quantitatively has been discussed extensively by researchers, however, the fact remains that the creation of shelter is a continuous process owing to the ever increasing population, inflated real estate values, activities of speculators, influx of immigrants, cost of construction materials, shortage of facilities and services, design, noise, sewage, drainage, waste and disposal problems; environmental problems, advancement in technology and lack of planning just to name but a few (Onibokun, Wahab, & Adeniji, 1981; Olayiwola, Adeleye, & Ogunshakin, 2005b; Olotuah, 2006; Ademiluyi, 2010; Gasu, Fadare, & Olayiwola, 2010b; Olayiwola, 2012). Urban planning amongst other things involve conservation of natural resources and the provision of physical and social infrastructure to raise the living standards of people living in specific regions. Therefore, plans are drawn up with the inhabitants as the focal point. In other words, planning revolves around creation of shelter, which allows man to function effectively in his environment. Construction involves the use of flora in the ecosystem; mature trees are cut and processed into different sizes for various construction purposes.

Global warming will continue to threaten our environment if steps are not taken to change traditional methods of construction that depend on forest products. Alternative construction materials which are sustainable and environmental friendly should be embraced to address climate change. Polyvinyl Chloride (PVC) claddings and polystyrene wall panels are examples of such materials which are cheap, easy to cut, light weight, easy to install, replace, does not need painting and can be cleaned by powder washing (Ed Plastics, 2007; Cubic Homes, 2007). The objective of this study was to evaluate the performance of polyvinyl chloride (PVC) cladding and Polystyrene panels as alternative building materials with a view to combating climate change.

1. CONCEPTUAL FRAMEWORK

1.1 Climate Change

Climate can be defined as the average weather in a region over a period of say 30 years. The word climate comes from the Greek *klima,* referring to the inclination of the sun. Climate is influenced by the complex structure and composition of the atmosphere and by the ways in which the atmosphere and the ocean transport heat. Thus, for any given area on earth, not only the latitude (the sun's inclination) must be considered but also the elevation, terrain, distance from the ocean, relation to mountain systems and lakes, and other such influences (Pachler, 2007). The Climate system of a given area has certain composition of gases that determine the macro climate of the area. It can also be said to be the long-term effect of the sun's radiation on the rotating earth's varied surface and atmosphere. It can be understood most easily in terms of annual or seasonal averages of temperature and precipitation (Pachler, 2007).

Gasu et al. (2010a) identified a number of policy responses to combat the looming climate change problem which include: the United Nations Framework Convention on Climate Change, the United Nations Convention to Combat Desertification, Intergovernmental Panel on Climate Change (IPCC, 1988) and Kyoto Protocol (1997) just to mention but a few. Similarly, a number of local content legislations have equally been enacted in Nigeria to combat CC amongst which include; the first legislation on Gas flaring: Petroleum (Drilling and Production) Regulation 1969 Reg. 42. The next important but short-lived legislation was the Associated Gas Re-Injection Decree 1979 promulgated by the military regime of General Olusegun Obasanjo's administration, which specifically required oil companies to: submit preliminary program for gas re-injection, a period within which to cease gas flaring; and prescribed a penalty for contravention of the Decree. The Associated Gas Re-Injection (Amendment) Decree promulgated by Major General Buhari administration amended the 1979 Decree to permit companies engaged in the production of oil and gas to continue to flare on the payment of a prescribed fee (Gasu et al., 2010a).

Akinola (2012) while quoting Umejei (2011) observed that the passage of the National Climate Commission bill which Nigeria's Head of State is yet to sign into law, is expected to enable Nigeria access the climate fund of $200 billion that the industrialized nations had agreed to make available annually up to 2020 at the 16th Conference of Parties (COP16) in Cancun, Mexico. In the light of the above, COP17 of the United Nations Framework Convention on CC that held in Durban, South Africa, from November 28 to December 9, 2011, sidelined Nigeria's active participation because of lack of Climate Change Commission. Other responsibilities of the Climate Change Commission include; strengthened and coordinating resources, policies and actions on the climate change, such as developing a national strategy for the reduction of Green House Gas emission and advising the Federal Government on climate change policies and priorities in the areas such as renewable energy, technology transfer and transport management. The bill also stipulates that 10 % of Ecological Funds and

certain percentage of the Consolidated Revenue Account will be given to the Commission for the discharge of it duties (Umejei, 2011). All these are critical issues that are beyond the capability of a ministry and only a commission can address (Akinola, 2012).

1.2 Deforestation

This is the clearance of forest by logging or burning for different purposes that range from farming to road and building construction. Continuous growth in population has increased the pressure exerted on forest through human developmental needs such as evolving families with increasing housing needs and infrastructural facilities. Mature trees remove carbon dioxide from the atmosphere through carbon sequestration but the decay and burning of wood release much of this stored carbon back to the atmosphere. Deforestation particularly for construction purpose may cause carbon stored in soil to be released into the air there by increasing the atmospheric carbon concentration. Conservation of forest demands the use of alternative materials that serve as substitute for wood.

1.3 Alternative Building Materials

Researchers have invented and developed alternative building materials that will be helpful in saving our precious forest and environment efficiently and economically from degradation and deforestation. These materials have been proven to be good substitutes for wood used in construction of door shutters, frames, false ceiling, interior wall partitions and similar applications. Increasing human population particularly in Nigeria has led to increasing demand for building materials to meet housing needs both in rural and urban areas. Traditional building technology methods use sandcrete blocks, reinforced concrete, timber and steel as materials. Modern methods and technology embrace the use of alternative construction materials fuelled by development in technology as substitutes for traditional construction materials.

Recently, Polyvinylchloride (PVC claddings) and Polystyrene wall units which are both products of plastics have been embraced as alternative building materials by Engineers, Builders, Architects and Planners because their physical and chemical properties meet latest construction requirements. Berrad (2005) defined plastics as materials made up of large, organic (carbon-containing) molecules that can be formed into a variety of products. The molecules that compose plastics are long carbon chains that give plastics many of their useful properties. In general, materials that are made up of long, chainlike molecules are called polymers. Plastics have a lower density than metals, so plastics are lighter. Most plastics vary in density from 0.9 to 2.2 g/cm^3 (0.45 to 1.5 oz/cu in), compared to steel's density of 7.85 g/cm^3 (5.29 oz/cu in) (Berrad, 2005). Plastics can also be reinforced with glass and other fibres to form strong materials. Out of the different types of plastics that exist, this paper will focus on polyvinyl chloride claddings and polystyrene wall panels.

1.4 Polystyrene

Polystyrene is an aromatic polymer from the monomer styrene, a liquid hydrocarbon that is commercially manufactured from petroleum (Olawuyi & Babafemi, 2009). Polystyrene has been used extensively in industries, for the manufacturing of electrical and mechanical materials and it is now used in building construction.The two raw materials required for the production—which can be found locally—are galvanized steel and polystyrene beads (Cubic Homes, 2007). They are made into light prefabricated panels that come in various shapes based on the architecture of the building. Its light weight, allows easy handling of the panels through all work phases: from the production to the installation, which can be carried out manually by workers. Erection of panels is achieved by simply standing the polystyrene end to end and fastening them to each other and to the starter bars in the floor by using binding wire. Then with a spirit level, they are made plumbed and temporary bracing are fixed before the concrete is sprayed on the required surfaces (Cubic Homes, 2007).

1.5 Polyvinyl Chloride (PVC)

Polyvinyl chloride is a synthetic material made by polymerizing vinyl chloride; it is lightweight, durable and waterproof. Chlorine atoms bonded to the carbon backbone of its molecules give PVC its hard and flame resistant properties (Berrad, 2005). Wall claddings can be simply defined as the act of wrapping wall surface(s) with another material. Claddings also serve as protective shield for wall(s). Claddings provide a weathered shell which protects and strengthens a building; claddings can also make a building look aesthetically appealing (Alan, 2007).

A wide range of materials are available today due to improvements in technology and materials research. This presents today's architects, builders, planners and engineers' options to choose from when selecting materials for cladding depending on the function the intended space will perform. Polyvinyl chloride (PVC) claddings is known as a cheap siding material that is easy to cut, install and replaced as necessary. Vinyl siding is available in a wide array of colours, and is sold according to the thickness and durability required. This material does not need to be painted, and the only maintenance needed is cleaning via powder washing when necessary, typically every year or twice as illustrated in Table 1 (Ed Plastics, 2007).

There are various alternative construction materials that can substitute for wood as wall partitions, furniture and fittings. The types discussed in this paper (polystyrene and pvc claddings) are not the only ones in existence, but these ones are studied with the aim of carrying out Post Occupancy Evaluation (POE) on buildings where these materials were used extensively. Post Occupancy Evaluation (POE) constitutes a comprehensive approach to evaluating buildings. Traditionally POE goes through three levels which are: indicative, investigative, and

diagnostic (Preiser, Rabinowitz, & White, 1988; Zubairu, 2012). The first level of POE is the indicative which is carried out in a short period of time to determine whether there are serious problems in the building. The second level is the investigative POE which is carried out after an indicative POE has identified issues that need further investigation. The third level is the diagnostic POE which may take from several months to a year and the results are long-term oriented to improve not only a particular facility but also the state of the art of a given building type (Zubairu, 2012). This approach is important because it gives an assessment of the materials' performance as alternative building materials from the occupants' point of view.

Table 1
Shows PVC Claddings Characteristics Compared With Other Building Materials

Characteristics	Wood	Aluminium	steel	Pvc cladding
Cost	Expensive	Expensive	Cheap	On par with wood and aluminium
Corrosion	Good	Fair	Poor	Excellent
Durability	Good	Fair	Poor	Excellent
Thermal conductivity	Nil	High	High	Nil
Chemical resistance	Rots	Corrodes	Corrodes	No effect
Surface finish	Good	Good	Poor	Excellent
Installation period	Long	Short	Long	Very short

Source: Ed Plastics, *Technical Installation Bulletin*, 2007.

2. RESEARCH METHODOLOGY

This study was based on the indicative Post Occupancy Evaluation method of research, owing to the fact that the study area is a new residential estate. A total of 20 questionnaires were administered on respondents in a systematic random sampling manner at Royal Estate located at Obafemi Awolowo Way, Ikeja, and Lagos. The Estate which was purposively selected as a modern residential estate built with Polyvinyl chloride (PVC) claddings and polystyrene wall panels with a typical floor plan design. A typical block has 4 units of 4 bedroom duplex apartments. It has a total of 20 blocks in all, totalling 80 dwelling units and one dwelling unit per block was selected systematically for sampling. Systematically, beginning from block1, flat1 was picked, in block 2 flat 2 was picked, in block 3 flat 3 was picked, in block 4 flat 4 was also picked, in block 5 now flat 1 was picked and it continued in that order until all the twenty blocks were covered totalling 20 selected flats. Questionnaires were administered systematically in the same manner described above on each household head in each selected flat. This approach was chosen because it guides the researchers through responses of the users' (occupants) and other evaluation techniques to assess the appropriateness and performance of alternative building materials which if embraced can serve as an antidote to deforestation that aggravates climate change. Observations and walk through were the first approach used to obtain other data in the estate. An official application was sought and obtained from the facility managers (Sanderton Nig. Ltd) to carry out this exercise. Data analysis made use of descriptive and inferential Statistics.

Figures 1, 2 and 3 show gate house, PVC claddings on exterior walls and block of flats respectively at the Royal Estate.

Figure 1
Gate House View of Estate

Figure 2
Side View of Estate With PVC Claddings

Figure 3
Front View of a Typical Block of Flats in the Estate
Source: Authors' fieldwork, 2010.

3. RESEARCH FINDINGS

Table 2
Socio-Demographic Background of the Respondents

Age	Frequency	Percentage
20-30	12	60.0
30-50	8	40.0
Total	20	100.0
SEX	Frequency	Percentage
Male	13	65.0
Female	7	35.0
Total	20	100.0
Level of education	Frequency	Percentage
Non formal education	0	0.0
Primary	0	0.0
Secondary	4	21.1
Tertiary	15	78.9
Total	19	100.0
Duration of occupancy	Frequency	Percentage
Less than 2 months	2	10.0
6 months	5	25.0
More than 6 Months	9	45.0
More than one year	4	20.0
Total	20	100.0

Source: Authors' fieldwork, 2010

Results in Table: 2 show that, 60% of the total respondents were between 20-30 years, while the remaining 40% were between 30- 50 years old. Out of all the people interviewed, 65% were males while 35% were females, and the level of education of the participants shows that 21.1% of the respondents had secondary education while 78.9% of the participants had tertiary education. The results of these analyses also reveal that, respondents with less than 2 months of occupancy were 10% of all the participants, those with up to 6 months of occupancy made up 25%, participants with more than 6 months of occupancy made up 45% while the remaining 20% of all the respondents had more-than-one-year occupancy.

Cross tabulation analysis was carried out to understand the level of awareness of PVC cladding and polystyrene wall panels among the occupants duration of occupancy and used as explanatory variable. The results of the analysis and graphical illustrations are shown in Figure 4.

Figure 4
Level of Awareness of PVC Claddings and Polystyrene Wall Units Among Respondents
Source: Authors' fieldwork, 2010

Figure 1 shows that 30%,10% and 5% with more than 6 months of occupancy (total 45%) rated their awareness of the use of PVC claddings and polystyrene wall units and finishes as good, excellent and fair respectively. Respondents with up to 6 months of occupancy (25 % of total), gave their ratings as follows; 20% considered it as good while 5% considered it as fair. In the same vein, respondents who had less than 2 months of occupancy (10 % of total) rated PVC claddings and polystyrene wall units as good. Similarly, 10% of respondents who had more than one year residency (20 % of total) in the Royal Estate gave their views as excellent while 10% considered it as good with none of the respondents being indifferent.

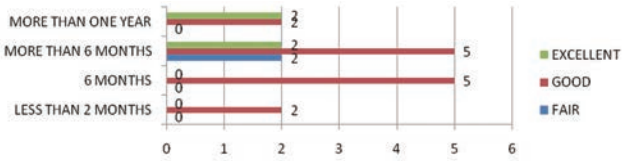

Figure 5
Respondents Views on PVC Claddings and Polystyrene Wall Panels as Building Materials
Source: Authors' fieldwork, 2010

Figure 5 show occupants with more than 6 months of occupancy which represents 45% of total respondents rated PVC attractiveness as follows; 25% considered it good, 10% rated it excellent while10% rated it as fair. In the same vein 25% of respondents who had up to 6 months occupancy (25% total) rated PVC claddings and polystyrene wall units attractiveness as good. Ten percent of respondents who had less than 2 months of occupancy (10% total) gave their ratings as good. Similarly, 20% of total respondents who had lived in Royal Estate for more than a year considered PVC claddings and polystyrene wall unit's attractiveness as excellent (10%).

Respondents' preferences for non-wood based building materials particularly polyvinyl chloride claddings and polystyrene wall panels were sought using duration of occupancy of the respondents as a variable. The results of

the analysis (Figure 6) shows that occupants with more than 6 months of occupancy (45%) of total respondents stated their preference as follows: 66.6% were affirmative, 22.2% were on the negative side while 11.1% of respondents were indifferent.Twenty five percent of total respondents with 6 months of occupancy gave their ratings as follows; 10% gave preference to it, 10% were negative while 5% were indifferent. Ten percent of respondents who had lived in these houses for more than a year (20% of total) were indifferent while 5% were on the negative side and the last 5% were affirmative. This position of the respondents may be due to the fact that these materials are relatively new in the Nigerian construction industry.

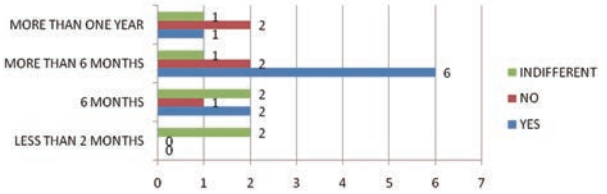

Figure 6
Respondents' Preferences for Non-Wood Based Building Materials Particularly Polyvinylchloride Claddings and Polystyrene Wall Panels
Source: Authors' fieldwork, 2010

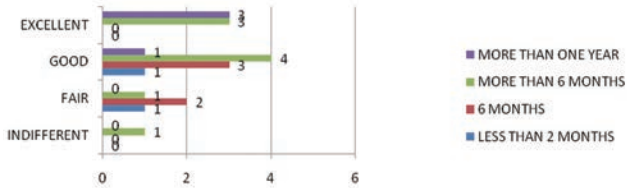

Figure 7
Respondents Rating of PVC Claddings and Polystyrene Wall units .
Source: Authors' fieldwork, 2010

Results in Figure 7 shows that out of the occupants with more than 6 months of occupancy 15% considered the quality of PVC claddings for external wall finishes as excellent, 20% considered it good, 5% rated PVC claddings as fair while 5% were indifferent. Among the 25% of total respondents who had 6 months of occupancy, 15% rated PVC claddings as good, 10% rated it as fair. Results show further that 5% of respondents who had less than 2 months of occupancy (10 % of total respondents) rated PVC as good while 5% rated it as fair. Twenty percent of total respondents who had lived in these houses for more than a year rated the quality of PVC claddings and polystyrene wall units as alternative construction materials as follows: 15% rated PVC cladding as excellent, 5% rated it as good while 5% rated it as poor.

CONCLUSION AND RECOMMENDATIONS

The research shows that occupants' level of awareness of PVC claddings and polystyrene wall units was good, as 90% of respondents responded positively to the question. We can infer from these results that occupants of this estate are aware and conscious of the materials used. Occupants were equally satisfied and commended PVC claddings and polystyrene wall units' aesthetic appeal where (70%) and (20%) rated it as excellent and good respectively. Although some respondents were impressed with PVC claddings, majority expressed their preferences for traditional building materials to PVC claddings, which may be due to the fact that PVC claddings were new and only time and its performance, will make it credible. Colour retention of PVC claddings was highly commended by occupants as only one respondent rated it as poor, while 85% of respondents rated it as durable. PVC claddings installation takes place by fixing trims around the periphery of the area to be clad followed by installation of the cladding strips; which makes maintenance access to walls easy. The overall quality of PVC claddings as exterior and interior wall finishes were rated as good (75 % of total occupants), though the use of PVC claddings as interior wall finishes was preferred by occupants when compared with exterior wall finishes.

Aggressive sensitisation should be embarked upon by the National Orientation Agency (NOA) and other Government agencies on information dissemination on the reality of climate change in Nigeria and the use of PVC as alternative to wood. The immediate and remote effects should be highlighted and explained to the populace. Government through policy statement and political will should discourage deforestation, to conserve the forest and encourage reforestation. Alternative construction materials that may reduce the pressure on forest-based products should be given adequate attention which could persuade the construction practitioners in Nigeria accept and trust their ability to serve as substitutes for wood-based products which may go a long way to reduce the impact of climate change. Finally, the National Climate Commission bill which Nigeria's Head of State is yet to sign into law needs to be speedily addressed as it is short changing the nation from accessing the Global Ecological Funds which is meant to provide measurable and practical solutions (projects) towards reducing the negative impact of climate change.

REFERENCES

Ademiluyi, I. O. (2010). Public housing delivery strategies in Nigeria: A historical perspectives of policies and programmes. *Journal of Sustainable Development in Africa, 12*(6), 153-161.

Akinola, S. R. (2012). Climate change, urban degreening and knowledge mangement in Nigeria: Migating flood through polycentric planning and urban greenery strategy (PPUGS). In *Procs. of Climate Change and ICT Conference* (pp.70-107). Okuku Campus, Osun State, Nigeria.

Alan, E. (2007). *Mitchell's building construction series* (pp.38-60). London: Bradford Ltd.

Berrad, M. T. (2005). *Polyvinyl chloride (PVC) Claddings handbook*. Hansen Valley.

Cohen, B. (2004). Urban growth in developing countries: A review of curent trends and a caution regarding existing forecasts. *World Development, 32*(1), 23-51. Retrieved from www.elsevier.com/locate/worlddev.

Cubic Homes Ltd. (2007). Product specification manual.

Ed Plastics.co.uk (2007). *Technical installation bulletin* (No.4).

Fadare, S. O, Gasu, M. B, Gasu, G. N., & Eleghasim, I. C. (2010). Climate change and wetlands resource utilisation, a critical appraisal. *Ife Journal of Environmental Design and Management, 4*(1), 1-13.

Gasu, M. B., Fadare, S. O., & Olayiwola, K. O. (2010b). Rural housing needs and responses: Challenges and prospects in Nigeria. *Urban and Regional Planning Review*, *2*(1&2), 41-50. Akoka Lagos: University of Lagos.

Gasu, M. B., Gasu, G. N., & Ntemuse, U. E., (2010a). International and national policy responses to combat climate change. *Journal of Applied and Environmental Science, 6*(2), 74-84.

Geist, H. J., & Lambin, E. F. (2001). What drives tropical deforestation? A metal-analysis of proximate and underlying causes of deforestation based on subnational case study evidence. *LUCC Report Series, No.4*. Louvain-la-neuve, Belgium: LUCC International Project Office, International Geosphere- Biosphere Programme.

Geist, H. J., & Lambin, E. F. (2004). Dynamic causal patterns of desertification. *BioScience*, *54*(9), 817-829.

Kalu, U. (2011, July 15). Lagos floods: Residents, senate blame Fashola, Johnathan. Retrieved from http://www.vanguardngr.com/2011/07/lagos-floods-residents-senate-blame-fashola-janathan/

Minter, W., & Wheeler, A. (2009, October 29). Climate change and Africa's natural resources: African governments and outside powers must be accountable, Issue 455. Retrieved from http://pambazuka.org/en/categoty/feature/59823

Nigerian Environment as Senate considers climate bill. (2009, June 7). Retrieved from http://allafrica.com/stories/2009.06.09 0089 html

OCHA (UN Office for the Coordination of Humanitarian Affairs). (2010, October 10). 377 dead in West and Central African Flood. Retrieved from http://www.googl.com/hostednews,afp/article/ALegM5gFc1QX6Okk9H7MTgFaurC0bJMQ?docld=CNG.5ad543ce839fb7c75ade44a2db5fb0eb.b31

Oladele, B. (2011, September 1). 102 died in Ibadan floods. *The Nation* (p.1).

Olawuyi, B. J., & Babafemi, A. J. (2009). Performance of Polystyrene Wall Units. *Ife Journal of Environmental Design and Management, 2*(2), 54-59.

Olayiwola. L. M. (2012). The journey through the corridor of housing. *252 inaugural lecture series of Obafemi Awolowo University* (pp.25-29). Obafemi Awolowo University Printing Press.

Olayiwola. L. M., Adeleye, O. A., & Ogunshakin (2005b). Urban Housing Crisis and Responses in Nigeria: The Planners View Point. In *Proceedings of the XXXIII IAHS (International Association for Housing Science) World Congress on Transformation Housing Environments through the Design, Pretoria, South Africa* (pp.1-10).

Olotuah, O. A. (2006,). Housing quality in Suburban Areas (an empirical study of Oba-Ile, Nigeria). *Demensi Teknik Arsitekur*, *34*(2), 133-137.

Onibokun, A. G., Wahab, K., Adeniji, E. A. (1981). Rural housing in Southern Nigeria: Technical report prepared for the Nigerian Institute of Social and Economic Research (NISER).

Oyo State Government (OYSG). (2011, November). Assessment of August 26th 2011 flood disaster in Ibadan Metropolis: Report of the Task Force on Flood Prevention and Management. Ministry of Physical Planning and Urban Development, Ibadan.

Pachler, K. Building Nigeria response to climate change. Country Reports 2007.

Preiser, W., Rabinowitz, H., & White, E. T., (Eds.). (1988). Post occupancy evaluation. New York, Van Nostrand: Reinhold Co.

Satterthwatite, D. (2009, December). Big emitters: How growth in consumption drives climate change Briefing. The International Institute for Environment and Development (IIED), London.

Schneider, S. H., & Londer, R. (1984). *The coevolution of climate and life, Sierra Club Books* (pp.363-365). San Francisco.

Schneider, S. H. (2009). Global warming. In W. A. Redmond (Ed.). *Microsoft Encarta* (DVD). Microsoft Corporation.

Seto, K. C., & Kaufman, R. K. (2003). Modeling the drivers of urban land use change in the Pearl River Delta, China: Integrating remote sensing with socioeconomic data. *Land Economics,* 79(1),106-121.

Stearns, S. (2011, July 14). Lagos governor orders demolition of ilegal buildings. Retrieved from http://www.voanews.com/english/news/africa/lagos-Governor-orders-Demolition-of-ilegal-Buildings-125481883.html

The Guardian Newspaper. (2010, September 13, p.52).

Thisday Newspaper. (2012, June 29). Lagos groans as floods wreck havoc (p.1).

Umejei, E. (2011, July 22). *Nigeria's climate change commission still a mirage*. Retrieved from http://www.independentngonline/Dailyindependent/Article.aspx?id=37571 (accessed 22/07/2011).

UNEP, (2002). *Handbook of environmental law* (pp.80–84). Hartfordshire, UK: UNEP Publication.

United Nations (U.N) (1995). World urbanisation prospects: The 1994 revision. U. N., New York: population division.

Vangurd. (2012, June 29). *Seven feared dead as floods sweeps Lagos* (p.1).

Williams, M. (2003). *Deforesting the earth: From prehistory to global crisis*. Cambridge, U. K: Cambridge University Press.

Zubairu, S. (2012). The importance of evaluation and sustainability in the built environment. In: Laryea, S. *et al* (eds*) Procs. of the 4th West Africa Built Environment Research (WABER) Conference,* 24-26 July 2012, Abuja, Nigeria, pp.9-13.