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ENVIRONMENTAL SUSTAINABILITY: CLAY SOLUTION TO HIGH COST OF BUILDING MATERIALS IN CONSTRUCTION INDUSTRY

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ABSTRACT: *The objective of this paper is to identify the social, economic and environmental sustainable significant of clay as a building material in the construction industry. Building materials are considered the largest input in any building project therefore, has a great influence on the total cost of any projects. High cost of projects calls for in co-opting clay products in most past and present building projects. The research is aimed to identify significant of clay as solution to high cost of building materials in the construction industry. The research was carried out in suitable civil and building construction companies in Katsina, Kano and Kaduna states in Northern Nigeria. The research findings reveled that economic factors has the highest significant as sustainable building materials in the construction industry.*

Keywords: Building Industry, Building Materials, Economic, Environmental, High Cost**,** Clay.

Introduction

Clay, known as the oldest environmental friendly building materials, can easily be re-cycled in different forms, have low energy consumption low toxicity in production and applications. Building professionals have the responsibility to ensure that clay products are used as environmental friendly and sustainable building materials. This is part of construction, environmental designers and materials sciences. One of the main aim of Millennium Development Goals is to provide friendly environmental sustainable infrastructures. It is evident that environment is adversely affected, trees are. cut down bushes, grass is cleared, and soils are excavated randomly while construction activities generate noise and environmental pollution (Gonchar, 2007).

Clay products has been the most widely known and used as building materials in construction industry, successfully used as sustainable building materials in various aspects of civil and building construction projects.(Abdurrahman, 2010). United Nation Centre for Human Settlements stated that, about half of the world's populations are still living in clay buildings mostly in Africa and Asia. The materials are economically effective, easy to work, mostly abundant universal and inexpensive, it reduce transportation costs and workers with prior knowledge and experience can be employed in the construction (UNCHS 2011). Clay buildings are resistance to sound transmission, fire resistance and insect damage and provide coolness during hot weather. It requires little energy in the extraction, processing, and also environmentally friendly construction materials in the construction industry.

Clay as Sustainable Building Materials

Clay can be extracted and applied to the local production of low cost construction products Okereke (2003) identified sources of materials on which clay can be categorized as sustainable construction materials. Nigeria one of the clay producing country, but not effectively utilized. Fig.1 shows some states in Nigeria where clay materials are abundant. One of the disadvantages of these materials is lack of standards that leads to non acceptability making the materials as second class or inferior materials. Clay products are most efficiently used in developing countries to house greatest number of people with the least cost. However, it must be noted that clay buildings are not a phenomenon only of the third world countries, but also in developed countries (Lemougna *et al.,* 2011). Different types of clay are suitable for use in large building and civil engineering works. Figure 1 presents' historic building made of laterite in Northern Nigeria.

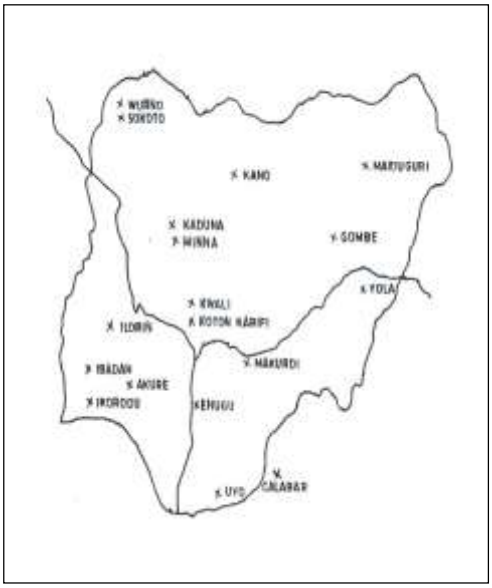

Fig.1. Clay deposits areas in Nigeria

The benefits of having clay as building materials in tropical regions are warming rooms during cold and cooling in hot seasons, availability in most areas, low cost of excavation, processing and production of building products such as bricks, blocks, floor tiles, roofing slates, decorative tiles water pipes and sanitary appliances. Another benefit is better properties while beauty can be obtained by adding colour additives to this materials. It is important to ensure that the materials meet all the specifications in every respect. This means that all relevant properties must be checked and certified properly before used as building materials. Other benefits is low energy requirement; to produce clay bricks is only 5 (kWh)/cubic meter, while it is about 1000 (kWh)/ cubic meter for fired brick and 400 to 500 (kWh)/ cubic meter for concrete block (Adamson, 2010).Clay buildings are completely recyclable in many forms without environmental pollution, using clay for such environmental buildings will be a strong component in the future of humankind.

FIGURE 2: Historical Gobarau Minerate

Built with clay over 1000 years

Research Methods

Qualitative and quantitative research methodologies were used for data collection, which incorporates some aspects of the mixed method approach in some selected construction companies in Katsina, Kano and Kaduna states in Nigeria. Correlation is a statistical technique used to established significant elements for improving utilization of clay as sustainable building materials to answer research question 4 and achieve objective 4 of this research (refer to appendix **C**), . It shows whether and how strongly pairs of variables are related. The main result of a correlation is called the correlation coefficient (or "r") that ranges from -1.0 to +1.0.

DATA COLORATION

Correlations Economic, Environmental and Social Factors				
Factors		**Economic**	**Environmental**	**Social**
Economic	Pearson Correlation	1	.634**	.739**
	Sig. (2-tailed)		.006	.001
	N	17	17	17
Environmental	Pearson Correlation	.634**	1	.659**
	Sig. (2-tailed)	.006		.004
	N	17	17	17
Social	Pearson Correlation	.739**	.659**	1
	Sig. (2-tailed)	.001	.004	
	N	17	17	17
Correlation is significant at the 0.01 level (2- tailed).				

Research Findings

The findings are based on the Likert scale statistics that any mean below 3.0 of the Likert scale is considered as ***not significant*** and mean above **3.0** to **4.5** is considered as ***significant***, whilst **4.5** to **5.0** is considered for this analysis as ***highly significant***. Therefore, the majority of the respondents indicate ***highly significant*** on impact of clay as sustainable building materials and ***agree*** for improving factors for clay as sustainable building material as shown in table 1 below.

TABLE.1. Significant Factors for clay as Sustainable Building Materials

Significant factors for clay as sustainable Building Materials	Categorical Mean (x)
Economic factors	4.25
Environmental factors	4.24
Social factors	4. 01
Mean average	**4.17**

CONCLUSION

In conclusion, this research has identified the factors for improving utilization of clay products as solution to high cost of building projects in the construction industry; the research findings also established significant factors for sustainability of clay as sustainable building materials

in the construction industry. It also established ***high significant factor*** for clay as sustainable building materials in the construction industry.

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