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EDITORIAL: RESEARCH IN ENVIRONMENTAL SCIENCES AS A GATEWAY TO EXPLORING THE INTERACTIONS OF HUMANS WITH THE NATURAL AND BUILT ENVIRONMENT

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In this edition (Volume 17 Numbers 1 and 2) of our journal which combines two issues in one volume, the published articles quite display how research in the disciplines of environmental sciences can advance our understanding of the nature and extent of human interaction with the natural and built environment. In all, thirteen articles were accepted for this volume and they address a number of broad themes. In the succeeding paragraphs we undertook a post-mortem of the articles (without following the order of their arrangement) so as to highlight how our contributors have provided us with a gateway to exploring the human environment.

There are four articles that are connected to the theme of 'construction, architecture and buildings'. One of the submissions is by Ujene and Adewuyi whose study is concerned with residential building procurement with labour only. The du evaluates the performance of labour only projects, the influencing factors and the relationship between the significant factors and performance of labour only projects executed by federal income earners in Akwa Ibom State, Nigeria. Second in the line of 'construction, architecture and buildings' is a submission from Haruna, Oluigbo and Sagada. The authors investigate the reflection of indigenous spatial context in the design of centres for arts and culture in Nigeria. The study which was based on visual survey and observation reveals that there is a limited reflection of indigenous spatial context in the design of the case study buildings. The study recommends recourse to indigenous spatial context as basis for the design of cultural facilities so as to achieve optimum relevance to the locals/users and also contribute to the protection and preservation of the indigenous culture.

In another article, Sotunbo examines the causes of accidents and their preventive measures on building construction sites in Lagos city. Sotunbo's article provides a detail analysis of the causes of accidents on building construction sites, and the effective preventive strategies. The study ends with a call on government agencies and the bodies/institutions responsible for safety enforcement on construction sites to do more regarding safety monitoring, inspection and sanctioning of violators. The study of Edike and Nduka is the fourth submission that touches on the theme of 'construction, architecture and buildings'. The duo of Edike and

Nduka, while focusing on Ogun State in Nigeria, identified a number of construction site security challenges that are interwoven and contributory to the occurrence of one another. They drew conclusions and recommended that internal stakeholders should pay more attention to security challenges at every construction process and equally provide adequate preventive measures.

There is one submission that contributes to the theme of 'time geography'. The contributing author (Bombom) raises a concern of time being often taken for granted as part of the activity participation experience of people. In his study, Bombom employed a time geography framework to develop the daily activity intensity similarity index (DAISI) that can compare and analyse daily activity participation rates of individuals and ultimately clustered groups of persons with similar activity intensity profiles. The study opined that DAISI fills in some of the gap in dearth of practical indices for using the time geography framework to measure activity intensity profiles.

Jurbe, Daniel and Ewuga contribute to the theme of 'methodology'. The authors introduced their study by highlighting a problem of the lack of capacity for the understanding of research philosophies and their connection to research designs in contemporary built environment disciplines in Nigeria. As consequence, the researches carried out within the built environment disciplines are often devoid of philosophical underpinning of the research approach chosen. And quite often, the researchers' choices of methods and procedures often go without justification. In view of this concern, the authors presented an example of research design for the achievement of a set of research objectives. It is hoped that this would serve as a useful guide to researchers within the built environment disciplines.

We received one submission which falls within the theme of 'mineralogy of clay soil'. The contributor (Odewumi) of this article undertakes a mineralogical characterisation of the clay soils at Nahuta in Plateau State, Nigeria. Through this mineralogical characterisation, the study of Adewumi provides understanding on the hydrothermal alteration

implications of the various minerals contained within the Clay at Nahuta.

The edition also contains one submission that contributes to the theme of 'gender and estate management profession'. The contributors (Omogor, Achoru and Adamu) of the article examine the problems and prospects of women in Estate Management practice in Nigeria. The study utilised data collected from a survey of firms in Abuja and found that women constitutes only 30% of the industry's workforce. The study also uncovers some elements of discrimination against women on the basis of assignment of tasks. Other challenges found were in connection to the difficulty in combining marriage/associated responsibilities with practice, doubt of women competence and their failure of women professionals to promote women interest. Recommendations were offered in connection to these findings.

There are three submissions that contribute to the theme of 'livelihoods and environmental sustainability'. In one of the three articles, Amba and Amba appraise the agricultural activities of women in Miango District of Plateau State, Nigeria and how these accelerate climate change process. The authors recommend that government authorities should enlighten women in the study area so they can be made aware of those practices that can mitigate climate change. In like manner, Sati and Bature examines the adaptation of agrarian households to draught in north eastern Nigeria. The last of the three articles is a submission by Okwii and Amba, who examined environmental sustainability in the context of church organisations in Jebbu Bassa area of Plateau State, Nigeria. On the basis of their study, Okwii and Amba recommend that environmental sustainability should be incorporated into church programmes so that more people can be educated on environmental sustainability.

Two of the submissions focused on the profiling of 'real estate and household sanitation facilities'. In one of the study, Njungbwen and Nissi undertook a profile study of the ownership, condition and sufficiency of real estate in some selected Nigerian universities. In the second study, Wapwera, Songden, Bot and Akinde undertook a profile of toilets facilities in households in Jos, and offered some recommendations for household sanitation policy.

As it is clearly evident in the foregoing discussion, the articles in this edition of our journal cut cross the various discipline of the environmental sciences. Not only do they cut across multiple disciplines, the articles also touch on wide range of issues arising from human activities. Publishing research articles that have wide environmental scope is consistent with the tradition of JOES, which has been established over the two decades of its existence. On this note, we present our teaming readers with the Volume 17 Number 1 and 2 of the Journal of Environmental Sciences with the hope that it would greatly enrich their understanding of humans' interactions with the natural and built environment.

In closing, we would like to use this opportunity to apologise to our contributors and teaming readers for the delay in publishing this edition of our journal. The delay arises mainly from the economic recession that has caused a surge in the price of goods and services including printing materials. Within this economic circumstance, striking an affordable printing deal was quite a challenge – but we got one eventually. We sincerely regret any inconvenience caused by this delay. As we sent apologies, we equally wish to pledge our commitment to getting future editions out timely.

A DAILY ACTIVITY INTENSITY SIMILARITY INDEX (DAISI) USING TIME- GEOGRAPHY FRAMEWORK: A SEQUENTIAL ALIGNMENT-BASED MEASURE OF ACTIVITY PROFILE: I

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ABSTRACT

Until recently, time has often only been taken for granted as part of the activity participation experience of people but has not been explicitly modelled in activity pattern analysis. Recent developments in time geography have increased interest in modelling time as an integral part of the human activity participation. Important concepts in time geography framework that may be important in activity analysis include stations, space-time path, space-time prisms, activity constraints and the sequences of activities. In this paper, a time geography framework is employed to develop the daily activity intensity similarity index (DAISI) to compare and examine daily activity participation rates of individuals and ultimately clustered groups of persons with similar activity intensity profiles. DAISI fills in some of the gap in dearth of practical indices using the time geography framework to measure activity intensity profiles.

Key Words: Time, time geography, activity profile, modelling time

INTRODUCTION

Recent developments in time research have improved the analysis and modelling of human behaviour by explicitly incorporating the time dimension in human activity framework. One of these frameworks is time geography, proposed and developed by Hagerstrand (1970). Time geography examines the inter-relationship between activities in space and time and their constraints (Miller, 2004; Yu, 2006). A fundamental tenet of time geography is that all human activities have both spatial and temporal dimensions that cannot be meaningfully separated. However, only recently has the time dimension been explicitly modelled in activity analysis (Shaw, 2006).

For quite some time, time geography provided an elegant conceptual basis for activity pattern analysis with little operational analytical capacity (Miller, 2004; Yu, 2006). However, major developments in the field (e.g., Miller, 1991; Kwan, 2003; Yu and Shaw, 2004; Yu, 2006) have ignited a lot of interest in time geography and have opened new frontiers for the application of the time-geography framework.

Time geography possesses enormous potential for activity pattern analysis and modelling, which help to improve the understanding and prediction of spatial interactions. However, very few studies have attempted to comprehensively model activity patterns in time-geography framework (Kwan, 2004; Scott, 2006). However, there is a growing number of studies (Yu, 2006; Neutens et al., 2008; Kang and Scott, 2008; Yu and Shaw, 2008; Shaw et al., 2008; Shaw and Yu, 2009; Kraak and Huisman, 2009; Chen et al., 2011) that are geared towards developing computational and practical methods to operationalise time-geography concepts to facilitate activity analysis for a better

understanding of human activity patterns in the real world. These studies have opened up new methodological opportunities to practically compute time-geography concepts. This paper builds upon the previous studies geared towards developing practical analytical methods to analyse activity patterns to fulfil this apparent research need. It proposes a similarity index, based on time-geography principles and concepts to measure the activity profiles of individuals and groups. To effectively do this, the methodology is presented in two parts. The first part is this paper, which presents the basis and methodology for developing the daily activity intensity similarity index (DAISI) in line with time-geography principles. For clarity on the general format of the methodology, a simulated data is included to demonstrate the output of the DAISI software. The proof-of-concept of the methodology is presented in a sequel paper that involves actual data collected from the Oklahoma State University (OSU), Stillwater campus, USA to demonstrate the application of the model and its usefulness in activity analysis.

BACKGROUND OF THE STUDY

Traditionally, activity profiles are important indicators of activity patterns and may be used to measure the intensity of activity participation of a group of individuals. Kulkarni and McNally (2000) define an activity profile as the proportion of the members of a group that are participating in each specified activity type at any particular time. In essence, the activity profile shows the number of people engaged in each activity in each hourly time frame during a day (Eom et al., 2009). Generally, it provides a good snapshot of a representative activity pattern, which can be described and visualised (Kulkarni and McNally, 2000). It also facilitates understanding of the daily activity sequence of each group, the type of activities, their starting and

ending times, and the sequences in which the activities are undertaken (Alam and Goulias, 1999; Eomet *al.*, 2009).

The activity profile is an established and well-used method of analysing activity patterns (Misra and Bhat, 2000; Allison et al., 2005; Eom et al., 2009). It provides a glimpse into the degree of involvement of members of a group in certain activity types within given time periods. Its adoption as the basis for the daily activity intensity similarity index is therefore well-founded. DAISI however adopts a time-geography approach in several ways. First, it is based on individual activity participation, which is one of the attractions of the time-geography framework (Thrift, 1977; Pas, 1990; Peuquet, 1999; Shaw and Yu, 2009). Groups of individuals with similar activity intensities are then clustered into groups rather than predefined as is traditionally the case. Second, the intensity of activity participation is measured for each individual on an hourly time frame as conventional but irrespective of activity type. Third, the sequence in which the activities are undertaken, which is a distinguishing feature that sets the time-geography approach apart from other time study approaches, is significant in computing similarity scores between individuals. This allows for hourly activity time frames to be compared element by element.

DAISI utilises these time-geography principles to intuitively measure the similarity between the activity intensities of a pair of individuals and ultimate activity patterns of groups that would be useful to identify activity intense periods of the day and the characteristics of the individuals and groups involved in the activities. Activity characteristics gleaned from the clusters generated may provide the basis on which to plan effective strategies to ease transition between important activity locations and provide facilities and amenities at important anchor locations and during important transition times. This is an important input in organising activities and enhancing the human activity experience by providing necessary facilities at appropriate times and to the appropriate persons.

The aim of this paper is mainly to introduce the concept of DAISI and to provide the bases and methodology involved in deriving the index. The sequel paper demonstrates the application and usefulness of DAISI as a measure of activity analysis by providing a proof-of-concept using actual data collected.

Thus the paper is organised as follows. First is a review of the requirements for developing a similarity index. Second is a presentation of how DAISI fulfils these general requirements of a similarity index and the third part is a step-by-step procedure for developing DAISI. The significance and implications of the index follows

and then the conclusion summarises some of the applications of DAISI.

REQUIREMENTS FOR DEVELOPING A SIMILARITY MEASURE

In a review of 20 similarity indices, Hayek (1994) identified a common notation that underlies several requirements of a similarity index:

a = the number of entries that are common to both lists.

b = the number of entries in the first list that are not in the second.

c = the number of entries in the second list that are not in the first.

n = the maximum number of entries that could occur in either list.

d = the number of entries (of the maximum n) that do not appear in either list.

DAISI accounts for two in this list (a and n) explicitly, and adapts the remaining notations. Unlike the factors in the indices reviewed by Hayek (1994), activity intensity rates are identical or not identical rather than present or absent as in a list. Consequently, notations b and c are not available options in DAISI. However, they are accommodated by calculating the differences between activity rates for pair of activity profile lists. Notation a is defined by DAISI as the number of activity time frames whose activity rates are identical. Initially however, time frames are composed of activity frequencies, not activity rates. Each hourly time frame contains the number of activities undertaken by an individual in a time frame. A maximum number of activities (n) in an hourly time frame is assumed as one activity per minute, which is then used to convert activity frequency into activity rates by dividing the number of activities undertaken by an individual within an hourly time frame by the maximum number of activities (n) assumed within an hourly frame. Between a pair of activity profile lists, the differences in activity rates will be contributed by those time frames that are not identical. Notation d is based on notation n and is measured as the average value of the differences in activity rates between the two activity profile lists. DAISI accounts for these apparently conventional notations as much as they can be accommodated within its framework.

Generally, similarity measures are expected to fulfil certain broad conditions, which are referred to as requirements. Tulloss (1997:125-126) summarises them thus:

“REQUIREMENT 1: A similarity index shall be sensitive to the relative size of the two lists to be compared; and great difference in size shall be interpreted to reduce the value of the similarity index.”

“REQUIREMENT 2: A similarity index shall be sensitive to the size of the sublist shared by a pair of

lists; and an increase in difference in size between the smaller of the two lists and the sublist of common entries shall be interpreted to reduce the value of the similarity index.”

“REQUIREMENT 3: A similarity index shall be sensitive to the percentage of entries in the larger list that are in common between the lists and to the percentage of entries in the smaller list that are in common between the two lists and shall increase as these two percentages increase. For logical completeness, we add the following definition:

“DEFINITION 1: When two lists to be compared by means of a similarity index are of the same size (cardinality), one shall arbitrarily be selected to be called ‘the larger.’ The remaining list shall be ‘the smaller.’)”

“REQUIREMENT 4: A similarity index shall yield values having fixed upper and lower bounds.”

“REQUIREMENT 5: A similarity index shall have the property that when two lists are identical, the similarity index for the two lists shall be equal to the upper bound of the index.”

“REQUIREMENT 6: A similarity index shall have the property that when two lists have no entries in common, the similarity index for the lists shall be equal to the lower bound of the index.”

“RECOMMENDATION 1: The upper bound of a similarity index should be one; the lower bound of a similarity index should be zero.”

“REQUIREMENT 7: Distribution of values of a similarity index between zero and one shall be such that (a) if the size of two input lists is fixed, then the output shall vary roughly directly as the number of entries shared between the lists; and (b) if the smaller list is a subset of the larger list, then the value of the similarity index shall vary roughly inversely as the size of the larger list.”

REQUIREMENT 7(a) is a variation of “linearity” defined by Hayek (1994). Experience with other similarity indices suggests that an additional requirement must be added to the list. It relates to convenience in using a program that implements a similarity index.

“REQUIREMENT 8: A similarity index program shall check its input data to verify that the following relationships hold: $a + b > 0; a + c > 0$ ”

One of the most popular methods of measuring similarity is the employment of a sequence analysis. Halpin (2007) summarised some of these methods. Hamming distance measures similarity between sequences of equal length by comparing them element by element. However, it does not do indels (insertion, deletion, and substitution of elements) and consequently it can only recognise similarity at the same location. Degenne’s method defines sequence similarity as a “function of the vectors of cumulated duration in each

state, measured at each time point” (Halpin, 2007:14). The sequences of activities may be different between two lists but it is assumed that if they have the same cumulated duration at the end, they will necessarily end at the same point.

Wilson et al. (1999) developed the ClustalG algorithm to analyse sequential events based on indels of elements between two sets of events. The basic idea is to compute the distance between the two events, which involves indels operations necessary to make the two strings of events identical. When the “distance” score (the number of operations necessary to make the two strings identical) of the strings is low, it indicates a higher degree of similarity between them.

DAISI is a measure of similarity between strings of activity intensities based on simple principles of sequencing. Like the Hamming index, DAISI measures similarity between sequences of equal length and does not use indels. However, it calculates and uses the average rate of activities per time frame to make the two activity profiles identical as a means to determining similarity between them.

BASIC REQUIREMENTS OF THE DAILY ACTIVITY INTENSITY SIMILARITY INDEX (DAISI)

DAISI requires the lengths of the activity profiles of individuals being compared to be equal (e.g., 6:00 am to 6:00 pm). The starting and ending hourly time (e.g., 6:00 am to 7:00 am) for each time frame should be the same for all individuals. This addresses some of the concerns expressed by Wilson (2001) about unequal length of sequences posing problems in deriving accurate results of similarity between pairs of sequences. This also accounts for *requirement 1*, which needs the index to be sensitive to differences in sizes of the two lists to be compared. By ensuring the equality of the two lists, DAISI complies with this requirement but also circumvents it in some ways. The reporting of activities using an activity diary presents a problem when people use arbitrarily different times to report the start and end of their activities. This could complicate computations as identified by Wilson (2001). Equal length of activity profile lists mitigates the problem, fulfils *requirement 2* and ensures that there are no sublists to consider.

DAISI employs the activity rates between two individuals as a determinant of their similarity. In the first component, as the number of common entries between the individuals increases, their similarity also increases, which complies with *requirement 3*. In the second component, DAISI adopts the average of the differences in activity rates between corresponding hourly time frames of the individuals as a measure of “activity distance” between them. When the activity

distance between the activity rates of two individuals is small, the similarity between them is greater. These are the two principal components of DAISI.

Requirement 4 dictates that an index should be bounded by an upper and a lower limit. The values of the index therefore fall within the range of these limits. DAISI has a range between 0 and 1, where zero (0) is the lower limit denoting lack of similarity, and 1 is the upper limit signifying perfect similarity. These features of DAISI also satisfy *requirements 5 and 6*. *Requirement 5* requires that when two lists are completely identical, their similarity index should equal the upper limit; and, for *requirement 6*, when there are no common entries between the two lists, the similarity index value should equal the lower limit. DAISI fulfils these requirements.

DAISI has equal lengths (or sizes) for the time frames of individuals' activity profiles as assumed by *requirement 7a*. In such situations, the output is expected to display some linearity, in which case it should vary roughly directly as the number of entries shared between the lists. DAISI attempts to fulfil this requirement to the extent that a progressively larger number of shared entries of activity rates results into a progressively greater level of similarity between individual activity profiles. DAISI, however, does not need to fulfil *requirement 7b*, because there are no subsets involved. All activity profiles are required to be of equal lengths.

There are no zero (0) activity entries in any time frame of the activity profiles as explained in the steps. Because of this any combinations of the components will yield values greater than zero (0). Consequently, the conditions $a + b > 0$ and $b + c > 0$ are met in all situations. This meets *requirement 8*.

DAISI has attempted to fulfil all the requirements for a similarity index as recommended by Tulloss (1997). The proceeding section presents the development of DAISI as recommended.

DEVELOPING THE DAILY ACTIVITY INTENSITY SIMILARITY INDEX (DAISI)

The daily activity intensity similarity index (DAISI) is composed of two components, which are encapsulated in the following simple formula:

$$(1) \quad \text{DAISI} = 1 - (rd * dd)$$

Where rd = ratio of dissimilarity between a pair of individuals

dd = ratio of dissimilarity (activity) distance between the pair of individuals

Each of these components (ratios of dissimilarity and dissimilarity distance) involves several steps, which are

presented shortly. Before then, the activity profile data need to be processed into a format that would allow the two components to be computed.

The activity profile is basically the number of activities that an individual undertakes within given hourly time frames of the day. DAISI measures the similarity between the activity profiles of two individuals at a time. For several individuals, DAISI measures the similarity between the activity profiles of each individual against all other individuals, one at a time. The final product is therefore a matrix of similarity values, which indicates the degree to which the activity profiles of two individuals are similar.

Step 1: Demarcating Length of Time Frames

First, the length of time of the activity profiles is demarcated into time frames such that each activity profile has uniform hourly time frames (e.g., 8:00 – 8:59 am; 9:00 – 9:59 am; 10:00 – 11:00 am). All time frames should start at the same time and end at the same time for all persons (e.g., from 8:00am – 12:00 noon; 6:00 am – 12:00 midnight) and therefore ensure equal length of activity profile lists.

Step 2: Determining Hourly Activity Intensity Frequency

Second, count and enter the number of activities, irrespective of type, that each individual undertook within each hour time frame. This provides the profile of activity intensity for individuals. In this sense DAISI measures the intensity of human activity participation and not the tendency to particular activity types. Each activity conducted within the hourly period is counted for the particular hour. For example, when a student completes a class session at location A at 9:20 am, walks to location B and starts the next class session at 9:30 am, three activities are recognised for the hour period (2 class sessions and a movement activity). When an activity extends beyond the hour mark demarcated, the activity is recorded for the two hourly periods it traverses. For example, when a class session takes place between 9:30 am and 10:20 am, it would be counted as two different activities, each on one side of the 10:00 am hour time line and recorded for both the 9:00 am to 9:59 am and 10:00 am to 10:59 am hour time frames. This solves the problem of “zero” (0) activity within any hourly period, which is rather impractical in human activity experience. The option of counting an activity for only the hour period within which it was initiated or in which it ended was considered and discarded because of the “zero” activity problem (e.g., if a class session starts at 10:30 am and ends at 12:30 am and is counted as only one activity, it means that the 10:00 am to 11:00 am time frame will record “zero” activity. Yet a class session took place at that time frame). The basic idea is to count the number of

activities undertaken in any given hour time frame rather than regard the activity as a single activity stretched across time frames. There is no hour time frame that is devoid of an activity episode in the time-geography framework; even “idle” is considered an activity (Ellegard, 1999). It would therefore be erroneous to have a zero (0) in any activity time frame.

Step 3: Determining Hourly Activity Intensity Rate

Third, the number of activities recorded in each hour frame is normalised by a factor of 60 to convert the activity frequencies into activity rates. This section accommodates Hayek’s (1994) notations *b*, *c* and *d*. Hagerstrand (1975) lists eight conditions necessary to measure the degree of reality present in a geographic model or theoretical framework. Two of these conditions are important to this step of the process.

The first is the realisation that human beings are limited in the number of tasks they can perform at a time; and, secondly that every task has a duration (time limit). Taking these conditions into consideration, it is assumed that individuals can perform only a limited number of activities in any given day and each activity consumes limited time span or duration within the given day. The number of activities an individual can undertake in a given time period is therefore not infinity. According to Wilson (1998) a typical activity diary contains between 10 and 40 separate activity episodes in a day. In a given day, the 1-minute activity episode interval is “probably the shortest practicable sequence element and generates a very fine activity record, 1440 elements per day, while remaining manageable” (Wilson, 1998:1027). In essence, every individual is assumed a capacity to undertake not more than one activity for every minute of the day (Vanhulsel et al., 2011). This breaks down to 60 activity episodes every hour, which DAISI adopts as the maximum number of activities that can be recorded in any hour frame. This accounts for *n* in Hayek’s (1994) notation.

The number of activities conducted by an individual, and recorded in the hour time frame, is therefore measured against the maximum allowable number of activities that could be conducted in the hour time frame. This converts the activity frequencies to activity rates. This averaging factor (maximum number of activities per time frame) normalises all the entries into a range of values between 0 and 1, where values tending towards 1 indicate a large number of activities in the time frame and values tending towards zero (0) indicate a fewer number of activities. This normalisation is crucial to maintaining the index values within the specified upper bound of 1 and lower bound of zero (0) and helps fulfil requirements 4, 5 and 6.

Step 4: Determining the Rate of Dissimilarity (*rd*) Component

The *rd* is basically the ratio of dissimilarity between the activity profiles, represented as hourly activity rates, of a pair of individuals. The number of time frames in the study period is counted and represented as *y*. For example, if the study period is between 6:00 am and 12:00 midnight, there are 18 hour time frames, which means *y* = 18. The notation *y* is therefore the length of the activity profile list.

The variable *a* is the number of hourly time frames between the activity profiles of two individuals that have different values of activity rates. In Hayek (1994), the notation *a* is the number of entries which is common to both lists. DAISI however takes on a reversed role for the notation *a* for an obvious reason. Take three individuals (A, B and C) with no common activity rates between any pair of them. If *rd* is based on common entry of values among them, then the value returned will be zero for each pair (AB, AC, BC). Irrespective of how close the activity rate of one individual (A) is to another (B) compared to the third (C), the eventual similarity index will be zero (0). This would suggest that the three individuals (A, B, C) have same or similar activity intensity rates. For example, it may be argued that a string of values (A) [0.2, 0.3, 0.2] may be more similar to a second string (B) [0.3, 0.4, 0.3] than a third string (C) [0.8, 0.9, 0.7], if they all represent same variables of real numbers as is the case with activity intensity rates. Since there are no common identical entries between them, all three strings would return an index score of zero (0). Technically, this may be correct; however, it renders the second component (*dd*) of the index redundant because the value will still be zero, irrespective of any value that may be multiplied by the *rd* component. It is therefore necessary to ameliorate this situation and imbue the index with the capacity to differentiate, even if only slightly, between activity profiles with varying degrees of differences between them. By inverting the role of notation *a*, only individuals with total similarity between them will return a value of zero, which signify exact similarity. This solves the problem and still meets the conditions set out in requirement 1, albeit in a different way. Consequently, *rd* is calculated as the number of dissimilar activity rate entries divided by the number of time frames. For example, if 6 out of the 18 hour time frames (*y*) have different corresponding values of activity rates, then *a* = 6. The rate of dissimilarity (*rd*) is calculated as:

$$rd = \frac{a}{y} \quad (2)$$

Where *a* = number of time frames with non-identical corresponding values; and *y* = number of hourly activity time frames.

Using the values provided in the example, rd is calculated as:

$$rd = \frac{6}{18} = 0.3333 \text{ (or 33.33\%)} \quad (3)$$

For an individual's time frame measured against itself, $rd = 0$ because all the time frames will be identical (i.e., if there are 18 time frames, then $y = 18$. If all the time frames have same value entries, then $a = 0$. The value of rd will therefore be $0/18=0$). In a situation where no time frames have any identical common entries between a pair of activity profiles, $rd = 1$ (i.e., $y = 18$; $a = 18$; therefore $rd = 18/18 = 1$). This fulfils requirement 3 in a similar way as requirement 1 is fulfilled. Consequently, on a scale of 0 to 1, pairs of individuals with rd values tending towards zero are more similar than those with rd values tending towards 1. Since similarity index expects higher values to represent similarity (Hayek, 1994), the rd component actually measures ratio of dissimilarity between individuals.

The next stage is the dd component.

Step 5: Determining the Dissimilarity Distance (dd) Component

The dd component represents the measure of average dissimilarity distance between two individual activity intensity profiles. The dd is calculated as:

$$dd = \frac{\sum \text{abs}(r_i - r_j)}{y} \quad (4)$$

where: dd is the measure of dissimilarity, calculated as the average of differences between the activity rates of a pair of individuals

r_i and r_j = activity rates for corresponding time frames for individuals i and

j , respectively.

In many sequential alignment methods, the principle of indels (insertion, deletion, and substitution) is employed to measure the "distance" between two sets to be compared. Wilson et al. (1999) and Shoval and Isaacson (2007) define this "distance" as the number of operations (which may include insertion, deletion, and/or substitutions) needed to make the two sets identical. DAISI defines "distance" (dd) as the average value of the absolute difference between the two activity profiles that is needed per time frame to make the two profiles identical. This becomes the equivalent of the indels operation for DAISI. Averaging the difference between the activity intensity rates of a pair of individuals has several advantages, including (i) maintaining an index range of 0 to 1 in keeping with requirements 4, 5 and 6; and, (ii) accounting for any subtle differences between activity rates of individuals, which is not accounted for by rd .

To calculate dd , therefore, absolute differences between corresponding values of time frames are determined.

The activity rate in time frame for 8:00 – 8:59 am for individual A is subtracted from the activity rate in time frame for 8:00 - 8:59 am for individual B. Only absolute values are returned. The sequence of the differences is maintained to ensure that corresponding time frames are compared for the individuals. The average of these differences then becomes the measure of dissimilarity between the activity profiles of the individuals. It represents the average value necessary to make the activity rates of the pair of time frames identical.

It may be pertinent to point out that the range of values for both rd and dd are the same (from 0 to 1) and are interpreted similarly. For rd , values tending towards 1 are indicative of dissimilarity between a pair of individuals. When 4 out of 5 entries in time frames in a pair of activity profiles are identical, the level of dissimilarity is 0.2 ($rd=1/5=0.2$), which signifies that the pair is more similar than not. For the same range for dd (0 to 1), values tending towards 1 are indicative of dissimilarity between a pair of individuals. When the average of the difference in activity rates is 0.2222, it indicates that the activity profiles are more similar than when the value is 0.5555. Assuming that the cumulative absolute difference between the two lists, A and B, over an 18 hour time difference as in the earlier example is 14.004, then $dd=14.004/18=0.778$.

At this stage, the two components of the formula for DAISI have been computed. Since DAISI is meant to be a similarity measure where higher values should indicate greater degree of similarity and lower values should signify lesser degree of similarity between a pair of individuals' activity profiles (in keeping with requirements 4, 5 and 6), the product of rd and dd is subtracted from 1. The range of values is 0 and 1. Since a value of 1 indicates total dissimilarity, subtracting 1 from itself, would invert the range such that value of 0 signifies total dissimilarity and value of 1 indicates perfect similarity. Similarity in activity profiles (DAISI) of a pair of individuals therefore is calculated as:

$$\text{DAISI} = 1 - (rd * dd) = 1 - (0.3333 * 0.7778) = 1 - 0.2592 = 0.7408 \text{ or } 74.08\% \quad (5)$$

This example indicates that the pair of activity profiles has a 74.08% similarity between them. It is pertinent to point out again that the similarity index is calculated for all pairs of individuals such that each individual, compared against itself returns a perfect score of 1 for perfect similarity. A value of zero(0) indicates complete dissimilarity between the pair of activity profiles for the respective individuals. The final product therefore is a symmetrical matrix of similarity scores between pairs of individuals, which is then subjected to a clustering analysis to identify group patterns in activity profiles.

DAISI Software

Software, DAISI[®] (Fig. 1), has been developed in Python to calculate and return similarity values between

pairs of daily activity intensity sequences for all individuals in dataset.

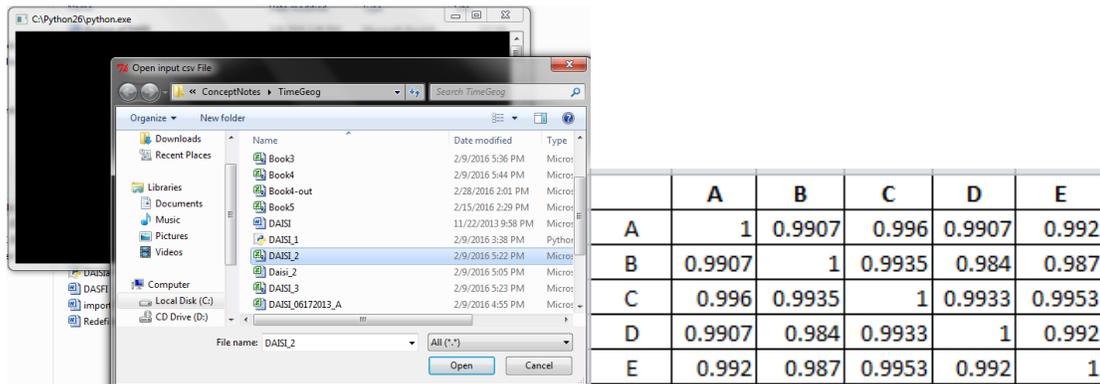


Fig. 1: DAISI[®] showing input file and the output file both in Excel .csv extensions

The software employs an Excel .csv (comma delimited) extension file as input. The Excel file is expected to contain only the hourly activity intensity frequencies of all individuals as explained in Step 1. DAISI[®] computes Steps 2 to 5 and returns a matrix of similarity indices ready for clustering into groups of identical activity intensity patterns as described in Step 6.

Step 6: Clustering the Similarity Score

The result, a symmetrical matrix of similarity values from Step 5, is subjected to a clustering method to produce groups of individuals with similar activity profiles. In clustering analysis the choice of clustering method and probably, the number of clusters is very important. So the choice of clustering method is significant.

Two of the most commonly used clustering techniques are the hierarchical and K-means methods. Hierarchical clustering techniques do not require the choice of the number of clusters. The algorithm chooses the number of clusters intuitively using gaps identified in the data. K-means clustering however requires the choice of the number of clusters to be created.

Several methods have been developed to ensure the selection of an optimal number of cluster groups. These include the use of measures of compactness such as Silhouette and Dunn's indices, and also the employment of the number of clusters generated by a hierarchical clustering method as the optimal number of groups for k-means clustering (Lenz and Nobis, 2007).

The cluster groups are then mined for any variables that may provide insight into the patterns of activity profiles generated from the index.

SIGNIFICANCE AND IMPLICATION OF THE DAILY ACTIVITY INTENSITY SIMILARITY INDEX (DAISI)

DAISI is significant in two basic ways: first, it provides a method to statistically measure activity profiles in regards of intensity of activity participation. Not much has been done in this regard. Second, it enhances understanding of how the activity profiles of individuals are similar or dissimilar, and how activity patterns of groups are created.

Traditionally, activity profiles have adopted simple statistical methods to test for variations between predefined groups. The results usually indicate whether any variations exist in the intensity of activities between groups. These predefined groups are normally assumed to be homogeneous, which is often not necessarily the case. DAISI has individuals as the central components in understanding activity patterns. It therefore builds groups from sets of activity participants whose activity profiles are similar. The index therefore is able to expose any patterns that may be hidden in the data with regards to the intensity of activity participation of groups of individuals than may be possible through predefined groups. DAISI is therefore more intuitive and realistic in detecting actual similar patterns of activity profiles than the traditional methods.

Through a rigorous process, the approach provides another method through which activity profiles may be studied and patterns discerned. Traditionally, the process has been more descriptive in nature, with only simple statistical tests to examine any differences that may exist between groups. DAISI does not only add a layer of method to the methodology of studying activity patterns but also lends it a veneer of rigor that enhances an extraction of patterns from the data rather than merely describe it.

Understanding these patterns provides the possibility to create enabling environment for better activity

engagement. For example, understanding important time frames for high level of activity participation may help in planning strategies to improve the human activity experience. This may involve identifying types and locations of activities and the nature of constraints that need to be overcome. DAISI provides the background to help enhance activity participation.

Another advantage of DAISI is that it employs already existing software packages to compute. The index and matrix can easily be calculated in Microsoft Excel Spreadsheet. The clusters can be generated by any statistical software package with clustering capabilities such as SPSS, SAS, R and other commonly available statistical software packages. This underscores the simplicity of the index, its accessibility and compatibility with already existing packages. Moreover DAISI[®] further simplifies the task of computing the index.

The index has some limitations as well. By insisting on same length of time frame for all individuals, the index is restrictive and rigid, and not suitable for comparing differences across time scales and for disparate lengths of time.

Second, the index is biased towards activity profiles that have common entries between them. The *rd* component carries a lot of weight such that when two strings of activity profiles do not have any identical common entries but are numerically very close, the index returns a similarity score that is close to zero. Sequences with more common activity intensity rates between them but large differences at other time frames would return a higher index value.

Third, it may be acknowledged that most of the index values may be stacked towards larger values. This may not be unconnected with the fact that compared to the maximum number of 60 activities per hourly time frame used to normalise activity frequencies, most actual human activity numbers are very low. This is easily corrected by selecting a more realistic maximum number of activities in an hourly time frame other than the ideal 60 activities. For example, 10 activities may be a more realistic maximum number of activities per hour than 60 especially in most human activity participation conditions. Normalising by 10 rather than 60 activities would produce a starker difference in similarity indices. If the choice of a more “realistic” maximum hourly activity frequency could be justified, the computation may be appropriately amended to respond to the peculiarities of the study. This flexibility may be an added advantage of DAISI.

Finally, there is the issue of linearity that is still largely unexplored in the index. Preliminary evidence suggests

progressive increase in index values with progressive similarity between activity profiles but the depth of this linearity is currently untested.

CONCLUSION

DAISI provides a new method by which to analyse and understand patterns of activity profiles. Instead of comparing the activity profiles of predefined groups, the index measures, compares and groups the activity profiles of individuals, which yields more intuitive groups of persons with similar characteristics of activity participation than predefined groups of participants. Activity characteristics gleaned from the clusters generated may provide the basis on which to plan effective strategies to ease activity participation at intense group activity time periods and also the transition between important activity locations. Understanding these patterns provides the possibility to create enabling environment for better activity engagement. For example, understanding important time frames of high level of activity participation within a given time period for certain groups of persons may help in planning strategies to improve their activity participation experience. This may involve identifying types of activities, locations of activities, the type of facilities needed to facilitate their activities and the nature of constraints that need to be overcome. DAISI provides the background through which such activity enhancement could be made possible.

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RESEARCH DESIGN TO ACHIEVE SET OBJECTIVES: AN EXAMPLE FOR BUILT ENVIRONMENT RESEARCHERS

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ABSTRACT

Researches generally are characterised by diversity of approaches to identifying and solving problems and there exist an extensive literature on the strengths and weaknesses as well as adoptability and/or suitability of these approaches for addressing research questions. This understanding appears to be missing among the present generation of Nigeria's built environment researchers and students alike. As consequence, the researches carried out within the built environment disciplines are often devoid of philosophical underpinning of the research approach chosen. And quite often, the researchers' choices of methods and procedures often go without justification. All these failings contribute to poor research outputs within the built environment disciplines. It is within the context of this problem that this paper presents an example of research design to achieve set objectives in a built environment research. The example presented in this paper is tied to a problem of stakeholder management in construction projects. In achieving this lofty goal, a general background and comparison of the key concepts guiding research design is presented. The focus then turned to explaining the main components of the research design model found most suitable for a set of objectives. Following this, the authors adopted a guiding research design and then present the research design and methodology adopted for the achievement of the set objectives.

Key words: Research Design; Built Environment Research; Research Philosophies; Research Approach; Research Strategies

INTRODUCTION

Research practices are generally influenced by knowledge bases underpinned by philosophical ideas or philosophical worldviews based on which there are different options of research methods available for researchers of different disciplines (Creswell, 2009). It is necessary for researchers in the built environment disciplines to use these to explain the choices they make in designing their research but this is not often the case for the researches conducted within the Nigeria's built environment disciplines. It is against this background that this paper presents an example of research design to achieve set objectives in built environment research. The example presented in this paper is tied to a hypothetical problem of stakeholder management in construction projects. The paper start by giving a general background and comparison of the key concepts guiding research design, it then considers the main components of the research design model found most suitable. Next to this, the paper adopted the most suitable research design model as a guide to solving the hypothetical problem of stakeholder management problem in construction. On the basis of this, the paper presents the research design and methodology adopted for the study, which is aimed at addressing a set of objectives that are carefully formulated around the hypothetical problem as follows: the first objective is concerned with the reviewing of previous work on stakeholder management in construction projects; the

second is interested at investigating the current practice of stakeholder management within the construction industry; the third assesses the effect of procurement routes and contract conditions on stakeholder management process; the fourth attempts to model the relationship among the critical success factors for stakeholder management in construction projects; the fifth develops a framework for stakeholder management in construction project; and last validates the framework developed.

RESEARCH DESIGN CONCEPTS

Given the set objectives which are carefully couched around a hypothetical problem above it is necessary to start by reviewing the research design concepts that can potentially inform the choice of methodology for the investigation. Researches generally are characterised by diversity of approaches to identifying and solving problems and there exist an extensive literature on the strengths and weaknesses as well as adoptability/suitability of these approaches for addressing research questions. Therefore, there are different ways to go about research design to achieve the aim and objectives of any research venture. According to Blaikie (2007), there are two ways to solving this problem of research design; either to adopt one approach or explore a combination of appropriate approaches for the research. It is important for researchers to instead of focusing on method only, focus

on the problems in order to employ the most or all suitably available approaches (“tailor made design”) to address the research question(s) (Rossman and Wilson, 1985; Patton, 1990; Morgan, 2007).

Therefore, for the purpose of adopting appropriate research design for achieving the objectives set earlier, a comparison of five research design models including Nested model (Kagioglou, *et al.*, 2000); Research ‘onion’ (Saunders, *et al.*, 2009); ‘Choices’ (Blaikie, 2007); research design ‘framework’ (Creswell, 2009); and ‘Relationship between epistemology, theoretical perspective, methodology and research methods’ (Gray,2014) is presented.

Kagioglou *et al.* (2000) proposed a nested approach to modelling research design shown in Fig. 1. The nested design model is based on three circles in a ring with the research techniques and research approaches respectively forming the inner and middle circles which

are guided by research philosophy in the outer circle. While research philosophy is the bases for the development of knowledge, research approach is the method used to generate and test theory such as case study, survey, action research and experiment and research techniques refer to the data collection means which include interview, questionnaire, observation or focus group workshop.

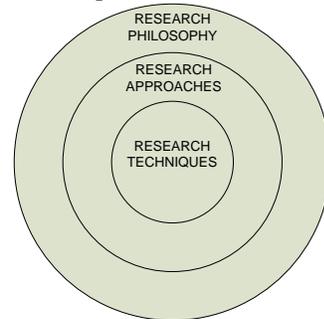


Figure 1 Nested research model (Kagioglou et al., 2000)

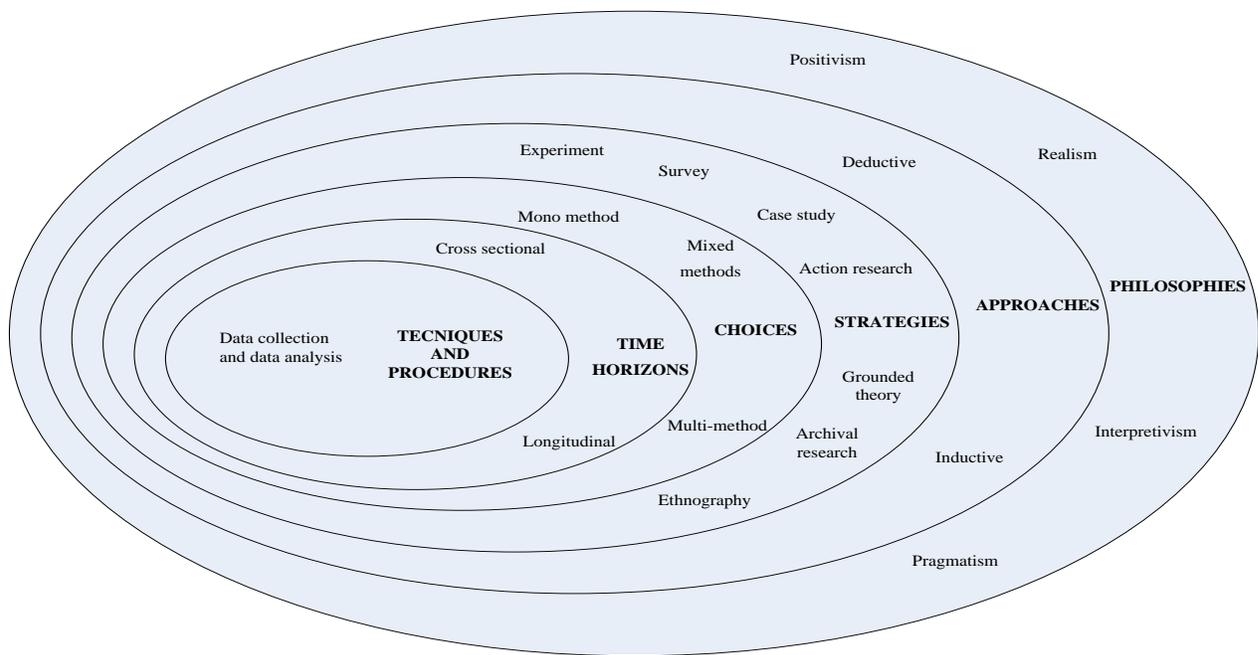


Figure 2 The research 'onion' (Saunders, et al., 2009)

The research ‘onion’ (Saunders, *et al.*, 2009) shown in Fig. 2, has six layers and is referred to as the research ‘onion’ because the six layers constituting the model resemble the rings of an onion. Each of these layers (research philosophies, research approaches, research

strategies, time horizons, choices and data collection and data analysis offers a number of options from which to choose in order to achieve the aim and objectives of the research. While research philosophies form the outer ring, data collection and data analysis form the

innermost (core) ring of the research 'onion' suggestive of the need to gradually peel the layers of the 'onion' one after the other starting from the outer (research philosophies) ring before arriving at appropriate research design.

According to Blaikie (2007), research strategies or logic of inquiries are associated to one or more research paradigms based on which researchers have to make some basic 'choices' in carrying out any research project (Fig. 3). Figure 3 shows, as indicated by the vertical arrows, that decision and choices on the research problem, questions, strategies and paradigms are interrelated such that it may become necessary for researchers to move back and forth between them before final decisions are made on which option(s) or combination(s) to adopt. The horizontal arrows indicate the basic categories among which to choose for each step in designing and conducting research.

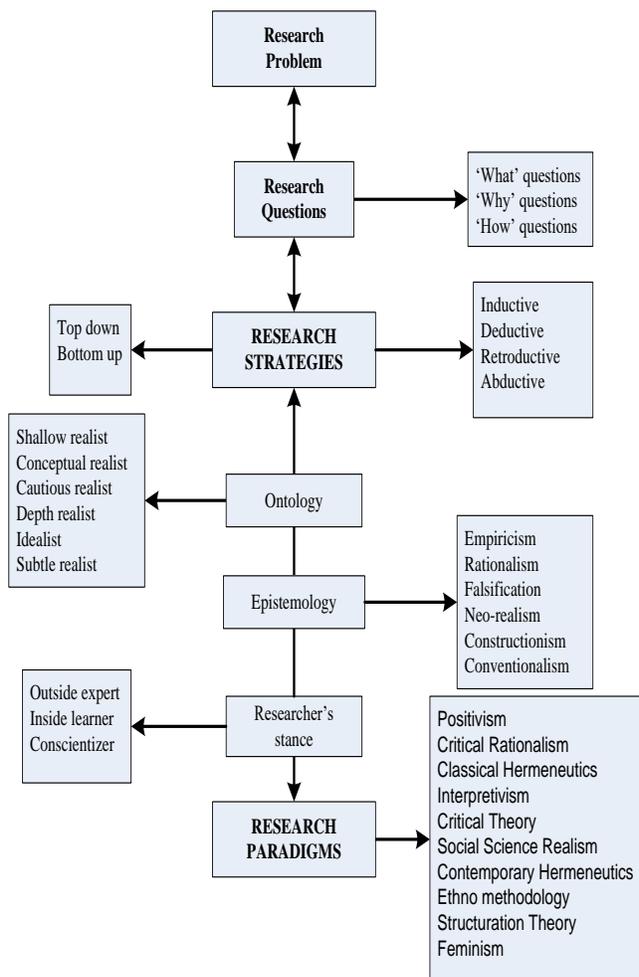


Figure 3 Research 'Choices' (Blaikie, 2007)

Creswell (2009) proposed a framework for research design based on the interconnection of worldviews, strategies of enquiry and research methods. Based on this framework (Fig. 4), arriving at research design involves determining the intersection of philosophies (philosophical world views), strategies of inquiry and specific methods in relation to the research question(s) to be addressed. Worldview refer to the basic set of beliefs that guides action otherwise referred to as epistemology and ontology (Crotty, 1998); research paradigms (Blaikie, 2007) while strategies are the types of qualitative, quantitative and mixed method that specifically direct procedures in research design and research methods are the specific steps involved in data collection, analysis and interpretation. This framework is hinged on the need for researchers to think through the philosophical worldview assumptions they rely upon, the strategies of inquiry that are related to this worldview and the specific research methods or procedures that put the approach into practice.

In trying to provide an understanding on how a researcher can select between theories, methodologies, and methods, Gray (2014), explained that there exists an interrelationship between the theoretical stance adopted by the researcher, the methodology, and methods used and the researchers view of the epistemology as shown in Fig. 5. He further noted that the data gathering method and the choice of methods will be influenced by the research methodology chosen. The methodology, in turn will be influenced by the theoretical perspectives adopted by the researcher, and in turn, by the researchers epistemological stance.

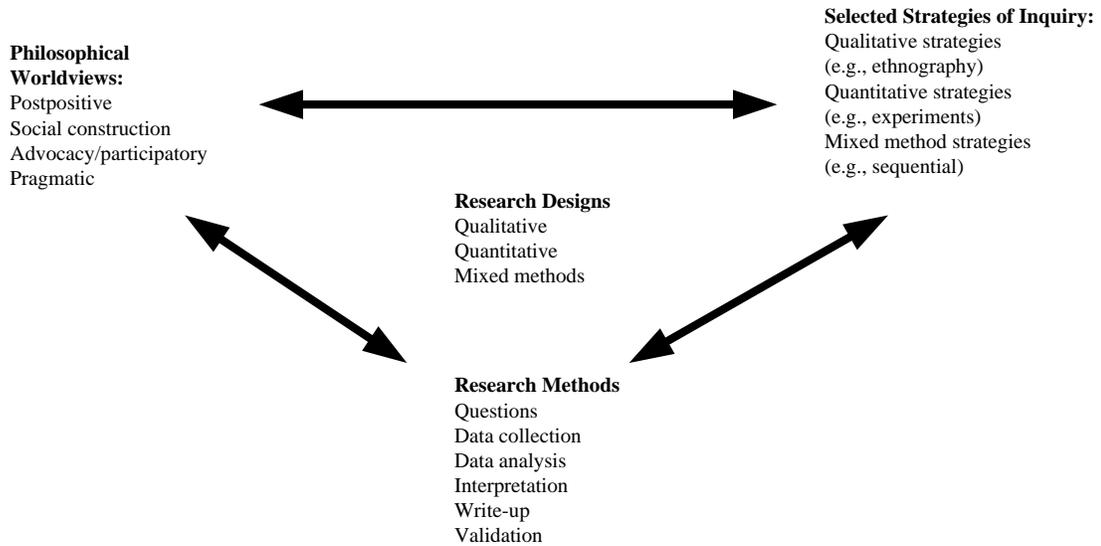


Figure 4 Framework for research design (Creswell, 2009)

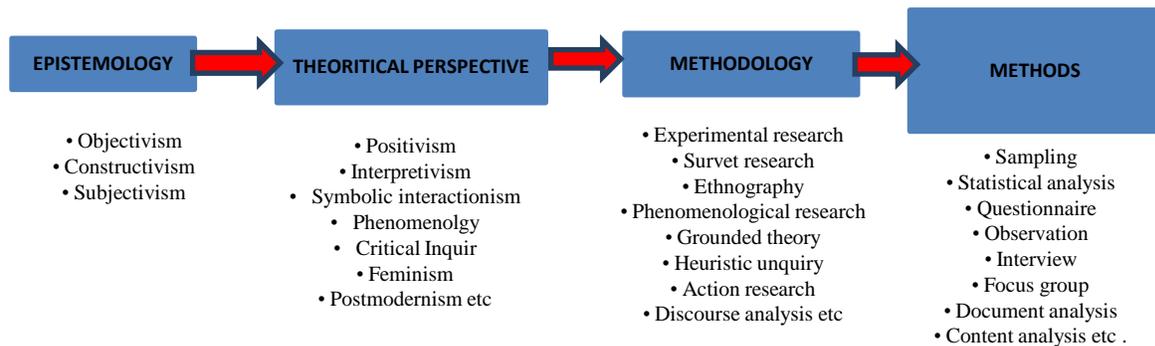


Figure 5: Relationship between epistemology, theoretical perspective, methodology and research methods (Gray, 2014)

The comparative features of these propositions for research design are shown in Table 1. All five of them have the research philosophy consideration included, although Creswell, Blaikie and Gray considered them under different names. Both the nested research model and the research onion have the research approaches, but they present slightly different options under them. The research approaches in the nested research model and the selected strategies of inquiry in the research design framework correspond to the research strategy layer in the research onion. Further, the research

methods in the framework for research design is similar to the data collection methods layer of the research onion, just as the choices layer in the research onion is similar to the research design options in the research design framework and the methodology options espoused by Gray. Also, the research paradigms (ontology and epistemology) in the choices are similar to the research philosophy in the four other models and the research strategies in the choices are similar to the research approaches in the research onion.

From this comparison, the research onion and research design framework are similarly more comprehensive and instructive in providing a base for formulating a research design. However, given the importance of time consideration in a research study, the time horizon layer makes the research onion the most detailed research

design model among the four research design models compared (Table 1). Therefore, the research 'onion' by Saunders *et al.* (2009) is used to explain the research design outline for this study in the following sub-sections.

Table 1 Comparison of consideration in the five research design models

Research Design Framework (Cresswell, 2009)	Research Choices (Blaikie, 2007)	The Research Onion (Saunders, et al., 2009)	Nested Research Model (Kagioglou, et al., 2000)	Relationship between epistemology, methodology and research methods (Gray, 2014)
Philosophical worldviews	Research paradigms (Ontology and Epistemology)	Research Philosophies	Research Philosophies	Epistemology/theoretical perspectives
Selected strategies of inquiry	Research strategies	Research approaches	Research approaches	Methodology
Research design		Choices		
Research methods		Time horizons		
		Data collection and data analysis	Research techniques	Methods

Source: Authors' Compilation (2016)

DESIGNING A RESEARCH BASED ON THE RESEARCH 'ONION'

This section adopts the research 'onion' to explain the research design outline for the investigation of the hypothetical problem of stakeholders' management in construction projects.

Research Philosophy

Research philosophy is concerned with the development of knowledge and the nature of the knowledge developed. It is important to understand the philosophical thoughts that underline the research methodology leading to the development of knowledge. Researchers philosophically make claims about what knowledge is (ontology), how knowledge is known (epistemology), what values go into knowledge (axiology), how knowledge is written (rhetoric), and the process of studying knowledge (methodology) (Creswell, 2003). Nonetheless, the main branches of philosophical thoughts in social science research include: Ontology, Epistemology and Axiology (Saunders *et al.*, 2009).

Ontology is the study of the nature of what exists. It is concerned with the state of being and it answers the question of what the nature of social reality is (Blaikie, 2007). Ontology is the starting point of all research, after which epistemological and methodological positions logically follow (Grix, 2004). This position was corroborated by Blaikie (2007) who posited that all

research paradigms embody a world view underpinned by ontologically driven assumptions. Furthermore, while ontology embodies understanding what is, epistemology tries to understand what it means to know (Gray, 2009). Therefore, it is important to note that ontological and epistemological issues tend to emerge together (Crotty, 2003). There are two main ontological assumptions namely: Objectivism (realism) and Subjectivism (idealism) (Saunders *et al.*, 2009; Blaikie, 2007). Objectivism is based on the believe that the existence of social entities is in reality external to the social actors concerned with their existence; and subjectivism is based on the believe that social phenomena are created by the perceptions, thoughts and consequent actions of the social actors concerned with their existence. Similarly, Blaikie (2007) explains the idealist and realist ontological assumptions as follows: "An idealist theory assumes that what we regard as the external world is just appearances and has no independent existence apart from our thoughts. In a realist theory, both natural and social phenomena are assumed to have an existence that is independent of the activities of the human observer."

Epistemology, is the theory or science of the nature of knowledge; which deals with its possibility, scope and general basis (Crotty, 2003; Blaikie, 2007). In other words, epistemology is concerned with what is considered as acceptable knowledge in a given field of study (Saunders *et al.*, 2009). Furthermore,

epistemology is concerned with the provision of philosophical bases for establishing what kinds of knowledge are possible to be known and how to decide that what have been known are both adequate and legitimate knowledge (Crotty, 2003). Similarly, Vogt *et al.*, (2012) argued that epistemology is the study of the origin and justification of knowledge and its claims. Epistemology determines the stance of the researcher in the development of knowledge. The main epistemological stances a researcher can take include positivist and interpretivist stance. Positivism is based on the idea that only observable phenomena can lead to acceptable data, collection of which is based on hypotheses derived from existing theory. The positivist researcher is concerned with facts and that the conduct of research should be value-free such that neither the subject of the research nor the researcher influences each other. Interpretivism advocates the need for the researcher to understand differences between humans in their roles as social actors. The interpretivist researcher armed with the view that the world is subjective and socially constructed is actively involved in what is being studied (Saunders *et al.*, 2009).

Axiology, the third main branch of philosophy is concerned with the study of value judgements. It may cover aesthetical and ethical values but the main concern of axiology as a branch of philosophy is the process of social enquiry linked with the role the researcher(s)' values play throughout the research process (Saunders *et al.*, 2009).

In addition to the ones discussed under ontology and epistemology, there is a research philosophy (pragmatism) which is neither based on ontological nor epistemological knowledge claims alone. Pragmatism advocates that the most important consideration for deciding the appropriate knowledge claim for research should be the research question(s) since some knowledge claims may be more suitable than others for addressing different research questions or objectives. Moreover, the research questions to be addressed within a single study may be such that require a heterogeneous combination of different knowledge claims to be adequately addressed (Saunders *et al.*, 2009). Adding the pragmatist philosophical position, a comparison of four research philosophies mostly used in management research is presented in Table 2 showing their ontological, epistemological, axiological stance as well as data collection techniques they most commonly use.

Research Approaches

The research approaches that guide and direct the procedures in a research design occupy the second layer of the research 'onion' (Fig 2). It is important for researchers to after adopting research philosophy decide which research approach is suitable for their research

(Saunders *et al.*, 2009). There are two research approaches; these include *inductive* and *deductive* approaches the logics of which are shown in Table 3. *Inductive* approach to research aims to establish a universal generalisation to be used as pattern of explanations; by first accumulating data to produce generalisations which are then used as patterns to explain further observations. *Deductive* approach to research on the other hand, aims to test existing theories, to eliminate false ones and corroborate the survivor; by identifying a regularity to be explained, constructing a theory and or deducing hypotheses which are then tested by matching them with empirical data (Blaikie, 2007). In other words, while the inductive approach is aimed at building theory and is based mainly on the collection of qualitative data; the deductive approach is aimed at testing theory and is based mainly on the collection of quantitative data. Furthermore, inductive approach requires a prolonged period of data collection and analysis as ideas emerged gradually; whereas, deductive approach takes shorter time provided care is taken to adequately set up the study before going into data collection and analysis (Saunders *et al.*, 2009).

Research approaches have elsewhere, been referred to as qualitative and quantitative approaches instead of inductive and deductive approaches respectively; and mixed method when both qualitative and quantitative approaches are used (Tashakkori and Teddlie, 1998; Creswell, 2009; Walker, 2010; Creswell and Clark, 2011). Inductive (qualitative) and deductive (quantitative) approaches to research each have their weaknesses hence, it is possible to use a combination of these in a single research and take advantage of their strengths thereby minimising their weaknesses (Blaikie, 2007). Some possible combinations (Figure 6) are discussed below.

Research Strategies

There are seven different research strategies from which researchers can chose to use to answer their research questions and meet their research objectives (see the third layer of the research 'onion'- Figure 2). These include: experiment; survey; case study; action research; grounded theory; ethnography and archival research strategies (Saunders *et al.*, 2009). The choice of appropriate research strategies should be guided by the research questions and aim, the extent of existing knowledge on the subject, the amount of time and other resources available to the researcher, and the researcher's philosophical standpoint. It is also important to note that the use of these strategies is not mutually exclusive and a suitably appropriate combination of two or more strategies can be adopted for one research.

Table 2 Comparison of four branches of research philosophies

	Positivism	Realism	Interpretivism	Pragmatism
Ontology: the researcher's view of the nature of reality or being	External, objective and independent of social actors	Is objective. Exists independently of human thoughts and knowledge of their existence (realist), but is interpreted through social conditioning (critical realist)	Socially constructed, may change, multiple	External, multiple, view chosen to best enable answering of research question
Epistemology: the researcher's view of what constitutes acceptable knowledge	Only observable phenomenon can provide credible data, facts. Focus on causality and law like generalisations, reducing phenomena to simplest elements	Observable phenomena provide credible data, facts. Insufficient data means inaccuracies in sensations (direct realism). Alternatively, phenomena create sensations which are open to misinterpretation (critical realism). Focus on explaining within a context or contexts	Subjective meanings on social phenomena. Focus upon the details of situation, a reality behind these details, subjective meanings motivating actions	Either or both observable phenomena and subjective meanings can provide acceptable knowledge dependent upon the research question. Focus on practical applied research, integrating different perspectives to help interpret the data
Axiology: the researcher's view of the role of values in research	Research is undertaken in a value-free way, the researcher is independent of the data and maintains an objective stance	Research is value laden; the researcher is biased by world views, cultural experiences and upbringing. These will impact on the research	Research is value bound, the researcher is part of what is being researched, cannot be separated and so will be subjective	Values play a large role in interpreting results, the researcher adopting both objective and subjective points of view
Data collection techniques most often used	Highly structured, large samples, measurement, quantitative but can use qualitative	Methods chosen must fit the subject matter, quantitative or qualitative	Small samples, in-depth investigations, qualitative	Mixed or multiple methods designs, quantitative and qualitative

Source: Saunders et al (2009)

Table 3 The logics of Inductive and Deductive research approaches

	Inductive	Deductive
Aim:	To establish universal generalisation to be used as pattern explanations	To test theories to eliminate false ones and corroborate the survivor
Start:	Accumulate observations or data Produce generalisations	Identify a regularity to be explained Construct a theory and deduce hypotheses
Finish:	Use these 'laws' as patterns to explain further observations	Test the hypotheses by matching them with data

Blaikie (2007)

Research Choices

Research choices which occupies the fourth layer of the research ‘onion’, refers to how researchers chose to combine the use of quantitative and qualitative data collection and analysis techniques and tools in the same research. Researchers can choose to use a single data collection technique and corresponding data analysis

tool or use more than one techniques and tools to collect and analyse data in addressing their research problem(s) (Saunders *et al.*, 2009). A comparison of single and mixed methods is presented in Table 4, indicating how qualitative and quantitative methods converge into mixed methods.

Table 4 Quantitative, Mixed and Qualitative methods

Quantitative methods	Mixed methods	Qualitative methods
<ul style="list-style-type: none"> • Pre-determined • Instrument based questions • Performance data, observation data, and census data • Statistical analysis • Statistical interpretation 	<ul style="list-style-type: none"> • Both pre-determined and emerging methods • Both open- and closed-ended questions • Multiple forms of data drawing on all possibilities • Statistical and text analysis • Across databases interpretation 	<ul style="list-style-type: none"> • Emerging methods • Open-ended questions • Interview data, observation data, document data and audio-visual data • Text and image analysis • Themes, pattern interpretation

Creswell (2009)

More detailed possible options of research choices are shown on Figure 6. The use of a single technique is called mono method and the use of more than one technique is called multiple methods. The multiple methods are further divided into multi-method and mixed-methods. It is referred to as multi-method when researchers decide to use more than one quantitative or alternatively, qualitative data collection and analysis techniques and procedures restrictively (see Figure 6) in a single research design. When both quantitative and qualitative techniques and procedures are used for data collection and analysis, the research design choice made is referred to as mixed methods approach. Mixed methods research choices are further subdivided into mixed-method research and mixed-model research. Mixed method research is when quantitative and

qualitative data collection techniques and analysis tools are used either at the same time (in parallel) or in turns (sequentially) (Tashakkori and Teddlie, 1998; Saunders *et al.*, 2009). Depending on what the research seeks to achieve, the researcher using mixed-methods is able to switch between qualitative and quantitative methods or use both of them at the same time do achieve different and or related aspects of the research (Walker, 2010). On the other hand, mixed-model research is that in which, combinations of quantitative and qualitative data collection techniques and analysis tools are used such that; quantitative data can be converted to narratives and be analysed qualitatively or qualitative data can be operationally converted to numerical codes and be analysed statistically.

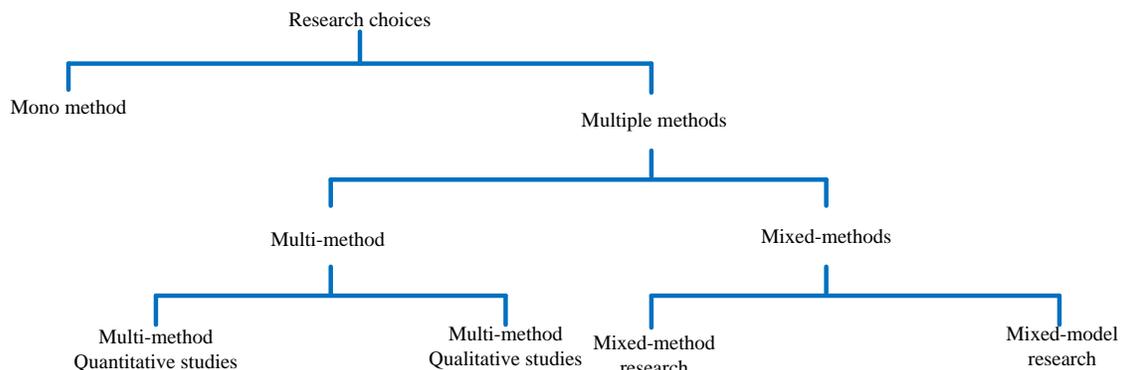


Figure 6 Research choices (Saunders *et al.*, 2009)

Furthermore, there are three major types of mixed methods research namely: sequential mixed methods,

concurrent (parallel) mixed methods and transformative mixed methods. In sequential mixed methods, the

researcher uses qualitative and quantitative methods in sequence with each of them helping to achieve different aspects of the same study. For example, “*the study may begin with a quantitative method in which a theory or concept is tested, followed by a qualitative method involving detailed exploration with a few cases or individuals*” (Creswell, 2009).

In concurrent (parallel) mixed methods, as the name implies, the researcher combines both qualitative data and quantitative data at the same time in order to comprehensively address the research question(s). The researcher using concurrent mixed methods, simultaneously collects both form of data and then integrates the available information to interpret the overall research outcome or embeds one smaller form of data within a major form of data collection in order to address different aspects of the research questions (Creswell, 2009; Creswell and Clark, 2011).

Transformative mixed methods involve the use of theoretical bases for a research design that contains both qualitative and quantitative approaches. The theoretical lens according to Creswell (2009) “*provides a framework for topics of interest, methods for collecting data and outcome or changes anticipated by the study*”. This could involve collecting data based on either sequential or concurrent approaches.

Time Horizons

The last but one layer of the research ‘onion’ is ‘Time horizon’. Time horizons consideration in research design determines whether the research is carried out at a particular time or over a given period of time. It always depends on the research questions the researcher seeks to address and the amount of time available, regardless of which research strategies are methods are chosen. Time horizon can be considered to be either cross-sectional or longitudinal (Saunders *et al.*, 2009). Cross-sectional time horizon is said to be the case if the research is undertaken at a particular point in time (i.e. as a ‘snapshot’). On the other hand, longitudinal time horizon is said to be the case if the research is carried out over a given period of time.

Data Collection and Data Analysis

Occupying the last layer but at the centre of the research ‘onion’ are the data collection and data analysis considerations in research design. There are many techniques and tools for collecting and analysing data respectively depending on the nature of questions to be addressed in the research (Saunders *et al.*, 2009; Creswell and Clark, 2011). Data collection techniques include observation, questionnaires, interviews, experiments, etc and the corresponding data analysis tools will depend on the type of data collected, whether it is quantitative or qualitative.

RESEARCH DESIGN (METHODOLOGY) ADOPTED

The research used as example in this paper was aimed at examining a problem of stakeholder management in construction projects. In order to achieve this aim, six objectives constituting major stages were set out for the study as presented when introducing the paper. The first is to review previous research on stakeholder management in construction projects, in order to identify research gaps and define the focus of the study. The outcome of the first stage gave rise to the need to review related topics such as project success, procurement routes, project life cycle, and stakeholder collaboration as part of the first stage before moving on to the second stage. The subsequent stages of the study were based on the findings from the first stage. The second stage was to investigate current practice of stakeholder management in construction projects followed by the need to assess the effects of procurement routes and forms of contracts on stakeholder management in construction projects. The fourth stage of the study was to model the interrelationships among critical success factors for stakeholder management in construction projects and relate them to project success. The methods adopted to address the stages of the study include literature review (for stage one), survey using questionnaire for stages (two, three and four), process modelling was used for stage five and structured interview and questionnaire for stage six. The research process is shown in Figure 7.

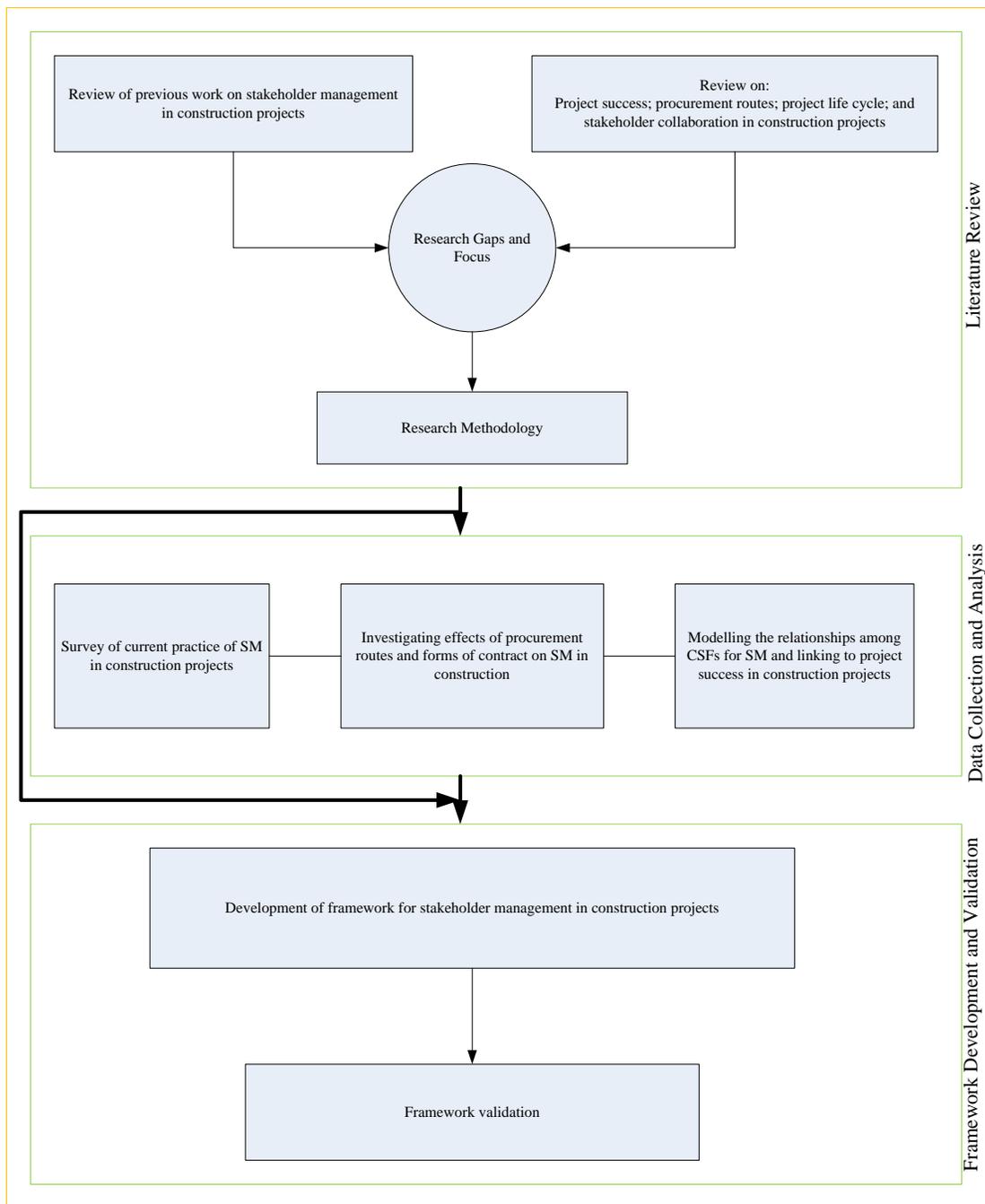


Figure 7 The research process

Literature Review

The research process commenced with literature review on stakeholder management in construction. Key among the outcome of the literature review include identification of critical success factors for stakeholder management in construction projects, need to carry out stakeholder management in construction project throughout the project life cycle, lack of clarity as to who should be responsible for stakeholder management in construction projects, need for collaboration among internal stakeholders, and need for a comprehensive

framework for stakeholder management in construction projects. Based on these the research focus was set and a questionnaire was designed for data collection to address the succeeding objectives of the study.

Research Design

After identifying the research problem(s) and or research questions, the choice of a suitable research method or any possible combination of research strategies is very important before proceeding further with the research. There is not just one correct way to

research design: it is up to the researchers to circumspectly decide which options they think work best for their research. Research design is all about making appropriate choices from the many available options to address research question(s) (Walker, 2010). Philosophical world views, research strategies, research

methods and other necessary considerations all combine to make up the research design which could be based on quantitative qualitative or mixed method research approaches as shown on Table 5 presenting the distinct practices of the three approaches (Creswell (2009).

Table 5 Quantitative, Qualitative and Mixed methods approaches

Tend to or typically:	Qualitative Approaches	Quantitative approaches	Mixed methods approaches
<ul style="list-style-type: none"> Use these philosophical assumptions 	<ul style="list-style-type: none"> Constructivist/advocacy/participatory knowledge claims 	<ul style="list-style-type: none"> Post-positivist knowledge claims 	<ul style="list-style-type: none"> Pragmatic knowledge claims
<ul style="list-style-type: none"> Employ these strategies of inquiry 	<ul style="list-style-type: none"> Phenomenology, grounded theory, ethnography, case study and narrative 	<ul style="list-style-type: none"> Surveys and experiments 	<ul style="list-style-type: none"> Sequential, concurrent and transformative
<ul style="list-style-type: none"> Employ these methods 	<ul style="list-style-type: none"> Open-ended questions, emerging approaches, text or image data 	<ul style="list-style-type: none"> Closed-ended questions, predetermined approaches, numeric data 	<ul style="list-style-type: none"> Both open- and close-ended questions, both emerging and predetermined approaches and both quantitative and qualitative data and analysis
<ul style="list-style-type: none"> Use these practices of research as the researcher 	<ul style="list-style-type: none"> Positions him- or herself Collects participant meanings Focuses on a single concept or phenomenon Brings personal values into the study Studies the context or setting of participants Validates the accuracy of findings Makes interpretations of the data Creates an agenda for change or reform Collaborates with the participants 	<ul style="list-style-type: none"> Tests or verifies theories or explanations Identifies variables to be studied Relates variables in questions or hypotheses Uses standards of validity and reliability Observes and measures information numerically Uses unbiased approaches Employs statistical procedures 	<ul style="list-style-type: none"> Collects both qualitative and quantitative data Develops a rationale for mixing Integrates the data at different stages of inquiry Presents visual pictures of the procedures in the study Employs the practices of both qualitative and quantitative research

Creswell (2009)

Based on the research design model (Figure 4) chosen to guide this research, the research design components found suitable and adopted for this example is the research onion which was earlier presented on Figure 2.

Research philosophy: The research philosophy adopted for this study is pragmatism. A pragmatic approach which is based on actions, situations and consequences and allows the use of both quantitative and qualitative assumptions as well as a combination of both (mixed

method) was adopted for this study (Creswell, 2009). The objectives of this study required the use of both qualitative and quantitative data/information both of which are explained by different knowledge claims as discussed earlier and shown on Table 4. Objectives 1

and 6 were based on qualitative data whereas objectives 2, 3 and 4 were based mainly on quantitative data.

Research Approach: Both qualitative and quantitative approaches are adopted to address different aspects of this study. Quantitative approaches were used to model the relationship between critical success factors for stakeholder management in construction projects and to assess the effects of procurement routes on stakeholder management process. Combinations of qualitative and quantitative approaches were used to investigate the current practice of stakeholder management in construction projects and to validate the framework developed for stakeholder management in construction projects.

Research Strategies: The main research strategy is survey research strategy. Survey strategy was chosen because it allows the collection of large amount of data within constrained time and resources yet ensuring credible data are obtained (Saunders *et al.*, 2009). In the survey, the same questionnaire was used to collect mostly quantitative data and a bit of qualitative data to address objectives 2 to 4 and structured interviews was used to collect data for the purpose of validating the framework.

Research Choices: The qualitative and quantitative techniques were used in a complementary manner in order to address all aspects of the study which would have normally not been adequately addressed by either of the techniques if it was used alone in the study. This was very necessary in this study because, while some of the objectives can be addressed using qualitative techniques others can only be addressed through the use of qualitative techniques of data collection (information retrieval). Several reasons have been advanced for using mixed methods strategy in research, these include: triangulating data sources to obtain convergence between qualitative and quantitative methods, to integrate and or connect qualitative and quantitative data, to use the results from qualitative data and quantitative data side by side to complement or reinforce each other because one source may be insufficient, when there is need to generalise exploratory findings, when there is need to explain initial results (Creswell, 2009; Creswell and Clark, 2011). Literature review was used to address objective 1. Questionnaire survey was used to obtain quantitative and qualitative data to address objectives 2, 3 and 4. A form of analysis following IDEF0 process (which is too wide to be accommodated within this study) was used to address objective 5. Questionnaire/interviews were used to address objective 6.

Time Horizons: Time horizons form an important consideration in the study due to time limitations. The

cross-sectional time horizon option guided the conduct of both the quantitative and qualitative aspects of the study. The objectives of the research as outlined previous do not require a longitudinal study to be addressed since the study was not designed to observe any change over a period of time.

Data Collection method: The main data collection technique was questionnaire survey administered among experienced construction professionals practicing in the UK construction industry. A questionnaire can easily be completely quantitative, completely qualitative or a suitable combination of both quantitative and qualitative, because each question in a questionnaire seeks to obtain one type of data or the other (Walker, 2010). The questionnaire used in this study was designed predominantly to collect quantitative data with ample opportunity provided for the respondents to make comments in order to elicit any information that may have been missed by the questions and options provided. Structured interviews/questionnaires were used to collect qualitative and quantitative data to validate/evaluate the framework.

Questionnaire: The survey conducted to collect data for this study used a close ended questionnaire with an opportunity provided for respondents to make comments freely. A questionnaire survey was designed under three sections covering the research objectives to elicit responses from construction professionals within the United Kingdom. The first section collected background information of the respondents; the second section collected data on the critical success factors for stakeholder management and the effect of procurement routes on stakeholder management process; and the third section collected data on the current practice of stakeholder management in construction projects. Professionals in architecture, construction management, quantity surveying, engineering, facility management, etc with at least five years of relevant professional experience were targeted to participate in the survey. The survey respondents were asked to respond to the questions based on their most recently completed project. The questionnaire also gathered background information of the respondents in order to ensure that they have the required background and years of professional experience to take part in this survey. A minimum of 5 years relevant professional experience was set for sampling the respondents to ensure they have participated in some projects up to completion so that they can have practical knowledge of stakeholder management issues.

For the purpose of sampling, a minimum of 50 responses was required to achieve the objectives of the current study (Iacobucci, 2010). Using an estimated response rate of 25% based on the average response rate

obtainable in similar research in construction management, the sample population for the current study was determined as follows: $[(50 \times 100) \div 25] = 200$ (Saunders, *et al.* 2009). The survey link was sent to 200 professionals practicing within the United Kingdom. After two reminders (at one month's interval each) a total of 74 responses were received representing 37% of the total number of respondents to whom the link to the survey was emailed. Out of the 74 responses received, only 61 (30.5% of respondents contacted) were found suitable and accepted for analysis; 13 were rejected for having less than 5 years of professional experience in construction and/or for incomplete responses.

The following steps were taken in order to facilitate high response rate:

- (i) Including a cover/invitation letter in which details about the research and researcher are provided encouraging participants to voluntarily complete the questionnaire with the assurances of anonymity and confidentiality in collating and handling their responses.
- (ii) The questionnaire was divided into three relevant groups. The questions were made closed very clear with all of them having options except the last question where respondents were required to comment freely.
- (iii) The observations from the pilot study carried out were taken into account before the questionnaire was sent out to respondents. Reminders were sent out twice to respondents.

Framework Development and validation/evaluation: The framework development was based on the outcome of the survey data analysis. The results of the data analysis were combined with important indications from literature review to form the components and structure of the framework. The life cycle based framework for stakeholder management in construction covers four stages including stakeholder management at inception, design, construction and operation stages.

Data analyses: Regarding data analyses tools, different statistical techniques were used to analyse data collected aimed at addressing different objectives. Detail explanation on the data analysis tools employed including validity and reliability of the research design as well as model development are not covered with this article. Future article will provide explanation on these aspects.

CONCLUSION

This study sets out to present an example of research design to achieve set objectives in a built environment research. Using a hypothetical problem of stakeholder management in construction projects, the paper couched

a set of objectives that could optimally scrutinise the problem. Firstly, rigorous literature reviewer was carried for the purpose of identifying the critical success factors for stakeholder management in construction projects. After identifying the research problem, a detail design consisting of mix method was presented and this was underpinned on the philosophical stance of pragmatism. Regarding the research approach, both qualitative and quantitative approaches were adopted to address different aspects of the study.

The main research strategy adopted is a survey research strategy. Survey strategy was chosen because it allows the collection of large amount of data within constrained time and resources yet ensuring credible data are obtained (Saunders *et al.*, 2009). In the survey, the same questionnaire was used to collect mostly quantitative data and a bit of qualitative data to address objectives 2 to 4 and structured interviews was used to collect data for the purpose of validating the framework. In respect of research choices, the qualitative and quantitative techniques were used in a complementary manner in order to address all aspects of the study which would have normally not been adequately addressed by either of the techniques if it was used alone in the study. Literature review was used to address objective 1. Questionnaire survey was used to obtain quantitative and qualitative data to address objectives 2, 3 and 4. A form of analysis following IDEF0 process (which is too wide to be accommodated within this study) was used to address objective 5. Questionnaire/interviews were used to address objective 6. The time horizons form an important consideration in the study due to time limitations. The cross-sectional time horizon option guided the conduct of both the quantitative and qualitative aspects of the study.

The main data collection technique was questionnaire survey administered among experienced construction professionals practicing in the construction industry. A questionnaire can easily be completely quantitative, completely qualitative or a suitable combination of both quantitative and qualitative, because each question in a questionnaire seeks to obtain one type of data or the other (Walker, 2010). The survey conducted to collect data for this study used a close ended. All these led to the deliverable of the study which a framework developed for management of stakeholder in a construction project. The framework development was based on the outcome of the survey data analysis. The results of the data analysis were combined with important indications from literature review to form the components and structure of the framework. The life cycle based framework for stakeholder management in construction covers four stages including stakeholder management at inception, design, construction and operation stages. Regarding data analyses tools,

different statistical techniques were used to analyse data collected aimed at addressing different objectives.

With this elaborate example is hoped that researchers in the built environment disciplines would find a useful guide for designing investigations that could lead to quality research outputs.

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MINERALOGICAL CHARACTERISTICS OF NAHUTA CLAY, JOS PLATEAU, NORTHCENTRAL NIGERIA: IMPLICATIONS FOR HYDROTHERMAL ALTERATION

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ABSTRACT

Nahuta Clays occurs within the Rop Complex, Jos Plateau, north central Nigeria. The present study focuses on the mineralogical compositions of Nahuta clay with the aim of ascertaining the protoliths and process of clay formation. The clay samples were studied geochemically using X-Ray Diffraction analyses. The peaks of XRD analyses of representative clay samples indicate four groups of clay minerals and they include: Serpentinite-Kaolin group (kaolinite, dickite and halloysite); Pyrophyllite-Talc group (talc and pyrophyllite); Mica group (phlogopite, hydrobiotite and illite) and Palygorskite-Sepiolite group (sepiolite). Based on the mineralogical compositions of Nahuta clay, the other non-clay minerals identified are: quartz, osumilite, tobermorite, albite and hematite. The presence of kaolinite, illite, quartz and albite indicate felsic rocks as the predominant protoliths of Nahuta clay. Osumilite occurs as grains in volcanic rocks while tobermorite occurs as hydrothermal product in basaltic rocks. This is suggestive that part of the protoliths of Nahuta clay was derived from hydrothermal alteration of basaltic rocks. The presence of dickite, osumilite and tobermorite further attest to hydrothermal alteration of the protoliths because dickite, osumilite and tobermorite are restricted to hydrothermal occurrences. This is indicative that the process of formation of Nahuta clay is through hydrothermal alteration and/or weathering of granitic host rocks with contributions from volcanic rocks.

Keywords: osumilite, volcanic, hydrothermal, felsic and protoliths

INTRODUCTION

Nahuta clay occurs in the western part of the Rop Complex, Jos Plateau, north central Nigeria (Fig. 1). The Rop Complex is a roughly triangular area of 360km² of which 105 km² are underlain by the Younger Granite suites. The Basement Complex rocks are the oldest rocks and they underlie the Rop Complex (Macleod, Turner, & Wright, 1971). Nahuta area is located within Latitudes 9°29¹ to 9° 32¹ N and Longitudes 8°51¹ to 8°53¹E on the North East of Topographical Sheet 189 (Kurra). This area is bounded to the North by Gana Rop and to the west by Rarin Sho village.

Most clay minerals form where rocks are in contact with water, air or steam. These situations include weathering boulders on a hillside, deeply buried sediments containing pore water, and rocks in contact with hydrothermal fluids. The origin of clays and clay minerals is governed principally by protore rocks, climate, relief and time (Blum & Stillings, 1995; Buggle, Glaser, Hambach, Gerasimenko, & Markovič, 2011). The primary minerals are replaced by the secondary minerals when there is a change in the prevailing conditions subjected to the rock. Hydrothermal alteration is a chemical replacement of the original minerals in a rock by new minerals via interaction with hydrothermal fluids. The hydrothermal fluids cause hydrothermal alteration of rocks by passing hot water fluids through the rocks and changing their

composition by adding, removing or redistributing components (Eberl, 1984; Konta, 1995).

In geothermal environments, primary minerals usually tend to alter to hydrothermal alteration minerals that are either stable or at least metastable in these environments. The formation of these hydrothermal alteration minerals is usually dependent on the temperature, permeability, pressure, fluid's composition, initial composition of the rock and the duration of the hydrothermal activity (Singer, 1979; Velde, 1995). Kaolin was reported in Nahuta area and is being exploited in the Rop Complex as well as cassiterite (Rose, Hawkes, & Webb, 1979). Kuba and Nahuta clays have been estimated to be about 18 million tons (Raw Materials Research and Development Council [RMRDC], 1989).

Aim and Objectives

The mineralogical compositions of Nahuta clay have not been used in determining the protoliths, the process of formation and Economic potentials of the clays. The present study focuses on the mineralogical compositional analysis of Nahuta clay with the aim of ascertaining the protoliths and process of clay formation.

LITERATURE REVIEW

Antolimi (1967) reported large reserve of black clays in the Delimi River south of Jos airport and stated that the

black coloration of Delimi River clay may be from mafic minerals. The black clay in the Sabon Gida mine was also reported by Kogbe (1979). He stated that the black clay originated from the feldspars in the biotite granite of the Jos-Bukuru Complex by chemical weathering of minerals containing Al and Si. The black coloration may be due to the appropriate presence of some mafic minerals like biotite in the parent rock.

Emofurieta (1992) described the mineralogy and economic potentials of a pegmatite residual soil profile in southwestern Nigeria. The mineralogical and major oxides compositions of the residual soils were compared with other known clay bodies to determine their economic uses. Emofurieta and Salami (1988) gave a comparative study of two clay deposits in southwestern Nigeria and highlighted the physical and geotechnical properties of these clays, and stated that they are suitable for ceramics purposes. Kehinde-Phillips (1991) gave the physical, mineralogical and chemical compositional variations within lateritic profiles over mafic and ultramafic rock units of the Ilesha schist and determined the uses of these clays for constructional purposes.

Elueze and Kehinde-Phillips (1992) highlighted the mineralogy and major oxides compositional features of lateritic profiles above anorthophyllitic schist in Ita Osan area, southwestern Nigeria and provided the variations in the mineralogy and major oxides composition along the profile and as well described the uses of the derived laterites. Emofurieta, Kayode, and Coker (1992) investigated the mineralogy, geochemistry and economic evaluation of the kaolin deposits near Ubulu-Uku, Awo-Omama and Buan areas and the mineralogical and geochemical compositions of the kaolins were compared with industrial specifications. Emofurieta, Ogundimu, and Imeokparia (1994) reported on the mineralogy, chemical compositions and the economic uses of clays and shale deposits in southwestern and northeastern Nigeria, and that these clays can be used in the manufacturing of refractories, ceramic wares, paints and in pharmaceutical industries. Emofurieta, Aladesawe, and Ogunseiju (1995) reported that two soil types of distinct composition were derived from the banded biotite gneiss in Ile Ife, southwestern Nigeria. The variety derived from the melanocratic band is ferriallitic, mica-rich and reddish brown in colour whilst the derivative of the leucocratic band is alkali-allitic, felsic and whitish in colour.

Geological Settings and Mode of Occurrence of Nahuta Clay

Nahuta area is underlain by crystalline rocks in which three groups of rocks have been identified (Fig. 2). They are:

- (i) Older Granites (porphyritic granite),

- (ii) Younger granites (granite porphyry, micro granite and biotite granite)

- (iii) Volcanic rocks (Older basalt).

Nahuta clay extensively overlies the Basement and is underlain by porphyritic granite (Precambrian in age) and micro granite of the Rop Complex of Younger Granite Province (Jurassic in age). Some other granitoids that are Jurassic in age include biotite granite and granite porphyry (Fig. 2) while Older basalt is the youngest rock unit overlying the Younger Granites and Nahuta clay deposit. The overburden encountered was lateralized ironstone with an average thickness of about 1.5m.

Sampling was carried out at the main pit of Nahuta Clay. The pit has a depth of about 20 to 22m, which extends to 25m. The deposit can be divided into four horizons (Fig. 3): a kaolinized granite horizon overlying a variegated reddish clay horizon that is overlying whitish kaolin horizon (Fig. 3), which, in turn, overlies light grey kaolin. The thickness of kaolinized granite horizon ranges from 2.5 to 3.0m, the thickness of variegated reddish clay ranges from 3.2 to 3.5m, whitish kaolin (Fig. 3) horizon varies from 4.2 to 6.3 m and light grey horizon ranges from 5.3m onwards to the underlying Basement rock. Fig. 4 shows the field photograph of the Mining cave of Whitish kaolin from Nahuta area.

METHOD AND PROCEDURE

Fresh and representative clay samples were collected using pickaxe at varying depth and horizons from the deepest to the topmost part of the Nahuta clay deposit according to Maynard (1992). This is to determine the sequential variation in the compositions of the clays along the profile. The thickness of each horizon was measured using measuring tape and the clay samples were stored in air-tight plastic bags labelled with a sample number. The dried clay samples were subjected to clay mineral separation analyses at Engineering Geology Laboratory, University of Ilorin, Nigeria while X-ray diffraction (XRD) analyses were carried out at Department of Geology, University of Pretoria, South Africa.

For XRD analyses, the clay samples were mounted on sample holders with little pressure, using a blade to minimize preferred orientation of the kaolinite particles. Samples were scanned from 0 to 70° 2 θ at a counting time of 1s and their diffractograms recorded. Powder X-ray diffraction for bulk clay samples were carried out using a Philips PW 1710 XRD unit operated at 40KV and 30Ma, with a Cu-K α radiation. A graphite monochromated with a PW 1877 Automated Powder Diffraction, X-PERT Data collector software package was employed for qualitative identification of the minerals (Odeyemi, 2011).

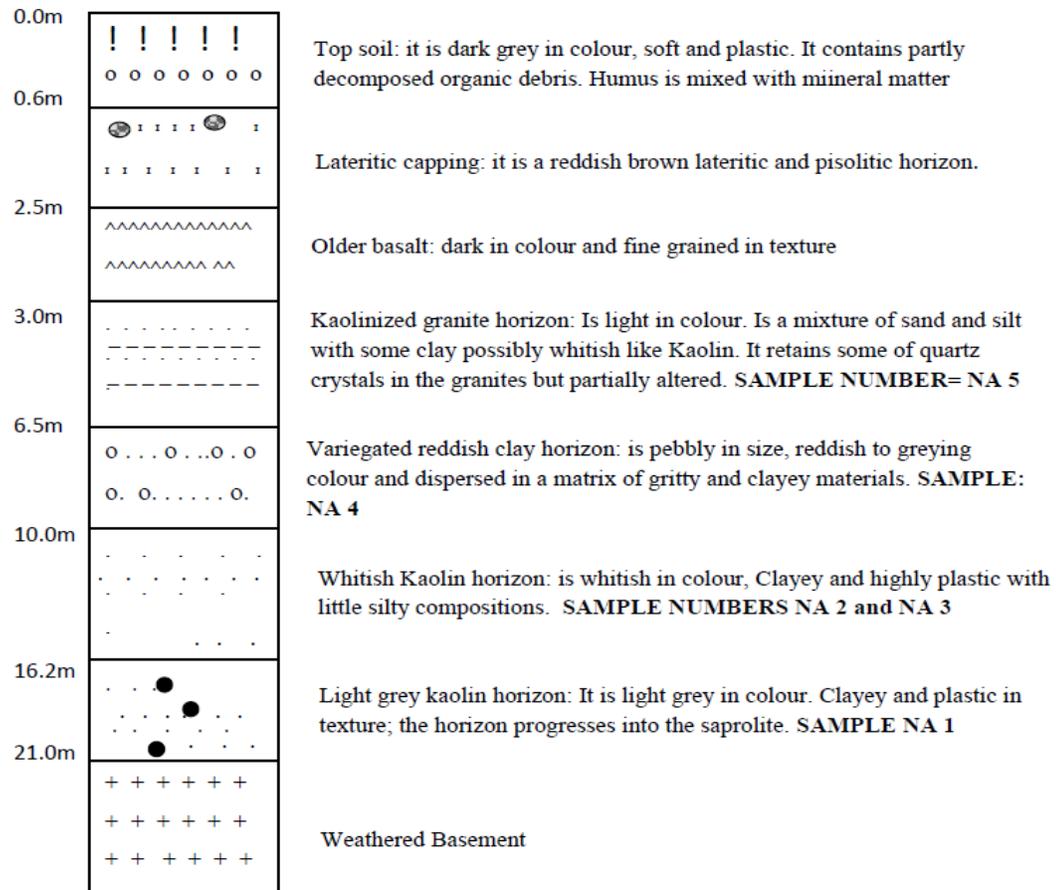


Fig. 3: Profile section of Nahuta clay (Latitude: 09° 29' 18.3" N and Longitude: 008° 51' 12.9" E)



Fig. 4: Field photograph of Mining cave of Whitish kaolin from Nahuta area

ANALYSIS AND DISCUSSION

The result of XRD analyses of the representative clay samples from Nahuta area is shown in Figs. 5 and 6. From the peaks of XRD analyses, the following non-clay minerals were identified and they include:

osumilite, tobermorite, albite and hematite (Figs. 5 and 6). The semi quantitative mineralogical compositions of the five clay samples (NA 1 to NA 5) from Nahuta area is presented in Table 1.

Based on the mineralogical compositions, four groups of clay minerals were identified and they include:

- (i) Serpentinite-Kaolin group: kaolinite, dickite and halloysite.
- (ii) Pyrophyllite-Talc group: talc and pyrophyllite
- (iii) Mica group: phlogopite, hydrobiotite and illite
- (iv) Palygorskite-sepiolite group: sepiolite.

The Percentage composition of illite is relatively low ranging from 11.2 to 15.0 wt% (Table 1), this indicate abundance of muscovite and/or K-feldspar. The percentage compositions of kaolinite, halloysite and phlogopite range from 41.29 to 52.54wt%, 7.70 to 21.30wt% and 9.34 to 10.11wt% respectively. The percentage composition of pyrophyllite and talc varies from 2.25 to 6.40 wt% and 5.69 to 7.40wt% respectively (Table 1).

Table 1: Semi quantitative Mineralogical compositions (wt%) of Nahuta clay

Minerals	NA 1	NA 2	NA 3	NA 4	NA 5
Tobermorite	5.30	7.45	-	-	9.82
Osumilite	-	8.65	-	4.35	-
Illite	-	11.20	15.00	11.90	14.11
Phlogopite	10.11	8.20	-	-	9.34
Halloysite	-	-	21.30	7.70	-
Kaolinite	52.54	42.11	42.65	41.29	44.77
Dickite	2.80	5.19	-	-	9.05
Sepiolite	-	8.20	9.15	-	-
Hydrobiotite	10.31	-	-	16.22	-
Pyrophyllite	-	-	2.25	6.40	-
Talc	7.40	-	-	5.69	-
Quartz	11.54	9.00	-	-	7.68
Hematite	-	-	6.25	6.45	-
Albite	-	-	3.40	-	5.23

Source: Author's Analysis (2016)

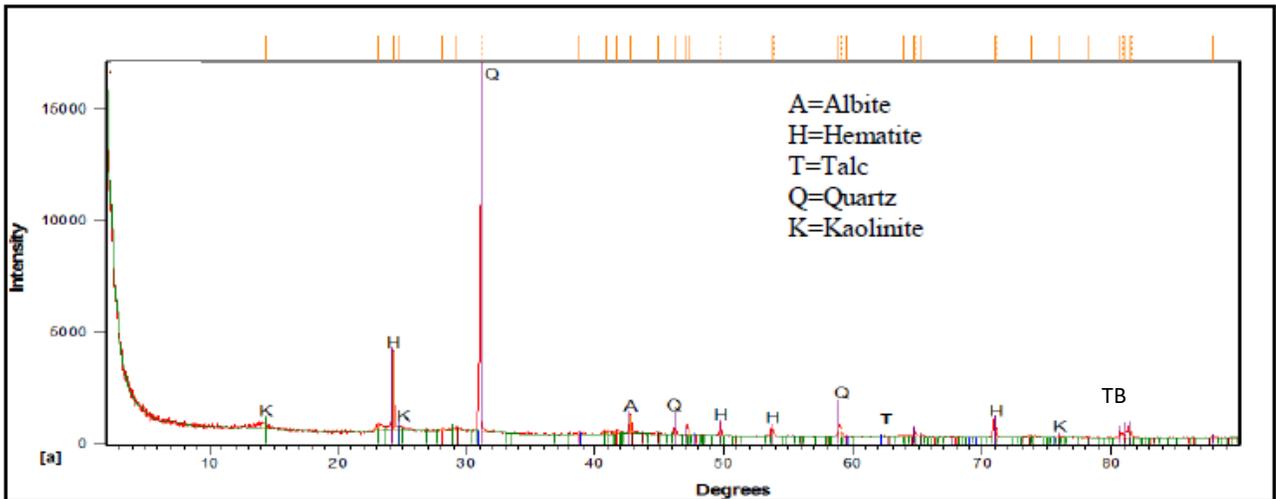


Fig. 5: X-Ray diffraction traces of Nahuta clay NA 1 (Q=Quartz, K=Kaolinite, T=Talc H=Hematite, A=Albite and TB=Tobermorite)

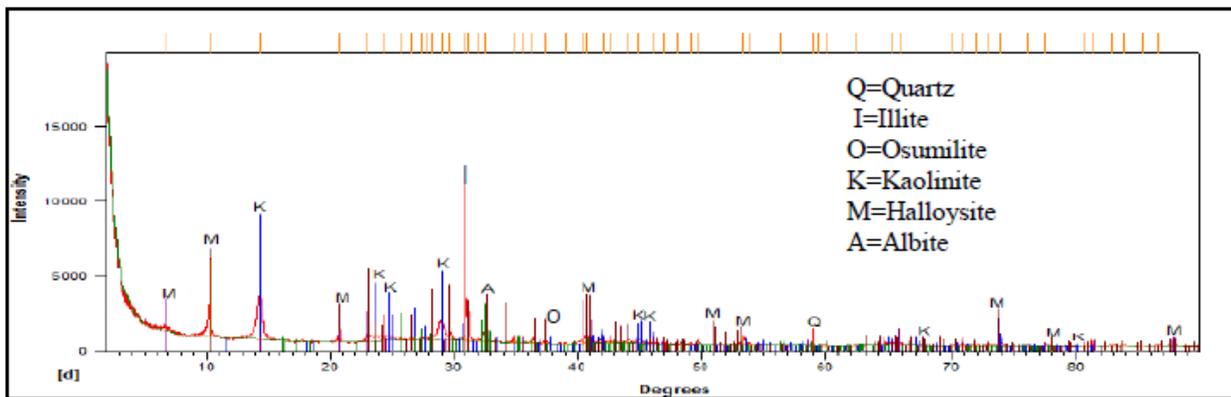
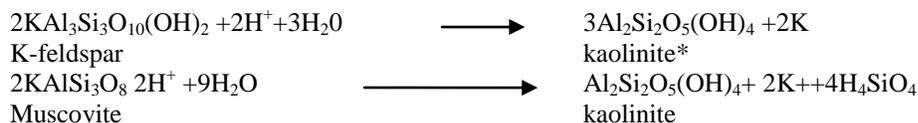


Fig. 6: X-ray diffraction traces for Nahuta clay sample NA 2 (Q=Quartz, I=Illite, O=Osumilite, K=Kaolinite, M=Halloysite and A=Albite)

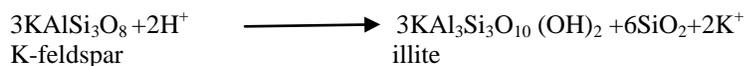
Serpentine-Kaolin group is identified in the mineralogical compositions of Nahuta clay and they include: kaolinite, dickite and halloysite. The percentage compositions of kaolinite and halloysite range from 41.29 to 52.54wt% and 7.70 to 21.30 wt% respectively (Table 1). Kaolinite and halloysite could be derived through hydrothermal alteration and/or weathering of the protoliths containing a high proportion of aluminosilicate minerals (Konta, 1995). The limited variation in the compositions of kaolinite across the section further suggests that the process of formation of Nahuta clay is predominantly through hydrothermal activity because if weathering predominates the percentage composition of kaolinite will increase with the trend of weathering (Nesbitt & Young 1982, 1984).

The occurrences of dickite and sepiolite further attested to hydrothermal alteration of the protoliths because these minerals are produced only through hydrothermal alterations (Duane & Robert, 1997). Serpentine-Kaolin



Mica group (phlogopite, hydrobiotite and illite) is identified in the mineralogical compositions of the clay deposit from Nahuta area. Percentage composition of illite from Nahuta clay is low ranging from 11.2 to 15.0wt% (Table 1). This further indicates abundance of muscovite and/or K-feldspar because illite is formed by chemical alteration of K-feldspar indicating contributions from granitic sources.

The percentage composition of phlogopite from Nahuta area varies from 9.34 to 10.11wt% while hydrobiotite varies from 10.31 to 16.22 wt%. The presence of hydrobiotite is an indication that biotite is contained in the mineralogical composition of the protoliths. Illite



The Palygorskite-sepiolite group (sepiolite) is identified in Nahuta clay. The percentage compositions of sepiolite in Nahuta clay ranges from 8.20 to 9.15wt%. Sepiolite composition in Nahuta area is relatively low and Palygorskite ($\text{Mg}_2\text{Al}_2\text{Si}_8\text{O}_{20}(\text{OH})_2(\text{OH}_2)_4\text{M}^+(\text{H}_2\text{O})_4$), previously referred to as attapulgite or fuller's earth, is a rare, fibrous clay (Murray, 2000). The genesis of sepiolite is associated with alkaline and hydrothermal alteration of magnesium-rich rocks. It is fibrous

group is important industrial clay for economic benefit. Kaolin groups can be used as indicators of the environment during weathering, allothi- and authi- genesis in the sediments and in the study of source area of the detrital supply. Kaolin group can serve as pH indicators and indicators of processes in micro and mega-environments and as well as changes in the course of diagenesis and metamorphosis, mineralogical, and geochemical investigations of clay minerals. Kaolin can also serve as one of the correlation methods, in the recognition of processes in the origin of climatic, geodynamic, paleogeographical and weathering rate interpretations (Konta, 1995).

Kaolinite in Nahuta area is primarily occurring as mixed hydrothermal and/or residual. Based on the percentage of kaolinite from Nahuta clay, this indicates that larger percentage of the mineralogical compositions of the protoliths of the clay would probably be from K-feldspar content of granitic rocks considering the equation below:

$(\text{K}_{1.5}\text{Al}_4\text{Si}_{7-6.5}\text{Al}_{1-1.5}\text{O}_{20})(\text{OH})_4$ is among hydromicas and others include biotite $\text{K}_2(\text{Mg},\text{Fe}^{+2})_{6-4}(\text{Fe}^{+3},\text{Al},\text{Ti})_{0.2}(\text{Si}_{6.5}\text{Al}_{2.3}\text{O}_{20})(\text{OH},\text{F})_4$ and muscovite $\text{K}_2\text{Al}_4(\text{Si}_6\text{Al}_2\text{O}_{20})(\text{OH},\text{F})_4$.

Illite is micaceous with similar chemical and mineralogical composition as muscovite but slightly smaller in particle size. Differences of hydromicas especially muscovite and illite occur in their physical properties such as their particle size. Illite is formed by the chemical alteration of K-feldspar. The hydromicas occur in low to medium grade metamorphic and igneous rocks (Ekosse, 2011).

providing high surface area and porosity which provide excellent sorption and gelling properties (Singer, 1979). This is indicative that part of the protolith of Nahuta clay would have resulted from hydrothermal alteration of Mg-rich alkaline rocks.

The Pyrophyllite-Talc group (talc and pyrophyllite) is identified in the Nahuta clay. The percentage composition of pyrophyllite and talc ranges from 2.25 to

6.40 wt% and 5.69 to 7.40wt% respectively. Talc and pyrophyllite are derived from hydrothermal alteration of volcanic host rock in an unmetamorphosed lithology changing the primary minerals. This further attests to the hydrothermal alteration of protoliths of Nahuta clay and partly contributions from volcanic sources.

Osumilite was first discovered as grains in volcanic rocks near Osumi, Japan and occur in the groundmass of rhyolite and dacite. Osumilite is found in the Obsidian Cliffs, Oregon, Sardinia, Italy; Kagoshima and Yamanashi Prefecture, Japan; and the Eifel district in Germany. This indicates that Osumilite occurs in volcanic rocks. Tobermorite occurs as vesicles and cavities in basaltic rocks (Merlino, Bonaccorsi, & Armbruster, 2001). This is the first time osumilite and tobermorite will be reported in Nahuta clay deposit. This is suggestive that part of the protoliths of the clays was derived from hydrothermal alteration of basaltic rock overlying the clay deposits. The present research is attested to by the report of Shaw, Clark, and Henderson (2000) that tobermorite and osumilite usually occur where hydrothermal fluids react with basaltic rocks in Okayama, Japan (Henmi & Kusachi, 1992) and Skye, United Kingdom (Livingston, 1988).

The presence of kaolinite, illite, quartz and albite indicate predominant contributions from felsic sources. The presence of dickite further attests to hydrothermal alteration of the protoliths because dickite is restricted to hydrothermal occurrences (Duane & Roberts, 1997). The process of formation of Nahuta clay was through hydrothermal alteration and/or weathering of granitic protoliths as evident in the minerals identified but not

completely through weathering as proposed from Sabon Gida clay in Jos Plateau (Kogbe, 1979) and Delimi river clay, south of Jos Airport (Antolimi, 1967).

Economic Potentials

The mineralogical compositions of Nahuta clays are compared with mineralogical compositions of Nigerian clays such as Share clay (Odewumi, 2013); Asaba, Aramoko-Ekiti, Ibadan and Benin clays (Okunlola & Owoyemi, 2011), Kankara and Oza-Nagogo clays (Emofurieta & Kayode, 1992) and other industrial specifications of clays like China clays (Huber, 1985) and Nigerian Fertilizer Company of Nigeria (NAFCON, 1985) as shown in Table 2.

The kaolinite composition of Nahuta clay compares well with Ibadan and Benin clays (Okunlola & Owoyemi, 2011) but lower in kaolinite composition compared with the China clays (Huber, 1985) that is suitable for ceramic productions and NAFCON (1985) specification that is suitable for fertilizer production. Quartz content of Nahuta clay is relatively higher than the quartz content of China clays (Huber, 1985) and NAFCON (1985).

Kaolinite, quartz and illite content of Nahuta clays are not compatible with clays in Aramoko Ekiti, Benin, Kankara, China and NAFCON specifications as shown in Table 2. This indicates that for the uses of Nahuta clay in fertilizer production using NAFCON (1985) specification will require some processing. Also for the application of Nahuta clay in ceramic using China clay specification will require processing (Table 2).

Table 2: Mineralogical compositions (wt.%) of Nahuta Clays compared with other clays in Nigeria and industrial specifications.

Minerals	NA	A	B	C	D	E	F	G	H	I
Quartz	9.41	20.75	21.0	38.00	31.67	29.00	2.00	14.00	Tr	4.00
Kaolinite	44.67	55.00	51.25	53.00	47.00	50.00	96.00	86.00	85.00	85.00
Illite	13.05	-	3.00	-	1.50	3.00	2.00	-	-	-
K-feldspar	4.32	-	3.00	-	2.50	9.0	-	-	15.00	3.00
Sepiolite	8.68	-	12.75	6.00	6.33	6.00	-	-	-	-
Others	19.87	-	3.50	1	5.0	10.00	-	-	-	8.00

NA-Average mineralogical compositions of Nahuta clay; A-Share clay (Odewumi, 2013); B-Asaba, C-Aramoko-Ekiti, D-Ibadan and E-Benin clays (Okunlola & Owoyemi, 2011); F-Kankara and G-Oza-Nagogo (Emofurieta & Kayode, 1992); H-China clays (Huber, 1985) and I-NAFCON (1985).

CONCLUSION

The abundance of kaolinite, illite, quartz and albite indicate predominant contributions from felsic rocks. Talc, pyrophyllite, osumilite and tobermorite are derived from hydrothermal alteration of volcanic rocks. The presence of dickite attests to hydrothermal alteration of the protoliths. The process of formation of Nahuta clay was through hydrothermal alteration and/or

weathering of granitic protoliths and partly contributions from volcanic sources. The application of Nahuta clays in fertilizer and ceramic productions will require some clay processing.

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RESIDENTIAL BUILDINGS PROCUREMENT WITH LABOUR ONLY METHOD: PERFORMANCE EVALUATION AMONG FEDERAL INCOME EARNERS IN AKWA IBOM STATE

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ABSTRACT

The study evaluated the performance of labour only projects, the influencing factors and relationship between the significant factors and performance of labour only projects executed by federal income earners in Akwa Ibom state. A survey design approach was adopted using structured questionnaires purposively administered on 132 respondents resulting in 118 valid mail questionnaire comprising 23 low, 40 middle and 55 high income earners. Data were analysed using descriptive, relative importance index, Kruskal Wallis and correlation analysis. In conclusion there were 46.2%, 69.2% and 76.9% level of performance among low, medium and high income earners respectively, with minimal high level performance, while performance variation was significant among income groups. All the income groups unanimously perceived that majority of the factors have significant influence on the performance of labour only projects. The significant factors among the low and medium income had negligible correlation, while the factors among the high income earner had no significant correlation with the performance of labour only projects. The study recommends that low and medium income earners should enhance the performance of their labour only projects by putting consideration on other factors, apart from management styles and availability of fund, while high income earners should place priority on other performance attributes apart from clients' satisfaction and meeting construction costs. Government should create enabling environment through provision of soft loans, improved technology, procurement awareness, and use of local materials.

Keywords: Akwa Ibom; Federal income earners; Labour only method; Performance; Procurement; Residential buildings

INTRODUCTION

A recent study conducted in Nigeria (Ujene and Idoro, 2015) opined that buildings are major products of the construction industry which serve as life support systems, provide shelter, enhance productivity, and embody our culture. The peculiarity of buildings as outdoor products which consume huge resources make them incredibly expensive to build and maintain, hence the economics of building is a vital and complex issue throughout their existence. Memon, Rahman, Abdullah, and Abdu Azis (2010) see cost as a foremost consideration in project delivery and regarded as one of the most important criteria of project success. According to Ujene and Idoro (2015) some studies (Ogunsanmi and Bamisile, 1997; Ogunde, Fagbenle and Amusan, 2012; Ujene, 2012; Ogunsemi, 2013 and others) have placed continuous search for alternative procurement systems, construction methods, cost estimation/prediction and control methods due to the high costs of buildings, continuous failure of cost and other performance considerations of projects. Clients and consultants have always been considering cheaper ways of achieving constructions since the downturn in the Nigeria economy between 1985 and 1999 which had created recession in the construction industry (Ogunde, Fagbenle and Amusan, 2012). This led to modifications of existing project execution systems in favour of labour-only, direct labour and public-private partnership systems. In a labour-only system clients are involved in

the purchase of materials while leaving the management of the labour and construction to the contractor who gets paid for the costs of engaging the labour and the contractor's profit (Adenuga and Akinsola, 2007).

The economic downturn, cost failure, tenancy problems, among others have made private clients out of frustration to commence occupation of partially completed buildings after the partial completion of the structural building elements (foundation, floor, wall, frame, doors and windows and roof), while the finishing and other work items are done gradually, especially among low and medium income families in Nigeria (Ujene, 2012). Olugbenga and Adekemi (2013) stated that housing delivery in Nigeria is provided by either the Government or Private sector, but despite Federal Government access to factors of housing production, the country could at best expect 4.2% of the annual requirement. Substantial contributions have been observed from other public and private sectors, with private sector developers accounting for most of urban housing. Despite all efforts Jiboye (2009) observed that the quantity or quality of houses in Nigeria have never been satisfactory. The current national housing policy that de-emphasises government involvement in housing provision has also put the potential for tackling affordability problems on private or individual developers.

According to Ndubueze (2009) the increasing concerns over rising levels of homelessness, housing costs, mortgage defaults and foreclosures, negative equity experienced by households, together with the declining neighbourhoods, and over-heated housing markets have concertededly pressed quality housing development into the centre of housing policy. The capacity of a household to pay for and maintain quality houses depends to a great deal on the income group which it belongs as well as the pressure exerted by other needs on the family earnings. Omole (2010) noted that the problem of low income affects the level of capital formation, which deprives the people of sufficient resources to utilize in improving their homes and keep their environment healthy for comfortable living. The cost of a building is seen as a key determinant of house ownership affordability because families who pay more than 30 percent of their income on housing are considered cost burdened and may have difficulty affording other necessities such as food, clothing, transportation and medical care (Aribigbola, 2011). Kamau (2002) noted that there is increasing desire for families to develop and own their homes rather than paying rents because of some associated discomforts. The capacity of a household to pay for their housing development depends to a great deal on the income group which it belongs as well as the pressure exerted by other needs on the family earnings.

Similarly, Agburu (2012) observed that insufficient wages or income makes life extremely precarious for a worker and members of his/her family, hence many private developers in Akwa Ibom state have resorted to the use of labour only procurement system with the expectation of high project performance through improved resource management and cost savings. Project procurement methods are the different delivery methods that can be used by a developer to take the design and construction of a project from its inception to its completion and handover. "Project Delivery methods" also refers to the methods for assigning responsibility to an organization or an individual for providing design and construction services to a client. This definition agrees with that given by Ogunsanmi and Bamisile (1997), Ashwort and Hogg (2007) and Babatunde *et al.* (2010) who defined procurement method as the management of the total process involved in construction project delivery. Some studies have been carried out on procurement systems, most of which are on appraising the performance of procurement methods as can be seen in Masterman (2002); Kadiri and Odusami (2003); Achuenu and Shinkut (2006); Ojo *et al.* (2006) and Babatunde *et al.*(2010). Adenuga and Akinsola (2007) examined the basis of award and execution of the management of labour only contract in the Nigerian construction industry, while Ogunde, Fagbenle and Amusan (2012) carried out a comparative

analysis of performance of labour only and direct labour contracts in south western Nigeria. These studies have not focused on the influence of the income capabilities of the private financiers on the performance of labour only system which is becoming dominant among private developers. This study therefore aims at providing an insight into the influence of income capabilities on the performance of labour only contract, with a view to ensuring sustainable housing development among federal income earners in Akwa Ibom state.

Aims and Objectives of the Study

The study has the following as its objectives: one, to evaluate the extent of performance of labour only projects executed by low, medium and high federal income earners in Akwa Ibom state; and two, to evaluate the factors influencing the performance of the labour only system among the three income groups.

REVIEW OF RELATED LITERATURE

A number of studies on procurement systems and its influencing factors, project performance indicators and categories of federal income earners were reviewed as a basis for the questionnaire formulation for this study as highlighted hereafter.

Procurement Methods

There are several methods and combinations of methods an owner can choose for construction project delivery. Literature has shown that there are diverse views in the classifications of delivery methods. Ramus and Birchall (1996) showed that classification commonly used, in practice, often combine the characteristics of two or more types. Each of the methods has distinct advantages and disadvantages for both the owner and the contractor. The procurement method chosen for a project will determine the relationship, obligation and the line of communication between the client, consultants and the contractor (Bamisile, 2004). Nonetheless, studies by Kobayashi (1997), Babatunde *et al.* (2010) among others, classified construction procurement methods into two broad categories as: traditional procurement method, and non-conventional procurement method. The various methods which can be used to procure construction projects as identified by literature are as follows; traditional method, project management method, management contracting, construction management, design and build, labour only method and direct labour method (Adenuga and Akinsola, 2007; Ogunde, Fagbenle and Amusan; 2012; Ogunsanmi, 2013). For the purpose of this study emphasis is placed on labour only method.

Labour only Procurement Method

Labour only procurement method has been defined as where the client is involved in the purchase of materials while leaving the management of the labour and

construction to the contractor who gets paid for the costs of engaging the labour and his profit and overhead. In other words labour-only contracting refer to an arrangement where the contractor or subcontractor merely recruits, supplies or places workers to perform a job, work or service for a client (Adenuga and Akinsola, 2007; Ogunde, Fagbenle and Amusan; 2012; Ogunsanmi, 2013). Labour-only contract has any of the following elements:

- i) The contractor or subcontractor does not have adequate capital stocks and subscribed capitalisation in the case of corporations, tools, equipment, implements, machineries and work premises, actually and directly needed in the performance or completion of the job,
- ii) The client does not allow the contractor to exercise the right to control over the performance of the work.

Procurement Performance and Its Influencing Factors

Performance has been generally described as the degree of achievement of certain effort or under-taking, or more literally as how well or badly some-thing is done. Takim and Akintoye (2002) observed the fact that the element of success in a project refers to efficiency and effectiveness measures. These have been measured in terms of cost, quality and time, value for money for their investment, minimal exposure to risk and early confirmation of design and price or cost health and safety, absence of legal claims/ disputes, users' satisfaction, public interest, pleasant environment, among others (Takim and Akintoye, 2002). The performance of construction procurement methods has been a foremost concern to researchers not only in Nigeria but all over the World. Recent studies by Ogunsanmi, Iyagba and Omirin (2003), Holt and Graves (2001), Ojo (2009), Babatunde, Opawole and Ujaddingbe (2010) and Ogunsanmi (2013) have similarly identified measures of procurement performance to include cost, time, quality, profitability, productivity and client satisfaction. These measures of project and procurement performance are utilised in this study to compare the outcome of the use of labour only in the procurement of residential buildings in Akwa Ibom state.

The efficiency and performance of the procurement systems have been identified to be influenced by several factors which include; employee competency, enforcement, management styles, records management, conflict in project, ineffective co-ordination, ineffective planning, lack of control, no team relationship, lack of communication, lack of adequate supervision.

(Ogunsanmi, 2013; Shiundu and Rotich, 2014). Kiage (2013) identified procurement planning, resources allocation, staff competency and contract management as variables which influence procurement performance. Velnampy (2008) also identified absence

of knowledge of procurement management, time duration, suppliers/ contractors, availability of funds and availability of technologies as the main bottlenecks of an effective procurement management

Classification of Household Income and Earning Capacity

There appear to be diverse opinions on the classification of household income and earning capacity which may be due to differentials in wages across states and federal civil services. For instance, Ndubueze (2009) identified the low income group as those households whose per capita income are below N40, 180.76 (Naira) while the high income were identified as households with per capital income earnings above N100, 451.00 (Naira), implying that those between these two extremes are the middle income earners. Jaja (2013) categorized the low income earners as those earning less than N20,000 average monthly salary, the medium income earners as those earning between N20,000 and N50,000, while the high income earners were classified as those earning more than N50,000 as average monthly salary. Nwude (2013) observed that the classification of households into income earning capacity can be done as: low income- those earning up to N100, 000 per month; medium income – those earning up to N300, 000 per month; high income- those earning above N300, 000 per month. The study also stated that the classification can also be through civil service salary scale thus: low income- those between level 01 and 10, medium income - between level 11 and 14, high income -between level 15 and 17. This differ from the categorization by Rukaiyat *et al.* (2015) in a study of housing affordability by federal civil servants in Minna, which grouped federal civil servants into lower cadre (grade level 3 to 7), middle cadre (GL8-GL13) and higher cadre (GL14-GL17). However, this study attempts to harmonize the classifications by adopting GL01-GL06 as low income, GL07-GL13 as medium income and GL14-GL17 as high income with particular emphasis on the general Federal Civil service workers in Akwa Ibom State. This is consequent upon the observation by Omole (2010) that the problem of low income affects the level of capital formation, which deprives the people of sufficient resources to utilize in improving their homes and keep their environment healthy for comfortable living. The use of federal income earners is to allow for a wider level of generalization of result outcome for sustainable development in Nigeria.

RESEARCH HYPOTHESES

Three hypotheses were postulated for this study. The first, states that there is no significant variation in the performance of labour only projects among the three federal income earners' in Akwa Ibom state. The second, states that there is no significant variation in the

factors influencing the performance of labour only projects among the federal income earners and the third, states that there is no significant correlation between the performance of labour only projects and the factors influencing the labour only projects among federal income earners in the study area. The results of these hypotheses will provide an insight into the importance of labour only procurement method in the study area. It will also provide an insight into the relationship between influencing factors and the performance of labour only procurement method in the study area. The results will also provide the private developers with the insight to the prioritization of effort in the management of projects procured with labour only systems.

THE STUDY AREA

Akwa Ibom State which is the study area is one of the thirty-six states that make up Nigeria and one of the nine oil and gas producing states of the Niger Delta region in Nigeria. The State is geographically located in the South-South Geo-Political zone of Nigeria with an estimated population of 3,902,051 people and has a total land mass of 6,187km², which represents 0.67% of the total land mass of Nigeria (National Population Commission, 2007). The state which has three major languages of Ibibio, Annang and Oron is located between latitude 4° 3' and 5° 32' North of the equator and longitude 7° 25' and 8° 3' East of the Greenwich meridian (Akpan, 2014). Politically, the state has three senatorial districts namely Eket, Ikot-Ekpene and Uyo senatorial districts, ten federal constituencies and thirty-one Local Government Areas. According to Akpan and Usoro (2011) Akwa Ibom State at the time of its creation in 1987 was rich in the large number of public-sector employees it inherited from the old Cross River State estimated to be more than 60per cent of the work force of the Old Cross River State. This situation which

has lingered over the years sometimes justifies the popular description of the state as “a civil service state”.

As at now, some urban areas like Ikot-Ekpene, Abak and especially Uyo capital city, which has other part of Uruan, Ibiono Ibom, Itu, Ibesikpo and Etinan Local Government Areas carved out and added to the former Uyo Township, have witnessed tremendous transformation. Their former natures of rural local government headquarters have metamorphosed into Municipalities with many modern roads which have completely changed the aesthetics of the places (Udoh, 2014). These transformations have also encouraged rural-urban migration and steady influx of people from neighbouring states, which has imposed several housing problems like health, high cost of land and building development (James, Akpan, Essien and Ekpo, 2012; Udoh, 2014). With the available good road networks some public servants have resorted to several alternative methods of developing buildings within and outside Uyo metropolis to provide shelter over their heads.

METHOD AND PROCEDURE

This study adopted a survey approach which was exploratory,descriptive and inductive to achieve the aim of the study through the research process shown in Figure 1.

A cross-sectional survey was adopted which quickly helped to reveal, prevalence and relationships (and non-relationships) among variables at a particular point in time, a deductive approach which does not emphasize on processes or changes through time or differentiating cause and effect from simple association (Mann, 2003; Saunders, Lewis and Thornhill, 2009).

The survey was carried out with the aid of structured questionnaire, since the study was based on exploration of the perception of respondents on variables which are mostly measured in ordinal scale.

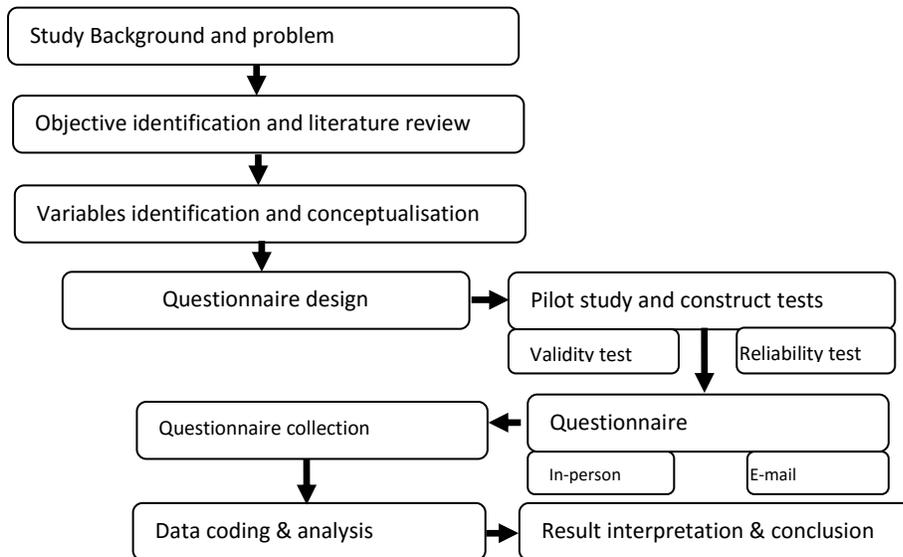


Fig 1: Flow chart showing research process

In order to determine if the questions were unambiguous and have substantially captured the performance levels of projects procured with labour only method among federal income earners, there was a pilot survey of experts who are conversant with the subject. These were tested for reliability and validity and found to be of high level with Cronbach α of 0.69, 0.72 and 0.88 for the low, medium and high income groups respectively, thus can be highly acceptable, since the value of alpha is desirable with the range higher than 0.6 (Gliem and Gliem, 2003). The study population consists of federal income earners who have developed their residential houses with labour only procurement method in Akwa Ibom state. The study purposively sampled 132 respondents resulting in 118 valid mail questionnaire comprising 23 low, 40 middle and 55 high income earners. The purposive sampling was adopted for convenience because of lack of existing data on total number of employees in the three categories of study, more so the unwillingness of some respondents to give information regarding their income status made the study to rely on the Household heads that willingly cooperated from the three senatorial districts in the state.

Through the guidance of the group discussion during the pilot study thirteen project performance indicators and sixteen factors influencing the performance of projects executed with labour only procurement system were all identified from the related articles reviewed in this study. The measurements of performance and influence were on a five point Likert-scale namely: poor=1, low=2, moderate=3, high=4 and very high=5. In analyzing the collected data, the total weight value (TWV) was then calculated for each of the variables. The TWV was arrived at from the summation of the products of the number of responses for the rating of

each variable and the respective weight value for each rating. The relative importance index (RII) method was used in this study to determine the respondents' perception of performance of labour only projects and importance of the factors influencing labour only projects in line with the formula used by Ugwu and Haupt (2007) and Enshassi, Mohamed and Abushaban (2009) as shown in equation 1

$$RII = \sum W / A \times$$

N..... (1)

Where W is the weight given to each variable by the respondents and ranges from 1 to 5; A – the highest weight = 5; N – the total number of respondents.

The RII were then classified as: 0-0.359 very low significance (VLS); 0.36-0.529 low significance (LS); 0.53-0.679 moderate significance (MS); 0.68-0.839 high significance (HS) and 0.84-1.0 very high significance (VHS) (scale of $0 \leq RII \leq 1$) as adapted from the classification by adapted from Kazaz, Manisali and Ulubeyli (2008). A cut-off score of RII computed was determined by summing the weights and dividing by the total number of weighting items and highest weight respectively: $(1+2+3+4+5)/5 = 0.60$. Thus, events that have RII that are higher than 0.60 are defined as being significant, those with RII equal to 0.60 are moderate, while those less than 0.60 are insignificant. This approach adapted from Ujene (2014) is with the expectation that the use of 0.60 as reference value will effectively cover only important variables in terms of their performance and importance. Statistical Package for Social Sciences (SPSS version 20) was used to enhance the data analysis. During analysis the variations in the perceptions of the performance, and factors influencing the performance of projects procured with labour only system were analysed using Kruskal Wallis

tests, while the correlations were with spearman rank correlation.

ANALYSIS AND DISCUSSION

The analyses of the collected data and the discussion of results are presented in this section.

Characteristics of Respondents used for the Study

The respondents that supplied the data used for the study were analysed for an understanding of the characteristics the people whose perceptions were investigated. For this purpose, the type of house developed, sex, marital status, working experience, age, and qualification of the respondents were evaluated and the result presented in Table 1. The result in Table 1 shows that majority of the low income earners are able to develop separate rooms with shared facilities, self-contain and one-bedroom flat. Majority of the medium income earners build two and three-bedroom flat, while the high income earners develop four bedrooms flat and duplexes.

The result also shows that male respondents were dominant among the three groups of income earners.

Majority of the income earners were married, hence require quality housing for their families. The result also shows that the low income earners who were mostly between 40 and 60 years had experience ranging up to 15 years. The medium income earners were slightly higher in age and experience, while majority of the high income earners were fast approaching retirement. Majority of the respondent also have adequate educational background as most of them had above ordinary level certificate. In terms of location of houses developed by the respondents, it can be noticed that 29.0%, 33.0% and 56.0% were obtained from Eket, Ikot-Ekpene and Uyo senatorial districts respectively. This shows that although the research tried to cover the three senatorial districts, yet more respondents were used from Uyo. This may be attributable to the fact that Uyo senatorial district houses majority of the federal civil/public service jobs like University of Uyo and parastatals of federal government located at the Federal Secretariat in Uyo. The results generally show that the selected respondents have the required characteristics to provide reliable information for this study.

Table 1: Descriptive results of Respondents' characteristics

Characteristics of Respondents	Sub characteristics	GL	GL	GL	Total
		01-06 No (%)	07-13 No (%)	14-17 No (%)	No (%)
Type of House Developed	Separate rooms with shared facilities	11(47.80)	02(05.00)	00(0.00)	13(11.02)
	Self-contain & One-bedroom flat	09(39.20)	09(22.50)	06(10.91)	24(20.34)
	Two & Three-bedroom flat	3(13.00)	25(62.50)	13(23.64)	41(34.75)
	Four-bedroom flat & duplex	00(0.00)	04(10.00)	36(65.45)	31(33.90)
	Total	23(19.50)	40(33.90)	55(46.60)	118(100)
Sex of Respondents	Male	17(73.91)	30(75.00)	39(70.90)	86(72.88)
	Female	06(26.09)	10(25.00)	16(29.10)	32(27.12)
	Total	23(19.5)	40(33.9)	55(46.6)	118(100)
Marital Status of Respondents	Single	04(17.39)	06(15.00)	00(0.00)	10(08.47)
	Married	14(60.87)	25(62.50)	41(74.55)	80(67.80)
	Separated/Divorced	03(13.04)	05(12.50)	10(18.88)	18(15.25)
	Widow/Widower	02(08.70)	04(10.00)	04(07.27)	10(08.47)
	Total	23(19.50)	40(33.90)	55(46.60)	118(100)
Experience of Respondents	1-5yrs	01(04.35)	2(05.00)	00(0.00)	03(02.54)
	6-10yrs	05(21.74)	04(10.00)	05(09.09)	14(11.86)
	11-15yrs	06(26.09)	06(15.00)	10(18.18)	22(18.64)
	16-20yrs	08(34.78)	09(22.50)	17(30.91)	34(28.81)
	>20yrs	03(13.04)	19(47.50)	23(41.82)	45(38.14)
	Total	23(19.50)	40(33.90)	55(46.60)	118(100)
Age of Respondents	1-17yrs	00(0.00)	00(0.00)	00(0.00)	00(0.00)
	18-40yrs	08(34.78)	05(12.50)	06(10.91)	19(16.10)
	40-60yrs	11(47.83)	12(30.00)	19(34.55)	42(35.59)
	>60yrs	4(17.39)	23(57.50)	30(54.55)	57(48.31)
	Total	23(19.50)	40(33.90)	55(46.60)	118(100)

Characteristics of Respondents	Sub characteristics	GL	GL	GL	Total
		01-06 No (%)	07-13 No (%)	14-17 No (%)	No (%)
Qualification of Respondents	Ordinary Level & Trade Tests	05(21.74)	05(12.50)	00(0.00)	10(08.47)
	Ordinary /Higher National Diploma	03(13.04)	04(10.00)	10(18.18)	17(14.41)
	B.Sc	08(34.74)	09(22.50)	13(23.64)	30(25.42)
	M.Sc	06(26.09)	16(40.00)	23(41.82)	45(38.18)
	PhD	01(04.35)	06(15.00)	09(16.36)	16(13.56)
	Total	23(19.50)	40(33.90)	55(46.60)	118(100)
Locations of Houses Developed	Ikot-Ekpen Senatorial District	7(30.44)	12(30.00)	14(25.45)	33(27.97)
	Eket Senatorial District	8(34.78)	10(25.00)	11(20.00)	29(24.57)
	Uyo Senatorial District	8 (34.78)	18(45.00)	30(54.55)	56(47.46)
	Total	23(19.50)	40(33.90)	55(46.60)	118(100)

Source: Author's Analysis (2015)

Evaluation of Performance of Labour Only Projects among Income Earners

In order to evaluate the performance of residential projects executed with labour only procurement system, thirteen indicators of project performance were identified from literature. Respondents were then requested to indicate their assessment of the performance as described in the methodology. The results presented in Table 2 show that although 46.2% of the performance indicators attained the 0.60

significance level among low income earners, with none attaining high quality level. Among the medium income earners 69.2% of the indicators were of significant quality of which 30.1% attained high performance. Among the high income earners 76.9% of the performance indicators were of significant value out of which 38.5% attained high performance.

Table 2: Performance evaluation of labour only projects executed by federal income earners

Performance indicators	Low Income Earners - N=23			Medium Income Earners - N=40			High Income Earners-N=55		
	TW V	RII	Rank	TWV	RII	Rank	TW V	RII	Rank
Client satisfaction	70	0.61	4	133	0.67	5	228	0.83	1
Meeting construction cost	63	0.55	8	170	0.85	1	223	0.81	2
Meeting construction time	72	0.63	3	126	0.63	6	195	0.71	3
Absence of legal claims/disputes	39	0.34	11	78	0.39	11	194	0.71	3
Meeting quality	35	0.30	13	164	0.82	3	191	0.69	5
Minimal exposure to risk	152	0.66	1	78	0.39	11	181	0.66	6
Value for money invested	69	0.60	5	122	0.61	8	176	0.64	7
Users satisfaction	49	0.43	10	166	0.83	2	174	0.63	8
Health and safety	37	0.32	12	78	0.39	11	171	0.62	9
Profitability	64	0.56	7	119	0.60	9	165	0.60	10
Productivity	57	0.50	9	102	0.51	10	154	0.56	11
Maintainability	74	0.64	2	124	0.62	7	148	0.54	12
Public & Environmental interest	69	0.60	5	138	0.69	4	134	0.49	13

Source: Author's Analysis (2015)

The result also shows that the performance attributes of most significance among the low income earners are; minimal exposure to risk, maintainability, meeting

construction time and clients' satisfaction. The result suggests that the low income earners do not like taking

risks, and as such they develop to their satisfaction what

they can maintain in view of their lean income.

Table 3: Kruskal Wallis result for comparing performance of labour only projects executed by the income groups
Kruskal-Wallis Test

Items compared among Income groups	Low income Mean Rank	Middle income Mean Rank	High income Mean Rank	Chi- Square	p-value	sig. level	Decision
Performance of labour only projects	13.880	21.620	24.500	6.040	0.049	0.050	Reject

Source: Author's Analysis (2015)

Among the medium income earners, the performance attributes of most significance are; meeting construction cost, users' satisfaction, meeting quality and, public and environmental interests. Among the high income earners, the performance attributes of most significance are; client satisfaction, meeting construction cost, meeting construction time and absence of legal claims/disputes. This suggests that the medium and high income earners are more concerned about cost performance probably due to higher financial capability and awareness.

In order to compare the perceptions of performance of labour only projects executed by the income groups, the first hypothesis was postulated as previously stated. The results of the hypothesis which was tested with Kruskal Wallis test at $p \leq 0.05$ was meant to provide confidence of views and ascertain if significant variation exists in the performance of labour only projects executed by the three groups of income earners. The decision rule is that if $p\text{-value} > 0.050$, the hypothesis is accepted, but if $p\text{-value} \leq 0.050$ the hypothesis is rejected. The results are presented on Table 3.

The results in Table 3 show that the p-value for the first hypothesis is $0.049 < \text{the significance level of } 0.050$, hence the null hypotheses is rejected, implying that there is significant variation in the performance of labour only projects executed by the different income earners. The variation in the performance of labour only projects may be attributable to the level of poverty among the low and some medium income earners

worsened by lack of affordable financial facilities to the groups.

Evaluation of Factors Influencing Performance of Labour Only Projects Among Medium Income Earners

In order to evaluate the factors influencing the performance of residential projects executed with labour only procurement system, sixteen performance influencing factors were identified from literature. Respondents were then requested to indicate their assessment of the importance of the factors as described in the methodology. The result presented in Table 4 shows that all the income groups perceived that majority of the factors have significant influence on the performance of labour only projects. The low and medium income groups perceived that the most significant factors to the performance of the labour only projects are management styles, availability of funds, level of communication and records management. The high income groups perceived that the most significant factors are availability of funds, management styles, level of planning and level of control. The result suggests that there is difference in the significance of the factors, as the low and middle income groups perceived that level of planning, level of control, availability of technology and procurement management knowledge are least significant. The high income perceived that the least significant factors are availability of technologies, knowledge of procurement management, suppliers/sub contractors.

Table 4: Result of factors influencing the performance of residential projects executed among income groups.

Performance Factors	Low Income Earners - N=23			Medium Income Earners - N=40			High Income Earners-N=55		
	TWV	RII	Rank	TWV	RII	Rank	TWV	RII	Rank
Availability of funds	92	0.80	2	161	0.81	2	226	0.82	1
Management styles	99	0.86	1	169	0.85	1	211	0.77	2

	Low Income Earners - N=23		Medium Income Earners - N=40			High Income Earners-N=55			
Level of planning	65	0.57	14	118	0.59	14	213	0.77	2
Level of control	66	0.57	14	117	0.59	14	204	0.74	4
Co-ordination level	80	0.70	8	144	0.72	5	191	0.69	5
Time duration	82	0.71	7	136	0.68	9	183	0.67	6
Supervision level	73	0.63	11	130	0.65	10	182	0.66	7
Level of communication	92	0.80	2	153	0.77	3	176	0.64	8
Team relationship	86	0.75	6	142	0.71	7	172	0.63	9
Records management	92	0.80	2	150	0.75	4	170	0.62	10
Employee competency	78	0.68	9	140	0.70	8	161	0.59	11
Enforcement level	75	0.65	10	122	0.61	13	160	0.58	12
Conflict in project	61	0.53	16	98	0.49	16	157	0.57	13
Availability of technologies	70	0.61	12	125	0.63	11	154	0.56	14
Knowledge of procurement management	70	0.61	12	124	0.62	12	153	0.56	14
Suppliers/sub contractors	88	0.77	5	143	0.72	5	137	0.50	16

Source: Author's Analysis (2015)

In order to ascertain the significance of the suspected difference in the perceptions of factors influencing the performance of labour only projects executed by the income groups, the second hypothesis was postulated as previously stated. The result of the hypothesis which was tested with Kruskal Wallis test at $p \leq 0.05$ was meant to provide confidence of views and generalization of opinions of the three income groups. The decision rule

is that if $p\text{-value} > 0.050$, the hypothesis is accepted, but if $p\text{-value} \leq 0.050$ the hypothesis is rejected. The results presented on Table 5 show that the $p\text{-value}$ for the second hypothesis is $0.413 >$ significance level of 0.050 , hence the null hypotheses is accepted, implying that there is no significant variation in the significance of factors influencing the performance of labour only projects executed by the different income earners.

Table 5: Kruskal Wallis result for comparing factors influencing performance of labour only projects executed by the income groups

Kruskal-Wallis Test							
Items compared among Income groups	Low income Mean Rank	Middle income Mean Rank	High income Mean Rank	Chi-Square	p-value	sig. level	Decision
Performance factors of labour only projects	26.690	26.090	20.720	1.769	0.413	0.050	Accept

Source: Author's Analysis (2015)

This indicates that the suspected difference is not significant enough to imply divergence in opinions among the income groups. The similarity in the perception of the factor may be attributable to the common prevailing economic and environmental concerns which affect the sustainable construction development in Nigeria.

Correlation of Performance of Labour Only Projects and Influential Factors

In order to ascertain the extent to selected factors significantly influence the performance of labour only

projects among the federal income earners, the third hypothesis was postulated as earlier stated. To be able to test the hypothesis among the three income groups, the five most significant attributes of performance and influential factors were selected among the various income groups and ascertained if significant correlation exists between the performance attributes and influential factors. This hypothesis was tested using the Spearman rank correlation test at $p \leq 0.05$. The decision rule is that if $p \leq 0.05$, the test rejects the hypothesis, but if $p > 0.05$, the test accepts the hypothesis. The results are presented in Tables 6, 7 and 8.

Table 6 reveal that the correlation between the five most significant factors and the five most significant performance attributes have p-value range of 0.114 and 1.000, which are more than 0.05 hence accepting that there is no significant correlation between the significant factors and the performance labour only projects executed by the low income earners. The only exception is the correlation between available funds and clients' satisfaction with a p-value of $0.019 < 0.050$ indicating that the relationship between the available funds and clients' satisfaction is significant. The result is an indication that the low income earners' projects have not significantly responded to the factors so as to significantly influence their performance. They have only given consideration to availability of funds as a means of attaining their satisfaction. This may be attributable to their level of awareness and income level which may put some impediment to their concern for the essential factors.

The results in Table 7 reveal that the test of correlation between management styles and four most significant performance attributes have p-values range of 0.365 and 0.962, which are more than 0.05 hence accepting that there is no significant correlation between the factors and the four performance attributes of labour only projects executed by the middle income earners. The only exception is the correlation clients' satisfaction with a p-value of $0.009 < 0.050$ indicating that there is significant relationship between the management styles and clients' satisfaction. The correlation between

availability of funds with the performance attributes shows that meeting construction cost (0.008), along with public and environmental interest (0.029) were less than the significance level while the correlation of availability of funds with other performance attributes shows p-values greater than the significance level.

The result also shows that correlation of all other three factors with performance attributes have p-values more than 0.05 hence acceptance of the null hypotheses. The result is an indication that the availability of funds is significantly related to meeting construction cost and public and environmental interest. This may be attributable to their level of income and greater public and environment awareness which may put some impediment to their concern for other essential factors.

The results in Table 8 reveal that the tests of correlation between the five most significant factors and the five most significant performance attributes have p-value range of 0.082 and 0.787, which are more than 0.05 hence accepting that there is no significant correlation between the factors and the performance of labour only projects executed by the high income earners. The result is an indication that the high income earners have not significantly integrated the housing sustainability concerns so as to significantly influence the quality of houses the lived in. This may be attributable to their level of awareness income level which may put some impediment to their concern for housing sustainability and quality of home they live.

Table 6: Correlation of performance of labour only projects and influential factors among low income earners

Variable correlated	TWV	Mean	SD	R	P-value	Decision
Management styles	99	4.304	0.926			
Minimal exposure to risk	76	3.304	0.703	-0.108	0.624	Accept
Maintainability	74	3.217	0.951	-0.116	0.597	Accept
Meeting construction time	72	3.130	0.458	-0.191	0.383	Accept
Client satisfaction	70	3.044	1.147	-0.084	0.702	Accept
Value for money invested	69	3.000	0.426	-0.158	0.473	Accept
Availability of funds	92	4.000	1.000			
Minimal exposure to risk	76	3.304	0.703	-0.133	0.546	Accept
Maintainability	74	3.217	0.951	0.214	0.327	Accept
Meeting construction time	72	3.130	0.458	0.222	0.308	Accept
Client satisfaction	70	3.044	1.147	-0.484	0.019	Reject
Value for money invested	69	3.000	0.426	-0.232	0.288	Accept
Level of communication	92	4.000	0.905			
Minimal exposure to risk	76	3.304	0.703	0.000	1.000	Accept
Maintainability	74	3.217	0.951	0.154	0.483	Accept
Meeting construction time	72	3.130	0.458	0.227	0.298	Accept
Client satisfaction	70	3.044	1.147	-0.188	0.390	Accept
Value for money invested	69	3.000	0.426	0.118	0.592	Accept

Variable correlated	TWV	Mean	SD	R	P-value	Decision
Records management	92	4.000	0.798			
Minimal exposure to risk	76	3.304	0.703	0.104	0.638	Accept
Maintainability	74	3.217	0.951	0.121	0.583	Accept
Meeting construction time	72	3.130	0.458	0.129	0.559	Accept
Client satisfaction	70	3.044	1.147	-0.036	0.872	Accept
Value for money invested	69	3.000	0.426	0.134	0.543	Accept
Suppliers/sub contractors	88	3.826	0.984			
Minimal exposure to risk	76	3.304	0.703	0.238	0.274	Accept
Maintainability	74	3.217	0.951	-0.039	0.860	Accept
Meeting construction time	72	3.130	0.458	-0.338	0.114	Accept
Client satisfaction	70	3.044	1.147	0.148	0.500	Accept
Value for money invested	69	3.000	0.426	-0.074	0.738	Accept

TWV- Total Weight Value

Source: Author's Analysis (2015)

Table 7: Correlation of performance of labour only projects and influential factors among middle income earners

Variable correlated	TWV	Mean	SD	R	P-value	Decision
Management styles	169	4.225	0.862			
Meeting construction cost	170	4.250	0.439	-0.147	0.365	Accept
Users satisfaction	166	4.150	0.362	0.139	0.393	Accept
Meeting quality	164	4.100	0.304	0.008	0.962	Accept
Public & Environmental interest	138	3.450	0.504	0.066	0.684	Accept
Client satisfaction	133	3.325	0.656	0.407	0.009	Reject
Availability of funds	161	4.025	1.025			
Meeting construction cost	170	4.250	0.439	-0.413	0.008	Reject
Users satisfaction	166	4.150	0.362	0.051	0.753	Accept
Meeting quality	164	4.100	0.304	0.065	0.691	Accept
Public & Environmental interest	138	3.450	0.504	-0.345	0.029	Reject
Client satisfaction	133	3.325	0.656	-0.085	0.604	Accept
Level of communication	153	3.825	0.874			
Meeting construction cost	170	4.250	0.439	-0.151	0.351	Accept
Users satisfaction	166	4.150	0.362	0.000	1.000	Accept
Meeting quality	164	4.100	0.304	-0.027	0.867	Accept
Public & Environmental interest	138	3.450	0.504	0.000	1.000	Accept
Client satisfaction	133	3.325	0.656	0.264	0.099	Accept
Records management	150	3.750	0.776			
Meeting construction cost	170	4.250	0.439	-0.130	0.426	Accept
Users satisfaction	166	4.150	0.362	0.131	0.421	Accept
Meeting quality	164	4.100	0.304	-0.008	0.962	Accept
Public & Environmental interest	138	3.450	0.504	0.132	0.418	Accept
Client satisfaction	133	3.325	0.656	0.202	0.211	Accept
Suppliers/sub contractors	143	3.575	0.903			
Meeting construction cost	170	4.250	0.439	-0.069	0.674	Accept
Users satisfaction	166	4.150	0.362	0.128	0.431	Accept
Meeting quality	164	4.100	0.304	0.164	0.312	Accept
Public & Environmental interest	138	3.450	0.504	-0.041	0.800	Accept
Client satisfaction	133	3.325	0.656	0.088	0.587	Accept

WV- Total Weight Value

Source: Author's Analysis (2015)

Table 8: Correlation of performance of labour only projects and influential factors among high income earners

Variable correlated	TWV	Mean	SD	R	P-	Decision
Availability of funds	226	4.109	1.012			
Client satisfaction	228	4.146	0.678	0.080	0.562	Accept
Meeting construction cost	223	4.055	0.524	-0.123	0.370	Accept
Meeting construction time	195	3.546	0.857	0.133	0.333	Accept
Absence of legal claims/disputes	194	3.527	0.813	-0.039	0.780	Accept
Meeting quality	191	3.473	0.790	0.112	0.417	Accept
Management styles	211	3.836	1.067			
Client satisfaction	228	4.146	0.678	0.236	0.082	Accept
Meeting construction cost	223	4.055	0.524	0.038	0.785	Accept
Meeting construction time	195	3.546	0.857	0.160	0.243	Accept
Absence of legal claims/disputes	194	3.527	0.813	-0.124	0.369	Accept
Meeting quality	191	3.473	0.790	-0.054	0.696	Accept
Level of planning	213	3.873	0.818			
Client satisfaction	228	4.146	0.678	0.049	0.720	Accept
Meeting construction cost	223	4.055	0.524	-0.192	0.161	Accept
Meeting construction time	195	3.546	0.857	0.040	0.774	Accept
Absence of legal claims/disputes	194	3.527	0.813	-0.122	0.375	Accept
Meeting quality	191	3.473	0.790	0.060	0.665	Accept
Level of control	204	3.709	0.936			
Client satisfaction	228	4.146	0.678	-0.165	0.228	Accept
Meeting construction cost	223	4.055	0.524	0.054	0.697	Accept
Meeting construction time	195	3.546	0.857	-0.037	0.787	Accept
Absence of legal claims/disputes	194	3.527	0.813	-0.055	0.689	Accept
Meeting quality	191	3.473	0.790	-0.042	0.762	Accept
Co-ordination level	191	3.473	0.879			
Client satisfaction	228	4.146	0.678	0.127	0.355	Accept
Meeting construction cost	223	4.055	0.524	0.122	0.374	Accept
Meeting construction time	195	3.546	0.857	0.090	0.515	Accept
Absence of legal claims/disputes	194	3.527	0.813	0.158	0.249	Accept
Meeting quality	191	3.473	0.790	-0.093	0.500	Accept

TWV- Total Weight Value

Source: Author's Analysis (2015)

CONCLUSION AND RECOMMENDATION

This study has evaluated the performance of labour only projects executed federal income earners' and the factors which influence the performance so as to provide an insight into the extent to which certain factors influence the performance of labour only projects executed by federal income earners in Akwa Ibom state, with a view to ensuring sustainable housing development in Nigeria.

The study concludes that 46.2% of the performance indicators attained significance level among low income

earners, with none attaining high quality level. Among middle income earners 69.2% of the indicators were significant of which 30.1% attained high performance, while 76.9% of the performance indicators were of significant value out of which 38.5% attained high performance among high income earners. It was also concluded that the performance attributes of most significance among the low income earners are; minimal exposure to risk, maintainability, meeting construction time and client satisfaction, suggesting that the low income earners do not like taking risks, and as such they develop to their satisfaction what they can

maintain in view of their lean income. The most significant performance attributes among the medium income earners are; meeting construction cost, users' satisfaction, meeting quality and, public and environmental interests, while the most significant performance attributes among the high income earners are; client satisfaction, meeting construction cost, meeting construction time and absence of legal claims/disputes. The study inferred that the medium and high income earners are more concerned about cost performance probably due to higher financial capability and awareness.

The study indicates that there is a significant variation in the performance of labour only projects executed by the different income earners. In this regard, it is concluded that all the income groups perceived that majority of the factors have significant influence on the performance of labour only projects. The low and medium income groups perceived that the most influential factors to the performance of the labour only projects are management styles, availability of funds, level of communication and records management. The high income groups perceived availability of funds, management styles, level of planning and level of control as the most influential factors are. The study concluded that there is no significant variation in the influence of the factors among the three income groups. It was also concluded that the significant factors among the low and medium income are of negligible correlation and influence on the performance of labour only projects, while the factors among the high income earner had no significant correlation and influence on the performance of labour only projects.

The study therefore recommends that the low and medium income earners should enhance the performance of their labour only projects by putting consideration on other factors apart from management styles and availability of fund, while the high income earners should place priority on other performance attributes apart from clients' satisfaction and meeting construction costs. Government should also create enabling environment for the performance of projects through provision of soft loans, improved technology, procurement awareness, and use of local materials to avoid conflicts with suppliers.

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WOMENS' LIVELIHOOD AND CLIMATE CHANGE IN MIANGO DISTRICT OF PLATEAU STATE, NIGERIA

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ABSTRACT

Climate change is the greatest environmental challenge facing the world today. Climate change is caused mainly by climate forcing and anthropogenic factors. Women in developing countries are involved in Agricultural activities at subsistent levels as a source of their livelihood. The farming activities of women in Nigeria appear seem to contribute to climate change but little research has been done to substantiate this. This paper therefore appraises agricultural activities as source of livelihood of women in Miango village of Bassa local Government Area of Plateau State in order to examine how these contribute to climate change. In carrying out this study, a survey methodology is adopted and data was collected questionnaire. Data was generated in such a way that significant views of women in four wards of the study area were received. A total of 200 women were purposely sampled and their responses were retrieved. Descriptive analysis was conducted and the results obtained show that poverty level is high and the literacy level of women in the study area is low, and the women lack the understanding of how their activities are affecting the climate. Majority of the women admitted using chemical fertilisers and herbicides while farming and this practice has a long time effect on the environment. It was further discovered that the collection of fire wood by the women is leading to deforestation and this can cause desertification. The study therefore recommends that government authorities should enlighten women in Miango Village on how their activities can potentially serve as agents of climate change. They should also be made aware of practices that could mitigate climate change.

Keywords: Climate change, Livelihood, Women, and Agriculture.

INTRODUCTION

Climate is the average weather condition observed in an area a period of time not less than 30 years (Amba, 2014). The major cause of climate change is the increasing concentration of carbon dioxide and other greenhouse gases in the atmosphere induced primarily by anthropogenic activities such as bad agricultural practices. Adams and Jeanrenaud (2008) opine that in the 21st century, there is increasing global awareness on the threat posed by the human greenhouse effect, produced largely by forest clearing and the burning of fossil. Amba (2014) opines that globally climate change related problems have reached an alarming proportion to the extent that there is no single region of the world that is not engulfed in one problem or the other. Climate change is one of the most important global environmental challenges facing humanity with implications for food production, natural ecosystems, freshwater supply, health, and others.

Enger and Smith (2008) alluded to this by stating that the earth's climate system has demonstrably changed on both global and regional scales since the preindustrial era. This unprecedented increase is expected to have severe impacts on the global hydrological system, ecosystems, sea level, crop production and related processes. Climate change is the greatest environmental challenge facing the world today. Climate change is caused mainly by climate forcing and anthropogenic factors. Women in developing countries are involved in

agricultural activities at subsistence levels as a source of livelihood. According to Ibrahim (2014), about 90% of African woman especially those living in the rural areas depend mostly on agriculture for their survival. The agricultural activities of women affect the environment. Such activities however in the word of Duncan (2008), 'increase the risk of climate change in our environment'. This paper therefore appraises the role of women in agriculture as a setback to climate change mitigation in Miango village of Bassa local Government Area of Plateau State.

LITERATURE REVIEW

Climate change is basically caused by climate forcing and anthropogenic factors, and these causal factors have their scientific bases (Ibrahim, 2013, p.13). Climate determines the system of farming choice and schedule of farm operations. It affects the rate of breeding and spread of certain pest or diseases which are harmful to crop. The direct relationship between climate components and the atmosphere makes it easier to determine the state of the atmosphere and invariably the climate (Enger and Smith, 2008). Climate forcing refers to external or natural factors that can shape climate which include changes in the sun's intensity, slow changes in the earth's orbit and natural processes like changes in ocean circulation while anthropogenic factors are human activities that change the environment. They include burning fossils fuels, deforestation and urbanization. Climate change attracts

global concerns as a result of its perceived threat to humanity and earth's environment.

The interaction of man with the environment through agriculture urbanization, human settlements, logging, deforestation burning of fossils fuels population explosion and a host of others contribute greatly to climate change. Climate change manifests when there reprising temperature, irregular rainfall pattern flooding rising sea levels, draught desertification increase in inland erosion threat to nature water resources. As a result of population explosion the change in climate have greatly stressed the carrying capacity of the planet as human population increases are is a continues depletion of the natural earth resources.

Factors Responsible for Climate Change

The major cause of the climate change is the increasing concentration of CO₂ and other green cause in the atmosphere. Okali (2008) identified human activities as one of the drive of climate change. The activities include the level of consumption of the earth's resources consumption and change in organization of human lives. Ibrahim (2013), identified three basic ways by which natural ecosystem is tampered with. These includes population explosion (rapid population growth and rapid urbanization) trussing the carrying the capacity of the planet, Depletion of natural earth resources (indiscriminate exploitation of renewable and non-renewable resources as well as environmental pollution (introduction of harmful substances into the environment). Other factors as corroborated by Amba (2014) that could also contribute to climate change includes; extreme poverty, environmental impact of extractive industries and deforestation.

Women Activities and Climate Change

Women collect fuel wood that serves as means of cooking food within the families. According to Akinjide (2014) about 60-80 % of all domestic fuel wood supplied is gathered from the forest by the Women. Woman has known to associate with forest activities such as farming and collection of fuel wood. However not many of them are knowledgeable of the danger, posed by over exploitation of the forest resources. The problems of deforestation forestation and desertification have been prevalent in society, all this relate to the indiscriminate and illegal felling of trees, excess use of fuel wood and so women not only bear the brunt of environmental degradation but also play a vital role in its mismanagement. Odebode (2013), opines that Women perform two-thirds of world's work and produce rather half of the food in most countries.

Cunningham and Cunningham (2007) corroborates that woman's skill and needs is a focal issue in sustainable

development and this has often been ignored due to general misconception and marginalization of woman's role in preserving biodiversity. Some Women in the developing world are largely responsible for producing and providing for their families. The Impact of climate change on agriculture also means that women already constitute the majority of poor people and are mostly adversely affected. Women depend more than men on the ecosystem that is threatened by climate change, but Adedire (2014) alludes that they lack access to and control over natural resources, technologies and credit. Enger and Smith (2008) similarly believed that women are more vulnerable than men to seasonal and episodic weather phenomena and to natural disasters resulting from climate change. However women have been leading innovative efforts to adapt to the impact of climate. Ibrahim (2013) asserts that in Malawi for example in response to ever worsening harvests and increased food security in their communities, rural woman have mobilized to form women's farmers club, they acquire resources tools, seeds and knowledge about agricultural practices so they can respond collectively to decreases in food production.

Agricultural Products Collected by Women in Nigeria

The most important product usually collect by rural women is Food and Fodder. Odebode (2013) stated that women collect various types of food such as, condiments, grasses, fruits, nuts, gums, starch plants, salt yielding plants, and beverages, stimulants, oil, honey, edible insects, mushrooms, vegetables, leaves etc. Leaves collected from the forest are used for wrapping food items such as pap, moimoi and for preserving fruit. Condiments such as *Allium sativum*, Parkiaetc gives flavor and makes food palatable and delicious. Grasses are used in the treatment of ailment and feeding wild and range animals e.g *Cymbopoeitratus* (Lemon grass), pennisetum used in feeding grass cutter (elephant grass), *Cynodonlactylong* (carpet grass), *Artocarpusaltitilis* (bread fruit), *Lovoatrichiliides* (walnut), *Dialiumguinensis* Cola among others serves as snacks, stimulant and appetizer. Alcoholic beverage could serve as medicine treatment of some ailment especially when mixed with other plant materials and also as drink relaxation eg juice from palm tree (*Elaeisguinensis*). Mushroom, vegetable and leaves are used in the preparation of soup and food; it could also be eaten raw or cooked or squeezed to serve as appetizer. Another important agricultural products that rural women usually go for are Medicines, Dyes and Cosmetics. Women are involved in the collection trading of plant parts such as roots, leaves, bark and branches which are used in preparation of local concoction for the treatment of various ailments or diseases. Dyes and cosmetics are also used in clothing industries and for beautification especially during traditional ceremonies.

Utensils and Handicrafts are also collected by women for various uses such as cooking, domestic uses, trading, and also during ceremonies. It is important to however note that the collection of these agricultural products without any method to replace or allow nature to replace these resources negates the mitigative processes of climate change.

Ways to Mitigate Climate Change

One of the greatest ways of mitigating climate change is through Agro Forestry. Enger and Smith (2008) defined agro-forestry as a collective native land use system and technology in which woody perennials are deliberately combined on the management unit with herbaceous crops and/or animals either in the form of spatial arrangement temporal sequence. Apart from providing wood, food and/or animal resources agro-forestry could go way in ameliorating the environment, creating micro-climate, enhancing recycling of minerals, providing a more complete ground cover which could help to protect the soil from erosion, extreme temperature and prevent rapid heat loss (Adedire, 2014). This method satisfies the need of the rural farmer as food and wood can be produced same time in a sustainable manner thus, making tree a productive part of the farming system.

Another important way of curbing the menace of climate change is through the practice of Urban Forestry. One of the major problems of urban areas is poor air quality. Urban forestry has greatly helps this system of forestry, it removes pollutants from the air in diverse absorption by the leaves or the soil surface, deposition of particulates and aerosols on leaf concept dust, mask farms, and disagreeable odours by replacing them with more in pleasing scents by actually absorbing them thereby helping in reducing the incidence of respiratory illness. Women, according to Gbadebo (2013) participate on farm conservation of tress and planting. Women often have a special relationship with the natural environment because of their direct and heavy dependence on such primary natural system as soil, water and forest. Agro-silvo- pastoral system practiced by women is a participatory way to achieve sustainable solution to effective forest resource management which results in climatic amelioration. This also helps to increase the relative humidity of urban air through evapo-transpiration. Trees help to control temperature extremes by modifying solar radiation. Agroforestry also serves as means of conserving solids in fragile ecosystems. It also plays a very important social role in easing tension and improving psychological, health, invisible pollution such as excessive noise levels produced by vehicular traffic which contribute to both physical and

psychological damage which could be absorbed and refracted or even dissipate by trees .

METHOD AND PROCEDURE

The study is empirical in nature, thus the survey design was adopted with questionnaire serving as the instrument of data collection. The study was conducted in Miango district of Bassa Local Government Area of Plateau state. The sample for the study was randomly drawn from four villages namely: Tee'gbe , Chinye, Dantanko and Miango respectively. The data was collected from the field through the use of questionnaire. A total of 200 women were randomly sampled to provide the needed information for this work. A descriptive statistics was used in analyzing the responses of the respondents and the results were expressed in simple percentages and presented in a tabular form.

RESULTS, ANALYSIS AND DISCUSSIONS

The data analyzed is presented in tables below using simple percentages from manual analysis.

Characteristics of the Respondents

The respondents in the study area were asked about their ages and their responses are presented in table 1.

Table 1 Percentage distribution of Age of Respondents

Responses	Freque	Percentage
Under 15 years	6	3
16 – 30 years	92	46
31 – 45 years	66	33
46 – 60 years	28	14
More than 60	8	4
Total	200	100

Source: Authors Analysis, 2015

As presented in table 1 about 46 % of the respondents were between 16 - 30 years of age with those between 31 - 45 years of age accounting for 33%. It follows that more than 70% of the respondents were between 16 - 45 years of age, the active human population. This active population is likely to lead to increase in population (most fertile or productive group) and increase demand for houses, food and other Forest materials. This will further depletes the environment and makes the area more vulnerable to climate change.

In regard to marital status, 64% of the respondents were married while 19% were single. There were 4% who were widowed and another 13% who reported being divorced. Detail is provided in Table 2.

Table 2. Marital Status of Respondents

Responses	Freque	Percentage
Married	128	64
Single	38	19
Widowed	8	4
Divorced	26	13
Total	200	100

Source: Author's Analysis, 2015

There is a high tendency of family formation and demand for food, land for Agriculture and wood for housing in the study area. This can negates climate change mitigative efforts in the area. The educational attainment of an individual to some extent determines his occupation, income level, and the type of house desired or occupied and his appreciation of clean environment. The highest educational attainment of respondents in the study area is presented in Table 3

Table 3 Highest Educational Qualification

Responses	Frequenc	Percentage
None	57	28.5
Adult Education	16	8
Primary	71	35.5
Post Primary	46	23
Tertiary	10	5
Total	200	100

Source: Author's Analysis, 2015

As presented in table 3 above, 28.5% of the respondents had admitted that they had never been to walls of any school in their life time. Another 5% of the respondents attended tertiary institutions. About 8% attended adult schools and 35.5% respectively had attended primary school. Furthermore another 23% attended secondary school while only 5% of the respondents went to any tertiary institution. It means that the literacy level in the study area is low. The perception of Climate change or good environmental quality among the women may be low due to low literacy level.

Source of Livelihood of the Respondents

Information on the Source of livelihood of the respondents was sought and the result is presented in table 4 below.

From table 4, 64% of the respondents were farmers with civil/public servants accounting for 4.5% of the respondents. Traders accounted for 21% while others like Tailoring, weaving, etc, accounted for 10.5% of the respondents. This goes to show that majority of the women are engaged in Agricultural activities as a source of livelihood. If farming in the study area is done on substandard level, it will to leads to

deterioration of environmental quality of the area which thus enhances climate change.

Table 4 Source of livelihood of the respondents

Responses	Frequenc	Percentage
Farming	128	64
Civil / Public Service	9	4.5
Traders	42	21
Others	21	10.5
Total	200	100

Source: Author's Analysis, 2015

Income Level of Respondents

Information on the income level of the respondents was inquired and the result is presented in table 5.

Table 5 Monthly incomes of respondents

Responses	Frequen	Percentage
Less than ₦3000	67	33.5
₦3001 - ₦6000	51	25.5
₦6001 - ₦9000	39	19.5
₦9001 - ₦12,000	29	14.5
More than ₦12,000	14	7
Total	200	100

Source: Authors's Analysis, 2015

From table 5 about, 25.5% of the respondents earned between ₦3001 - ₦6000 as monthly family income. About 33.5% of the respondents earned less than ₦3000 monthly. Only 7% of the respondents earned more than ₦12,000 monthly. From the above analysis, income level in the study area is low. Low income areas have the tendency of depleting environmental resources in their quest for survival.

Application of manure and chemicals in Farming

Information on the application of manure and chemicals in farming by the respondents and the result is presented in table 6 below.

Table 6 Application manure and chemicals in Farming

Responses	Frequency	Percentage
Manure	42	32.8
Chemical Fertilizer and Herbicides	86	67.2
Total	128	100

Source: Author's Analysis, 2015.

From table 6, about 32.8 % of the respondents

were farmers admitted using manure in farming. However 67.2% of the women admitted using chemical fertilisers and herbicides while farming. The use of these chemicals has a long time effect on humans, animals and environmental quality of the area, and could also lead to climate change.

Source of Cooking Fuel

Information on the source of energy used in cooking of the respondents was sought and the result is presented in table 7 below.

Table 7 Energy source used for cooking

Responses	Frequency	Percentage
Fuel wood	148	70
Kerosene	37	18.5
Gas	8	4
Electricity	7	3.5
Total	200	100

Source: Author's Analysis, 2015.

From table 7, 70% of the respondents used wood in cooking with 18.5% of the respondents using kerosene to cook. Gas accounted for 8% of the population while, Electricity accounted for 3.5% of the respondents. This goes to show that majority of the women are used fuel wood in cooking. This shows that Forest resources are depleted daily for the purpose of cooking which exposes the area to deforestation. It will lead to deterioration of environmental quality of the area which thus enhances climate change.

CONCLUSION AND RECOMMENDATION

The most effective way to address climate change is to adopt a sustainable development pathway by shifting to environmentally sustainable technologies and promotion of energy efficiency, renewable energy, forest conservation, reforestation, water conservation, as well as agricultural practices that are friendly to the environment. Since the competition for the world's dwindling resources will only grow more intense, and because women's involvement in Agricultural activities is bound to increase, Municipal Authorities, and Environmentalists are dutifully bound to teach the women in Miango village how to mediate environmental conflicts and build bridges to mitigate climate change as they continually get involved in agricultural practices. The contradiction existing between conservation and exploitation of the trees for food, fuel construction and other numerous benefits must be combated. Women must be educated to protect trees and the community forest. In this regard, people should be made through persuasive education to understand that the destruction of trees and forest brings about environmental degradation and poverty. It is therefore

the responsibility of policy makers to establish environmental friendly policies (Odebode, 2003). Women are the key to the management of many environmental systems. Therefore programmes to ensure women active participation in land improve activities such as agro-forestry and urban forestry should be encouraged in the study area.

Furthermore, the study recommends the introduction of environmental friendly activities which are not currently practiced in the study location. It is therefore recommended that the role of women combating mitigating and participating the activities leading to sound principal of environmental sustainability through efficient sustainable agricultural methods must be encouraged. Additionally funding should be directed specifically to women farmers who are both particularly vulnerable to climate change, but also leading innovative efforts to adapt to its impact. There is need for the government of Nigeria to commit itself to the search for the model of human development that is fundamentally favourable to women and sustainable development. It is therefore imperative for the government of Nigeria to be actively involved in developing a more just and more sustainable model of human living to replace the present decadent and exploitative one that exploits or rapes our natural environment.

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CAUSES OF ACCIDENTS AND PREVENTIVE MEASURES ON SELECTED BUILDING CONSTRUCTION SITES IN LAGOS, NIGERIA

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ABSTRACT

Globally, the construction industry provides direct jobs to a significant amount of people. It has been acknowledged in literature that the construction sites are unsafe; this is due to accidents and uncertainties. Hence, the need for effective accident prevention strategies to improve safety on construction site; and in-turn make the work place safe for all workers. This paper examines the causes of accidents and various preventive measures on construction sites in Lagos State. The study was carried out in two stages; the first stage involved review of literature to identify causes of accidents on sites and their preventive measures. The second stage entailed the use of questionnaire to capture the perception of respondent on the causes of accidents and effectiveness of preventive measures or strategies. Mean rank (descriptive statistical tools) was used to present the data collected while Analysis of Variance (ANOVA) was used to test the hypothesis. The findings of the study revealed that improper or defective scaffolds, improper fixing of components, operator's error, untidy site and defective or unstable ladder are various cause of accidents on sites. Various ways of preventing these accidents on sites include but not limited to the provision and use of helmet, first aid services, protective clothes and traction boots. The study however recommends that more emphasis should be laid on safety on site through adequate awareness and provision of safety measures. Government agencies and bodies/institutions responsible for safety enforcement on construction sites should do more in safety monitoring, inspection and sanctioning of violators.

Key words: Accidents, Building Construction Sites, Causes, Preventive Measures, Performance, Safety

INTRODUCTION

Cost, time and quality which are often termed the 'iron triangle' are metrics for measuring the success of construction projects. Alsulamy, Wamuziri and Taylor (2012) point out that these project performance measures are "product-oriented". Furthermore, the project-oriented focus of these metrics may be partly responsible for continued poor project performance experienced in the construction industry. Therefore, there has been a call for a shift away from these traditional project performance indicators. Previous studies have suggested new indicators such as: safety, efficient use of resources, effectiveness, satisfaction of stakeholders, and reduced conflicts and disputes (Toor and Ogunlana, 2010), but other researchers such as Alsulamy, Wamuziri and Taylor (2012) only focussed on cost, time and quality. The adopting and incorporating these new indicators such as safety; will go a long way in improving performance within the construction industry. In addition, it is important to note that safety plays an essential role in the lives of construction workers and construction project performance.

Reliable data on the number of accidents on construction sites are not available in Nigeria (Agwu and Olele, 2014; Idoro, 2008) and most developing countries (Idoro, 2008), but data from developed countries shows that the construction industry performs poorly among industries in terms of safety (International Labour Organisation, 2005). For example, Kines, Andersen, Spangenberg, Mikkelsen, Dyreborg and

Zohar, (2010), posited that the construction industry is one of the most injury-prone industries, in which output is usually prioritized over safety in daily on-site communication. In the same vain, (ILO, 2005) reported that over 60,000 fatal accidents occur on construction sites annually around the world. This is much higher when compared with occurrence in other sectors of the economy (ILO, 2011). These reports show high level of the poor performance in the construction industry in term of safety. In Nigeria, according to Dodo, (2014), health and safety has not been given the required attention to reduce or prevent hazards and accidents on construction sites, thereby posing serious threats to workers and even non-workers. This view was supported by Idoro, (2008) that the situation in developing countries like Nigeria is worse compare to what prevails in developed countries. This was due to lack of concern, accurate records and statutory regulations on health and safety (H&S) (Idoro, 2008). Moreover, if accidents on sites are not curtailed, whether minor or fatal, could result to loss of resources and loss of lives in cases of fatalities and position the industry as a deadly working place (Augusta, Mimi & Kamariza, 2015). These submissions by scholars raised a concern on the need to raise awareness towards curbing this menace on site. In order to address this problem, there is a need to gain insights into the current knowledge on safety in the field of construction management globally and consequently raise its awareness for enforcement in Lagos State. Thereby leading to this study been carried out in Lagos State. Lagos is a south-western part of Nigeria and one of the

mega-cities (UN-habitat; 2014) in Africa. The state was selected because it is the commercial nerve of Nigeria and economic hub of West Africa (Economic Planning Department, 2012) with huge construction activity widely spread across. A state with these characteristics has high tendency of construction accidents. Therefore, it becomes needful to conduct the study in the state in order to raise the awareness of safe practice on sites.

AIM, OBJECTIVES AND HYPOTHESIS

This study aimed at examining the causes of accidents and preventive measures in place on some selected building construction sites within Lagos State, Nigeria; in view of contributing to/raising the awareness of the need for workplace safety. To achieve this aim, two objectives were stated. The objectives are: one, to identify the causes of accidents on building construction site; and to examine preventive measures of these accidents on building construction site. In accordance with these objectives, following hypothesis is formulated:

H₀: there are no significant preventive measures of accidents on sites.

H₁: there are significant preventive measures of accidents on sites.

LITERATURE REVIEW

Literature reviews provide information on the trends and gaps in the knowledge about a topic. This section of this paper present the review on various studies on the types of accident, causes of accident on building site, various government policies and regulations, preventive and control measures; and the danger these accidents present to workers on site. This is important because it gives insight to the trend on the research focus in terms of work done and shed light into what the present study encompasses.

Accidents

Accident refers to an unplanned, unexpected, and un-designed (not purposefully caused) event which occurs suddenly, causes injury or man-day loss and decrease in abilities (Dhanasekar, Manigandan, Abdul Zubar and Visagavel, 2014). In another study by Mwombeki (2005), it was viewed as an unplanned and unexpected occurrence, which upsets a planned sequence of work, resulting on loss of production, injury to personnel, damage to plant and equipment and eventually interrupting the production flow. From these definitions, the major themes that emerge are that accidents are “unplanned” which result in “loss of production time and resources” and “injuries or death in severe cases”. Thus, there must be measures in place to prevent, control or reduce the occurrence of accident and promote safety on site.

Types of Accidents on Construction Sites

Ling, Liu and Woo (2009) asserted that the main types of fatal accidents in Singapore are fall from height and struck by objects. Haslam, Hide, Gibb, Gyi, Pavitt, Atkinson and Duff, (2005) agreed with the study by Ling, Liu and Woo, (2009) that fall from height and struck-by are common types of accident on site; but further reiterated that slip, trip and electrocution are also common causes in the UK. But in another study by Chong and Low (2014), they categorise construction accidents into three main categories. First, stepping-on, struck-by or striking against; these were said to be most common on site. The second categories are falls accident which could result from stairs, ladders, roofs and other falls. While the third category are electrocution, fire, explosions, toxication, collapse of structure and overexertion.

Other researchers such as Mungen and Gurcanli (2005); Kartan and Bouz (1998); Hinze, Petersen and Fredley (1998); Huang and Hinze (2003) have also supported the findings of Ling, Liu and Woo, (2009); Haslam et al (2005) and Chong and Low (2014). But asserted further that scaffold falls, tools and crane accident are also significant on site. These studies showed a common trend in the type of accidents; *falls from height*, and apparently the most common accident on construction sites. This may be attributed to the fact that most construction works are height related and require scaffold or temporary formwork to execute.

Causes of Accidents on Building Sites

A large and growing body of literature have investigated safety problems on construction project sites. Human errors due to misjudgement of hazardous scenarios are major cause of accidents on construction sites (Huang and Hinze, 2003; Lucy, Ian and Ian, 1999). In addition, Abdelhamid and Everett (2000) viewed causes of accidents from two perspectives; unsafe conditions and unsafe acts. In their explanations, unsafe conditions were said to be conditions where the physical layout of the workplace, the status of the tools, equipment and materials are in violation of set safety standards. While unsafe acts are situation where a worker proceeds to carry out the work regardless of the unsafe conditions and fails to take necessary precautions. For instance, when a worker proceeds to use a defective ladder (unsafe condition) without correcting or rectifying the defect, or replace it completely (unsafe act) and then a fall occur (accident). Thus, it can be inferred that unsafe working conditions and unsafe acts (behaviours) are leading cause of accidents. This position by Abdelhamid and Everett (2000) corroborates Jannadi and Assaf (1998) submission that the immediate causes of accident on site are unsafe conditions and unsafe acts from the site management and the workers respectively.

Other authors have viewed causes of accidents differently. For instance, Abdulhamid, Abdmajid and Singh (2008) assert that causes of accidents in the construction industry is a multi-faceted phenomenon, mainly attributed to by workers' negligence, failure of workers to obey work procedures, work at high elevation, operating equipment without safety devices and poor site management. Harsh work operation, low knowledge and skill level of workers; failure to use PPE and poor workers attitude about safety are also major contributors. In the similar vein, Hon, Chan and Wong (2010) identify causes of accidents in Repair, Maintenance, Alteration and Addition works (RMAA) in Hong Kong to include: low safety awareness, inadequate safety supervision, inadequate safety planning, insufficient training and hurry to finish work, inadequate regulatory and monitoring and poor housekeeping. However, the three main underlining causes based on this analysis are poor safety consciousness of the workers, underestimating potential risks when performing task and PPE not provided or misused where provided.

Moreover, Gharardi, Nicolini and Odella (1998) studied the causes of accident from two perspectives; the site managers' and the engineers' perspective. It was found from the two perspectives that lack of organizational control, economic and time constraints, lack of respect for safety regulations/norms, human error, poor workforce professionalism and lack of site organization are factors that cause accidents on site. The site managers argued that each of these factors independently (multi-faceted/dimension) causes accident on site. While the engineers argued that a linear relationship among these factors causes accident on site i.e., one factor must lead to another or several others and then accident occurs. Thus, the occurrence of accident on site is in chain-like manner that one factor would infer another or several others and then the ultimate result would be accident. It then means that to control the occurrence of accident on site requires a multi-dimensional approach as the root cause is multi-faceted.

Some of the causes of accidents identified in literatures are as listed in table 1 below in no particular order.

Table 1 Identified Causes of Accident from Literature

S/N	Identified Causes of Accident from Literatures
1	Carelessness
2	Negligence
3	Human Error
4	Improper Scaffolds
5	Use of Defective Tools and Machines
6	Faulty Ladders
7	Unsafe Working Conditions
8	Unsafe Acts/Practice
9	Failure to Follow Safety Rules
10	Improper Use of Safety Items
11	Dropping/Throwing From Heights
12	Lifting Heavy Objects
13	Contact with Electricity
14	Failure of Lifting Devices
15	Poor Site Keeping
16	Falls
17	Slips
18	Lack of Proper Safety Training
19	Lack or Organisational Commitment
20	Act of God

Sources: Kadiri, Z. O et al, (2014); Abdulhamid, et al (2008); Tam, et al, (2004); Toole, (2002); Abdelhamid and Everett (2000) and kartam and bouz (1998).

Control Measures/Prevention of Accidents on Sites

In order to reduce the high likelihood of accidents on construction sites, several preventive strategies have been proposed. Safety on any construction project is the responsibility of all the parties involved in the project; the client, the designer and the contractor (Zakari, Mansor and Abdullah, 2012; Haslam, et al, 2005; Toole,

2002; Jannadi and Assaf, 1998). That is, not just the contractor along should be safety conscious but the client and the design team should be as much concern with safety as the contractor. Because any fatal incident on site could lead to a temporary halt on the construction process which may in turn affect the client's budget projection or expectations. Jannadi and

Assaf (1998) pointed out that the safety level in construction sites varies with project size in Saudi Arabia. That is; larger projects constructed by larger international firms have better safety ethics than the smaller firms. This variance indicates the need for enforcement of standard safety practice on sites across board, regardless of the size of the construction firms or projects. However, a comprehensive accident prevention or safety program should entails management policy/safety plans, safety training and meetings, provision and enforcement of personal protective equipment (PPE); and first aid/medical arrangements (Mwombeki, 2005; Hassanein and Hanna, 2007; OSHA, 2002).

Management safety policy/plan according to OSHA, (2002), was viewed from management commitment perspective. The organization stated that in an effective safety or accident prevention program; management regards workers' safety and health as a fundamental value of the firm. And thereby, applies its commitment to health protection with as much vigor as to other organizational goals. The type of management policy or commitment to safety at workplace is very essential to the prevention of accidents. The safety commitment of any construction organization should include drawing up an effective safety plans, provision of protective equipment for all the site workers and personnel, encourage safe working habits, incentives for safety and regular review of accident prevention or safety programs (Kadiri, Nden, Avre, Oladapo, Edom, Samuel, and Anaso, 2014; Hassanein and Hanna, 2007; OSHA, 2002). Thus management's commitment to safety begins with self interest in safety and by providing a safety policy/program to be followed by all employees (kartam and Bouz, 1998). An affective safety program is a significant tool to reduce site accidents, and directly or indirectly reduce project cost due to accident claims.

After management commitment, there should be safety trainings and meetings on site to keep the site workers informed about accidents and the expected actions to be taken when it occur. Effective safety training is an essential part of any safety and health program (OSHA, 2002; Huang and Hinze, 2003). Safety personnel and site workers should be trained in hazard identification, control and method of encouraging safe practices. The safety training and meetings must emphasis the project's safety requirements and depends on the size and complexity of the worksite, discuss the causes of accidents on site and ways of preventing future occurrence (Hassanein and Hanna, 2007). Regular safety meetings are necessary for communicating safety information to all parties; as lack of effective labor training is a major concern in safety management (Tam, Zeng and Deng, 2004). This training should therefore be provided in the language well understood by the

workers. Another element of a safety plan is first aid and medical arrangement and its significance on site cannot be over emphasized. First aid facilities must be provided on site regardless of the size of the project and the number of workers on site (Hassanein and Hanna, 2007). In case of any injury such as cuts, strips and step-on, etc; prompt treatment with first aid facility can help to curtail the effect on the individual before full medical attention is given. Lastly, provision and enforcement of personal protective equipment (PPE) is another key factor in accident prevention on site. Basic personal protective equipment such as hand gloves, had-hat and safety shoe must be available and used on site. Tam et al, (2004) submit that the most common PPE provided on sites are gloves, hard hats and eye goggles. Moreover, the proper use of PPE such as helmet, gloves, safety shoes, safety harnesses is key in reducing accidents on site (Jaselskis and Suazo, 1994). This view was supported by Huang and Hinze (2002) that provision and enforcement of fall protective equipment to workers, including full body harnesses along with proper training would reduce fall accidents on site. It may not be enough to provide, but training on the usage and enforcing it would go a long way to ensure safety on site.

These key elemental parts of accident prevention or safety plan must be incorporated in the management of any construction site. Without the plan well laid out and strictly followed, prevention of accident on site is a mirage.

Preventing common accidents on sites

Preventing common accidents on site such as scaffold; entails checking that the scaffold is sound, rigid and sufficient enough to carry its own weight plus four times the maximum load without settling or swaying, erected on firm and even ground; and anyone working on it must obey all safety rules associated with working on scaffold (O.S.H.A, 2005; H.S.E, 2004; McCann and Halperin, 2002). In works that require the use of ladder, it must be ensured that the ladder is long enough to safely reach the work area without unnecessary reaching too far to the sides, be strong enough to support the load of the worker and the materials; and be placed on solid and plane surface at the right inclination (Mitra, Cameron and Gabble, 2007; O.S.H.A, 2005). Accident caused by slip, trip or step-on accident are mitigated by maintaining good housekeeping on site, immediate removal of any obstructions on the walk way and constant wearing of suitable and traction footwear on site (Tappin, Ashby, Moore, Parker, Hide, Bentley and Legg, 2001; H.S.E, 2007; O.S.H.A (2005).

For crane operations on site, erection and operations must be done within the best crane safety practice (Neitzer, Seixas, Camp and Yost, 2001; O.S.H.A, 2005; Skinner, Watson, Dunkley, and Blackmore, 2006).

While working with electricity on site would require that all workers wear non-conductive hand gloves at work, all cables are in proper conditions before switching-on from the mains and adequate provision of other personal protective equipment on site. (Taylor, McGwin, Valent, Rue, 2002; Cawley and Homce, 2003).

RESEARCH METHOD AND PROCEDURE

A quantitative research approach was adopted in this study. This is because the study entailed collection of data through questionnaires from a population of building construction sites (i.e. sample) spread over Lagos State, Nigeria (cross-sectional survey). As pointed out by Sekaran (2003), questionnaire survey is well suited for studies targeted at gathering opinion of a large population about a particular problem.

Required Data Input

The population of this study consist of active construction sites (Building and Civil Engineering construction sites where construction activities are currently going-on) within the state. The data for the study were:

1 *Secondary Source of Data*

The secondary sources of data for this study include reviewed literature from journals and articles, conference proceedings, books, reports and policy statements.

2 *Primary Source of Data*

The primary data for the study were sourced through the administration of questionnaires, structured towards the cause of different types of accidents on sites and preventive measures in place to curtail its menace. 45 (forty-five)

contractors where randomly selected from a list of 88 (eighty-eight) registered contractors with the Lagos State Government Tender Board. The questionnaire were administered to the safety officers or the construction managers (as the case were) of these firms on sites. Follow-ups were made to these sites to ensure speedy response to the questionnaires as time was a constraint. The total number of questionnaires returned and valid for this study were 30 (thirty) (sample size) out of the 45 (forty-five) sent out. The effective returned rate of this instrument is 66.67%. The responses were rated on a five-point Likert scale (i.e 1 = never, 2 = low, 3 = average, 4 = high and 5 = very high) for the causes of accidents while response were rated on a three-point Likert scale (i.e 1 = never, 2 = sometimes and 3 = always) for preventive measures of accidents on sites.

Statistical Package for Social Sciences (SPSS) was used to analyse the data collected descriptively. Descriptive statistical tools such as frequency, percentage and mean ranking were used to present the respondents' response while the hypothesis (Null hypothesis (Ho): There are no significant preventive measures of accidents on sites) was tested using the analysis of variance tool (ANOVA) for its rejection or acceptance.

DATA ANALYSIS AND DISCUSSION

In this study, descriptive tools such as frequency, percentage and mean score (MS) rank, were adopted in presenting the result descriptively in tables; while analysis of variance (ANOVA) was used to test the hypothesis.

Table 2: Types of Organization and Years of Working Experience of Respondents

Types of Organization	Frequency	Percentage (%)
Contracting	27	79.4
Consulting	6	17.6
Technical/Research	1	2.9
Total	34	
Years Of Working Experience		
Below 5	6	17.6
5 – 10	10	29.4
11 – 15	11	32.4
16 – 20	5	14.7
Above 20	2	5.9
Total	34	

Source: Author's Analysis (2016)

Types of Organization and Years of Working Experience of Respondents

Table 2 below describe the type of organization and years of working experience of respondents to this

study. Most of the respondents belong to contracting firms (79.4%), followed by consulting and technical/research (17.6%) and (2.9%) respectively. As contracting firms has the highest percentage respondents, it suggest that the response provided would

truly imply what is obtainable on site because they are on-site professionals. For years of working experience, 32.4% of the respondents has between 11 – 15 years of experience, 29.4 % between 5 – 10years, 17.5% below 5years of experience, 14.7% has between 16 – 20years and 5.9% has above 20years experience in the construction industry. A trend was shown in this study that most of the respondents have above 5 years (82.4%) of working experience in the industry and could have witness different types of accidents on sites. Thus their responses to the study will be of great significant.

Causes of Various Types Accidents on Building Sites

The first objective of the study was to identify causes of accidents on building construction site in Lagos State. Table 3 shows the different types of accidents on sites and their various causes as identified by the respondents. Out of the identified causes of various types of accidents on site, falling object; which is a cause of scaffold accidents ranked first overall cause of accidents on site with a mean value of 2.53. It was also identified as the most common cause of scaffold accidents on sites in Lagos State. Untidy site, a cause of slip and trip accident, with a mean value of 2.44 ranked overall second as cause of accidents on site. This was also identified as the most common cause of slip and trip accidents on site. Instability of ladder and improper fixing of components had an overall mean value of 2.32 and ranked third respectively among the identified causes of accidents on sites. Unstable ladder and improper fixing of components were identified as the common cause of ladder and power tools accidents.

The table also shows that operation’s errors and broken ladder are the sixth and seventh common cause of accident on sites respectively with a mean value of 2.12. Operator’s error and broken ladder were identified as the most common cause of ladder and crane accidents on sites. The collapsing of scaffold and contact with bared cable, a type of scaffold and electrocution accidents, ranked nineteenth and twentieth among the causes of accidents on site with a mean value of 1.65 respectively. Electrocution as cause of scaffold accident is the least rated cause of accidents with a mean value 1.62.

Preventive Measures of Accidents on Sites

The second objective was to examine the various preventive measures on building construction site to curb the menace. Preventive measures of accidents are very essential on any construction site because of the nature of the work done on such site, therefore adequate provision of preventive measures must be made on site to arrest any occurrence of work related injury or accident on site. Table 4 and 5 below present the response on prevention of accidents on sites.

Table 4 shows the respondents response to the provision of preventive measures of accidents on sites. We could observe that 26 (76.5%) of the respondents claimed to always provide preventive measures of accidents to workers on site, 8 (23.5%) respondents only provide it sometimes while none claim to never provide it. This shows that, most contractors know the importance of preventing construction accidents among workers on site and also valued the life of their workers. Thus, imbibe necessary preventive measure though some still fall short in it.

Table 3: Type of Accidents and their identified causes

Types of Accidents (Group)	Identified Causes	Mean Value	Within Group Rank	Overall Rank
Scaffold Accidents	Fall from height.	1.82	2	15
	Collapse of scaffold structure	1.65	3	19.5
	Electrocution	1.62	4	21
	Falling objects	2.53	1	1
Slip and Trip Accidents	Binding Wires	1.94	4	11
	Debris	1.91	5	12
	Wet or Slippery surface	2.27	2	5
	Oily surfaces.	1.97	3	10
	Untidy Site	2.44	1	2

Types of Accidents (Group)	Identified Causes	Mean Value	Within Group Rank	Overall Rank
Crane Accidents	Collapse of Crane	1.34	3	22
	Unsecured Load	1.79	2	16.5
	Contact with Electrical wire	1.79	2	16.5
	Operator's Error	2.12	1	6.5
Ladder Accidents	Broken Ladder	2.12	3	6.5
	Unstable Ladder	2.32	1	3.5
	Uneven Surface	2.24	2	8
	Reaching too far to the sides	1.85	4	14
Electrocution Accidents	Contact with bare wire	1.68	1	18
	Contact with energized circuit	1.65	2	19.5
Power Tools Accidents	Electrical Shock	2.00	2	9
	Faulty Tools	1.88	3	13
	Improper fixing of components	2.32	1	3.5

Source: Author's Analysis (2016)

Note N represents the total number of respondents

Table 4 Provision of preventive measures of accidents on site

Provision of Control measures on sites	Frequency	Percent (%)
Always	26	76.5
Sometimes	8	23.5
Total	34	100.0

Source: Author's Analysis (2016)

Table 5 Different preventive measure of accidents provided and used on sites.

Control Measures	Mean	Rank
Provision of Traction Boots	2.76	4.5
Provision of Goggle or Eye wear	2.67	7
Provision of Helmet or Hard Hat	2.82	1.5
Provision of Hand Gloves	2.76	4.5
Provision of Protective Clothe	2.79	3
Usage of Safety Net on Scaffolds	2.27	10
Usage of Safety Belt	2.34	9
Usage of Protective Equipment	2.39	8
Provision of First Aid Facility	2.82	1.5
Use of Signs, Guides, Caution and Reflector	2.68	6

Source: Author's Analysis (2016)

Note: N represents total number of respondents, 3 = Always, 2 = Sometimes, 1 = Never.

Table 5 shows the difference preventive measures of accidents used or provided on construction and building sites as responded by the respondents. It can be shown from this table that hardhat and first aid facility are often provided as preventive measures of accidents on site as they both have a mean respondent value of 2.82 and ranked first and second respectively among others. Hard hat or helmet are provided to prevent been struck on the head by falling objects or materials while first aid services are provided to give a first-hand treatment to any injury sustained on site, so as to keep the victim stable before proper medical attention is given. Traction boots and hand gloves are third most commonly used to control accident on site as they both have a mean respondent value of 2.76 and ranked fourth and fifth respectively among other measures. Traction boots are provided to prevent any step-on or slip accident while hand gloves are provided to protect the hand from direct contact with energized cable or circuit, sharp objects or materials, etc. Provision of safety net on scaffold is least

used as control measures of scaffold accident among other measures, as it has a mean respondent value of 2.27 and ranked tenth on the table. Though, it is used to prevent falling-off, of workers, tools or materials from a scaffold, but its usage is not common on site in Lagos state. Despite the varying degree of usage of these preventive measures, all of the respondents responded to all preventive measures as a means of preventing accidents on sites as shown on Table 5.

Testing Hypothesis

The hypotheses of the study were presented earlier. The Null hypothesis (Ho) says 'there are no significant preventive measures of accidents on sites' while the Alternative hypothesis (H1) says 'there are significant preventive measures of accidents on sites'. Analysis of variance (ANOVA) was used to test the significance of the variables for the acceptance or rejection accordingly.

Table 6 ANOVA Table of result for identified Preventive measures on sites

Control measures	Sources Variation	Sum of Squares	Df	Mean Square	F cal	F tab X=0.05	Significance
Provision of Traction Boots	Between Groups	1.589	1	1.589	11.226	4.17	S
	Within Groups	4.529	32	.142			
	Total	6.118	33				
Provision of Google or eyes wear	Between Groups	3.098	1	3.098	22.680	4.17	S
	Within Groups	4.235	31	.137			
	Total	7.333	32				
Provision of Helmet or Hard hat	Between Groups	.412	1	.412	2.913	4.17	NS
	Within Groups	4.529	32	.142			
	Total	4.941	33				
Provision of gloves	Between Groups	4.281	1	4.281	74.594	4.17	S
	Within Groups	1.837	32	.057			
	Total	6.118	33				
Protective Clothe	Between Groups	2.240	1	2.240	21.209	4.17	S

Control measures	Sources Variation	Sum of Squares	Df	Mean Square	F cal	F tab X=0.05	Significance
Safety Net	Within Groups	3.275	31	.106	9.106	4.19	S
	Total	5.515	32				
	Between Groups	2.912	1	2.912			
Use of Safety Belt.	Within Groups	8.955	28	.320	2.243	4.17	NS
	Total	11.867	29				
	Between Groups	1.059	1	1.059			
Fall Protective Equipments.	Within Groups	14.160	30	.472	.371	4.18	NS
	Total	15.219	31				
	Between Groups	.093	1	.093			
Provision of First Aid Services	Within Groups	7.262	29	.250	9.111	4.17	S
	Total	7.355	30				
	Between Groups	1.095	1	1.095			
Use of Signs, Guides, Cautions and Reflector.	Within Groups	3.846	32	.120	16.265	4.17	S
	Total	4.941	33				
	Between Groups	3.182	1	3.182			
	Within Groups		32	.196			
	Total	9.441	33				

Source: Author's Analysis (2016)

Note: DF = Degree of Freedom, F cal = F Calculated, F tab = F Tabulated

The ANOVA result of the identified control measures of accidents on sites are as summarized in the Table 6. The calculated F value is higher than the tabulated F value for all except for fall protective equipment, use of safety belt and provision of hard hat. Thus, the null hypothesis (Ho) is rejected while the alternative hypothesis (H1) is accepted. That is, there are significant control measures of accidents on sites. This study therefore affirms that there are significant accident preventive measures on sites.

DISCUSSION OF FINDINGS

As stated in the introductory section of this paper, the aim of the papers is to examine the causes of accidents and effective measures of preventing accident on construction project sites. The result of this study revealed that (Table 3) scaffold accidents slip and trip accidents, crane accidents, ladder accidents, electrocution accidents, power tools accidents are various types of accidents on sites in Lagos State.

Among these types of accidents on sites; slip and trip, and scaffold accidents are the most common type of accidents while electrocution least occur. This findings corroborate with the findings of Mungen and Gurcanli (2005) (scaffold, tools and crane accidents); Kartan and Bouz (1998) (scaffold, tools and crane accidents); Hinze, Petersen and Fredley (1998); Huang and Hinze (2003) (scaffold and cranes accidents); Ling et al (2009); Haslam et al (2005) (slip, trip and electrocution) and Chong and Low (2014) (ladders, falls, electrocution, etc) as various types of accidents on site. It further suggested that these types of accidents are not peculiar to a region but cut across any construction sites regardless of the region; once preventions are not upheld.

Among the causes of these types of accidents; falling objects; an aspect of scaffold accident, is the most common cause of scaffold accidents on site while falls from height followed closely within the group. This finding is in agreement with a major finding of Huang and Hinze (2003); Kartan and Bouz (1998) and Haslam et al, (2005) that falls from height and falling objects are common causal of accident on construction site. This could be an indication that the uses of helmet and proper safety harnesses as a protection are not enforced on most of these sites under investigation, or unauthorized people move around the sites without restrictions. However, on the overall rank, fall from height ranked 15th; an indication that the incidence or cases of fall from height on site is less significant in Nigeria. Surprisingly, this finding negate one of the key findings of Tam, et al (2004) and Kartan and Bouz (1998) that fall from height is a major cause of accident on site.

Untidy site followed as second most common cause of accidents on sites after falling object on the overall rank. But this ranked first within the group of slip and trip accidents and followed by slippery surfaces and debris respectively. This is an effect of bad housekeeping on site. Among the group of crane accidents, operator's error (human error) occurred as a major cause of crane accident on site and ranked 6th on the overall table. This cemented the position of Neitzer et al, (2001) and Shapira and Lyachin (2009) that human error in terms of operator's error is a foremost cause of crane accident and also significant in accident causation. Instability of ladder and uneven surfaces being a main cause of ladder accident by the findings of this study, align with the findings of Mitra et al, (2007) and O.S.H.A, (2005) that unsteadiness, uneven surfaces and broken ladders are major causes of ladder accidents on site. The improper fixing of components and electrical shock are also significant causes of power tool accidents within the group and overall (Table 3).

This study also establishes that safety measures are provided on sites by most contractors (Table 4) but not all adhere to its tenets. This implies that, most contractors know the importance of controlling or preventing occupational accidents on site. Furthermore, various preventive measures of accidents used on site, ranges from traction boots to first aid services (Table 5) while 76.5% of the respondents provide these measures for workers on sites always. Among the safety gadgets; Hardhat, traction boots and first aid facility are mostly used on site while most contractors least use safety belt and net. The least usage of safety net and safety belt may be the reason accidents due to falling objects and falls from height are significant on these sites. These findings thereby, show consistency with Tam et al (2004) and Jaselski and Suazo (1994) that PPE are provided on site though their usage varies from site to site.

The hypothesis statement for this study is that there are no significant control measures of accidents on sites. This study explicitly rejects the null hypothesis (Ho) (there are no significant control measures of accidents on sites) and accepts its alternative hypothesis (H1) that there are significant control/preventive measures of accidents on sites. This therefore, suggest that efforts were made by contractors to prevent or control the occurrence of accidents on site but more effort should be made to curtail these accidents to the minimum. The acceptance of this hypothesis corroborate with Tam et al, (2004); Jaselskis and Suazo, 1994; and Huang and Hinze (2002) that personal protective measures are significant in preventing accident on site.

CONCLUSION

This study was carried out to assess the causes of accidents on construction sites and their measures of prevention. It was discovered that falling object, which is a cause of scaffold accidents, is the most common cause of accidents on sites. Also, untidy site, a cause of slip and trip accidents, instability of ladders and improper fixing of components are common cause of accidents on sites. While some other causes of accidents on site are operator's error, broken ladder, collapse of crane, contact with bared cable and electrocution on scaffolds. However, the major type of accident on construction site in Lagos State is Scaffold accident, slip and trip among others. The study also showed that most of the contractors understand and appreciate the importance of controlling the occurrence of accident on sites, as they all provides different control measures to workers on sites. However, it was established that helmet, first aid services, protective clothes and traction boots are the common safety equipment or measures on sites among several other measures. Though, their usage differs from site to site.

The key indication of these findings is that most construction workers are not careful of the causes of accident on site and so; do not adhere to the usage or proper usage of safety gadgets on site. This is therefore, an indictment on the construction firms that, even when these safety gadgets are provided, no strict enforcement on their usage or proper usage on site by the site management. This finding enhances our understanding of the causes of accidents on site. But most significantly is that, it is not enough to provide safety equipment for workers; the government, organisation, site management team and the workers must understand that safety should be first on site.

This study therefore, recommends that more awareness should be made on the causes of accidents and ways to prevent them on site, proper safety training for the workers and the managers. Also, strict adherence to health and safety policy; and practice on site should be paramount. Lastly, various government agencies and bodies/institutions responsible for safety enforcement on construction sites should do more in safety monitoring and inspection. Hence, should any be found defaulting, such should be duly sanctioned or prosecuted; as this would be a deterrent to others in the industry. Most construction firms do not have good accident records or accident data bank, few have trained safety officer while most combined the role with the construction managers' on site. Furthermore, most contractors are reluctant to disclose their accident status even as it was clearly stated that it is for research purpose. These caused some limitations to the study. Future studies could be carried out on accidents record keeping in the construction industry, construction accident fatalities and more robust ways of preventing accidents on site.

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PROBLEMS AND PROSPECTS FOR WOMEN IN ESTATE MANAGEMENT PROFESSION IN NIGERIA: CASE STUDY OF ABUJA

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ABSTRACT

Problems and prospects for women in Estate Management practice in Abuja real estate industry were investigated in this paper to spur effective women participation in the profession. Using data derived from survey of 75 firms and 24 principal partners, the study found that women constitutes 30% of the industry's workforce and 36% of the women workforce operate as clerks. Discrimination on the basis of assignment of tasks, difficulty in combining marriage/associated responsibilities with practice, doubt of women competence, failure of women professionals to promote women interest among other are problems impeding effective women participation. Women performance three decades ago fell short the performance of men with margin of 150% and 500% for agency and 60% and 600% for property management but this gap has reduced significantly to 2.7% and 4.7% for agency and 6.6% and 44.2% for property management. Valuation and project management have low participation as only 1% to 5% of the women undertake the tasks. The profession is affirmed prospective by 80% of respondents, formation of association of women in real estate is therefore recommended to promote effective women participation through conferences, sensitization, mentorship, networking and lobbying for even representation of women in the Nigeria real estate sector.

Keywords: Women participation, Real estate profession, Problems, Prospects and Even representation

INTRODUCTION

According to Lynn Zuckerman Gray (Cornell University, 2014), women by natural inclination are great problem solvers, often detail oriented, multitask well and have strong intuition about people and their decision making processes. These are outstanding qualities that are supposed to give women an edge over men in the real estate profession but history of discrimination against women has resulted in their underrepresentation in the profession. The underrepresentation of women in the profession is a global phenomenon. The participation rate of women in UK real estate industry is just 11% (Hirigoyen, 2014). In USA women brokers dominate the residential real estate market with participation rate of 57% (Polgar, 2014) but this success story in the residential real estate is yet to be replicated in other lucrative sectors of the profession such as commercial property and real estate development market (McCormick, 2014). In Africa and Nigeria by extension women are inequitably represented in the real estate profession (Obih, 2014). The reasons for the under representation is traceable to ill cultural practices that discriminate against women. "Girls education end in kitchen" was a common cliché I heard back in my primary and secondary school days in Port Harcourt, Nigeria over two decades ago. This notion is founded on the culturally assigned or defined roles for Nigeria women. According to Degan (1993), the view of culture is that women should stay at home and learn to tend family instead of attending school. Valerie (2006) in Ling, Sulaiman and Arif (2013) also is of the view that women are confronted by structural and cultural barriers that often exclude them from

professional and career ladder. Cultural beliefs of what women should be have negatively influenced women development in various stages of their lives.

Firstly as a child, the girl child is prone to abuse of right to education. It is not uncommon practice in Nigeria for family at time of financial incapacitation to withdraw their girl child from school for marriage while the boy remains in school (Omolewa, 2002). Secondly, at the point of making career choices the woman is discriminated against. For instance until 1868 women were forbidden access to Cambridge University and even when they were allowed access, they were restricted from studying courses like medicine, engineering that were considered men orientated profession until 1987 when the policy for equal opportunity for males and females was implemented (Schults, 2002). Stites (1978) cited in Ishaya et al (2011) supported this view by asserting that women were not given the option to study courses outside vocational courses such as teaching, nursing, fashion design, catering among others, which have been perceived as courses that enhanced women roles as good wife and mother. This unfairness meted to women decades ago has created a wide gap in the representation of women in the professions referred to as men profession today. In Nigeria for instance, women constitute 2.4% of architects, 3.5% of quantity surveyors, 25.5% of lawyers, 11.8% of lecturers, 8.4% of gynecologists and 18.3% of media practitioners (Adeniran, 2007).

Though the last several decades have brought to women gradual shift from the stereo-typed family life they were confined to by tradition to a force to reckon with in the labour force globally because women participation rate in the labour force have increased significantly reducing the gap between men and women in labour force (Fullerton, 1999). This development is acknowledged by World Bank Report (2013) that reported that women constitute 45.88% of UK labour force, 47% of USA labour force, 43.58% of China and South Africa 44.60% labour force. This huge involvement of women in the labour however has not translated into even

representation of women in the male-centric profession such as engineering, construction, real estate, surveying, medicine etc. (Mckinsey and Company, 2007). In Nigeria for instance, women constitute 42.4% of the total labour force (World Bank, 2013) but their participation in the real estate sector of the Nigeria economy is low compare to men. The record of Nigeria Institute of Estate Surveyors and Valuers (NIESV), an association of practitioners of real estate profession in Nigeria membership statistics shown in table 2 reflects the low level of women participation in the estate management profession in Nigeria.

Table 2 Membership Statistics of Nigeria Institute of Estate Surveyors

Category of membership	Sex	Number
Fellow/ Associate	Male	2578
Fellow/ Associate	Female	537
Graduate/Probationer	Male	4591
Graduate/Probationer	Female	1859

Source: National Secretariat of NIESV (2015)

Hence this study is aimed at examining the problems and prospects of women in the practice of Estate Management in order to encourage effective women participation in the industry with the objectives to: ascertain the level of women participation in the profession; identify and examine the problems to women participation in the profession; identify ways of overcoming the problems to enhance women participation and evaluate the performance of women in the industry.

LITERATURE REVIEW

This section undertakes a brief review of literature in order to appreciate the estate management profession, the involvement of women in the development of the profession, the problems confronting women in the real estate industry, avenues of overcoming the ways to promote women's success in the industry. Estate Management as a profession is the study of land, landed property and their uses for the purpose of achieving optimum return to its owners (Hemuka, 2001). Its practice consists: estate agency (marketing of real property for sale or rental purpose), property/facility management, project management, property development and property valuation (estimate of the worth of real property) (Hemuka, 2001). The practice of professional Estate Management has been for over a century. Record has it that Land Surveyor Club (professional body for estate surveyors) which is now known as Royal Institution of Chartered Surveyors (RICS) was established in United Kingdom in 1843. At this point, the roles of women in the real estate industry were clerical in nature but 37years down the line, the roles of women in the industry had accelerated from that of clerks to professional practice (Bello and Olajide, 2003; McCormick, 2014). In spite of this length of

existence of the profession, the participation of women is low globally including UK where the profession originated. After 146years of the existence of RICS a woman by name Louise Brook Smith for the first time was elected president of the association (Obih, 2014) this however has not translated into high level of women participation in the UK's real estate profession as men dominate the industry with very wide margin (Hirigoyen, 2014).

The level of participation of women in real estate profession varied from country to country. In United States for instance, the real estate industry two decades ago was highly dominated by men. Only few women who were wives of the Wall Street executives were in the industry. This was so because women were considered not business minded (Mitchell, 2014). But this viewpoint is being proven wrong as women are assuming dominant positions in some sectors of the USA real estate industry (Polgar, 2014). Report of Cornell University of its Baker Programme in real estate shows increasing number of young women aspiring to make career in real estate; the number of women enrollment in the programme increased from 16% in 2014 to 20% in 2015. The commercial real estate sector though still dominated by men is experiencing wind of change in women participation through its ranks with rise in the number of women in executive positions. Commercial Real Estate Diversity Report revealed that 62% of 175 real estate firms in the study had at least a woman director showing a significant shift from the 45% in 2012 (Pearson, 2014). Malaysia a developing nation like Nigeria with history of men dominance in the socio-economic sector is having women dominating the real estate industry. The Department of Statistics Report of 2009 stated that women in real estate make up

5.9% of the country's total labour force while men make 5.3%. In UK women participation rate is just 11% (Hirigoyen, 2014), however there is evidence of increase in their level of participation in the industry. Membership record of RICS rose from 9% in 1999 to 11% in 2014 (Ellison, 1999; Hirigoyen, 2014). South Africa is also witnessing rising interest of women in real estate. For instant, number of women applying for housing loan for property development increased from 36.53% in 2007 to 46.94 % in (2011); (Molopanele, 2013). Mhlanga (2015) also reported significant success achievement of South African women in the real estate industry.

The advancement of women in the profession in these countries came as a result of concerted efforts of associations of women in real estate and government interventions in these countries. In USA, women in real estate professional organizations such as Commercial Real Estate Women (CREW) and Urban Land Institute (ULI) whose aim is to achieve gender parity in the industry used various media to make women informed of the prospect in the real estate profession and engaged real estate services providers; to provide women that are interested in the profession with training that enabled them develop skills that would help them thrive and succeed in the industry (Pearson, 2014). Government intervention via legislation in UK helped boost board membership of women in estate firms from 12.5% in 2011 to 23.5% in 2015 (Cohen, 2015). Within this decade, more professional associations of women in real estate have emerged with determination to reduce gender gap in the UK real estate sector (RE:WOMEN, 2014). The programme of these organisations include: encouraging and nurturing aspiring talent in secondary schools and universities through seminars, networking and workshop to help them develop skills; help pave way for young women as future participants and leaders

in the professional, corporate and political real estate world (RE:WOMEN, 2012). *The approach of South Africa and Malaysia in boosting women participation in the profession is similar to that of UK, in that government interventions have bearing in the increased level of women participation. While land reform by the South Africa government ensure women rights to land and simplified property registration that takes 6 to 14days at cost of 3% to 8% of the property value to register property provided efficient platform for real estate business to thrive which in return spurred women interest in the profession (Doing Business Magazine, 2011), deliberate effort by the Malaysia government to mainstream effective women participation in social and economic development of Malaysia enhanced women participation in the real estate sector (The Star on Line, 2013).*

In spite of the success stories of women participation in the real estate industry in these countries, women are still confronted with some problems or barriers. In USA, access to finance constitutes a major barrier to women's participation in the property development segment of the industry as huge capital is required to finance property development but financial institutions are unwilling to give women in the business loans, as a result very few women are in property development sector of USA real estate market (Millard, 2008). Gender-based discrimination in wage is another problem confronting women in the industry. USA Bureau of Labour Statistics in 2012 reported that female property manager earns average of 78.2% of what the male holding such position earns (Pearson, 2014). Cornell University in its report affirmed the existence of wage gap between men and women in the sector but acknowledged the narrowing down of the existing gap as reflected in Table 2.

Table 2 Difference in Salaries of Men and Women in USA Real Estate

Percentage of Men Wage Earned by women	Year
Women earn average of 65% of men wage	1980
Women earn average of 76% of men wage	2000
Women earn average of 81% of men wage	2010

Source: Cornell University (2014)

In the UK, the growth rate of women participation in the profession is very slow, in the space of 15years the increase rate of women participation is just 2%. South Africa women in the sector are faced with problems such as: inability of women in the industry to prompt themselves and self-limiting views of women on themselves because of cultural believes; lack of access to finance and restriction in access to land by customary law (Turley, 2012; Molopanele, 2013). Malaysia women are considered incompetent and lazy to practice

the profession as they are perceived to have difficulties in combining work life with home front; men in Northern Malaysia do not consider real estate profession as women job; estate firms are unwilling to assign project development task to women (Ling, Sulaiman and Arif, 2013). This is however not a miserable situation because successful women in the industry who had overcome these barriers are helping others who are interested in the profession to succeed and achieve gender equality in the industry.

METHOD AND APPROACH

Abuja the Federal Capital Territory of Nigeria has a land area of 77539 km², consisting six area councils: Abuja municipal, Abaji, Gwagwalada, Kuje, Bwari and Kwali area council (Federal Government of Nigeria). It is considered the fourth most populous city in Nigeria with estimated population of 3million (TMTN magazine, 2015). Abuja being the capital of Nigeria, has huge property market and this has led to the siting and operation of many real estate firms there (FinIntell, 2015). Therefore, research on the performance of women in the real estate profession in Abuja will provide valuable insight on the problems confronting women in the Nigeria real estate industry, ways to overcome the problems and the prospect therein. The survey concentrated on the Abuja municipal area council which consists of the Central district, Maitama, Wuse, Garki and Asokoro district alone. This is so because the Abuja municipal area is the city's principal business zone, where all departments, multinational corporations and real estate firms are located (FGN). Secondly the NIESV directory shows that all the real estate firms are concentrated in the Abuja municipal area council.

The study employed the use of questionnaires for collection of data. The issuance of questionnaires was adopted because of the advantage of fast coverage of large area in less time and cost (Amaratunga et al, 2002). The questionnaires were of two schedules: one for the management of estate firms and the other for women working in estate firms. The questionnaire administered to the management is open ended allowing respondents to express their views freely on problems inhibiting women participation in the real estate profession and ways to overcome them. It was administered to selected females and males principal partners (those at the echelon) of the firms. The reason for adopting principal partners for the questionnaire is based on the assertion of Ashe-Edmunds (2015) that position of responsibility held in an organisation is a benchmark for determining career success. Furthermore, principal partners from their wealth of experiences could provide valuable information on: problems to women participation in the industry; how to overcome the problems and the basis for assessing women performance through comparison with the performance of men in the industry. The questionnaires administered to women working in estate firms were designed in line with the research objectives: allowing respondents to select answers from range of options and comment where need be. This category of women was included in the survey to obtain the views of women cutting across the whole spectrum of the industry.

Knowledge of all the estate firms operating in Abuja that are registered with NIESV at the time of this research and the contacts of their principal partners were obtained from the NIESV's directory. In administering the questionnaires, random sampling method was used to select 75 firms out of the total of 122 firms scattered across the five districts of Abuja municipal area. This sampling method was used because of its suitability for large sample populations and avoidance of biasness. The adequacy of 75firms as adequate representative of 122firms is based on Glenn (2009) assertion that sample size of 56 at 10% precision level can adequately represent population size of 125. Number of women available in each firm at the time of the survey was obtained from secretary of each firm and corresponding number of questionnaires were given out and retrieved thereafter. Total of 96 questionnaires were distributed and 85 of them were returned. It should be noted here that the number of women in the 75 firms is not 96 but the number of women available for the survey because some of them were away for official assignment. Out of the 85 questionnaires returned, three were invalidated because of incomplete response. The resultant 82 valid questionnaires which constitute response rate of 85.4% were used for the analysis. Adequacy of 82 in representing the study population is predicated on the assertion of Glenn (2009) that sample size of 64 at 10% precision level can be adequate representation of population size of 175. Given the total numbers of women in the 75 firms which is 175 (obtained from the survey), the 82 questionnaires are adequate.

Electronic-mail and telephone were used in administration of the management questionnaire. This method was adopted because of the difficulty of accessing the management members. Their consent was sort via phone calls and those that consented to the survey sent their email address through GSM text message for the questions to be sent to them. The questions were sent via email and responses were received through the same means. Telephone calls were used to obtain answers to questions that emanated from the responses. In all, a total of 41 consents were sort and 38 of them who consented were sent the questions. Out of this 38persons only 24 (12females and 12males) responded. Data obtained from both questionnaires schedules formed the basis for the research analysis.

DATA ANALYSIS AND DISCUSSION

Analysis of data is done in a fashion that addresses the objectives of the research that border on the degree of women participation in the real estate profession, problems to women participation, ways of overcoming problems to women participation and performance of women in real estate practice. The discussion will therefore be conducted in four parts.

Level of Women Participation in the Real Estate Profession

To determine the level of women participation in the industry in relation to their counterpart, as well as their area of specialization and marital status, respondents were asked to: state the number of female and male staff in their firm; indicate their marital status and job specialization. The findings shows that women workforce constitutes 30% of the entire labour force of the industry and 36% of this women workforce are not in the core practice of the profession but operates in

clerical or administrative capacity. Estate agency seems to be the comfort zone among the fields of Estate Management for women given that 29% of the workforce specialized in agency. Property/facility management has 18% of women participation and general practice (engagement in all fields of profession) has 11% of their participation. Valuation and project management have the lowest participation rate for the women as only 5% and 1% of the workforce respectively are involved in the fields. It is also discovered that married women constitutes 11% of the women workforce while single women constitutes 89%.

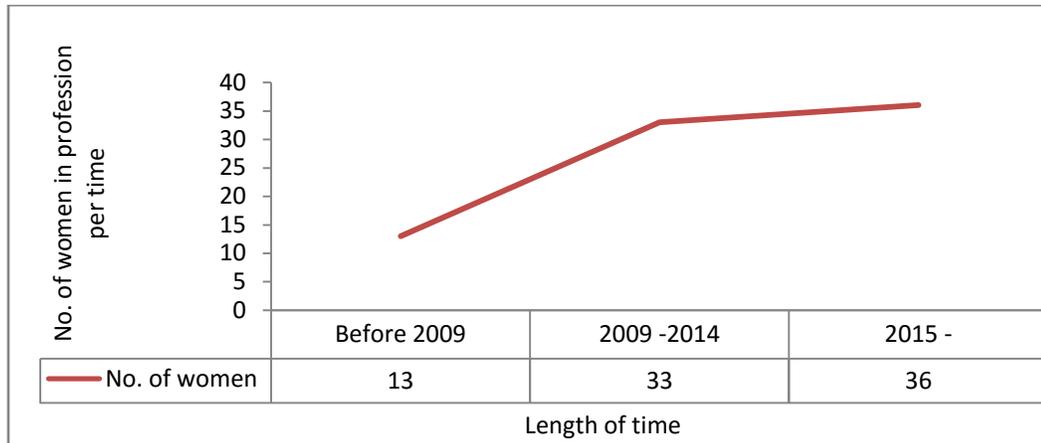


Figure 1: Growth Rate of Women Participation in the Real Estate Industry

The growth rate of women participation in the industry is determined from respondents response to length of time spent in the industry. Figure 1 shows that before 2009 there were 13 women working in the 75 sampled firms but in the space of 5years number of women rose to 33 meaning growth rate of 154%. That is the period between 2009 and 2014 witnessed an average annual growth rate of 30.8% in women participation. However the growth rate was not sustained in the subsequent year as the growth in 2015 was 9%. The reason for this fluctuation as gathered from the principal partners of firms is that some females use the industry to pass time while seeking for job elsewhere and as soon as they get the desired job, they opt out. This viewpoint is confirmed by the response to the question “If you have a choice of job, would you work with estate firm?” as 40% of the respondents were negative. Prominent reasons for this position are: poor salary; lack of job satisfaction and job too tasking with response rate of 33%, 27.3% and 18.2% respectively. There is therefore need for employers of labour in the industry to improve the salary package of their employees as obtainable in the banking industry that in spite of the tasking nature of the banking job, women are reasonably represented.

Problems to Women Participation in Real Estate Practice

The problems to women participation in the profession were viewed in two fronts: problems to women success in the profession and barriers to new entry of women. Respondents were firstly asked to identify the problems confronting women in practice of the profession and secondly to rank the barriers to new entry of women in order of their severity. Responses obtained are presented in Table 3 and Table 4 respectively.

Problems militating against women in practice as revealed by this study and captured in Table 3 are: discrimination against women on the basis of assignment of task with 24.4% affirmation rate from women working in the industry and 60% of the management; doubt of women competence to practice the profession by prospective clients with 34.5% and 70% response rate from both categories of respondents; sexual harassment, lack of mentorship, poor networking and inability to balance practice with marriage/associated responsibilities with 6.4%, 22.6%, 26.5% and 44.5% respectively as response rate.

Table 3 Response to the Problems Confronting Women in Real Estate in Abuja

Problems Confronting Women	Responses Rate (%)	
	Yes	No
Discrimination on the basis of assignment of task	24.4	79.6
Doubt of women competence for the job by prospective client	34.5	65.5
Sexual harassment	6.4	
Lack of mentorship	22.6	
Poor networking among women	26.5	
Marriage/association responsibilities	44.5	
Total	100.0	

Source: Survey (2015)

Table 4 Barriers to New Entry Women Participation in Real Estate

Barriers	Response Rates				Ranking Scores	Relative Index	Ranking %	Ranking Order
	1	2	3	4				
Marriage/associated responsibilities	15	12	19	32	224	0.683	68.3	2 nd
Lack of cooperation among women to promote women participation	14	16	20	32	234	0.713	71.3	1 st
Underdevelopment of Nigeria property market	18	30	16	18	170	0.518	51.8	8 th
Few property on the market create stiff competition	16	28	15	22	205	0.625	62.5	3 rd
Underdevelopment of Nigeria financial market	21	30	16	18	201	0.613	61.3	5 th
Cultural stereotypes or traditional values discourage women from participation	22	15	27	19	205	0.625	62.5	3 rd
Women exclusion from land inheritance or access to land	33	15	10	24	189	0.576	57.6	7 th
Estate firms not willing to employ women into key position	20	13	17	32	193	0.588	58.8	6 th

Source: Survey (2015)

Table 4 shows the views of respondents on the ranking of eight variables (factors that constitute barriers) to new entry of women in real estate practice. The variables were ranked in order of their severity having '1' for most severe barrier, '2' for more severe barrier, '3' for severe barrier and '4' for less severe barrier. The outcome of the survey in ranking of the variables from 1 to 8 in order of severity shows: lack of cooperation among women to promote women participation as most severe barrier; marriage and associated responsibilities

as more severe barrier; few property on the market create stiff competition and Cultural stereotypes or traditional values discourage women from participation as severe barriers and underdevelopment of Nigeria financial market, estate firms not willing to employ women into key position, Women exclusion from land inheritance or access to land and underdevelopment of Nigeria property market as less severe barriers in ranking order of 5th, 6th, 7th and 8th respectively. The finding of the existence of these problems confronting

women in the real estate industry is not peculiar to the Nigeria real estate sector alone but a common thread though in varied dimensions. Discrimination against women on the basis of assignment of tasks and doubt of women competence to practice the profession by prospective clients existing in the Nigeria real estate industry are also common in the Malaysia real industry (Ling, Sulaiman and Arif, 2013).

Ways of Overcoming the Problems to Women Participation in the Industry

In determining ways of overcoming the problems to women participation in the real estate profession views of the management of estate firms and women working in estate firms were obtained. From the management, the views of 12 female principal partners who had been in the industry for between 6 to 27years were obtained for upcoming women to learn from. This is shown in Table 5. The views of women working in the industry were also obtained and presented in figure 5

Table 5 Problems confronting women in the real estate industry and solutions

Problems	Solutions
Discrimination on the basis of assignment of task	Confidence in one’s self, competence in the execution of tasks assigned, willingness to dare challenging task and asking for them where necessary proved helpful in dealing with discrimination in task assignment.
Doubt of one’s competence on the basis gender by prospective client	Request for a chance to prove one’s worth and quality service delivery were measures adopted by successful women in the industry to earn the confidence of clients.
Sexual harassment	Strong moral disposition is needful in dealing with sexual harassment.
Lack of mentorship Poor networking among women	Frantic effort to develop one’s self through personal initiatives proved helpful.
Marriage/associated responsibilities	
	Effective plan that strike balance between career and family life and assistance of reliable domestic servant can managed this challenge.

Source: Survey (2015)

To determine ways to overcome barriers militating against adequate representation of women the industry from the view point of women working in estate firms, respondents were given options on measures of eliminating the barriers and asked to select from the potions. The outcome of this is shown in Figure 5.

The statistics shows organising conferences to brings female students of real estate profession and upcoming women in the industry to interact with successful women professionals to spur interest in practice and drive for success in the industry with response rate of 32.9% and use of all options state above with 24.4%

response rate as ways to overcome barriers impeding adequate representation of women in the Nigeria real estate sector. This finding also underscores the need for cooperation and net-working among women in the industry and with young prospective women outside the industry given that lack of cooperation among women in the industry as the most severe barrier to increased women participation in the profession; it is cogent for Nigeria women in real estate to build cooperation and net-working capacity to enhance women participation in the profession. These measures were found effective in enhancing women participation in USA real estate profession (Pearson, 2014).

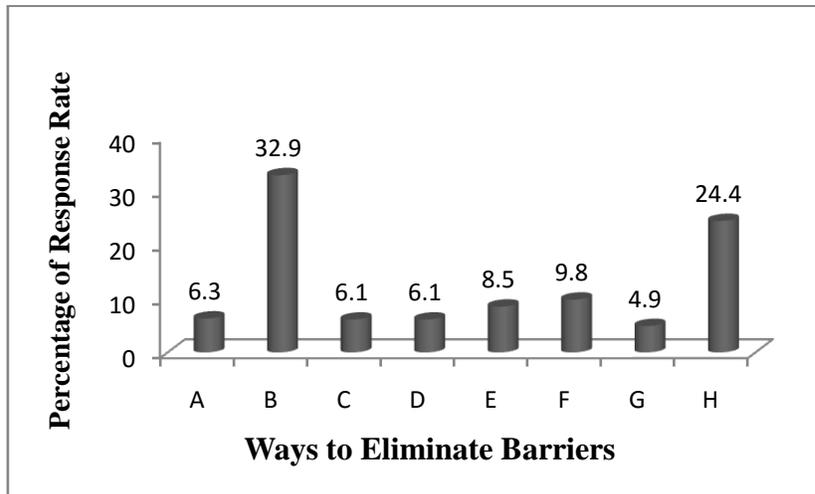


Figure 5 Ways of Eliminating Barriers to Women Participation in Real Estate

Where:

A = Create awareness of the prospect in the profession among girls in secondary schools to kindle their interest.

B = Organise conferences that brings female students of real estate profession and upcoming women in the industry to interact with successful women professionals to spur interest in practice and drive for success in the profession

C = Estate firms should be encourage to employ women professionals

D = Successful female professionals should network with upcoming women in the profession to assist them with technical know-how and in any area necessary

E = Government and professional bodies in the real estate industry should formulate and implement gender equality policy in the industry

F = Combination of option C and option D

G = Combination of option B and option D

H = All of the options

Evaluation of Women Performance in the Practice of Estate Management

The evaluation of women performance in the industry is done by comparing the performance of women in the fields of agency and properties/facility management against that of men. Agency and property management were adopted as the basis for this evaluation in spite of the prominence of valuation as a field in Estate Management for the following reasons: firstly, all the estate firms are involved in agency and properties/facility management but not all undertakes

valuation job; secondly, when respondents were asked on what basis should the success of firm be evaluated, 58.5% of the respondents affirmed that number of properties sold and managed by a firm should be the determinant. Therefore number of properties sold and under the management of a firm forms the basis for this analysis. Data obtained from 12 female and 12 male principal partners on duration of practice, number of property sold and under the management of their firms as presented in table 6 are used for this analysis.

Table 6: Duration of Practice of Principal Partners and Properties Sold and Managed by their Firm

Years of Practice	No. of Properties Sold		No. of Properties Managed	
	Female	Male	Female	Male
6 – 10	36	37	185	198
11 – 15	41	43	145	260
16 – 20	7	40	21	132
21 – 25	7	50	100	100
26 – 30	20	30	60	100
31- 35	-	40	-	98
36 - 40	-	22	-	150
Total	113	262	511	1038

Source: Survey (2015)

Table 6 shows that men have been in practice of the profession long before women therefore have the advantage of more experience over women. The play of this advantage is shown in number of properties sold and managed men. Comparing the performance of women against that of men taking into cognizant the time women became active in practice which is from 6years to 30years period, the finding is that the performance of women in the time groups of 26 – 30years, 21 – 25years and 16-20years is far below that of men with wide margin of 150% and over 500% for agency and 60% and over 600% for property management. However the performance of women in the time groups of 6 – 10years and 11 – 15years show significant reduction in the performance gap between women and men from 150% and over 500% to 2.7% and 4.7% for estate agency and from 60% and over 600% to 6.6% and 44.2% for property management. The implication of this finding is that women performance in the fields of estate agency and property though still below the performance of men but has improved significantly. Secondly, the general thinking is that old firms by virtue of long period of practice earn enough goodwill to keep top them in performance rating but this is not the case in this study as time group 6 – 10 and 11 – 20years which are the young groups both in female and male side have higher performance ratings than the old firms.

CONCLUSION

This research examined the problems and prospects of women in the practice of Estate Management with the aim to spur effective women participation in the Nigeria real estate industry. To this effect the objectives of the study focused on: the level of women participation in the profession; problems impeding effective women participation in real estate; ways of overcoming the problems to enhance women participation and evaluation of women performance in practice of the profession. The research findings show that women constitute 30% of the industry's workforce but 36% of the women workforce operates in clerical or administrative capacity. The concentration of women in practice are in estate agency and property/facility management with participation of rate of 29% and 18% respectively while valuation and project management which are the lucrative fields of the profession have few women with participation rate of 5% and 1% respectively.

In respect to the problems militating against woman participation in the profession, two sets of problems were identified: problem that limits the success of women in practice and those preventing new entry. The findings has it that discrimination on the basis of

assignment of task; doubt of women competence by prospective clients; sexual harassment; lack of mentorship; poor networking among women and difficulties in combining practice with marriage/associated responsibilities with response rate of 24.4%, 47.3%, 3.1%, 15.6%, 16.4% and 34.5% respectively are problems impeding the success of women in practice. In the case of barriers to new entry of women to the industry, barriers identified were ranked in order of their severity and it was found that lack of cooperation among women in the industry to promote effective women participation and marriage/associated responsibilities are ranked most and more severe barriers; stiff competition over few available properties and cultural stereotypes or traditional values are ranked severe barriers while underdeveloped property and financial market, exclusion of women from land inheritance or access to land and unwillingness of firms to employ women into key are ranked less severe barriers. The severity of marriage and the attended responsibilities to women participation in the profession is reflected in the proportion of married women in the industry. Married women constitute 11% of the women workforce in the industry.

Concerning ways of overcoming the problems and barriers to enhance women participation, the findings have it that: competence in execution of tasks assigned, willingness to dare challenging task and asking for them where necessary proved helpful in dealing with discrimination in the assignment task; request for opportunity to prove one's competence and quality service delivery helped to earn clients confidence; strong moral value proved effective in dealing with sexual harassment and effective plan that strike balance between career and marriage/associated responsibility and assistance of reliable domestic servant helped to manage career with home front. In addition, conferences that brings female students of real estate profession and upcoming women in the industry to interact with successful women professionals; employment of women professionals in estate firms; mentorship and networking with upcoming women professionals to assist them where necessary; formulation and implementation of gender equality policy in the industry and enlightenment of girls in secondary schools of the prospect in the profession are ways proffered by the study to ensure increased and effective women participation. With regard to evaluation of women performance, the performance of women was measured against men's performance in the fields of estate agency and property management taking into consideration the number of properties sold and managed by them. The findings show that three decades ago the performance women fell short of men performance with wide margin

of 150% and over 500% for estate agency and 60% and over 600% for property management but this gap has reduced significantly to 2.7% and 4.7% for estate agency and 6.6% and 44.2% for property management in the last one and half decades.

Finally the real estate profession is affirmed very prospective by 80% of the respondents. This affirmation was confirmed by Centre for Affordable Housing Finance (2014) that asserted that the Nigeria real estate contributed 6.6% and 7.4% to GDP in 2013 and 2014 respectively. Given that women constitute 49% of Nigeria population by UN Report of 2015, it is imperative for them to be evenly represented in the sector to derive the benefits therein. Hence formation of association of women in real estate that will through conferences, sensitization programmes in school, mentorship, networking and lobbying champion and promote the enhancement of women participation in the Nigeria real estate industry is recommended.

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ENVIRONMENTAL SUSTAINABILITY IN THE CONTEXT OF CHURCH ORGANISATIONS IN JEBBU BASSA, PLATEAU STATE, NIGERIA

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ABSTRACT

Environmental Problem is an age long issue that humans have continued to struggle with for decades. Various efforts have been made (political, scientific, legal, economic and intellectual) to solve this problem but to no avail. This paper examines environmental sustainability in the context of the Churches in Bassa local government Area of Plateau State. Bassa which served as a case study in this paper suffers from environmental problems as such the area looks filthy with huge keeps of refuse dumps along narrow and undefined streets and drainage channels. This study therefore makes an attempt to investigate the role the Church is playing towards ensuring a sustainable environment in Bassa. In carrying out this empirical study, the Survey method is adopted as part of the research design. It uses both descriptive and statistical techniques. Data for this paper was obtained from both primary and secondary sources. Primary data was generated through the use of questionnaire in such a way that significant view from each of the selected Churches in Bassa was received. A total of 100 people were purposely sampled and 82 responses were retrieved back. The questionnaires were analyzed by tabulation, Charts and simple percentage. Secondary data was obtained from the Library using Books and Journals. Results obtained from the analysis shows that majority of the respondent recognized that the Bible explains how the environment should be utilized by man. 63.4% believed that environmental preaching can affects man's attitude to the environment while another 67% believes that the church has not played a significant role in environmental sustainability. The implication is that the Bassa area suffers from ecological misbalance. The study concludes that while the attitude of Christianity to the environment, and the resources of nature are based in part of prohibition of abuse, it encourages construction and sustainable development The study therefore recommends that environmental sustainability must be embraced in our mismanaged environment and that there's a need for the Church in Bassa to become proactive through environmental preaching, discipleship and education in churches and missionary schools.

Keywords: Environment, Sustainability, Jebbu Bassa, and Church.

INTRODUCTION

As the new millennium began in the year 2000AD, it became naturally clear to ask what sort of planet are we, passing on to the generation coming behind. It seems clear that our legacy will both be blessing and curse. To one school of thought, we will hand over befits of globalization in communication, mobility and technical possibilities. Another school of thought we will bequeath unprecedented problem as the effects of global warming inexorably take their course, as gridlocks and pollution chokes the cities of the world, as waters and soils becomes increasingly vulnerable. There are quite some good signs, but many in the secular environmental sphere feel powerless and frustrated at how little we (especially the Church), have all acted to reduce those heart burdens generations coming behind will inherit (Gnanakan, 2004, p.21). This forms the fulcrum for this Paper.

Environmental problem include pollution, global warming, land degradation, deforestation as well as other anthropogenic activities and their impact on the coastal zone and waste management. It is no longer

news today that there is no part of the planet earth that doesn't have one form of environmental problem or the other. The case is not different for Bassa area of Plateau State. Several attempts have been made globally to solve environmental problems scientifically, intellectually, economically and politically, however these approaches have failed in recent years. The inadequacies of this approach are because the spiritual dimension of this problem has been neglected. Since Man is a spiritual being and environmental sustainability is not achievable without a religious component. The spiritual aspect of achieving environmental sustainability cannot be achieved without the Church. This is so because environmental problems have a spiritual origin and the world has refused to consider this fact, and the fact that an adequate solution to the environmental problem must take into consideration the question of the relationship between man and environment in the context of the Bible. Akinjide (1998, p.3) opines that the church should urgently address these problems if we are to bequeath to future generations of Nigerians, a safe and habitable environment.

Door (1990, p.26) posits that;“a basic lesson of history is that vision is an outgrowth of religion. It unites the spiritual and the physical and provides a compelling and integrative direction into the future. The material perception of environmentalism never had sufficient clarity to see into the spiritual sore of the problem. Because the vision was not whole environmental activism never became a widespread movement. It did not encompass blue collar. It did not embrace minorities, instead the environmental movement acquired an elitist reputation because its ecological vision never translated into goals which all society could understand. If there is any clear lesson from over two decades of environmental activism, it is that technological and legislative approaches by themselves are not adequate to the task of healing creation. There must be an ethical and moral dimensions as well as religious (Spiritual) approach” (p, 27).

Unfortunately the Church does not seem to be actively involved in environmental sustainability campaign. Although the World Council of Churches issued some statements right from the time the Stockholm Conference took place, the statements though not definitive tried to make a preliminary evaluation of the urgency of the environmental crises (Brattgard, 1963, p.8). Taiwo, (2006, p. 23) corroborates that the Council asked more questions than it answered. In other words the Church has not addressed the problem facing our environment from a Spiritual perspective. Wilkinson (1993, p.140) posits that Environmental problems cannot be addressed by shallow environmentalism of technical fixes; rather, they are the result of both physical as well as Spiritual and thus; must be met by double approaches for solution. It should be noted that there can be no meaningful development in any society without special care for the environment (Akaa, 2007, p.7). John Stott (1984, p.112) in his attempt to show that the biblical revelation of Jesus Christ gives a profound understanding of our ecology, asserts that if indeed the biblical averment that ‘in Christ all things cohere’, is true, then such a reality must have far reaching implication for ecology and the way those who follow Christ exercise the stewardship of their lives in the context of God’s creation. Kinoti (2006,p.43) is of the opinion that Church has not paid enough attention to the environment. This paper therefore attempts to examine the role of the Church in Environmental Sustainability in Bassa local Government of Plateau State.

Statement of Problem, Research Aim and Objectives

Problem identified in the study area includes a high level of Ignorance in the Church community on its responsibility as stewards of the environment, little or absence of any role played by the church towards

environmental sustainability. As a result it is observed that Bassa area is characterized by Narrow and undefined streets without drainage channels and with clusters of closely spaced houses observed in the study area. The study area looks filthy with huge keeps of refuse dumped along streets, and drainage channels. The area is also characterized by Indiscriminate felling of trees for cooking and building construction without any effort to replant new ones. All of these results to a misbalance in the ecological system.

This study examines the role the Church towards environmental sustainability in the context of Jebbu Bassa. The study intends to achieve the following objective;

1. To study the nature of Environment in the study area with a view of identifying environmental problems.
2. To analyze the role of the church in environmental sustainability of the area.
3. To explain how the church can deploy biblical principles in pursuit of positive attitude towards the environment

The Study Area

Jebbu Bassa (see Fig 1) is the headquarters of Bassa local Government area which was created in 1976. Bassa is located towards the peripheral of the eastern part of the Jos metropolis. It is located between latitude 9° 56N and longitude 8° 44E (Amba, 2007, p.45). It has an area of 1,743km². Bassa share a pleasant weather. According to Amba (2007, p.46) Monthly rainfall ranges from 0mm-330mm with the annual rainfall getting as high as 1,473 mm in a year. About 90% of the rain falls in six months, between April and September, usually in thunderstorm of high intensity particularly at the advent and the end of the raining season. The dry season starts from October to March which is characterized by the tropical air mass or north east trade winds. During this season, dry winter lowers the relative humidity to as low as 13.9 % or less. Consequently the mean monthly precipitation drops to 2.5 mm in the driest month. Because of the high elevation on the plateau, average annual temperature are lower than in the surrounding plains with march and April as the hottest plains while December and January are the coldest. Mean maximum temperature is about 10c lower. Presently, the Bassa community is one of the fastest growing areas of plateau state. The 1991 population census revealed that there were about 59,920 people living in the area (Amba, 2007, p.45). But due to the trend in rural-urban migration and others subsequent factors such as the Jos, September 2001 religious crisis and civil disturbance which made more people to relocate to this area thereby causing a sporadic growth rate in the population of the area. The 2006 census

estimated the population of the area to be 186,859 with

a growth rate of 3.5% (Amba, 2007, p.49).

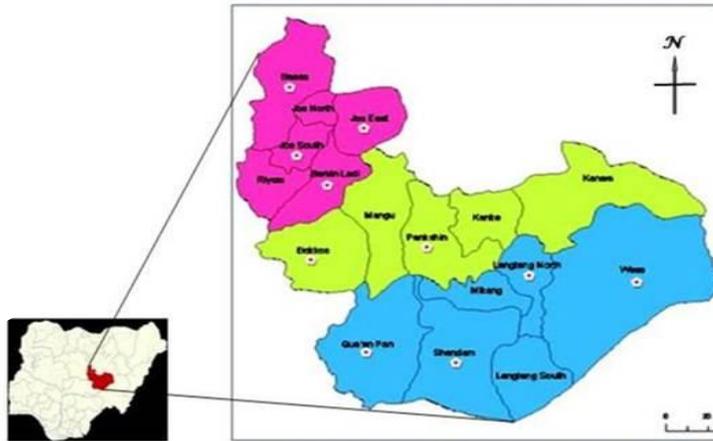


Fig 1 Map of Plateau State Showing Area of Study

CONCEPTUAL CLARIFICATION

Environmental science, like any other discipline is associated with certain technical terms. The environment can simply be defined as the sum of all external conditions affecting the life, development and survival of an organism (Enger and Smith (2008), p.102). These external conditions refer to living organisms or non-living such as plants, animals, water, air, land, animals, organisms etc. Broadly, the environment consists of three basic components namely the physical, biological and social environment respectively. Ibrahim (2013), corroborates that

‘The environment as a concept has been used in many ways to connote physical behavioural, operational and meta-physical setting. In our context, environment is considered as the unit from which resources needed for human development is directed. It implies the component of our ecological system (earth), the interaction therein and the structures whose policies at local and international levels exerts changes on the structure and organization of the physical setting’ (p.2)

The physical environment which is the focus of this work is classified into three components based on the natural composition and function to man. These are atmosphere, land and water respectively.

The word sustainability is derived from the Latin word ‘sustinere’ which literally means to uphold. Since the 1980s, sustainability has been used more in the sense of human sustainability of planet Earth and this has resulted in the most widely quoted definition of sustainability and sustainable development, that of the Brundtland Commission of the United Nations on March 20, 1987. Adams (2008, p. 21), elucidates that “sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs” A universally accepted definition of sustainability remains elusive because it is expected to achieve many things. On the one hand it needs to be factual and scientific, a clear statement of a specific “destination”. The simple definition "sustainability is improving the quality of human life while living within the carrying capacity of supporting eco-systems" (Adams, 2008, p.22). The Earth Charter speaks of “a sustainable global society founded on respect for nature, universal human rights, economic justice and a culture of peace” (Enger and Smith, 2008, p.54). Sustainability for this dissertation means the selfless and judicious usage, maximization as well as the management of God-given resources on planet Earth by mankind with the view that man will one day give account to the God of creation on how these God-given resources are used by Man.

METHOD AND PROCEDURE

This study is empirical in nature thus the Survey method is adopted as part of the research design. It uses both descriptive and statistical techniques. Representative sampling which according to Moses and Kalton (1974, p.45), is that which accurately represents the mind set or world view of the people was used in this study. The Jebbu Bassa District Church of the Anglican church has three churches. St. Barnabas Jebbu with a population of 93 people, Anglican Church Conan Lauje ,with 78 people and Anglican Church Gato, with 69 people. The three churches have a population of 240 members.

Random systematic sampling technique was used to administer the questionnaire. The population of study constituted all Clergy in the District church, members of Parochial Church Councils and leaders of Church groups of the churches that composes the Jebbu Bassa District Church. This study is empirical in nature thus the Survey method is adopted as part of the research design. It uses both descriptive and statistical techniques. Representative sampling which according to Moses and Kalton (1974, p.45), is that which accurately represents the mind set or world view of the people was used in this study. Data for this paper was obtained from both primary and secondary sources. Primary data was generated through the use of questionnaire in such a way that significant view from each of the selected Churches in Bassa was received. A total of 100 people

were purposely sampled and 82 people returned their questionnaire. The questionnaires were analyzed by tabulation, figures and simple percentages.

The data for this paper was obtained from both primary and secondary sources. The Primary sources of data for this study were generated through the use of questionnaire in such a way that significant view from each of the selected Churches in Bassa was received. A total of 100 people were purposely sampled and 82 people returned their questionnaire. The questionnaires were analyzed by tabulation, Charts and simple percentage. The Secondary sources of used for this study includes data were obtained from the Library using Books and Journals.

RESULTS, ANALYSIS AND DISCUSSION

The data collected from the field through personal observations, and purposely designed questionnaire is presented below. The questionnaire administered contained nine (9) items for the sampled population to response to. The data analyzed are presented using simple tables and charts from manual analysis.

Respondents understanding of the Environmental Sustainability

The respondents in the study area were asked whether they understood what environmental sustainability is and their responses are presented in figure 2.

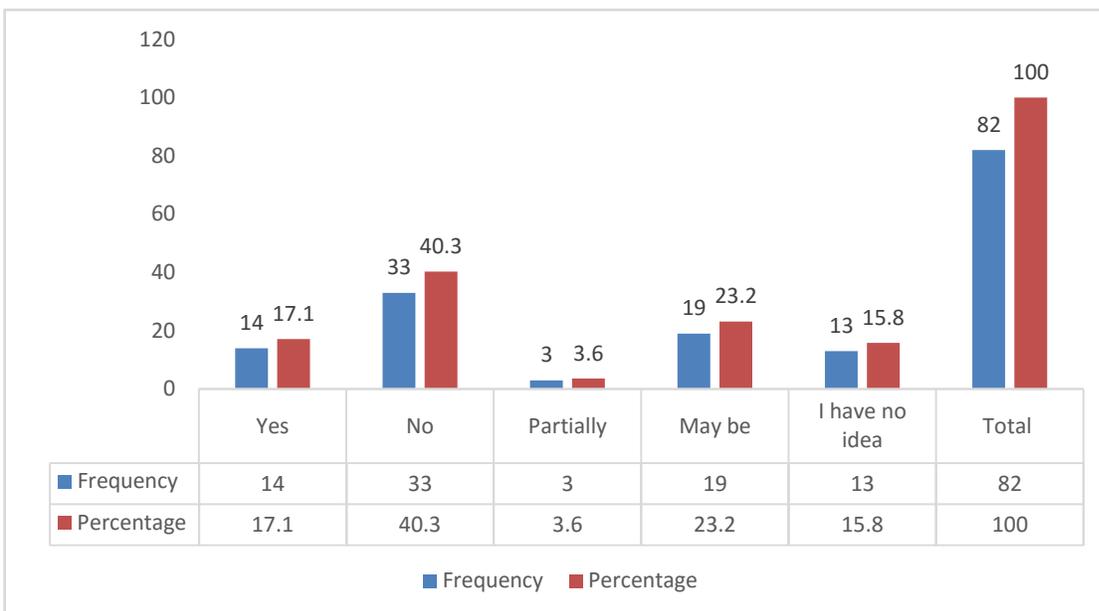


Figure 2: Respondents' understanding of the Environment

As presented in table 2 and Chart above 17.1 % of the respondents were aware of what environmental sustainability is 40.3% of the respondents claim total ignorance of what environmental sustainability is, while

another 3.6 % of the respondents agreed partially that they have an idea of what environmental sustainability is. Another 23.2 % thinks that may be they know what environmental sustainability is while 15.8% of the

respondents have no idea about the concept of environmental sustainability. This goes to show that the average knowledge of the people in Bassa on environmental sustainability is poor. With a poor knowledge of what environmental sustainability is, the tendency for lack of sustainability may be high in the society.

Biblical mandate on Christians to utilize resources in the environment

The respondents in the study area were asked whether they believed that the Bible has mandated Christians to utilize resources in the environment to make them renewable for others and their responses is presented in figure 3.

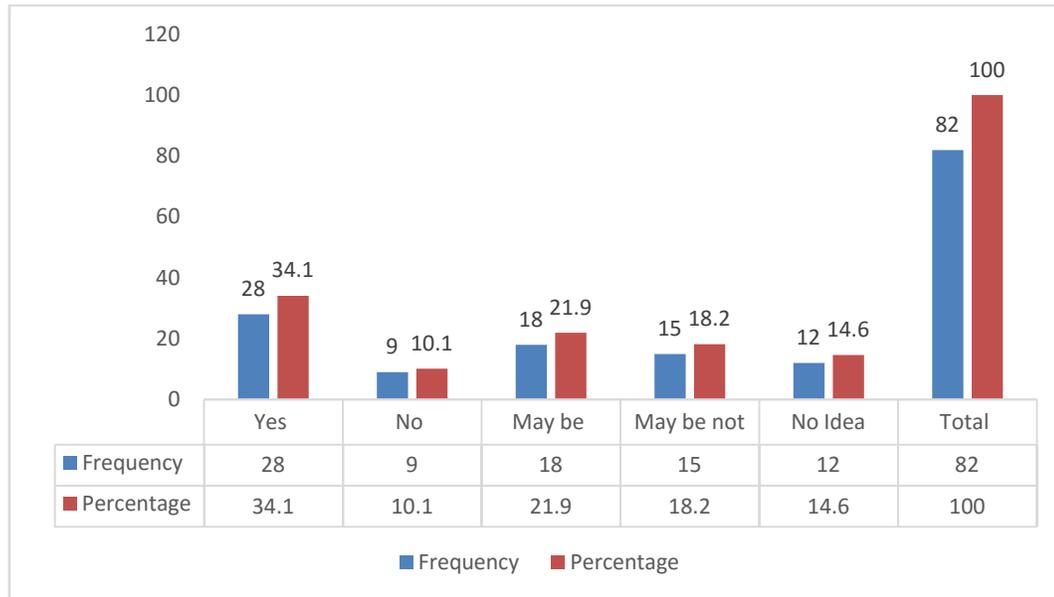


Figure 3 Biblical mandates on Christians to utilize resources in the environment

As presented in table and Chart 3 about 34.1% of the respondents agree that the Bible mandates Christians utilize their environment while another 10.9% disagree that there's no Biblical mandate for Christians to care for their environment. 21.9% said may be there is a Biblical mandate while another 18.2% view point is maybe not. However 14.6% of the respondents have no Idea whether there is such a mandate in the Bible.

Environmental Preaching on the Pulpit

The respondents in the study area were asked about how often do your priest preach about the environment on their pulpits and their responses is presented in figure 4.

As presented in table and Chart 4 above 8.5% of the respondents said environmental sermons are preached regularly while 13.4% agreed that they hear environmental sermons occasionally. 41.4% said they never hear environmental related sermons in their churches where as another 19.5% were not sure of ever

hearing environmental sermons and finally 17.1% don't even know anything about environmental sermons preached in their churches.

Environmental issues as an important concern in the church

The respondents in the study area were asked whether they think environmental issues should be an important concern in their churches and their responses is presented in figure 5.

As presented in table and Chart 5 above 45.1% of the respondents were of the view that the environment should be a thing of concern to the church, while another 12.2% are of the opinion that the environment should not concern the church. Another 15.9% are of the Opinion that may be the church should concern its self with environmental sustainability while another 17.1% view is maybe not. However another 9.7% have no idea whether the church should be concerned with environmental sustainability.

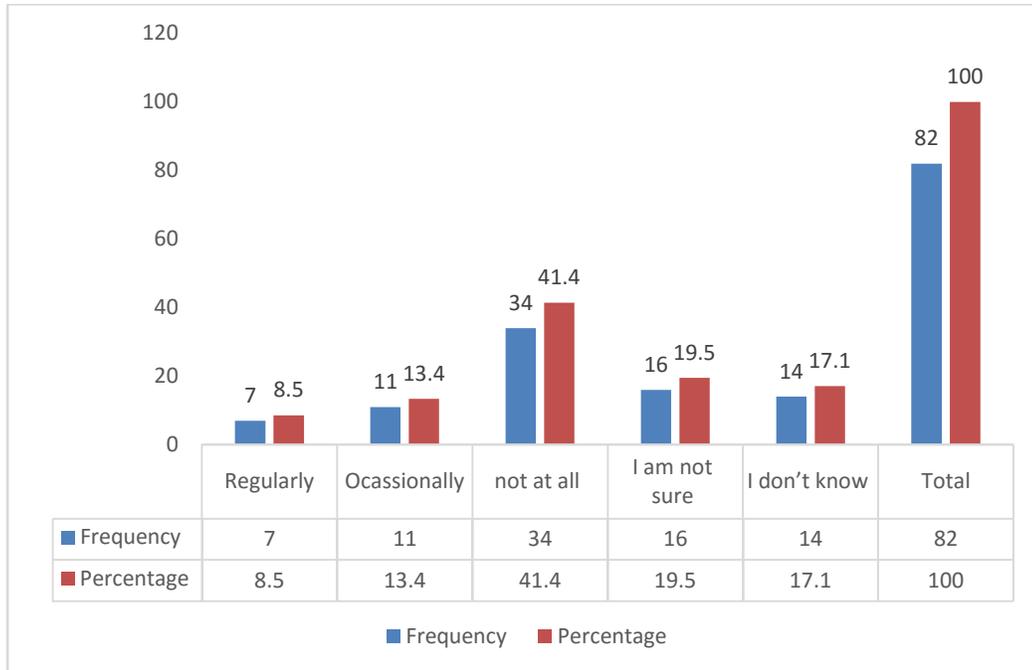


Figure 4 Percentage distribution of Environmental Preaching on the Pulpit.

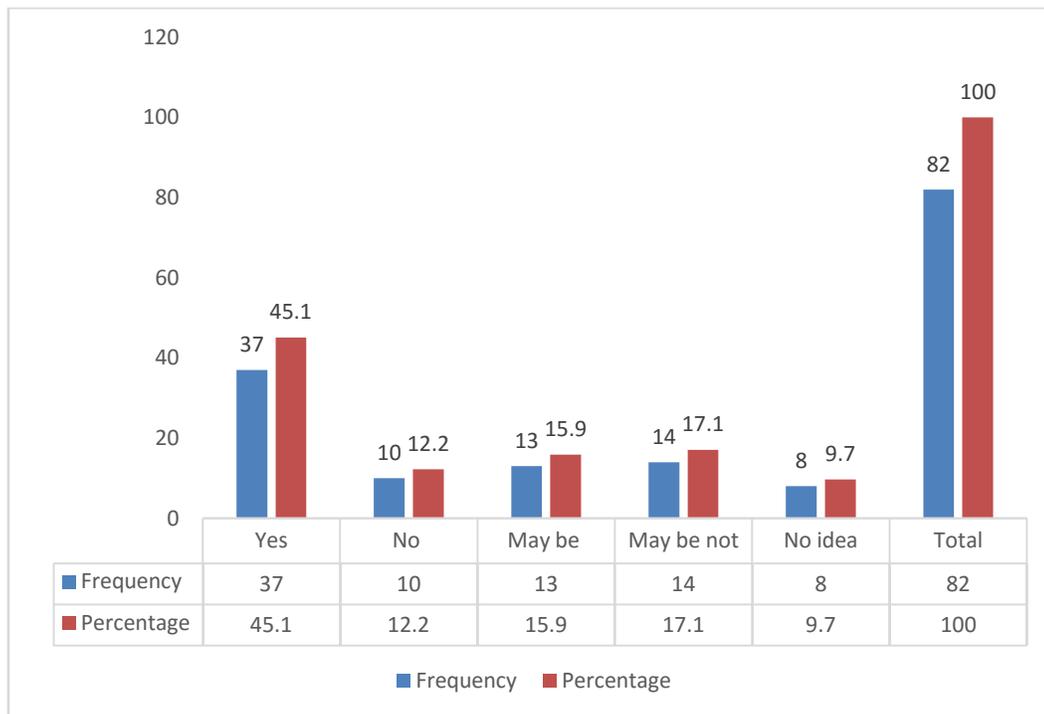


Figure 5 Views of Respondents on environmental issues as important concerns to Churches

Church having a standard policy on the environment
 The respondents in the study area were asked whether their Churches have any standard policy on the

environment and their responses are presented in Figure 6.

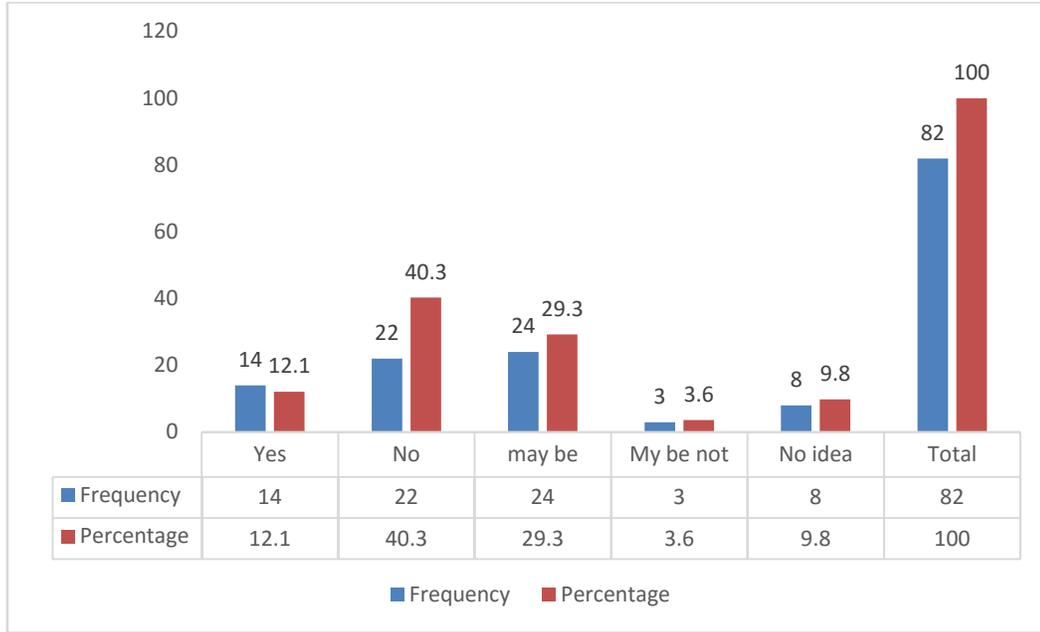


Table 6 Respondents' View on Church having a standard policy on the environment

As presented in table and Chart 6 above, 12.1% of the respondents agreed that their churches have policies on environmental sustainability while about 40.3% opined that there are no environmental policies in their churches. Another 29.3% said may be there environmental related policies in their churches where as another 3.6% said maybe not. Another 9.8% of the respondent had no idea about the said discourse. This result goes a long way to show that most Anglican Churches in Bassa Archdeaconry have no

environmental related policies in their vision. This result agrees with George Kinoti's position that the church has not paid enough attention to the environment.

Environmental Discipleship

The respondents in the study area were asked whether environmental issues forms part of their discipleship programme and their responses is presented in Figure 7.

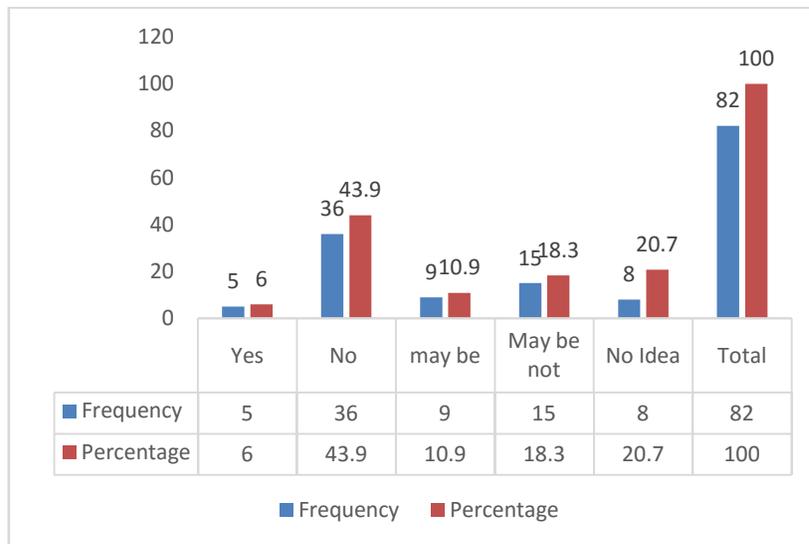


Figure 7 Percentage distributions of Respondents on environmental discipleship

As presented in table and Chart 7 above, 6% agree that environmental issues forms part of their church discipleship programmes where as another 43.9% opined that there are no environmental related issues in the discipleship of their churches. Furthermore 10.9% said there may be such a thing in their church while 18.3% views of the respondents were maybe not. However 20.7% claimed not to have any idea. This clearly shows that lack of environmental discipleship,

contributes to deterioration of the quality of environment.

Environmental Studies in the curriculum of seminaries
The respondents in the study area that are Clergy were asked whether there are environmental issues in the curriculum of their seminaries and their responses are presented in figure 7.

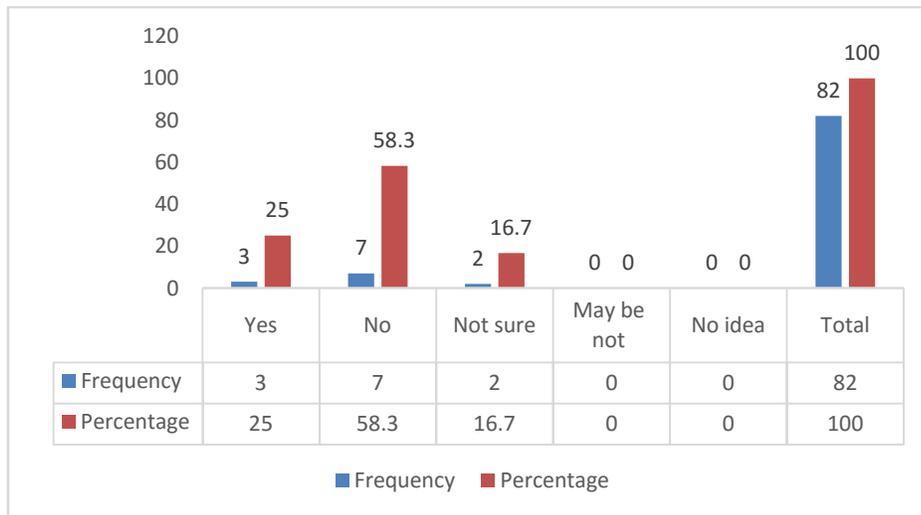


Table 8 Responses Regarding Environmental studies in the Curriculum of Seminaries

As presented in table and Chart 8 above 25% of the Clergy that environmental studies are part of the curriculum in their seminaries, however 58.3% of the respondents disagreed with the views earlier expressed by the former group. Another 16.7% of the Clergy they were not sure of any form of environmental studies in the curriculum of Theological Seminaries. If Pastors are not taught, there is no way they would be faithful in teaching environmental sustainability in their Churches.

As presented in table and Chart 9 about 63.4% of the respondents agree that preaching can affects people attitude on the environment while 4.8% do not agree with that view. 17% were of the opinion that may be preaching could affect environmental attitude and another 13.4% were of the view that preaching may not affecting environmental attitude. Another 1.2% claimed not to have any idea. From this result, it clear that preaching by the Clergy is capable changing Christian’s attitude to the environment.

Effects of Preaching on Peoples Attitude to the Environment

The respondents in the study area were asked whether they agreed that the Church through preaching can influence people’s negative environmental attitudes to positive ones and their responses is presented in Figure 9.

Role of the church in environmental sustainability
The respondents were asked whether they think the church is playing its role towards the sustainability of the environment and their responses is presented in figure 10.

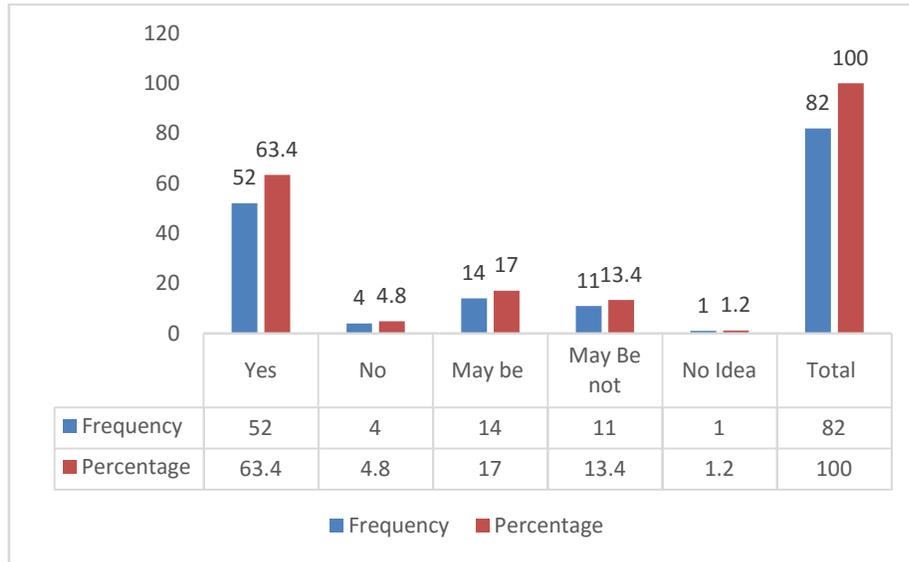


Figure 9 Respondents' views on the effects of preaching on people's attitude to the environment

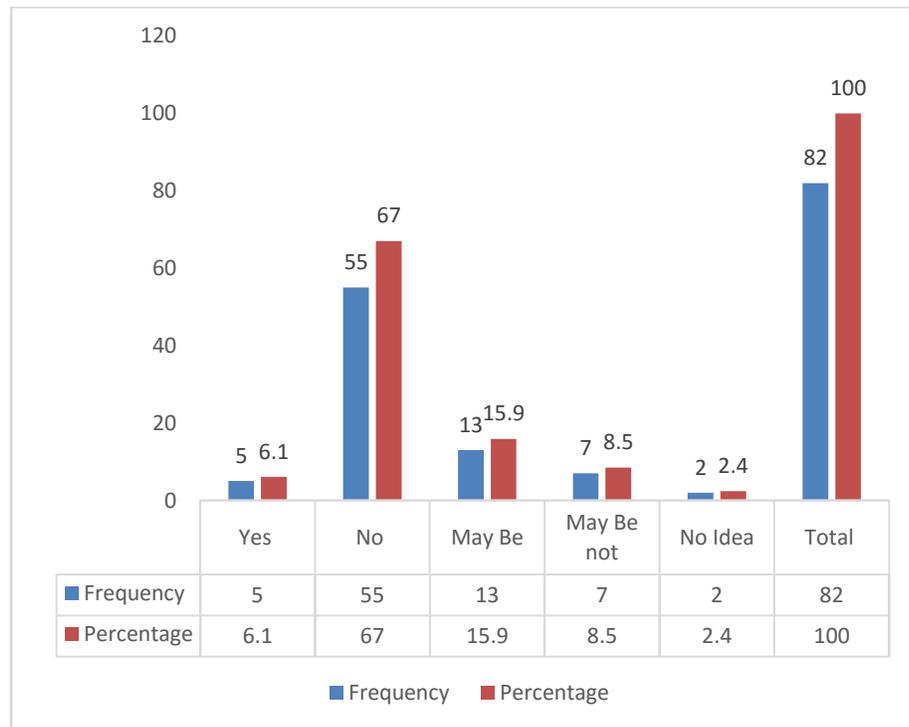


Figure 10 Distribution of respondent on the Role Church in Sustainability

As presented in Figure 10, Six percent of the respondents believed the Church is playing its role of sustaining the environment. Another 67% of the respondents opined to the fact that the Church has not done adequately in the management of our environment.

15.9% of the other respondent said may be the church has done well where as another 8.5% said may be not, while another 2.4% claimed not to have any idea to the question. This result shows that a majority of the respondents' position is that the Church has not played

its God's responsibility in the stewardship of the environment. Thus also goes a long way to agree with Kinoti's position on the irresponsibility of the church to the environment.

CONCLUSION AND RECOMMENDATION

Bassa like most part of the globe is being confronted with environmental problems at an alarming rate and the Christian community does not seem to understand the implication. This paper therefore concludes that environmental degradation experienced today in Bassa is as a result of Man's sinful misuse of the ecology. This study also asserts that the educational background and world view of the Church's knowledge of environmental sustainability in Bassa is poor thus it makes the community to resist sustainability as well as modern planning standards. This further goes to prove that the level of environmental preaching by the clergy in the area is poor. This study therefore concludes that the Church has not done remarkable well in the sensitization of Christians on the need to be good stewards of our God given environment. This study finally concludes that with proper environmental education, and economic empowerment, the people of Bassa would be up and doing in the quest for a global sustainability of the environment. In spite of the damage already done to the environment, it is definitely not yet late for the Church to become committed to the sustainability of the environment. This paper reiterates that the Church should concern itself with environmental issues because every Church operates in an environment. Man should exercise dominion over his environment responsibly not only because he depends on environment for survival, the environment also depends on him for its survival; and also because the Church whose duty is to teach man would be held responsible for its attitude to the environment.

This paper finally concludes that the right to utilize and harness resources, which God has granted man, necessarily involves an obligation on man's part to conserve them both quantitatively and qualitatively, thus the Church cannot shy away from its responsibility. The study asserts that the Church has not playing a leading role in environmental sustainability and hereby insist that the church must take its place in the Community of nations to combat the menace of environmental mismanagement through Biblical environmental preaching, discipleship and teaching in churches and missionary schools. As a result of the findings of this exercise, this paper makes the following recommendations: One, the churches in Bassa should emphasize teaching about man and the environment relationship from a biblical perspective. This should be included in its discipleship programmes and Sunday school; Two, theological institutions

owned by Churches, should consider environmental education as part of theological education so that pastors can be taught while on training in the seminary. This will give the Clergy more insights into the biblical positions on man and environmental relationship; three, since Man's negative position about the environment is attitudinal, the Church should not relent in teaching Christians to match their belief about the environment with attitude of sustainability. Attitudes such as tree planting and reforestation, avoidance of indiscriminate burning, greater use of organic fertilizer and others should be encouraged by the clergy in Bassa. Four, it is recommended that Dominion theology of Genesis 1:26 should be preached by the Pastors of Bassa with cognizance to the fact there is interdependence between man and the environment; five, Church should establish environmental units with trained personnel and funds these units in order to propagate environmental sustainability through campaigns and community participation all over Bassa; six, an ecumenical environmental movement in Bassa should be established; and last, further efforts should be made by the Church in collaborating with Government and non-governmental environmental agencies in the fight against environmental mismanagement.

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REFLECTION OF INDIGENOUS SPATIAL CONTEXT IN THE DESIGN OF CENTRES FOR ARTS AND CULTURE IN NIGERIA

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ABSTRACT

Good architecture is experienced when it is tailored to fit the context of root users; however, globalization has posed a great challenge to this cause. This reflects the cravings for Euro-American space design in buildings such as Centres for Arts and Culture (CAC). It is in this light that this paper examines the reflections of indigenous spatial context in the design of selected centres for arts and culture in Nigeria. This was done through purposive selection of cases based on reconnaissance and archival surveys. Visual survey and observation were used to collect data for the study. The result reveals limited reflection of indigenous spatial context in the design of the selected centres. One of the key challenges uncovered was that some of CACs were not purpose-built, but converted buildings. Therefore, the design can be said to have been manipulated to do what it was not designed for. The study recommends recourse to indigenous spatial context as basis for the design of cultural facilities so as to achieve optimum relevance to the locals/users and also contribute to the protection and preservation of the indigenous culture.

Keywords: Architecture, arts and culture, globalisation, indigenous, spatial context

INTRODUCTION

Culture is one of the pillars of sustainable design, along with economy and environment. Cultural sustainability requires the maintenance of cultural diversity, values and practices currently existing in a region and building individual citizenship and complete social integration within a culture (Cunha and Cunha, 2005). The built environment reflects the lifestyle, social organization, artistic practices, and the architectural adaptation to cultural and religious factors (World Tourism Organization (WTO), 2005). It is a representation of a society's values and aspirations. Architecture, which is part of the built environment, is created for a number of reasons which include: communication of information; establishment of identity; and encoding of value systems (Rapoport, 2005).

Architecture plays a central role in the preservation of culture. According to Smith (2012) buildings are purpose-built based on the people's culture, therefore, culture is communicated and reflected through architectural structures and design. Architectural remains have been used by anthropologists to obtain information about the culture of ancient places. This was done by studying the spaces, forms, sizes, orientation and spatial relationships of the buildings. Understanding such spaces is only possible through the examination of the context within which they were created and the culture that produced them.

Centres for arts and culture are facilities built with the sole aim of preserving, maintaining and showcasing the indigenous art and culture of a people. Evans (2001) noted that Centre for Arts and Culture (CAC) is a functional community centre with a specific remit to encourage the practice of arts and culture and to provide

facilities for such. With this in mind, the design of centres for arts and culture should showcase the indigenous architecture of the culture and people it serves. This will in turn enhance the authenticity of the cultural activities that take place within them. There is however, a cause to worry about the design of centres for arts and culture in Nigeria today. According to Aikpehae, Isiwele, and Adamolekun (2016), before the colonial era, buildings communicated the culture and tradition of the region and people. However, colonisation and globalisation has led to the erosion of indigenous architecture resulting in smaller cultures being gradually dissolved and indigenous architecture moving towards extinction (Kenneth, Andrew, Aydan & Gerishwar, 1996; Adeyemi, 2008; Odinye and Odinye, 2012), to the extent that Western culture is now regarded as frontline civilisation while African culture has been termed primitive, archaic and regrettably unacceptable in public domain (Arowolo, 2010). Arts and cultural facilities are not spared from this dilemma. This is because Nigerian governments adopted Euro-American tendencies in virtually all its national theatre spaces at the expense of local context (Adebayo, 2015).

Aim and Objectives

The aim of the paper is to examine the reflections of indigenous spatial context in the design of selected centres for arts and culture in Nigeria.

This will be achieved through the following objectives:

- i. To review the context of space in relation to indigenous culture;
- ii. To evaluate the design of selected centres for arts and culture with regards to indigenous spatial context.

LITERATURE REVIEW

The literature review below focuses on three issues. The first section examines the concept of space and spatial context in order to emphasize its place in the dialect of architecture. The second section discusses the role of globalization on the loss of indigenous spatial character; this discussion includes other pre-globalization influences such as the spread of Islam, colonization, and the return of slaves from Brazil to Nigeria. The third section emphasizes the place of indigenous spatial context in the design of centres of arts and culture in Nigeria.

Space and Spatial Context

Space is at the centre of architecture since one of the major concerns of architecture is the creation and relationship between spaces. Space has been described as the area between and around objects, or the two dimensional or three-dimensional area into which all other elements of design are placed (Ching, 2007). However, space is more than a simple vacuum that surrounds us (Dursun, 2009). According to Dursun (2009) and Dursun (2012), space design begins by gaining understanding of the living culture, constraints and variables of the space, needs of users, their preferences, requirements and movement patterns. Architectural and urban spaces separate, structure and organize, facilitate, heighten and even celebrate spatial behaviour. They create settings which organize our lives, activities and relationships (Lawson, 2005).

According to Nobert-Schulz (1971) architectural space may be a concretization of this existential space. Furthermore, their physical form can be easily decoded and described by concrete characteristics such as length, width, scale, geometry and also texture, colour, light, and other characteristics that are abstract, complex, and difficult to explain (Dursun, 2009). Pearson and Richards (1994) noted that the relationship between spatial form and human agency is mediated by meaning. These are represented by codes, rules and abstract parts shaping meaningful things in space. These codes are a reflection of the circumstances surrounding the creation of such spaces and cannot be decoded without an understanding of the context of its creation and use, and the element of symbolism and hierarchical order of space (Mangena, 2010). Spatial context is the circumstance on ground that formed the environment within which an indigenous culture grows and expresses itself, in terms of the architecture of its spaces (Brazenor, Ogleby & Williamson, 1999; Freksa, Klippel, & Winter, 2007). This understanding can be attained through a study of spatial organisation. Oliver (1975) argues that different patterns signified different regions and meanings which then become symbolic to certain beliefs. Njoh (2006) argues that while form and technology may not literally be the same, spatial

organization becomes the informing factor which creates coherent unity of time in space.

Globalisation and the Loss of Indigenous Spatial Character

Different cultures organize their spaces differently, this is because the organization of the spaces is influenced by the culture of the people, based on their values, norms and how they perceive and tackle their unique environmental challenges (Oluwagbemiga and Modi, 2014). This spatial organization varies between communities according to value systems.

In the past, traditional buildings across Nigeria were known to have reflected the climate, culture, and technological capabilities of the localities from which they evolved. However, with the introduction of Islam into Northern Nigeria, the return of the former slaves from the Americas (especially Brazil), and colonization, there appears to have been a fracture in the development of indigenous architecture which has led to its gradual disappearance (Prucnal-Ogunsote, 2001; Vander-Smit, 2007; Rikko and Gwatau, 2011). Colonialism left little room for the development of indigenous architectural expression in colonies such as Nigeria. According to Aikpehae, Isiwele, and Adamolekun (2016), before the colonial era, buildings communicated the culture and tradition of the region and people. This erosion of indigenous architecture was further worsened with the advent of globalisation resulting in smaller cultures being gradually dissolved and indigenous architecture moving towards extinction (Kenneth, Andrew, Aydan & Gerishwar, 1996; Adeyemi, 2008; Odinye and Odinye, 2012), to the extent that Western culture is now regarded as frontline civilisation while African culture has been termed primitive, archaic and regrettably unacceptable in public domain (Arowolo, 2010). The effect of this can be seen in buildings in Nigeria which no longer take local peculiarities into cognizance (Arowolo, 2010). On the alternative, there is a continual importation of architectural character and high demand for Western building components and ideas. This has left most of the contemporary buildings in Nigeria today bereft of any connection with local heritage. If not checked, this trend may lead to creative indolence and cultural impoverishment, and leave the future generation without knowledge of their roots (Falola, 2003; Adeyemi, 2008).

Indigenous Spatial Context and Centre for Arts and Culture

Historically, cultural activities in Nigeria's localities were performed in communal spaces. For example, theatrical performances have always been a communal effort enjoyed by people of various households (Ogundeji, 2016). Centres for arts and culture primarily support the production and marketing of indigenous art

and the intergenerational transmission of stories of law and culture (Australian Government, 2014). This makes them a fundamental instrument when it comes to preserving culture, and also the hope of culture promotion when all sources have given way to globalization. In contrary to this, Vander-Smit (2007) noted that the colonial masters came along with their culture and where there were clashes between the indigenous African culture and the colonial masters the indigenous culture had to halt and give way to the white man's culture. This was reflected in the case of theatres in which actors, directors, and technicians were brought in by the colonial masters to promote European style theatre. Also, drama, ballet and opera performances were imported at enormous cost from Europe for the urban elite audiences' cultural taste, and had no interest or value for the indigenous peoples (Vander-Smit, 2007).

The influence of Euro-American designs on modern Nigerian theatre has been identified by Enendu (2012). Evidence of this can be seen in many of the 'modern' theatres in Nigeria such as the national arts theatre Lagos, with performance stages design in accordance with Western performances as against the pattern of indigenous performances. According to Adebayo (2015), Nigerian governments adopted Euro-American tendencies in virtually all its national theatre spaces. Pearson and Richards (1994) a constructed cultural space is a defined context where people undertake particular activities at particular times. There is therefore a need to re-examine the design of centres for arts and culture in Nigeria in order to make them true centres for cultural regeneration and preservation. The design of such centres should reflect, interpret, and communicate the context and settings of the cultural activities which they are designed to host in order to promote authenticity.

Key elements of indigenous spatial context in architectural design are; reflection of indigenous space, reflection of indigenous building forms, reflection of indigenous spatial organization and reflection of indigenous site planning (Oliver, 1997; Asquith, 2006; Maina, 2013). This is the basis of this study.

METHOD AND PROCEDURE

Four cases were studied namely; Cyprian Ekwensi Centre for Arts and Culture, Abuja, Oba Akenzua Cultural Centre, Benin, Edo State, Arts and Crafts Village, Abuja, and Usman Katum Bello Arts Theatre, Minna, Niger State, all in Nigeria. The cases were selected purposively based on reconnaissance and archival surveys aimed at identifying cases that have the potential to illustrate the research problem. Veal (2006) described illustrative case studies as those chosen deliberately to increase the likelihood of showing or

demonstrating a particular proposition. Visual survey and observation were the instruments used for data collection. Each case was studied in light of the variables that are discussed below. For each case, the floor plan and the site plan of the case was studied to understand the relationship between spaces. This was followed by the interview of personnel in charge of research and the design of such facilities so as to understand the spatial context of the place and relate it to the design to understand how the indigenous spatial context of the cultures which they served was reflected in their design. The variables for the study are interior building spaces, building form, spatial organisation, and site planning. The data was analysed descriptively, along with logical argumentation.

Required Data Input

The study is descriptive and basically reliant on simple primary and secondary as follows:

- 1 *Secondary Source of Data*
The secondary sources of data for this study are the images from google earth.
- 2 *Primary Sources of Data*
The primary sources of data for this study include pictures, sketches, and hand written notes.

ANALYSIS AND DISCUSSION

The analysis and discussion is contained under three subheadings. These are reflection of indigenous interior building space, Reflection of Indigenous Building Forms, Reflection of Indigenous Spatial Organisation, and Reflection of Indigenous Site Planning.

Reflection of Indigenous Interior Building Space

Reflection of indigenous interior building spaces is discussed under three sub-sections; provision of indigenous activity spaces, reflection of space forms and reflection of indigenous hierarchy within the space.

Provision of Indigenous Activity Spaces: Dursun (2012) stated that space design begins by gaining understanding of the living culture and variables of the space needs of users, their preferences, requirements and movement patterns. At least all the cases studied gave a level of consideration to some of the indigenous spaces. Some of the spaces replicated were pottery workshops, spaces for wrestling and boxing bouts, textile workshops, weaving workshops, painting studios, and performance spaces. However, some spaces like the kitchen where indigenous cuisines should be prepared were not adequately provided for in most of the cases studied.

Reflection of Indigenous Interior Space Form: Visual survey result shows that most of the cases studied made considerable attempt at reflecting the indigenous space

forms. Cyprian Ekwensi arts and craft village and U. K. Bello arts theatre both reflected the curvilinear form of the indigenous architecture of Abuja and Niger states respectively. Also, where the indigenous building forms were rectangular like in the case of Benin, rectangular forms were dominant in the design of Oba Akenzua Cultural Centre.

Reflection of Indigenous Hierarchy: Another aspect of indigenous space form is the hierarchy of spaces. Mangena (2010) identified the existence of hierarchical order of space (Mangena, 2010). This was reflected in the design of the performance theatres of the cases studied. Diverse approaches were observed depending on the indigenous context of space use. For U. K. Bello arts theatre, the hierarchy is clearly seen from the

distinction and attention that was given to the VIP sitting area. This appears to reflect the position of kings and their entourage in indigenous cultures. This was also reflected in the emphasis entrance, location, and quality of the seats (plate 1). The VIP section is positioned to directly face the performance stage. For Oba Akenzua cultural centre, the hierarchy was reflected by having the VIP section as the front rows, though the seats are not so much different in colour or size as in the case of U. K. Bello there is a red carpet that welcomes the VIP's (plate 2). This is to reflect traditional theatres where elders and elderly ones seat in front while the others seat or stand behind them (fig. 1). Arts and Crafts Village, Abuja however did not give much as regards to hierarchy (plate 3).



Plate 1: Reflection of hierarchy in U. K. Bello arts theatre; Plate 2: VIP seating arrangement with carpet for Oba Akenzua Cultural Centre

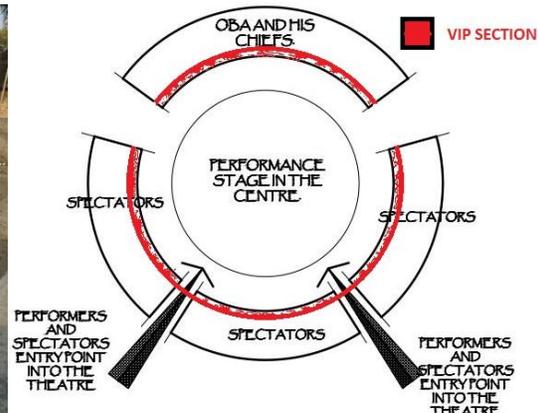


Plate 3: Amphitheatre in Arts and craft village (with no defined hierarchy) Figure 1: Spatial layout of indigenous Benin traditional theatre

Reflection of Indigenous Building Forms

Dursun (2009) emphasized the role of decodable physical form such as scale, geometry in communicating the context of indigenous architecture. CAC's in Nigeria express indigenous building forms in diverse ways and also diverse facilities in the centre such as workshops, shops, offices and also accommodations (see plate 4 to 8). Most of the cases investigated exhibited the use of

circular forms, to reflect indigenous building forms. However, some, like the Oba Akenzua cultural centre, Edo State, exhibited a combination of curvilinear and rectilinear (fig. 2). Some facilities, such as Cyprian Ekwensi centre for arts and culture, have been able to capture the building forms that evolved after the indigenous building style got mixed with the foreign ideas to produce rectangular building forms (plate 8).



Plate 4, Workshops in Cyprian Ekwensi centre for arts and culture; Plate 5, Shops at Arts and craft village, Abuja



Plate 6: Accommodation chalets in U. K. Bello arts theatre; Plate 7: Research and visual art department, U. K. Bello arts theatre

Reflection of Indigenous Spatial Organisation

Pearson and Richards (1994) noted that the relationship between spatial form and human agency is mediated by meaning. In contrast to this, most of the facilities investigated didn't fully reflect the indigenous spatial organisation. However, the spatial relationship that was observed was the relationship between the administrative space (which in traditional times was the king's palace) and the performance space (king's court, in traditional times) as seen in plate 9 and 10. This was to reflect indigenous space relationships were there exists a close relationship between performance area (or king's court) the king's palace.

Reflection of Indigenous Site Planning

Some cultural facilities in Nigeria have done well in reflecting the indigenous site planning through site layout and circulation, while others have not been able to successively translate this in an appreciable manner. Cases such as the arts and craft village in Abuja have been able to bring out the traditional indigenous layout.

The buildings are arranged in a traditional setting with the amphitheatre in the centre of the 'village' and also curvilinear circulation pattern (fig. 3). In Cyprian Ekwensi centre for arts and culture, shops in a form of huts were placed along the fence of the facility to reflect traditional compounds where unit of huts make part of the fence for the compounds. However, the circulation observed was basically a linear pattern of circulation which is in contrast with the indigenous pattern of circulation (fig. 4). For U. K. Bello art theatre, the circulation is basically a linear circulation between the facilities (fig. 5). While most part of the facilities are scattered around the site a portion where the Niger-fest chalets were built was designed with a touch of traditional village setting of the indigenous groups (fig. 5). Oba Akenzua cultural centre shows some level of reflection taking the advantage of the building form that curves in some parts where the theatre sits, and also the rectilinear part that reflected straight corridors of indigenous compounds (fig. 6)

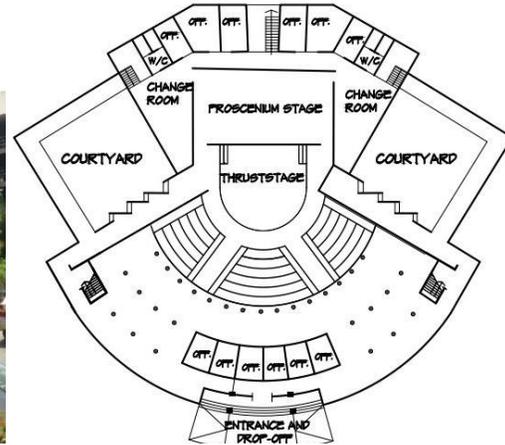


Plate 8, Rectangular building forms in Cyprian Ekwensi centre for arts and; Figure 2, Ground floor plan of Oba Akenzua Cultural Centre revealing the



Plate 9, Rear view of administrative building and the amphitheatre stage, forming a circle, in U. K. Bello art theatre; Plate 10, Rectangular multi-purpose space surrounded balconies serving as spectator area in Cyprian Ekwensi centre for arts and culture

CONCLUSION

The study has revealed that there are reflections of indigenous spatial context in design of centres of arts and culture in Nigeria. These reflections are however limited. The main buildings of such centres in most of the cases were a mix of modern and indigenous spatial concepts. However, the indigenous character was more glaring in smaller structures such as shops, workshops, art and craft centres, and chalets which were detached from the main buildings and glaringly in contrast. From the findings the study recommends recourse of indigenous spatial context as basis for the design of cultural facilities, so as to achieve optimum relevance of the design to the locals/users and also to uniquely serve in protecting and preserving the indigenous culture of the people to which the facility is design for.

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CONSTRUCTION SITE SECURITY CHALLENGES IN OGUN STATE, NIGERIA

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ABSTRACT

Security on construction sites is often an ignored facet in the construction industry. Failure in security impacts the success of a project and diminishes the potential profitability of the project under construction. It is a considerable problem in the construction industry and will continue to be a threat if not addressed. In view of advancing the knowledge of these construction security problems, this study X-rayed the construction site security challenges in Ogun State, Nigeria. A survey of 122 purposively sampled internal stakeholders resulted in 93 valid structured questionnaires comprising 52 contractors and 41 consultants. Data were analysed using mean score and Man-Whitney U test through IBM (SPSS) version 20. The study found that entry of unauthorized personnel, staff entering the site after work hour and delivery of materials out of hour ranked 1st, 2nd and 3rd with 2.58, 2.51 and 2.18 mean scores respectively are the most critical security challenges confronting internal stakeholders on site. The study concludes that construction site security challenges are interwoven and contributory to the occurrence of one another. Construction site security challenges do not vary between contractors and consultants showing that the internal stakeholders are well informed of the project environment and are in harmony with project objectives. The study recommends that internal stakeholders should pay frantic attention to all construction site security challenges at every construction process and provide adequate measures to mitigate these challenges because the lag in one aspect leads to the occurrence of many others.

Keywords: security, construction, challenges, internal stakeholders, Nigeria

INTRODUCTION

Protecting construction sites from arson, theft, and ensuring the safety of workers and members of the public should be a priority among internal stakeholders. The risk of having poor security measures on construction sites can result in serious injury or even fatalities to workers or visitors, serious fire can ravage buildings, injuries can bring litigation cases and theft of expensive equipment can prove a costly headache for firms (AVIVA, 2011). Failure in security could impact the success of a project and diminish the potential profitability of the project under construction (Farinloye, Matimidiwo, Adewunmi and Ajayi, 2009). Security is the protection of people and things such as buildings and sites from harm, theft, or sabotage and encompasses several components such as physical, personnel, investigations, awareness and information security (Arata, 2006). Security considerations are an often-ignored facet of construction projects. Contractors frequently lose materials, tools and expensive equipment to theft and vandalism; both by on-site workers and by criminals who recognize an easy opportunity. Total losses from theft and vandalism on construction sites have been increasing dramatically over the past decade (Great American Insurance Group, 2013).

Crime prevention on construction sites has become a major concern for many building contractors and losses from theft and vandalism in Nigeria can make the difference between making a profit and incurring a loss on a job (Farinloye, Odusami and Adewunmi, 2013). In general, even in advanced countries building site has

always been a target for thieves and vandals because valuable items are left on site over a long period, site location are easily approachable both at night and on weekends and, most times security system are defeated. Berg (2003) observed that control and management is often difficult particularly on large construction sites, where workers are often casual labour and not easy to keep track of, and where large amounts of equipment, tools and building materials are difficult to monitor.

Poor security measures on construction sites can result in serious injury to workers or visitors. It is crucial that children do not get onto construction sites. Many children regard sites as something of a play area without realizing the very serious dangers they present (AVIVA, 2011).

The need for the study stem from the fact that previous works have shone light on theft, vandalism and arson in relation to cost impact on project but literature on the criticality of construction site security challenges as perceived by the internal stakeholders is scarce. The focus on internal stakeholders is based on the observation by Olander (2006) cited in Ujene and Edike (2015) that the internal stakeholders are directly involved in the finance and management of a project. Adeyinka, Jagboro, Ojo and Odediran (2013) asserted that architects, builders, quantity surveyors and engineers are key internal stakeholders who are involved throughout the various stages of design and construction.

The study area, Ogun state is situated approximately between longitude 2^o 45¹ E and 4^o 45¹ E; and latitude 6^o

15¹ N and 7⁰ 60¹ N in southwestern Nigeria with circa 16,762 square kilometres land area representing 1.8 percent of Nigeria's land mass of 924,000 square kilometres (Ogun State Regional Plan, 2003). The state was created in 1976 from the former Western State. It borders Lagos State to the south, Oyo and Osun States to the north, Ondo State to the east and the Republic of Benin to the west (Nigeria Galleria, 2015). Ogun State is well known for its industrial hub and population overflow from Lagos state and currently the most industrialized state in Nigeria (Ogun: the making industrial hub, 2013). The overhauls of industries and exponential population growth rate have impacted greatly in the sporadic sprawling of buildings in all nooks and crannies of the state. High population and increased unemployment rate causes increase in crime rate (Iwuagwu, 2014). The result of demographic and socio-economic determinant of crimes in Nigeria by Douglasson (2012) indicated that lagged crime rate per capital income and population density is significant and positively correlated to all forms of crimes.

The boom in the building construction industry in the mix of rapid population growth and high unemployment rate graft the attention of misguided individuals or group into construction site as means of quick gains. Hence, the study assessed the security challenges on construction site in Ogun State in view of further advancing the knowledge of security threats on construction site among stakeholders.

Aim and Objectives

The study x-rayed the security challenges on construction sites in Ogun State with a view to further advance the knowledge of security pressures on construction site. This aim will be achieved by pursuing two objectives: The first objective evaluates security challenges on construction site in Ogun State; and second compare contractors and consultants perceptions on the criticality of construction site security challenges in Ogun State.

LITERATURE REVIEW

A number of studies on site security in construction projects internationally were reviewed as a basis for formulating the questionnaire for this study. The studies gave clandestine understanding of security, theft, vandalism, arson, pilfering, short deliveries, poor site storage etcetera in construction site, as subsequently discussed.

Security

Security as defined in Webster's New Collegiate Dictionary, as "measures taken to guard against espionage or sabotage, crime, attack, or escape" (Merriam Webster Inc. 1980). The American Heritage Dictionary of the English Language introduces the

concept of risk into its definition of security as "freedom from risk or danger; safety" (Houghton Mifflin Company, 2000). Oxford Advanced learner's Dictionary, defined security as "the activities involved in protecting a country, building or a person against attack, danger etc." All the definitions are similar, however the Webster's dictionary definition in addition sees security even from protection of information. Therefore, the Webster's dictionary definition is adopted for this research.

Challenges

Theft is defined as the unauthorized removal of any material or equipment from a job site (Gransberg, Popescu and Ryan, 2006). A person is guilty of theft if he dishonestly appropriates property belonging to another with the intention of permanently depriving the other of it (Farinloye, Odusami and Adewunmi, 2013). The work stressed that the most common form of theft on a construction site consists of materials and small handheld tools. These items are the most pilferable and easiest to resell. Heavy construction equipment, however, is of great concern since it generates the largest recovery, insurance claims, lost productivity, and future procurement costs. Gardner (2003) noted that majority of theft incidents are not done by strangers, but rather by individuals familiar with the jobsite. The person(s)/group that are performing criminal action involve the employees on the jobsite or by outside agencies. Theft is of two categories – theft involving employees (insider) and theft by outsiders Gardner (2003). The risk of insider theft is almost always underestimated, as employers are inclined to trust their employees. Many construction executives and managers, who tend to pay closer attention to reducing the risk of theft by strangers, may pay less attention to preventing theft by insiders. In addition, the size of the risk – in terms of the amount that could be lost – may be grossly underestimated. Farinloye, Odusami and Adewunmi (2013) suggested that certain management practices – create an environment that promotes honesty, and increase the perception that theft will actually be discovered have shown to make it less likely for employees to turn insider theft. Experts believe that an environment of trust is important in fraud prevention. However, almost all security measures introduced on a site are aimed at preventing outsider theft (Gardner, 2003). The study further stressed that a typical construction site turns into a "ghost town" after 4 or 5 p.m. and this often makes it vulnerable to individuals familiar with the jobsite to commit theft and vandalism.

Different groups of people steal and vandalize construction equipment and materials for their own personal reasons. Motivations ranging from simple greed to complex political and social statements lead individuals to commit these crimes on construction

projects. The goal of vandalism on a construction site is to disrupt the flow of normal work. The acts of vandalism are motivated by anger, boredom, catharsis, erosion of already damaged objects, or aesthetic factors (Cohen 1984 cited in Tamar and David 2003). According to Microsoft Encarta (2009), vandalism is the malicious and deliberate defacement or destruction of somebody else's property. Common examples of vandalism include destruction of completed work, damage to machines and equipment, and damage to materials. All of these actions cause the internal stakeholders to waste time and money correcting the deficiencies. Loss of productivity ultimately leads to significant problems in completing the project on schedule and within budget (Gransberg, Popescu and Ryan, 2006). Vandalism is credited to three main groups: disgruntled workers, social activists, and petty criminals (Douglas, 1975). Petty criminals, such as juveniles, are mostly likely to damage a small quantity of equipment and cause minor defacement such as graffiti. Social activists often indulge in vandalism as a means to promote their course. These courses may involve the project site directly or indirectly whereby activists/thugs use a variety of tactics including sit-down strikes, hindering normal project activities and actual destruction of machinery or completed work. All of these actions cause time delays and additional cost for repair or replacement. Disgruntled workers make up the final category of vandals. Disgruntled workers can be the most dangerous to the site because they can effectively slow down or stop all work on a project (Douglas, 1975). These people may include striking union workers, a group of disloyal or dissatisfied personnel, or a single employee who decides to take action against the company. Vandalism contributes to project delay and contractors losses.

Bertelsen (1993) identified pilfering and short delivery as some of the causes of yearly losses to a contractor. Pilfering occurs due to the contractor's own staff's dishonest activities. In most cases it is on a small scale, but if the entire proceeds from pilfering are added together within the construction industry large amounts of money are involved. A pocket full of nails taken by an employee for a private job at home is not a too infrequent occurrence: short lengths of timber or a plastic bag filled with cement removed via an employee's car-boot adds to the yearly losses for a contractor. It is not unknown for part of a load to disappear en-route to the site or substantial quantity of goods to be missing right from the supply source, e.g. ready-mix concrete, bricks, bags of cement or plaster and others materials. Short deliveries in no little way negatively impact on construction project profitability.

McDowell (2002) identified public exposure as one of the greatest concerns facing all construction projects.

Most of the public are not aware of the potential hazards at or around a construction site, and they need to be protected from these hazards to the highest extent possible. Pedestrian traffic, vehicular traffic, adjacent operations and attractive nuisances all contribute to the need for increased awareness throughout the construction industry. Public exposures of construction site can result in injuries to the public, damage to adjacent property and can quickly become a source of legal liability. The American Society of Safety Engineers (ASSE) recognized the growing concern to protect the public and developed the ANSI/ASSE A10.34- 2001 (R2005) Standard: Protection of the Public on or Adjacent to Construction Sites – American National Standard for Construction and Demolition Operations. Many of the construction site accidents that result in death, serious injury, bad publicity and soaring legal costs can be avoided if we focus on protecting the public (McDowall, 2002).

Berg (2003) noted deliveries out of working hours with consequential last minute arrival of materials on site to result in justifiable claim for extra charges in the way of overtime for offloading by supplier. Zurich insurance plc, (2012) in their site security journal identified poor site storage as a challenge stressing that if a property is left lying about the site, a trespasser may think that the property has been abandoned, in which case prosecution for theft may be difficult. An essential ingredient in all cases of theft is a guilty state in mind that he knew he was stealing, so that if in defence a thief says that he thought the property was abandoned and he is believed, a prosecution must fail.

In brief as noted from the preceding literature, construction site security challenges include theft of materials and tools, theft of office components and equipment, accident on site to staff and outsiders, fire and short delivery of materials, tools and equipment. Others are delivery of material out of working hour, destruction of properties by works and outsiders, damage of tools, office component, equipment off working hour, vehicular traffic, entry of unauthorized personnel on site and check in/out procedure at entry point.

Hypothesis of the study

The null hypothesis postulated for the study states that there is no significant difference in the perceptions of contractors and consultants on the criticality of construction site security challenges. The alternative hypothesis states that there is significant difference in the perceptions of contractors and consultants on the criticality of construction site security challenges. The hypothesis will help to know the level of internal stakeholders' agreement on security problems on construction site and thereby engineer good construction site security management.

METHOD AND PROCEDURE

The study adopted exploratory survey design approach using structured questionnaires. The study population consists of contractors and consultants with professional affiliations involved in the execution of building projects in Ogun State, Nigeria. The study purposively sampled 122 stakeholders who are directly involved in the management of on-going building construction works on sites and are therefore deemed highly knowledgeable in the subject matter and can provide valid information. The sample frame consists of 93 valid questionnaires comprising 52 contractors and 41 consultants. 21 construction site security challenges were drafted from literature. Data were collected from the internal stakeholders using structured questionnaires which were designed for ease understanding. The measurements were on a five-point Likert scale, namely: never occurred = 1, occasionally occurred = 2, frequently occurred = 3, very frequently occurred = 4 and always occurred = 5. Data collected were processed using IBM Statistics Package for Social Sciences (SPSS) version 20, to determine the effects of the security challenges and the priority placed on the challenges using the mean score (MS) of the Likert

ANALYSIS AND DISCUSSION

Characteristics of Respondents Used for the Study

The characteristics of the respondents – contractors and consultants that supplied the data used for the study were analysed for an understanding of the stakeholders whose perceptions were investigated. For this purpose, affiliation, sex, age, qualification and experience of professionals, were all evaluated and the results are presented in Table 1.

Table 1 shows that the majority of the respondents sampled were contractors this is because the questionnaires were majorly administered at the site where contractors' presence is dominant. The result also shows that 41% of the respondents are engineers (comprising civil engineers, electrical engineers, mechanical engineers, structural engineers and other engineers in engineering field), architects 26%, quantity surveyors 18% and 15% builders. Also, the table reveals that majority of the respondents work with medium scale companies and 89% have over 5 years working experience, hence the contractors and consultants could be relied on for the information based on their wealth of experience in the industry.

In order to evaluate the criticality of the construction site security challenges among internal stakeholders, 21 security challenges were drafted from literature. Respondents were then requested to rank the level at which the forms of construction site security challenges

ratings. The variation of the effects and priority placed on the challenges between the stakeholders were analysed using Man-Whitney U tests, since the data were obtained on an ordinal scale through subjective/cognitive evaluation. Likert scale data can be analysed with an interval measurement scale as this reflects meaningful relative distances between points (Trochim, 2006 and Boone and Boone, 2012). The interval between points equals to the ratio of the difference between upper and lower limits, to the number of points (in this case $4/5 = 0.8$).

The decision rule is that any challenge whose mean is equal to one (1.00) is regarded as "never occurred" while the ones that falls between 1.01 – 1.80 is regarded as "rarely occurred", 1.81 – 2.60 is "occasionally occurred", 2.61 – 3.40 is "frequently occurred", 3.41 – 4.20 is "very frequently occurred" and 4.21 – 5.00 is regarded as "always occurred" based on the interval ranges or values between points. For the Man-Whitney U test, decision to accept a null hypothesis is based on the Z value and the significance (2-tailed). If the significance level or the probability value (p) is greater than or equal to 0.05, it implies there is no statistically significant difference in the result, thereby accepting the null hypothesis.

are prevalent on construction site using the Likert scale. The results are presented in tables 2 and 3.

Criticality of Construction Site Security Challenges

In other examine the criticality of the security challenges on construction site responses from the internal stakeholders were processed and analysed using mean score (as their criticality or severity index) which were ranked in descending order. Table 2 shows the result of analysis of 93 internal stakeholder on the 21 construction site security challenges.

Table 2 shows that all the 21 construction site security challenges have occurred on site with mean scores ranging from 1.22 (rarely occurred) to 2.58 (occasionally occurred). The table indicates the criticality of the challenges with entry of unauthorized personnel ranked first having a mean score of 2.58 as the most critical security challenge confronting internal stakeholders on site. Staff entering the site after work hour, delivery of materials out of hour, accidents to staff and vehicular traffic during peak period ranked 2nd, 3rd, 4th and 5th with 2.51, 2.18, 2.08 and 1.99 mean scores respectively occurring occasionally on site. Other security challenges occurring occasionally on site include short delivery of material, tools and equipment, theft of materials, check in/out procedure at entry point, destruction of properties by workers and theft of tools. Damage of tools off working hours and destruction of properties by outsiders ranked 11th and 12th are also security challenges occurring

occasionally on site. Table 2 also shows that 9 challenges rarely occurred on construction site. The challenges include damage of equipment off working period (1.77 mean score ranked 13th), theft of office

components rank (1.46 mean score ranked 14th) and accidents on site to outsider (1.22 mean score ranked 21st).

Table 1: Respondents' Characteristics

Characteristics of respondents	Sub-characteristics	No	%
All respondents	Contractors	52	56
	Consultants	41	44
	Total	93	100
Sex of respondents	Male	87	94
	Female	6	6
	Total	93	100
Age of respondents	1 – 17yrs	0	0
	18 -60yrs	81	87
	> 60yrs	12	13
	Total	93	100
Professional affiliation	Architects	24	26
	Builders	14	15
	Quantity surveyors	17	18
	Engineers	38	41
	Total	93	100
Experience	1 -5yrs	10	11
	6 – 10yrs	37	40
	11 – 15yrs	26	28
	16 -20yrs	16	17
	>20yrs	4	4
	Total	93	100
Qualification	ND	8	9
	HND	17	18
	BSc	25	27
	MSc	39	42
	PHD	04	4
	Total	93	100
Size of establishment	Small (1 – 49 workers)	22	24
	Medium (50 – 500 workers)	58	62
	Large (>500 workers)	13	14
	Total	93	100

Source: Author's Analysis (2016)

Contractors Perspective

Table 3 shows the result of analysis of contractors' perception on the 21 construction site security challenges. It reveals that the contractors considered 12 challenges as occurring occasionally and 9 challenges rarely occurred on site. The contractors perceive entry of unauthorized personnel as the most occurring of the security challenges on construction site with Mean Score of 2.58 which means it occurs occasionally on site. Staff entering the site after working hours, delivery of materials out of hours, accident to staff and short delivery of materials, tools and equipment ranked 2nd, 3rd, 4th and 5th with mean scores of 2.48, 2.25, 2.08 and 1.98 respectively. Staff entering site after working hour could be as a result of delivery of material out of working hour. Materials are probably delivered out of

working hours to encourage sharp practices and consequently short delivery of materials, tools and equipment. Entry of unauthorized personnel on site and staff entering the site after working hour most have triggered theft of materials with mean score of 1.94 and ranked 7th. The high ranking of theft of material is also in consonance with Farinloye, Odusami and Adewunmi (2013) observation that most common form of theft on site are mostly on materials and small handheld tools.

Theft of tools with mean score of 1.88 (ranked 11th) lower than theft of material shows that perpetrators are more interested in material theft than tool theft or there is impediment to tools accessibility. Checking in/out procedure at entry point also ranked 7th indicating that individuals both staffs and outsiders do not like to be

checked and can also encourage sharp practices. Illegal removal of useful properties abandoned on site ranked 14th with a mean score of 1.52 indicating possible poor storage of some tools, equipment and materials on site. Vehicular traffic during the peak period has mean score of 1.96 and ranked 6th which could be attributed to the busy nature of the state as an industrial hub. The vehicular traffic challenge during peak period could have contributed to the delivery of materials out of working hours. Damage of office components off

working period and theft of office components ranked 16th with 1.42 (rarely occurred) mean scores reveal that people entering site after working hours, employees or outsiders have no access to office and are not interested in office components. Taking of little materials by staff without permission (pilfering) is ranked low (18th), showing agreement with Bertelsen (1993) which noted that pilfering occurs on construction site but on small scale.

Table 2: Internal Stakeholders' Perception on Criticality of Construction Site Security Challenges

Challenges	No	Sum	Mean	Rank
Entry of unauthorized personnel on site	93	240	2.58	1
Staff entering the site after work hour	93	233	2.51	2
Delivery of material out of hour	93	203	2.18	3
Accidents to staff	93	193	2.08	4
Vehicular traffic during peak period	93	185	1.99	5
Short delivery of materials, tools and equipment	93	184	1.98	6
Theft of materials	93	182	1.96	7
Check in/out procedure at entry point	93	181	1.95	8
Destruction of properties by workers	93	180	1.94	9
Theft of tools	93	179	1.93	10
Damage of tools off working hours	93	178	1.91	11
Destruction of properties by outsiders	93	174	1.87	12
Damage of equipment off working period	93	165	1.77	13
Theft of office components	93	136	1.46	14
Taking of small properties by outsiders without permission	93	136	1.46	14
Illegal removal of useful properties abandoned on site	93	136	1.46	14
Damage of office component off working period	93	129	1.39	17
Taking of little materials (e.g. nails) by staff without permission	93	127	1.37	18
Theft of equipment	93	123	1.32	19
Fire on site	93	117	1.26	20
Accidents on site to outsiders	93	113	1.22	21
Valid N	93			

Note: 1 = Never Occurred 2 = Occasionally 3 = Frequently 4 = Very Frequently 5 = Always

Source: Authors' Analysis (2016)

Pilfering with a mean score of 1.40 (rarely occurred) shows that employers have considerable level of trust on the employees and/or management is not interested in checking insider theft. It could also mean over concentration of effort in checking outsider theft as noted in Gardner, (2003). Table 3, also shows that accidents to outsiders is the least occurring site security challenge with Mean Score of 1.21 and ranked 21th on the table, indicating that despite the high rate of unauthorized personnel entering the site they are unfazed with accidents on the site.

Consultants' Perception

Table 4 shows the result of analysis on the perceptions of consultants on the 21 security challenges. It shows that the consultants also considered 12 challenges as

occurring occasionally and 9 challenges as rarely occurred on site. The consultants see entry of unauthorized personnel as the most occurring of the security challenges on construction site. Staff entering the site after working hours ranked 2nd with a mean score of 2.54, occasionally occurred on construction site. Delivery of materials out of hours, accident to staff and vehicular traffic during peak period, with mean scores 2.10, 2.07, 2.02 ranked 3rd, 4th and 5th respectively while theft of tools, theft of materials and short delivery of materials and tools ranked 6th with 1.98 mean scores. Unlike the contractors whose perceptions on the criticality of theft of materials and tools are different as they were ranked differently, the consultants' perceptions on the criticality of theft of materials and tools are the same. Also, the table shows

that consultants considers destruction of properties by workers, destruction of properties by outsiders, damage of tools off working hour, and checking in/out

procedure at entry point as security challenges occurring occasionally.

Table 3: Contractors' Perception on Construction Site Security Challenges

Challenges	No	Sum	Mean	Rank
Entry of unauthorized personnel on site	52	134	2.58	1
Staff entering the site after work hour	52	129	2.48	2
Delivery of material out of hour	52	117	2.25	3
Accidents to staff	52	108	2.08	4
Short delivery of materials, tools and equipment	52	103	1.98	5
Vehicular traffic during peak period	52	102	1.96	6
Theft of materials	52	101	1.94	7
Check in/out procedure at entry point	52	101	1.94	7
Destruction of properties by workers	52	100	1.92	9
Damage of tools off working hours	52	100	1.92	9
Theft of tools	52	98	1.88	11
Destruction of properties by outsiders	52	95	1.83	12
Damage of equipment off working period	52	92	1.77	13
Illegal removal of useful properties abandoned on site	52	79	1.52	14
Taking of small properties by outsiders without permission	52	74	1.46	15
Damage of office component off working period	52	74	1.42	16
Theft of office components	52	74	1.42	16
Taking of little materials (e.g. nails) by staff without permission	52	73	1.40	18
Theft of equipment	52	68	1.31	19
Fire on site	52	66	1.27	20
Accidents on site to outsiders	52	63	1.21	21
Valid N	52			

Note: 1 = Never Occurred 2 = Occasionally 3 = Frequently 4 = Very Frequently 5 = Always Source: Authors' Analysis (2016)

Table 4: Consultants' Perception on Construction Site Security Challenges

Challenges	No	Sum	Mean	Rank
Entry of unauthorized personnel on site	41	106	2.58	1
Staff entering the site after work hour	41	104	2.54	2
Delivery of material out of hour	41	86	2.10	3
Accidents to staff	41	85	2.07	4
Vehicular traffic during peak period	41	83	2.02	5
Theft of tools	41	81	1.98	6
Theft of materials	41	81	1.98	6
Short delivery of materials, tools and equipment	41	81	1.98	6
Destruction of properties by workers	41	80	1.95	9
Check in/out procedure at entry point	41	80	1.95	9
Damage of tools off working hours	41	78	1.90	11
Destruction of properties by outsiders	41	78	1.90	11
Damage of equipment off working period	41	72	1.76	13
Theft of office components	41	61	1.49	14
Taking of small properties by outsiders without permission	41	60	1.46	15
Illegal removal of useful properties abandoned on site	41	57	1.39	16
Damage of office component off working period	41	56	1.36	17
Taking of little materials (e.g. nails) by staff without permission	41	55	1.34	18
Theft of equipment	41	54	1.32	19
Fire on site	41	51	1.24	20
Accidents on site to outsiders	41	50	1.22	21
Valid N	41			

Note: 1 = Never Occurred 2 = Occasionally 3 = Frequently 4 = Very Frequently 5 = Always

Source: Authors' Analysis (2016)

Table 4 also shows that taking of little materials by staff without permission (pilfering) is ranked low, 17th with a

mean score of 1.36 (rarely occurred) and accidents to outsiders is the least occurring site security challenge

with Mean Score of 1.22 and ranked 21th on the table in harmony with the contractors' perception.

The consultants also perceive that illegal removal of useful properties abandoned on site rarely occurred with a mean score of 1.39 and ranked 16th and therefore support the possibility of poor storage of some tools, equipment and materials on site. From tables 3 and 4 the perceptions of contractors and consultants on the criticality of nine of the challenge varied in mean and ranking. Some of these challenges include vehicular traffic during peak period, theft of tools, theft of materials, short delivery of materials, tools and equipment and damage of tools off working hours. Others are destruction of properties by outsiders, theft of office components, illegal removal of useful properties abandoned on site and damage of office component off working period. In view of these variances, it is therefore pertinent to know the level of agreement between the consultants and contractors on

the construction site security challenges to ascertain if there is statistical significant difference.

In order to ascertain whether significant difference exist on the criticality of construction site security challenges as perceived by the contractors and consultants, the research hypothesis was postulated. The null hypothesis states that there is no significant difference in the perceptions of contractors and consultants on the criticality of construction site security challenges. The hypothesis was tested using Mann-Whitney U test at $p \leq 0.05$. The results are presented in Table 5. On the table, the significance is 0.920 greater than 0.05, hence the decision to accept the null hypothesis. This indicates that the differences in the criticality of construction site security challenges between the contractors and the consultants are not significant. The similarity in the perceptions of contractors and consultants may be due to the fact that the internal stakeholders are very familiar with the project environment and may have common aspiration for the success of the project.

Table 5: Result of Test on Contractors and Consultants Ranking of Construction Site Security Challenges.

S/N	Null Hypothesis	Test	Sig.	Decision
1	The distribution of Ranks is the same across categories of respondents	Independent sample Mann-Whitney U Test	0.920	Retain the null hypothesis

Asymptomatic significances are displayed. The significance level is 0.05
Source: Authors' Analysis (2016)

CONCLUSION

The study has identified 21 construction site security challenges and established the criticality of the challenges to internal stakeholders. The study found that 12 out of the 21 security challenges occasionally occurred on site while 9 of the challenges rarely occurred. Entry of unauthorized personnel, staff entering the site after work hour, delivery of material out of hour, accidents to staff and vehicular traffic during peak period ranked 1st, 2nd, 3rd, 4th and 5th with 2.58, 2.51, 2.18, 2.08 and 1.99 mean scores respectively are the most critical security challenges confronting internal stakeholders on site. The study observed that despite the entry of unauthorized personnel on site they are unfazed with accident on site. Vehicular traffic during the peak period contributes to delivery out of working hours which encourage sharp practices and consequently short delivery of materials, tools and equipment. The study concludes that the perceptions of the internal stakeholders are the same on all the security challenges. The delivery out of working hours encouraged staff entering the site after working hour and entry of unauthorized personnel on site which triggered theft of materials and tools. The study further concludes that construction site security challenges are interwoven and contributory to the occurrence of one another. The study therefore, recommends that internal stakeholders should

pay frantic attention to all construction site security challenges at every construction process and provide adequate measures to mitigate these challenges because the lag in one aspect leads to the occurrence of many others. Government should endeavour to construct more roads while effectively maintain the existing ones to alleviate vehicular traffic. It is also recommended that further research should be undertaken to examine the various practices use on construction site to alleviate these security challenges so as to further improve the construction site security system. The research conducted is limited to Ogun State in Nigeria and therefore care should be taken when generalizing its results to the general construction industry in Nigeria.

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OWNERSHIP, CONDITION AND SUFFICIENCY OF REAL ESTATE IN SOME SELECTED NIGERIAN UNIVERSITIES: A CRITICAL PROFILE STUDY

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ABSTRACT

This research sought to determine the status of the real estate assets (quantity of the leased and owned properties), the conditions and sufficiency of the real estate of the Universities in South Eastern part of Nigeria. The objectives of this study were to ascertain the existence of an inventory or asset register for the university real estate and determine the status of the corporate real estate of the university. In this research, the Cross-sectional study design was applied. This was done in combination with purposive sampling technique. That is to say only universities with dependable funding sources for example federal universities, universities with sizeable quantity of corporate real estate and located within the south eastern region were chosen for use as samples in this research. The three data collection instruments applied in this research were interview schedule, physical inspection and questionnaire. The data collected was coded and summarised through the use of the Microsoft excel software. The quantities of the leased and owned properties were not known as at the time data was analysed. However, estimates of the percentage values of the leased properties stood at 2% while the owned properties stood at 98%. The conditions of the real estate in the universities were assessed on a three point scale of Bad, Average and Good. The overall condition of the university real estate was described by about 75.0% of the respondents as being average. The overall assessment of the sufficiency of the university real estate was described by about 75.0% of the respondents as being insufficient. Valuation, real estate inventory or asset register and a good property management information system was highly needed in the universities.

Key Words: Real Estate Status, Quantity, Condition, Sufficiency.

INTRODUCTION

The potential importance of the changing corporate real estate (CRE) environment has been recognised by leading researchers in the USA. The first sign of emerging discipline appeared in 1983 when Zeckhauser and Silverman published an article, "Rediscovering your company's real estate" in Harvard Business Review. From the late 1980s articles began being published in the US real estate professional journals in significant numbers. A summary of US literature about CRE published in 1996 shows that decisions concerning CRE have a significant effect on the value of a business. Real estate decisions need to be consistent with the overall corporate strategic plan and those making such decisions need to be aware of empirical evidence indicating the financial market's reactions to real estate decision, (Weatherhead, 1997). Many corporate organisations in Africa do not know about their real estate and very few published articles on CRE can be found within the continent

Real Estate is an asset of strategic importance, representing a significant proportion of total assets and is the second most expensive cost after labour. It is the fifth corporate resource besides Capital, People, Technology and Information, but seems to be forgotten. Based on latest estimates it seems that Real Estate (at market values) represent, an average, around 20-30% of total assets in the United States of America and 30-35% in the United Kingdom, in Western Europe these figures might be in general even a bit higher (Luokko, 2004).

Varcoe(2000) has argued that corporate real estate (CRE) portfolio can be viewed from three perspectives: 1) as a financial asset of the corporation; 2) as a real estate market asset; and 3) as an operational asset (factor of production). A significant number of corporations deal with each of these perspectives separately and rarely seek to manage all of them together for the greater good of the organisation. In recent times, business managers have focused on improving their use of real estate resources, likewise Rectors, Provost, Vice-Chancellors and Chancellors of various institutions of higher learning in the world. That is why in some countries, universities seek to attract students from all over the world, and may provide university accommodation for their students. Universities often offer courses in subjects ranging from the Natural Sciences, Engineering, Architecture, Medicine, to Sports, Sciences, Social Sciences, Law and Humanities. They also offer many amenities to their student population including a variety of restaurants, banks, bookshops, print shops, job centres, and bars. In addition, universities have a range of facilities like Libraries, Sports centres, Students' unions, Computer laboratories and Research laboratories. In a number of countries, major classic universities usually have their own Botanical gardens, Astronomical observatories, Business incubators and University hospitals. Vice-Chancellors, Rectors, Provost, and Chancellors of various institutions of higher learning and universities have the responsibility to ensure that these Real Estate

resources are managed in such a way that they bring added value to the wealth of the universities and also accomplish the goals for which the universities were established.

Universities in Nigeria perform the primary functions of teaching, learning and research and often also render community services. To be able to effectively do this, there is need for real estate to be developed for various uses such as restaurants, health centers, shopping centers in the universities. The stock, quality, dispersion and functionality of this real estate are very vital for the development, growth and good performance of Universities in Nigeria and anywhere in the world. However, in Nigeria, it is common to find in many universities and other institutions of higher learning, a lot of abnormalities in the provision and management of real estate resources. Such abnormalities exist in the form of inadequate classrooms for students, inadequate offices for staff, inadequate bed spaces for students in the hostels, abandoned properties, decayed properties and or overstretched properties among others. These constitute serious cases of ineffectiveness and inefficiency in the management of the university real estate. For instance the capital sunk into the abandoned properties is very difficult to recover. Such abandonment arises from poor planning in terms of the structures, size and the availability of funds or capital to finance them. In the case of decayed properties and infrastructure, it implies poor maintenance and or lack of care. In the real sense, corporate real estate in our universities and higher institutions of learning need serious management attention and commitment on the part of the institutions, the real estate managers and the funding agencies.

In most universities, there are corporate real estate executives saddled with responsibilities to manage the university real estate. The research therefore investigated into how the managers of real estate of each university were carrying out the management of its real estate. It investigated into the existence of appropriate units that were saddled with the responsibility to develop and manage real estate in the university and how these units were going about the management of corporate real estate of the university. The study specifically investigated into the existence of an inventory or asset register for the university real estate, the corporate real Estate management employees, the status of the corporate real estate of the university, total properties under the management of the department or their real Estate portfolio and properties owned and or leased by the university, the conditions and sufficiency of the real estate of the Universities in South Eastern part of Nigeria. This was necessary because though the maintenance of university facilities is important for the well-being of users; students,

lecturers, administration, clerical, technical and support staff, a good inventory or asset register or good property management information system always forms good bases for effective real estate management.

Aim and Objectives

The aim of this study is to undertake a critical profile study of real estate assets in some selected Nigerian university with the view recommending ways for improving on the management of real estate. To achieve this aim, the following objectives are pursued: to assess the ownership status of real estate within the selected university; two, to determine status of employees involved in the management of real estate within the selected universities; three, to examine the condition of real estate assets within the selected university; and lastly, to assess the sufficiency of the real estate assets within the selected university.

LITERATURE REVIEW

It is important to start by defining the term 'inventory with reference to real estate. "An inventory is a historic snap shot of the condition of a property," (Wayne), 2011), proprietor of Belvoir Southend-on-Sea. "It's a good guide to use at the end of a tenancy and helps to prevent disputes over possible damages... and aids a smoother transition from the previous tenant to the new one." Craig Walke (2011), proprietor of Belvoir Camberley, adds, "Put together before a tenant moves into a property, an inventory is a dated record of an actual condition of a property." Harpreet Garcha, 2011, proprietor of Belvoir Kettering, explains, "You always have a front sheet which will state the address, landlord's name and tenant's name and the date the inventory was produced. An inventory is a binding legal document that provides an accurate written record of the condition and contents of a property at the beginning of a tenancy. Since the introduction of a legal requirement to bond a tenant's deposit in an approved scheme it has never been more important to have an inventory, preferably prepared. In order to deduct monies from a tenant's deposit you must be able to demonstrate changes beyond reasonable wear and tear. The only way to do that is with an inventory. It is a written record of personal property owned, along with price paid and current value, used for tax or insurance purposes.

The importance of an inventory

It is only effective if it is accurate, therefore all defects and soiling must be noted. Some landlords do not realise that although descriptions can appear uncomplimentary, it is those descriptions that will allow them to prove whether a tenant caused damage or is liable for cleaning costs. In every case, detailed comments are shown beside each description: Interior condition and decorative order, plus the fixtures and fittings including: doors, windows, drapes/blinds,

ceilings, walls, carpets etc. Furniture and other contents, excluding items which the Inventory Clerk considers as expendable, such as magazines, living plants and other such minute items. Gardens are described in layman's terms only. Garden statues, sheds, outbuildings etc will be described as deemed appropriate. Lofts, cellars and similar areas are not normally covered

Real Property Inventory (RPI) and Real Property Asset Management (RPAM)

Typically, Real Property includes land and anything permanently affixed to it, such as buildings, their installed systems, building equipment, and can include roads, parking facilities, fences, utility systems, structures, etc. Real Property Inventory (RPI) is a record of an organisation's real property asset (land, building, or structure). Real Property Asset Management (RPAM) is a program for collecting and maintaining a real property inventory (Watson, 2015). RPAM provides data to manage those assets and meet asset record and reporting requirements. RPAM provides the information necessary to formulate facility budgets, make decisions on facility replacement, identify repair costs, identify penalty costs, and improve the management of investments in Real Property assets, throughout the organisation. The information provided by the RPAM program will help in the planning, programming, and budgeting processes. This research sought to establish whether such a facilities exist in our universities for the effective management of our universities' real estate.

RPI Databases

In today's business environment, RPIs are best maintained in computer databases with detailed inventory records maintained in paper files. The records should contain details of transactions that affect the organisation's assets and should be maintained as permanent records for the life of each asset. The computer RPI size depends on the number of facilities and how the organisation chooses to maintain the database. The database may be located at a site/complex/campus or at a central location where the assets of the owning agency are maintained in total. The inventory data on an asset will include information as determined by laws, government regulations, and/or an organisation's management. It will depend on the use of the data and what requirements have been placed on the organisation, such as information to meet tax requirements, government regulations, management reports, operations and maintenance (O&M) considerations, and other requirements the organisation may have.

The RPI documentation and database should start with the acquisition of the asset whether by construction, purchase, lease, donation, or any other source of procurement. When by construction, the RPI records

should follow project delivery at the time the asset is turned over to the owner for operations and management (O&M). About two years back, the federal government made it compulsory by law for all corporate organisations including universities to carry out asset valuations and establish asset registers for their organisations updating them every year. It is questionable how many of the organisations have an up to date data base for the management of their real estate.

RPI Content

The RPI of an organization should include detailed documentation identifying the asset and its cost including its initial acquisition and improvements. All database information should include the asset's unique name (usually a descriptive title), unique facility number or address, book value, type of facility (may be a classification code or simply included in its descriptive title), capacity and Unit of Measure (UOM). Other database content will depend on the organisation and its management. Data may also include asset location, current replacement value, a building prioritisation code, use (may be a code) and status, listing of critical building systems condition status, and projected year of replacement, additionally building or site improvements and their costs, previous years O&M costs, and in the case of government agencies, General Services Administration (GSA) Usage Codes.

Maintaining the RPI

The organisation responsible for the RPI should develop guidelines and procedures necessary for the organisation to ensure compliance with applicable laws, regulations, and organisational policy. These procedures must include the assignment of responsibilities and establish controls necessary to ensure that the RPI records are kept current including the database. Additionally, they must ensure that periodic physical inventories are performed and that the records are reconciled based on the inventories. For federal facilities, the Federal Real Property Council directs each agency to appoint a Senior Real Property Officer who is responsible for maintaining accurate data within the RPI.

Application

An RPI should be maintained by all organisations responsible for maintaining asset records. By having the data in a database, reports and requests for information can be answered easily without using manpower to extract the data from paper files. This is particularly applicable where the organisation is responsible for a complex or campus with numerous assets as found at large corporations, universities, and government agencies. Security of computer databases continues to be an on-going concern for organisations. Ensure data is

backed up and is well protected from theft, modification, and destruction.

The Strategic Role of Corporate Real Estate (CRE) Manager in the University System

Real Estate is defined as “property in the form of Land and Buildings”. Real estate is owned and possessed by both individuals and corporate organisations. When it is owned and or possessed by corporate organisations, it is called Corporate Real Estate. Thus, Corporate Real Estate, (CRE), according to Zeckhauser and Silverman (1983) is “the land and buildings owned by companies not primarily in the real estate business”. According to Brown and Arnold (1993) the concept applies to “properties that are either owned or leased by firms to achieve corporate objectives”. Joroff *et al.* (1993), sees Corporate Real Estate as the ‘*fifth resource*’ of business corporations/organisations, after the traditional resources of *People, Technology, Information and Capital*. Corporate Real Estate (CRE) according to Brueggeman and Fisher (2001) refers to “the use of real estate as part of business operations and associated activities”.

Liow and Nappi-Choulet (2007) opined that Corporate Real Estate (CRE) is “the land and buildings owned by companies not primarily in the real estate business”. In this research corporate real estate is seen as land and buildings held by both public and private universities which are not primarily in the real estate business (Njungbwen, 2016). Edward and Ellison (2004) emphasize the role of CRE manager: “It is the role of property manager to provide options to achieve the overall business goals and to help solve business problems with property solutions. The property manager should be proactive and interactive, working with the board of directors to anticipate the business needs, and planning ahead to translate those needs to property requirements. In addition, she should be identifying opportunities where property might add to the business performance, giving it a competitive advantage over other businesses by increasing the net value of its activities (i.e. increasing its sales and/or decreasing its cost).” (Edward and Ellison 2004, p. 12). The CRE manager must be involved in the overall strategic planning of the business and its activities and should provide the property expertise to help the corporation achieve its long-term goals. Strategic management of the property is the only method of ensuring that it is managed for maximum value. Strategic management demands that the manager has a clear understanding of the owner’s and occupier’s objectives and the core activities that will take place in or on the property. It demands that the manager is able to understand the activities that the property supports and the competitive demand that it faces daily. Weatherhead (1997) pointed out one more aspect – globalisation. The CRE

manager making the most active contribution to corporate strategy will be seeking to understand the real estate opportunities and difficulties in a global context. Many businesses are now in global markets and must compete with those who operate under very different real estate systems. According to (Weatherhead 1997), CRE competence in the USA had shifted from the merely technical stage through the analytical, problem-solving and business planning stages to reach the need for real estate experts to have strategic competencies. The real estate managers have moved away from being taskmasters first to being controllers, deal-makers and entrepreneurs, finally becoming business strategist. The authors found that real estate experts are under pressure to move very rapidly along this path to become corporate strategists.

METHOD AND PROCEDURE

The study employs primary and secondary data. The primary sources of data for this study included information obtained through the interviews, observations and the administered questionnaires. The secondary sources of data for this study included information from inventories or asset registers, property information system, staff strength in corporate real estate unit in the universities. In this research, the cross-sectional study design was applied. This was done in combination with purposive sampling technique. That is to say only universities with dependable funding sources for example federal universities, universities with sizeable quantity of corporate real estate and located within the south eastern region were chosen for use as samples in this research. Three data collection instruments were applied in this research and these included interview schedule, physical inspection and questionnaire administration. The interview schedule was developed and used for this study. It covered several themes including the following: background information, corporate real estate unit objectives and strategy which comprised inventory of real estate, assets and real estate decision-making.

The corporate real estate managers in the selected federal universities in the zone were visited for interview and all the useful data needed from them were collected. Purposive sampling was adopted in the selection of the universities and all the Heads of Departments of the Faculties where contact lecturer colleagues were found in the selected universities for the research. This approach was chosen because the Heads of Departments were custodians of the university real estate and assets under their respective departments and was in the right position to speak on behalf of their students and staff. There was a purpose behind all the variables required for the research. The variables that were required were to meet certain criteria: for example,

Universities that were selected were to meet the below conditions: be a federal university, have one major funding source and must have been in existence for at least ten (10) years to develop substantial real estate. This research was a preliminary study on corporate real estate management issues in Nigerian Universities and the study was also highly qualitative at this stage. Thus, the data that were collected for this study were coded and summarized through the use of the Microsoft excel software. Tables were then extracted from the summarized data showing the

frequency and percentage of occurrences of certain activities as it relates to corporate real estate management practices in federal Universities in Nigeria.

ANALYSIS AND DISCUSSION

Real Estate Ownership Status and Management

This section examines the status of real estate within the selected universities and the employees involved with its management. The CREM employee and ownership status in the universities was is shown in table 1.

Table 1: CREM Employee and Real Estate Ownership Status in the Universities

Name	Core Business	Total Employees	CREM Employees	% of Owned properties	% of Leased properties
FUTO	Teaching and research	4175	74	98.39	1.61
MOUUAU	Teaching and research	3493	62	98.23	1.77
UniCal	Teaching and research	3239	57	99.20	0.80
UniPort	Teaching and research	4427	78	97.28	2.72
UniUyo	Teaching and research	3784	67	98.02	1.98
UniZik	Teaching and research	4135	73	96.87	3.13
Average Total				98.00	2.00

Sources: Author's Analysis (2016).

All corporate real estate executives interviewed and Heads of Departments from the selected universities ascertained that the number of employees from their respective universities were from 2000 and above as shown on table 1 above. The universities had less than 100 staff working in both their Department of works and Physical Planning Directorate. This constituted about 62.5% of the responses from the respondents. Furthermore, the quantities of the leased and owned properties were not known as at the time data for this research was collected. However, estimates of the percentage values of the leased properties stood at 2% while the owned properties stood at 98% as revealed by the interview with the corporate real estate executives. This was because no real estate inventory, asset register and or property management information system or valuation of the university real estate had been successfully carried out on or before the day of this data collection in the universities studied. This is absolutely unacceptable in corporate real estate management practice because this means that the corporate real estate executives were managing what they did not know its quantity, quality and overall value. Such information was required to be at the fingertips of the managers while carrying out their assignment.

Condition of Real Estate in Universities

The condition of the universities' real estate was as revealed on table 2. The conditions of the real estate in the universities were assessed on a three point scale of Bad, Average and Good. The overall condition of the university real estate (land and buildings /facility/space was described by the respondents as being average. This constituted about 75.0% of the respondents. This statement agrees with results on table 2 above. Some of the buildings inspected were old while a large part was not properly maintained. This justified again the public complain that there was infrastructure decay and poor maintenance of real estate resources in the university campuses in Nigeria. There was therefore need for re-investment in university real estate and regular and good maintenance of the other ones.

The Sufficiency of Real Estate in the Universities

The sufficiency of real estate in the universities was assessed on a two point scale of sufficient and insufficient and the results were as shown in table 3.

Table 2: Status of Real Estate (condition)

S/No	Items	Executives				Users			
		Bad (%)	Average (%)	Good (%)	Total (%)	Bad (%)	Average (%)	Good (%)	Total (%)
1	Office Space	25.00	75.00	0.00	100.00	15.38	56.41	28.21	100.00
2	Laboratories	25.00	75.00	0.00	100.00	12.82	74.36	12.82	100.00
3	Workshops	37.50	62.50	0.00	100.00	7.69	79.49	12.82	100.00
4	Classrooms	25.00	75.00	0.00	100.00	17.95	64.10	17.95	100.00
5	Studios	25.00	62.50	12.50	100.00	12.82	74.36	12.82	100.00
6	Recreational Places	25.00	62.50	12.50	100.00	15.38	64.10	20.51	100.00
7	Lecture Theatre	12.50	87.50	0.00	100.00	41.03	38.46	20.51	100.00
8	Sport Ground	12.50	75.00	12.50	100.00	12.82	51.28	35.90	100.00
9	Waste Disposal Equipment	0.00	50.00	50.00	100.00	15.38	46.15	38.46	100.00
10	Parking Lots	25.00	62.50	12.50	100.00	17.95	53.85	28.21	100.00
11	ICT Center	37.50	62.50	0.00	100.00	15.38	56.41	28.21	100.00
12	Road Network	25.00	75.00	0.00	100.00	10.26	61.54	28.21	100.00

Sources: Author's Analysis (2016).

Table 3: Sufficiency of Real Estate in the University

S/No	Items	Executives			Users		
		Sufficient (%)	Not Sufficient (%)	Total (%)	Sufficient (%)	Not Sufficient (%)	Total (%)
1	Office Space	25.00	75.00	100.00	23.08	76.92	100.00
2	Laboratories	25.00	75.00	100.00	38.46	61.54	100.00
3	Workshops	37.50	62.50	100.00	35.90	64.10	100.00
4	Classrooms	25.00	75.00	100.00	10.26	89.74	100.00
5	Studios	25.00	75.00	100.00	25.64	74.36	100.00
6	Recreational Places	50.00	50.00	100.00	69.23	30.77	100.00
7	Lecture Theatre	25.00	75.00	100.00	23.08	76.92	100.00
8	Sport Ground	25.00	75.00	100.00	82.05	17.95	100.00
9	Waste Disposal Equipment	12.50	87.50	100.00	25.64	74.36	100.00
10	Parking Lots	50.00	50.00	100.00	30.77	69.23	100.00
11	ICT Center	25.00	75.00	100.00	25.64	74.36	100.00
12	Road Network	25.00	75.00	100.00	35.90	64.10	100.00

Sources: Author's Analysis (2016).

The overall assessment of the sufficiency of the university real estate, land and buildings together with facilitiespace was described by the respondents as being insufficient. This constituted about 75.0% of the respondents. Again, it can be seen here that the sufficiency of the corporate real estate from table 3 and the overall assessment showed that it was insufficient. Hence, there was need for more investment/

development of real estate in the universities. This will require more funds of which government is already complaining of lack of funds for infrastructure development in the universities.

The assessment of University's Infrastructural development in the past 5 years showed that the infrastructure was expanding. This constituted about

62% of the respondents. Thus, there was expansion of infrastructure provision in the university system in the midst of the overall complain that infrastructure provision was insufficient. It can be inferred from here that though infrastructure development was expanding more students were also being admitted than required. Thus, the cry of insufficiency in real estate reported in all the universities in the study area. This was in line with the views of CNANU, (2012), chairman committee of needs assessment of Nigerian public universities. He stated in his report that physical facilities for teaching and learning were inadequate, dilapidated, over-stretched and improvised. He opined that so much pressure was put on existing facilities mainly due to unplanned expansion of programmes. In view of this, there is need for more development and investment in university real estate to ensure that adequate and sufficient space and facilities are available for users of the university real estate.

CONCLUSION

The overall structure for the management of university real estate in the study area was faulty which led to the inefficient and ineffective management of the university campuses. Though formerly organised corporate real estate units were in existence in all universities, however, all the units were decentralised. This was out of tune with the best cutting edge practice which advocates for a centralised system where all efforts/decisions need to be coordinated and geared toward achieving the organisational and or university goals. The quantities of the leased and owned properties and the value of the university real estate were unknown as at the time data for this research was collected because the management of most of the universities had not carried out valuation of the university real estate over the years, no real estate inventory or asset register of the university real estate had been successfully carried out and there was no property management information system for the management of the university real estate. It is recommended that the universities should carry out valuation of the university real estate. Real estate inventory or asset register or a good property management information system of the university real estate should be successfully carried out by university management to assist real estate executives in the campuses in Nigeria to do their job well. With regards to the condition of the university real estate, it is recommended that more funds and timely supply of funds are needed, each university should develop a maintenance culture and more attention is required from the university management with regards to the maintenance of the university real estate. Where

real estate investment is insufficient, there is need for more development and where some or most of the buildings are of age, there is need for re-investment in the university real estate.

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HOUSEHOLD SANITATION CONDITION IN JOS, NIGERIA: A PROFILE OF TOILET FACILITIES AND THE IMPLICATION FOR URBAN POLICY

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ABSTRACT

Poor sanitation conditions are responsible for multiple health and environmental problems experienced in Nigeria. In response to this problem, the Federal Government of Nigeria and the local authorities in Jos have pursued a number of programmes with the aim of helping households improve on their sanitation condition. This study examines sanitation conditions with specific focus on the types of toilet facilities used by households in the Greater Jos Metropolis. A cross-sectional survey methodology was employed for this study. The survey conducted lasted for 60 days and information was collected from 1697 households by systematic random sampling. The survey covered 77 Wards which cut across six Local Government Areas. Based on the data collected the study was able to analyse the profile of households' toilet facilities and the result indicates that improved toilet facilities which include a WC flush to septic tank, a simple pit latrine, the Ecosan and the VIP latrine account for 53.3 percent while the un-improved types—uncovered pit latrine, latrine with open pit, hanging toilet, bucket latrine and those without a toilet—account for 47.2 percent. The adequacy of toilet facilities was examined and the analysis reveals that in spite of government's sanitation improvement programmes in the study area, the use of un-improved toilet facilities remains considerable, accounting for 47.2 percent of the total. Of this, the absence of toilet facilities in residential buildings was overwhelming, accounting for 38.1 percent out of 47.2 per cent. Other inadequate (un-improved) forms of toilet facilities including uncovered pit latrine, latrine with open pit and hanging toilet were in the following proportions: 4.1, 4.8 and 0.2 percents respectively. The urban policy implications of these findings were examined and appropriate recommendations were proffered.

Key Words: Sanitation Condition, Sanitation Facilities, Toilet Facilities, Jos Metropolis

INTRODUCTION

Household sanitation covers a wide range of issues including the arrangement for the collection and disposal of human excreta, personal and general household hygiene, the process of collection and disposal of solid waste and garbage, and drainage systems etcetera. In Nigeria, the minimum standard for the disposal of household excreta is a safe, hygienic and conveniently-located facility. The expected standard for such a facility is an upgraded traditional Pit Latrine, a Sanplat Latrine, a Ventilated Improved Pit (VIP) toilet, a Water Closed (WC) or any expensive technology that can be built and maintained by households with their own funds (UNICEF, 2008).

General household sanitation is global concern and it is in recognition of this concern that the international community working through international organisations and inter-governmental agencies (such as the WHO, UNICEF, WaterAid, European Commission, DFID, World Bank and NEWSAN among others) proposed in the Millennium Development Goals (MDGs) to halve, by 2015, the proportion of people without access to basic sanitation. Household sanitation is relevant to attaining sustainable human settlement development and management in a rapidly urbanising world. It is in view of this that sanitation has been recommended in several international forums including the United Nations Conference on Environment and

Development (UNCED), Habitat Agenda, World Summit on Sustainable Development (WSSD), Agenda 21 and Millennium Development Goals (MDGs). These forums have advocated for the promotion of sustainable human settlements development and management in urban and rural areas in all countries of the world (UNICEF, 2008).

Countries around the world are devising strategies for tackling households' sanitations. Studies (Robinson, 2008; Kar and Chambers, 2008) indicate that there is increasing recognition of the critical importance of sanitation and hygiene programmes. It is reported that investing in sanitation and hygiene improvement can have two to three times more impact on health outcomes than investments in water supply. For example: hand washing with soap can reduce diarrhoea risk by 42-47%; safe excreta disposal can reduce diarrhoea risk by 30-35% and clean water supply can reduce diarrhoea risk by 15- 20% (Robinson, 2006). It is in recognition of these that non-governmental organisations (NGOs) in the Asian countries of Bangladesh and India have pioneered a new approach to sanitation development. This approach is known as the Community-Led Total Sanitation (CLTS). The CLTS has some fundamental difference from conventional approach: firstly, it focuses on stopping open defecation rather than building toilets; two, it operates on the basis of collective action to stop open defecation within the

community; three, it requires no toilet subsidy in such a way that households must finance their own toilets; and lastly, it leads to the promotion of low-cost homemade toilets constructed using local materials rather than standard toilets designed and imposed by outsiders. Furthermore, the CLTS recognises that sanitation is both a public and a private good, and that individual hygiene behaviour can affect the whole community. For instance, if your neighbours defecate in the open, then your children risk excreta-related disease even when the members of your own household use a sanitary toilet, wash their hands, and practice good hygiene. This is the premise upon which CLTS is founded (Kar and Chambers, 2008; Robinson, 2006).

In Nigeria, the federal government authorities have proposed policies for the promotion of sustainable human settlements. The need to support households to improve on their sanitation condition is contained in several documents including the Report of the Vision 2020 National Technical Working Group on Water and Sanitation (FRN, 2009a), the Report of the Vision 2020 National Technical Working Group on Urban and Rural Development (FRN, 2009b), the National Urban Development Policy of 2012 (FRN, 2012) among others.

At the local level in Jos, the Plateau State Government authorities have emphasised the need to promote sanitation as documented in the Plateau State Economic Empowerment and Development Strategy (PLASEEDS), the Greater Jos Master Plan (2008–2025) and the Strategic Plan For Urban Development and Housing in Plateau State (Government of Plateau State, 2005, 2008a and 2008b). Beyond these policy proposals, the authorities in Jos have, over the last decade, introduced three programmes: The first is the Water for Africa Cities (WAC I and II) which started in 2005 and ended in 2012. This programme came into existence as a result of the partnership created between local (the Plateau Rural Water and Sanitation Agency, Local Governments Councils, the National Water Resource Institute Kaduna, the Ministries of Justice, Education, and Women Affairs, Plateau State Government) and international agencies (UN-HABITAT Water and Sanitation Trust Fund and WaterAid). This programme had many objectives, one of which was to improve access to safe sanitation through the provision of public latrines and the mobilisation of communities for better waste management and disposal (UN-Habitat, 2009 & 2010).

The second programme is still ongoing and this is being organised by the Plateau State Community and Social Development Agency (PSCSDA). The programme is a fallout of an understanding that was reached between local actors (federal, state and local government

authorities and their agencies) and the World Bank for the purpose of addressing a number of urban and rural issues including infrastructure deficiencies, especially in low-income neighbourhoods (World Bank, 2012). The third and the last programme is one that is being organised through the MGDs project office in Jos. Through this programme, the MDG office has sunk and resuscitated boreholes across Plateau State for the purpose of providing safe drinking water and the improvement of households' sanitation condition (News Agency of Nigeria, 2014).

It is in an attempt to assess the impact of government programmes on households' sanitation that this study evaluates the toilet facilities used in residential buildings in the Greater Jos metropolis. The objective of the study are: to analyse the profile of toilets facilities used by households in the study area; two, examine the adequacy of the toilet facilities and methods of sludge disposal; and to outline urban policy implications based on the profile of the toilets used by households.

The choice of the Jos metropolis as the study area is informed by the fact that the region is the most urbanising part of the Plateau State and this urbanisation comes with a challenge of getting access to adequate sanitation facilities including adequate toilets. For instance, the 2006 population and housing census indicates that there were 260,658 households in the Greater Jos Metropolis, and out of this, only 18.1 per cent were using a Water Closet (WC) type of toilet facility. At that time 49.4 per cent of the households were using a Pit Latrine; a substantial percentage (27.2 per cent) never had a toilet facility; 0.7 per cent were using a Bucket Pan type of toilet facility; 0.7 were using a toilet facility in their neighbours' houses; 3.4 per cent were using a public toilet; and 0.2 had other forms of toilet facility (FRN, 2006 p.231). Secondly, as a result of rapid urbanisation, the city of Jos has expanded across six Local Government Areas (Jos North, Jos South, Jos East, Riyom, Bassa and Barkin Ladi). This development has come with a rise in population which also creates demand for adequate toilet facilities in residential buildings. And unfortunately, property owners are unable to provide such facilities in commensurate terms (FRN, 2006 p.231). Lastly, as indicated earlier, the authorities in Jos have implemented several programmes with the intent of addressing sanitation issues and it now necessary to assess the situation in order to offer recommendation for further improvement.

Having explained the reasons for the choice of Jos within this study, it is now necessary to give a brief description of the field study site. Jos started evolving into a modern city after the discovery of Tin 1904. It was the discovery of Tin along with the near-temperate nature of the weather and the existence of traditionally

planned human settlement that attracted the colonial masters to Jos. Today, the Greater Jos Metropolis houses the old township which was created by the colonial authorities under the 1917 Town Planning Ordinance (Bingel, 1978). Presently, the population of the city is projected at 1.5 million. The area experiences seasonal wet and dry tropical climate classified AW according to the scheme of Koppen. Rainfall is heavy totalling about 1,800mm per annum and falls between April and October. Variety of tropical crops including Maize, Guinea Corn (sorghum), Millet, Irish Potatoes, Sugar Cane, Vegetables and Acha (a local cereal crop) are cultivated in and around Jos. Jos metropolis has a high potential for expansion due to the insecurity in the North-Eastern Nigeria which is now leading to the influx of migrants. This development is likely to put more pressure on households' sanitation facilities (Government of Plateau State, 2009).

REVIEW OF LITERATURE

A survey of literature suggests that there is no universally acceptable definition of a toilet. This is so because the perceptions of the people about toilet facilities depend on their socio-economic status and their sense of reality. Consequent upon the varied perceptions, professionals of different calling—scientist, social scientist, environmental scientists, medical and health scientist, psychologist among others—have defined toilet facilities based on the way they perceived it. For the purpose of this review a toilet facility is defined as: a large bowl attached to a pipe that one can sit on or stand over when getting rid of waste matter from the body. A toilet facility could also refer to a room or small building containing several toilets each in a separate smaller room (Oxford Advanced Learners Dictionary 6th edition, 2000).

Toilet facilities are categorised into two: Improved and Non-Improved. The Improved toilet facilities include those that are designed with a connection to a public sewer, those with connection to septic system, the Pour-flush Latrine, the Simple Pit Latrine, the Sanplat and Ventilated Improved Pit Latrine amongst others. The Non-Improved toilet facilities include: Service or Bucket Latrines (where excreta are manually removed), Latrines with an open pit and defecation in open field and bushes (UN-Habitat, 2003). No matter the type of toilet available, its adequacy or lack of adequacy is what affects the people using it. The availability of a toilet facility in a building does not imply adequacy (Encarta, 2008). For instance, Anderson (2000) adduced that Water Closet (WC) facility is perceived as the most appropriate and ideal. But its adequacy largely depends on regular water supply. Without the supply of water, a WC facility would become inadequate. Furthermore, WC facility is expensive for many households to buy and consequently, Pit Latrine facilities often serve as

alternative. Unfortunately, Pit Latrine is inadequate and provides less satisfaction to its users and can easily spread disease due to its design (Anderson, 2000; Wapwera, 2009).

Access to toilet facility is a serious matter among households in developing countries. Access in relation to sanitation implies the availability of improved disposal facilities of human wastes that can effectively prevent human, animal and insect contact with the human wastes. The absence of, or in-accessibility to a toilet facility can cause a number of problems to households. Firstly, lack of access to basic sanitation facilities—such as adequate toilet—coupled with poor hygiene practices, causes diarrhoea. Diarrhoea is considered to be the second largest direct cause of childhood mortality in Nigeria and is a major contributing factor to malnutrition and other diseases such as pneumonia (UNICEF, 2008; WHO, 2014).

Secondly, the benefits of good sanitation—such as adequate toilet facility—far outweigh the costs, including the cost of health care and loss of productivity that may arise when people fall ill. In Nigeria it is estimated that over 10 million productive days would be gained if access to both water and adequate sanitation is improved (UNICEF, 2008). Thirdly, on a general note, the prevalence of disease is attributed to poor sanitation and environmental conditions. Specifically, high infant mortality rates around the world are attributed to household crowding, and the non-availability of adequate sanitation facilities including toilets (Gusler, 2000). Lastly, studies (Oomen, 1994 and UNICEF, 2008) have shown that the use of adequate toilet facilities in both public and private buildings around the world can lead to the reduction in deaths, disability and diseases resulting from malaria, cholera, diarrhoea among others.

From this brief review of literature it suffices to conclude by outlining the key issues for consideration as far as toilet facilities are concerned. The review clearly indicates that the adequacy or otherwise, of a toilet facility has implication for the hygiene, health and wellbeing of households. It is also clearly noted that the availability of a toilet facility in a building does not amount to its adequacy. The review equally confirms that accessibility to toilet facility means the availability of an improved facility. Finally, it is important therefore, to take into account the three considerations—adequacy, availability, and accessibility—when providing toilet facilities in residential buildings.

METHODOLOGY

This study employs a cross-sectional survey methodology with the objective of obtaining a snapshot of households' toilet facilities across six local

government areas (see table 1). A questionnaire was used in the survey and the choice of this method was premised on the need to collect a large sample. The questionnaire was designed to capture information on

households' socio-economic and demographic characteristics as well as toilet types and the level of satisfaction by users of the facilities among others.

Table 1 Local Government Areas in the Jos Metropolis and Number of Households Surveyed

S/No	LGA	Population	Total No Of Household Surveyed
1	Bassa	251,027	358
2	Barakin Ladi	256,290	222
3	Jos East	117,684	224
4	Jos North	467,616	417
5	Jos South	408,469	261
6	Riyom	224,756	212
Total		1,785,842	1694

Source: Authors' Field Work (2015)

The field work lasted for 60 days and a total of 1697 households were successfully surveyed (detail of the survey is contained in Table 1). Systematic random sampling technique was used to select 22 households from each of the 77 Wards that are spread across the six Local Government Areas (LGAs). The data collected was examined through univariate analysis and the responses were expressed in percentage terms. This was then followed by an examination of the urban policy implication of the findings.

DATA PRESENTATION, ANALYSIS AND DISCUSSION

The data collected is presented and analysed in this section. The analysis first of all, examines the profile of toilet facilities used by household across the six LGAs, it then went on to scrutinise the approach to sludge

disposal, and finally, the urban policy implication of the current is analysed.

The Profile of Toilet Facilities in Greater Jos Metropolis

The classification of types of toilet facilities used in residential buildings in the Greater Jos Metropolis is presented on Table 2. Based on the data collected, the toilet facilities are broadly classified into: the improved and the non-improved toilet facilities. As presented on Table 1, the improved toilet facilities that are used in residential buildings include a Simple Toilet Facility, which is the dominant as confirmed by 32.1 per cent of the total. This is followed by WC Facility (19.8 per cent) and VIP Latrine (0.4 per cent) respectively. The data collected indicate that the Ecosan type of facility is not being used in any building.

Table 2 Classification of Toilet Facilities in the Greater Jos Metropolis

Types of Toilet Facility		Total Count	Per cent	
Improved Toilet Facilities	Simple pit latrine	546	32.1	53.3
	WC flush to Septic Tank	337	19.8	
	Ecosan	0	0.0	
	VIP Latrine	7	0.4	
Un-improved Toilet Facilities		71	4.1	47.2
	Uncovered Pit Latrine			
	Latrine with open pit	82	4.8	
	Service or Bucket Latrine	0	0.0	
	Hanging Toilet	4	0.2	
No Toilet Facility	647	38.1		
Total		1697	100.0	100.0

Source: Authors' Field Study and Analysis (2015)

As indicated in table 2, the un-improved types of toilet facilities include the Uncovered Pit Latrine (4.1 per

cent), Latrine with Open Pit (4.8 per cent) and the Hanging type of toilet facility (0.2 per cent). The data

collected revealed that the Service or Bucket type of latrine is not being used in any building. However, a substantial proportion of residential buildings do not have toilet facilities. This is confirmed by percentage response of 38.1 per cent for those who reported not having a toilet facility.

A further examination of the data to check for the distribution of types of toilets facilities by Local Government Areas (LGAs) is presented in Table 2. For the entire study area, those residential buildings that do

not have toilet facilities constitute the highest proportion as confirmed by a survey count of 647 which represent 38.1 per cent of the buildings. Additional scrutinies on the spread of buildings that do not have toilet facilities reveal that the greatest proportion is in Bassa LGA which has 32.6 per cent. The next is Jos East LGA (24.2 per cent) which is closely followed by Barkin Ladi LGA (20.0 per cent). Riyom and Jos South LGAs have 11.4 and 10.3 per cents respectively while Jos North has the least proportion (1.2 per cent).

Table 2 Distribution of Types of Toilet Facilities by Local Government Areas

Types of Toilet Facility	Local Government Areas						Total Count	Per cent
	Bassa	Barkin Ladi	Jos East	Jos North	Jos South	Riyom		
Improved Toilet Facilities	Simple pit latrine	94 (19.2)	36 (6.5)	37 (6.7)	270 (49.4)	54 (9.8)	55 (10.0)	546 32.1
	WC flush to Septic Tank	0 (0.0)	37 (10.9)	16 (4.7)	159 (47.1)	112 (33.2)	13 (3.8)	337 19.8
	Ecosan	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 0.0
	VIP Latrine	1 (14.2)	0 (0.0)	0 (0.0)	0 (0.0)	6 (85.7)	0 (0.0)	7 0.4
Un-improved Toilet Facilities	Uncovered Pit Latrine	12 (16.9)	6 (8.4)	6 (8.4)	9 (12.6)	9 (12.6)	29 (40.8)	71 4.1
	Latrine with open pit	8 (9.7)	12 (14.6)	7 (8.5)	3 (3.6)	11 (13.4)	41 (50.0)	82 4.8
	Service or Bucket Latrine	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 0.0
	Hanging Toilet	0 (0.0)	1 (25.0)	0 (0.0)	1 (25.0)	2 (50.0)	0 (0.0)	4 0.2
No Toilet Facility	211 (32.6)	130 (20.0)	157 (24.2)	8 (1.2)	67 (10.3)	74 (11.4)	647 38.1	
Total Count and Per cent							1697	100.0

Source: Authors' Field Study and Analysis (2015)

As evident in Table 2, the proportion of those who responded having a simple toilet latrine constitutes 32.2 per cent with a count of 546. Jos North LGA has a substantial number—a count of 270 representing 49.4 per cent—of those households that are using simple pit latrines. The next LGA which has a considerable number of households that use simple pit latrine is Bassa (19.2 per cent) followed by Riyom LGA (10.0 per cent) and Jos North LGA (9.8 per cent) respectively. Jos East and Barkin Ladi with 6.7 and 6.5 per cents are the LGAs with small proportions of households that use simple pit latrine.

The WC type of toilet facility, which is a modern technology, is least popular in the study area when

compared with simple pit latrine. The study found only 337 households to have a WC type of facility. Also, the study found that open pit latrine and uncovered pit latrine had counts and percentages of 82 (4.8 per cent) and 71 (4.1 per cent) respectively. Only 0.4 per cent of households were found to use a VIP type of facility while 0.2 per cent were using a hanging/bucket type of toilet facility.

Adequacy of Toilet Facilities used in Residential Buildings

The evidence examined on Tables 2 and 3 suggest that there are adequacy arising from the arrangement for collection of faecal waste and its disposal. As it was earlier presented in table 2, the improved types of toilet

facilities in the Greater Jos Metropolis account for 53.3 per cent while the un-improved types account for 47.2 per cent. A further consideration (see Figure 1) of the un-improved types of toilet facilities reveals that 38.1 per cent of households in the study area are yet unable to provide a toilet facility in their homes. This implies

that those households that do not have a toilet facility in their homes are still practising open field defecation. Open field defecation is a matter of concern because it leads to the pollution of land, air and water resources (WHO, 2014).

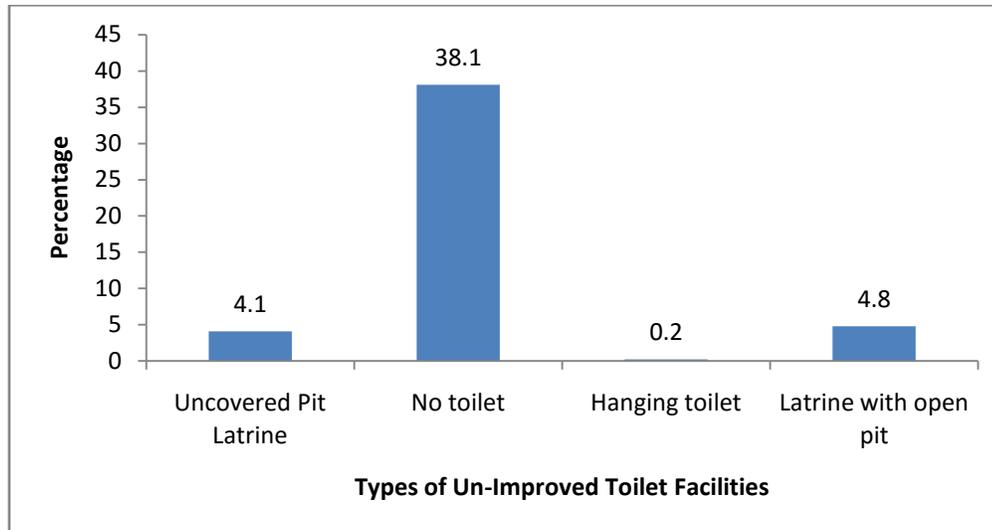


Figure 1 Percentage Distribution of Un-improved Toilet Facilities in Greater Jos Metropolis

The data presented on Figure 1 further reveals that about 10 per cent of households are using un-improved toilet facilities such as the Uncovered Pit Latrine, the hanging type of toilet facility and latrine with open pit. These forms of toilet facilities are expose their users to exposed faecal matter. Exposed faecal waste also permits flies to have contact with faecal matter and equally carry disease and then spread to households. This problem is evident in Jos and the situation corroborates a World Health Organisation (WHO) report which states that exposed faecal waste problem accounts for 70 per cent of diarrhoeal disease around the world (WHO, 2014 p.3).

CONCLUSION AND RECOMMENDATIONS

This study sets out to examine household sanitation condition in the Greater Jos Metropolis. By focusing on the toilet facilities used in residential buildings, the first objective was able to analyse the profile of households' toilet facilities. The profiling results indicates that improved toilet facilities which include a WC flush to septic tank, a simple pit latrine, the Ecosan and the VIP latrine account for 53.3 percent while the un-improved types—uncovered pit latrine, latrine with open pit, hanging toilet, bucket latrine and those without a toilet—account for 47.2 percent. The second objective of this study was concerned with issues of adequacy of toilet facilities in the study area. The data collected and examined in relation to this objective confirm that in spite of government's sanitation improvement

programmes in the study area, the use of un-improved toilet facilities remains an issue of worry, accounting 47.2 of the total. Of this, the absence of toilet facilities in residential buildings was overwhelming, representing 38.1 percent out of 47.2 per cent. Other inadequate (un-improved) forms of toilet facilities including uncovered pit latrine, latrine with open pit and hanging toilet were in the following proportions: 4.1, 4.8 and 0.2 percents respectively. All these allow for the conclusion that: almost halve of the households (47.2 of the total) in the Greater Jos Metropolis do not have adequate toilet facilities in their homes.

The above findings and conclusions have a number of urban policy implications in the Greater Jos Metropolis. One, government authorities and agencies need to collaborate with civil society groups, non-governmental authorities and community groups to further create awareness campaign on the need for households to upgrade from the use of un-improved toilet facilities. The general public should be made to understand the health and environmental benefits of upgrading to improved toilet facilities, and how they can utilise cost effective technologies that are within their reach to achieve this. Two, there is need for the local regulatory agencies to enforce penalties for open field defecation. This would possibly compel people to reconsider the practise of open field defecation in an urbanising environment such as the Greater Jos Metropolis. Three, government authorities and agencies should consider

the possibility of adopting the Community Led Total Sanitation (CLTS) approach as it has been practised elsewhere in Bangladesh and India. Finally, there is need for government to strengthen the institutional framework and the respective agencies responsible for handling sanitation issues in the Greater Jos Metropolis.

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ADAPTATION OF AGRARIAN HOUSEHOLDS TO DROUGHT IN NORTH EASTERN NIGERIA

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ABSTRACT

Rainfall distribution in Nigeria differs every year and both the timing and the quality of labour allocated to farming tasks must be adapted to the conditions as much as possible. The increasing variability in rainfall, both temporal and spatial particularly its onset, cessation and distribution makes agriculture a risky venture in North Eastern Nigeria. Although the variability of climate is inevitable, the loss of human life and disruption in economic activities associated with extreme climatic fluctuations can be mitigated by use of climate information. The objectives of the study were to determine and analyse the characteristics of the agrarian households in a manner that would facilitate the generation of data and information that could serve as inputs for the design of viable adaptation intervention programmes and activities for the agrarian households in North Eastern Nigeria and similar agrarian areas in Nigeria. Structured questionnaires were employed in order to generate data from the respondents, which were supplemented with field observations. A total of 360 respondents that were agrarian household heads completed the structured questionnaire forms by a face to face interview conducted on 15th and 16th October, 2006. The selection of respondents was by convenient sampling. That is to say the interview respondents are comprised of those heads of households that were found in their houses and willing to be interviewed at the time of visit. The questionnaire forms were administered in 12 villages – 3 villages from each of the four states namely: Bauchi, Gbembe, Yobe and Borno States in former Bauchi and Borno provinces. The study revealed that: the willingness of the agrarian households to adapt to drought differs randomly in the study area.

Key Words: Agrarian Households; Drought; Adaptation, North Eastern Nigeria

INTRODUCTION

Rainfall distribution in Nigeria differs every year and both the timing and the quantities of labour allocated to farming tasks must be adapted to the conditions as far as possible (Mortimore, 1998). The challenge faced by farmers, therefore, extends beyond an unpredictable drought crisis (where much farm labour is wasted) to the need for a technical flexibility in negotiating the rain every year. Development interventions - whether projects or policies have tended to focus on the economic or technical constraints which are perceived to face small holder agriculturalist, in order to increase output or value. The development of livelihood strategies, however, is influenced not only by environmental conditions, but also by cultural, social and political conditions. Many varied ethnic groups with different traditions and practices depend on local community management of common pool resources like water and grazing land. Many environmental problems are blamed on inappropriate management of watersheds. (Department for International Development, (DFID). A rapidly growing rural population and increases in the land area protected for conservation have added to the problems. In spite of policy developments that recognized the need to protect the rights of local people to natural resources while preserving and restoring ecosystems, there are yet no sustainable development strategies especially linking together policies to address problems of environmental degradation and poverty.

The objective of this study is to determine and analyse the characteristics of the agrarian households in a manner that will facilitate the generation of data and information that could serve as inputs for the design of viable adaptation intervention programmes and activities for the agrarian households in North Eastern Nigeria and similar rural centers in Nigeria. The study hypothesis is that the level of participation in adaptation programmes and willingness to adapt among agrarian households differs randomly.

LITERATURE REVIEW

Weather and Climate

Nigeria experiences a number of natural disasters arising from a variety of natural processes. Over 70% of these disasters according to Ayeni (2003), are related to extreme weather and climate events including droughts, floods, extreme temperatures, thunderstorms, among others. Whenever they occur, they are often associated with many severe impacts such as destruction of property, displacement of people, loss of lives and disruption of many socio-economic activities. Current scientific investigations point towards a discernible change in the global climate with associated regional impacts. These, therefore, underscore the importance of climate change in Nigeria, as virtually most of her socio-economic activities are extremely sensitive to

climate variability. In this regard, concerted efforts are being made in an endeavour to address the issue of change.

Drought Discourse

Drought is an abnormally dry climate condition caused by lack of rain or snowfall. Droughts are part of the natural climate cycle. Meteorologists and climatologists tend to adopt the hydrological perspective of drought as the consequence of a perturbation in the hydrological cycle. A causal chain of drought ultimately leads to famine, in a progression from human needs to wants, initiating events, exposure and consequences (Wilhite, 1998). Social scientists tend to focus on drought as a human-made phenomenon rather than a natural cause. Political economists, examine regulatory frameworks, the behaviour of farmers, water companies and governments, spatial distribution of industry and population, and the economics of water supply in order to explain why the amount of water available in certain places at certain times is deemed insufficient (Wilhite, 1998).

Perception of Drought

According to Scoones (1996), Perceptions of drought are complex and responses are often unpredictable. Drought is not viewed in a simple, unified way by people. Farmers do not have one overriding scientific model of its cause, effect and response; they have multiple perceptions and multiple responses. Farmer's perception of drought attempts to reduce the fears of uncertainty and the risks associated with losing control, both political and personal. Drought is not perceived as a chance event, but explained in terms of particular cause-effect relationships. Different people give different interpretations, but all attempt to derive order from apparent chaos, such perceptions offer a way of coping with the stresses and uncertainties of a crisis. Different explanations are offered for causes of drought. From local-level crop failure on an individual's field to wider impacts at local, regional and national levels. The type of explanation offered depends on how someone's perceptions are derived. In order to understand the diversity of coping strategies to drought, it will be necessary for us to explore the social framing of risk and ask: how do different people explain the causes of drought? What are the social, political and institutional factors that provide basis for these individual perceptions? How do these affect different people's varied responses?

As an outcome of these perceptions, farming households had apparently moved from some degree of autonomy to a position of acute dependency, if not on government aid, then on external forces beyond their control (Raynaut, 1997). For some observers, it was a consequence of half a century of colonial rule, coercive export agriculture and price exploitation (Copant, 1983). The urgency of the situation in the Sahel demanded immediate action that sometimes resulted in destructive effects (as in the case of food aid, the effects of which only became apparent much later). At the same time, however, it was soon recognized that effort was needed in order to understand the events leading to the crisis, as well as to provide the means for conceiving long - term interventions.

Drought Information

The increasing variability in rainfall, both temporal and spatial particularly its onset, cessation, distribution and lack of knowledge about the optimum time for planting, makes agriculture a risky venture in North Eastern Nigeria. The dependency of the farmers on rainfall, renders the population vulnerable to the vagaries of climatic extremes. Although the variability of climate is inevitable, the loss of human life and disruption in economic activities associated with extreme climatic fluctuations can be mitigated by use of climate information. The agrarian households' knowledge on forecast information was presented in Table 1.

Table 1, presents the respondents' knowledge on rainfall forecast information. Two-third of the respondents were not aware of forecast information in North Eastern Nigeria. Almost two-third received their forecast information seasonally and more than half reported that the information was reliable. For timeliness of delivery, more than half reported that it was satisfactory. For presentation of forecast information, less than half reported that it was satisfactory and for user friendliness, about one-third reported that it was satisfactory.

The household heads were also asked how they plan their activities in case of drought; the responses of the households were summarized in table 2. From table 2 about half of the respondents based their decision on local knowledge in case of drought; more than one-third had no standard procedure and one tenth base it on consensus decision by farmers. The figures are not mutually exclusive because some use more than one plan.

Table 1 Knowledge of Rainfall Forecast Information

Information		Number	Percentage
Aware of forecast information	Yes	10	33
	No	20	67
Type of forecast information received	Seasonal	20	66
	Monthly	8	26
	Other period	2	7
Reliability/accuracy of forecast information	Excellent	17	56
	Satisfactory	8	27
	Inadequate	2	7
	Natural	2	7
	Unacceptable	1	3
Timeless of delivery	Excellent	2	7
	Satisfactory	18	60
	Inadequate	5	17
	Neutral	4	13
	Unacceptable	1	3
Presentation of forecast information	Excellent	8	27
	Satisfactory	14	47
	Inadequate	4	14
	Neutral	3	13
User friendliness	Excellent	4	13
	Satisfactory	9	30
	Inadequate	6	20
	Neutral	8	27
	Unacceptable	3	10

Source: Field Work 2006

Table 2 Proposal of Plan in Case of Drought

Activity	Number	Percentage
		(%)
Utilize forecast information	5	17
Based decision on local knowledge	14	47
Depend on government, NGOs & extension workers	7	23
Instructions from village head	4	14
Consensus decision by farmers	3	10
No standard procedure	8	37
Drought not a consideration	1	3

Source: Field Work 2006

COPING MEASURES OF THE AGRARIAN HOUSEHOLDS

Adaptation to climate change includes adjustments in socioeconomic systems to reduce their vulnerability both to long-term shifts in average climate and to changes in the frequency and magnitude of climatic extremes like drought. In many parts of the world, especially in developing countries, these climatic extremes are hazardous and often exceed the capacity of

a country or community to cope. The vulnerability of a community to climate change is related to the exposure of the community to deal with those conditions (Smit, 2001). The adaptive capacity of individuals, groups and societies to adapt to climate variability and change is determined by their resources, access to these resources, and a host of institutional factors. The household heads were asked to indicate the changes they had implemented in the past ten years. They were asked to

report the coping measures they had been practising and the ways they had adapted. The responses were presented in Table 3.

The data revealed that most of the agrarian households had variety of coping measures. Some measures that

have been used widely in the past include: food storage, rudimentary irrigation, replanting of crops and planting of drought resistant varieties of crop. (Leary, et al 2008).

Table 3: Coping Measures of the Respondents

	Measures	Number	Percentage
1.	Planting of drought resistant varieties of crops	17	57
2.	Crop diversification	19	63
3.	Livestock diversification	11	37
4.	Planting of early mature crop varieties	17	57
5.	High yield crop varieties	18	60
6.	Use of low input crop varieties	13	43
7.	Modern Irrigation farming practice	10	33
8.	Replanting of crops	8	27
9.	Herd movement	16	53
10.	Herd supplementation	18	60
11.	Culling animals	20	67
12.	Labour migration	13	43
13.	Selling assets	11	37
14.	Herd sedentarization	16	53
15.	Farm relocation	12	40
16.	Reduction of herd/farm sizes	11	37
17.	Rudimentary irrigation practice	9	30
18.	Water storage	14	47
19.	Food storage	6	20

Source: Field Work 2006

Recently, culling of animals and crop diversification tops the list (67% and 63% respectively). Food storage as a coping measure has declined, only one fifth of the respondent use it; may be because most household had insufficient food even in good years to enable them to store food. Replanting of crops and rudimentary irrigation had also decline, less than one third of the household use it now as coping measures.

AGRARIAN HOUSEHOLDS WILLINGNESS TO ADAPT

In theories of human behaviour, intention has been viewed as important because it synthesizes the influence

of an individual's background and attitudes and mediates between those characteristics and their actual behaviour (Ajzen, and Fishbein, 1969). Agrarian households willingness to adapt is a combination of their intentions and actions aimed at adapting to drought in North Eastern Nigeria. To ascertain agrarian household's willingness to adapt they were asked to respond to the changes if an extension officer recommended that they will be better off (Table 4).

Table 4, revealed the respondents report, thus, more than two-third agreed to change types of crop, relocate to another place, change cropping times and changing grazing methods. Only half agreed to reduce herd size.

Table 4: Recommended Actions and Response

S/No	Recommended Action	Strongly Agreed		Agreed		Not Sure		Disagreed		Strongly Disagreed	
		Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%
1.	Reduce herd size	8	27	7	23	6	20	5	17	4	13
2.	Relocate to another place	6	20	16	53	5	17	2	7	1	3
3.	Change cropping times	5	17	17	57	3	10	5	17	-	-
4.	Change types of crops/animals	6	20	18	60	3	10	2	7	1	3
5.	Change grazing methods	6	20	16	53	5	17	2	7	1	3

Source: Field Work 2006

CONCLUSION

The willingness of the agrarian households to adapt to drought differs in the study area. Generally, the study has revealed that people are more likely to support adaptation strategies if they are consulted and their views taken into consideration in the formulation of the strategies.

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