



Examination of Practitioners' Awareness of Sustainability in the Construction Industry in Yobe State.

***Mohammed Bukar Girgiri; *Zakariyyah Bolaji Olatunde; & **Abdulazeez Hakeem Omilola**

**Department of Estate Management, Federal Polytechnic, Damaturu, Yobe State, Nigeria. **Department of Estate Management and Valuation, Waziri Umaru Federal Polytechnic, Birnin-Kebbi, Kebbi State, Nigeria.*

Abstract

The attention of practitioners, researchers, and policy maker has been drawn to the concept of sustainability in construction industry because of its level of adoption. This is attributed to low level of its awareness in Nigerian. This study therefore evaluates the level of construction practitioners' awareness of sustainability in construction in Yobe state. The research employed quantitative survey approach. Data was collected from a sample of 162 construction practitioners using stratified random sampling with the aid of structured questionnaires administered on site and analysed using both descriptive and inferential statistics. The study found that construction practitioners have moderately low level of awareness on sustainability. The study also revealed that, there is correlational relationship between the level of professionals' awareness of sustainable construction, frequency of conference attendance, concept of sustainability in educational curricula, sustainable construction policy and firm's commitment to sustainability. However the concept of sustainable construction in educational curricula has significant causal effect on the level of sustainable construction awareness. The study therefore

recommended that practitioners should acquaint themselves with sustainability in construction through attending seminars, workshops and conferences. Professional bodies and government should do more in creating awareness on sustainability in construction.

Keywords: Practitioners, Awareness, Sustainability, Construction Industry.

Introduction

Construction activities afford man the basics of his life such as shelter, infrastructure and to some people the job that earns them a decent living (Abidin, 2009 and Abidin, 2010). The construction industry as a major consumer of fixed natural non-renewable resources is a polluter of the environment, contributing to environmental deprivation through resource exhaustion, energy usage, air pollution and generation of waste in the acquisition of raw materials (Dania, Kehinde, & Bala, 2004; Lu & Yuan, 2011; Bossink & Brouwers, 2013). This is evidenced by the fact that construction accounts for the usage of about 40 percent of global resources and energy (Ghoddousi, Nikmehr & Hosseini, 2015). According to Ebohon & Rwelamila (2014), the construction industry consumes one-sixth of global fresh water, one-quarter of global wood and two-fifths of global material and

energy flows while almost one-quarter of ozone-depleting gases come from air-conditioning units in buildings. Besides the world's resource exploitation, the construction sector also produces enormous waste so voluminous that it surpasses most of other economic sectors. The resultant effect of these causes huge catastrophes such as flooding, mudslides, increased variability in global climate and the disappearance of several species of fauna and flora. These factors draw global attention to the enormous danger of the continuous environmental degradation which has the tendency of affecting the future generations adversely. To reverse this seemingly negative trend, the concept of sustainability was proposed and has since become the interest of researchers, practitioners and policy makers globally

(Abidin, 2009; Dania, Larsen, & Yao, 2013; Diyana & Abidin, 2013; Ojo, Mbowa, & Akinlabi, 2014; Gan, Zuo, Ye, Skitmore, & Xiong, 2015).

However, the level of adoption of sustainable construction varies from one country to another and the developing nations are struggling to imbibe its culture (Ebohon & Rwelamila, 2014; Gan et al., 2015). The major factor that is considered to influence the adoption of sustainable construction is the level of stakeholders' awareness and understanding of the sustainability concept. Abidin (2010) contends that the path to achieving sustainable construction begins with stakeholders awareness which gives rise to interest; then knowledge which brings acceptance; then demand that leads to commitment; and then adoption and implementation. Various other authors agree with the influence of stakeholders' awareness of sustainability on subsequent sustainable construction adoption (Abidin, 2009; Dania et al., 2013; Diyana & Abidin, 2013; Gan et al., 2015; Ojo et al., 2014; Shelbourn et al., 2006).

In Nigeria, like other developing African Nations, the level of adoption of sustainable construction is adjudged to be poor and in some cases non-existent (Ebohon & Rwelamila, 2014; Ojo et al., 2014). This is attributed to many factors and barrier impeding the adoption of the practice. Ojo, Mbowa, & Akinlabi (2014) attributed it to lack of resources, supplier resistance to change and lack of awareness. Similarly, Abolore (2012) submitted that level of awareness impede the adoption of sustainable construction. This point is buttressed by Shelbourn et al. (2006), Nwokoro & Onukwube (2011), and Hussin et al. (2013). However, despite the commitment of Nigerian government to organising awareness campaigns and the conception of green building council of Nigeria including the keen interest displayed by allied professional bodies, the outcome of these commitments remains to be seen (Dania, Larsen, & Yao, 2013).

Yobe state construction industry is not an exception to the Nigerian general experience with regards to sustainable construction. With the various construction activities currently on-going in the state and against the established background, this study seeks to examine the construction practitioners' level of awareness of sustainable construction with a view to identifying areas needing improvement for sustainability to be fully implemented in construction activities.

LITERATURE REVIEW

Concept of Sustainability

It is not easy to give a single acceptable definition to the word sustainability. (O'Riorden, 1985). According to Gibson *et al.* (2005) "Unlike the work of the

old sustainability, the new one is relentlessly dynamic. Munier (2005) also, international organizations such as IUCN, UNEP, WWF (1991).have given various definition to sustainability, but the generally acceptable definition was given by Brundtland (1987) which states that “Sustainable development is development that meets the needs of the present without compromising the needs of future generations to meet their own needs. From the various definitions proposed to the term sustainability or sustainable development, it is very clear that our present approach and the way we use our resources needs to be drastically changed, hence the need for sustainability.

The Need for Sustainability

The need for Sustainable Development as highlighted by Defra (2010) is due to the following reasons:

- Already existing unavoidable climate change;
- The increasing over stressing of our resources and environmental systems by our production, consumption and waste practices;
- There also has been an increase in the loss of biodiversity.

In view of the above, it is clearly justified that, the current trend of development is entirely unsustainable. The need for the reconciliation of these contradictions are, therefore, inevitable to face a more secure future, hence the need for sustainable development.

Principles of Sustainable Development

Sustainability or sustainable development could not be achieved without concerted efforts from global down to household level in the way and manner we utilize our resources. Policies need to be established and properly implemented to achieve this aim. Defra (2008) pointed out clearly that “For a policy to be sustainable, it must respect all five principles outlined below:

- i. Live within environmental limits stressed about respect to the environment, resources and biodiversity
- ii. Ensuring a strong, healthy and justice society to meet the people’s needs presently and in future.
- iii. Achieving a sustainable economy by means of building a strong, possibly stable as well as sustainable economy that is prosperous taking into consideration all the environmental and social cost.

- iv. Using Sound Science Responsibly
- v. Promoting good governance.

Looking critically at these principles, it suffices to say that, they are geared towards proper utilisation of the environment and all resources attached in a very good manner. In addition, co-operation and utilisation of the knowledge of science and technology has been proven to be the cardinal pillars which actualizes the sustainable development goals.

Sustainable Construction

The term has been used interchangeably with Green Building. The United States Green Building Council (USGBC) defines it as “building that is aimed at energy conservation, saving natural resources and preserving the environment.” On the global value Jones (2009) states that a shift toward “green building” has begun, and may ultimately lead to the replacement of much of the world’s built environment. It may take decades, but green building is poised to become a major segment of the global construction industry. Furthermore, According to a 2009 study by McGraw-Hill construction, the value of the world’s green building market will increase to USD 60 billion by 2010 and, within the following three years, will rise to USD 96 and then to 140 billion when residential and non-residential sectors are combined together. Asia will be a hotbed for the sector, and by 2013 it is expected that three-quarters of its construction firms will be involved in green building – in fact, a full 60 per cent of their projects will be green. In Europe, by the same year, two thirds of all building companies will be in a similar position, and in North America, the proportion will be slightly more than half.

Benefits of Sustainable Construction

Sustainable construction is very beneficial to the whole nation and the world over. The benefits cannot be over emphasised and comprises of economic, environmental and social. As green building becomes more popular, the financial benefits for developers and homeowners are becoming clearer. One of the most comprehensive reports which examine the costs and benefits of green buildings is a 2003 analysis conducted by Gregory H. Kats for the state of California. According to Kats, the average cost premium over just building to code is less than 2%. The Kats report finds “that minimal increases in upfront costs of about 2% to

support green design would, on average, result in life cycle savings of 20% of total construction costs – more than ten times the initial investment. The majority of savings from green building are in maintenance and utility costs. Furthermore, the benefits of sustainable construction were stated by Turcotte, Villareal and Bermingham (2006): That could be Economic, Social and environmental. These are looked upon and the need to harness these advantages in Nigerian has been very vital.

Over 20 cities in the U.S. have saved money and gained other important benefits by setting up GB programs and incentives as stated by Turcotte, Villareal and Bermingham (2006). The benefits are unquantifiable, Green buildings offer value that extends well beyond the standard measures of profit and cost savings – they represent improved tenant comfort, health and productivity, increased marketability and asset value, reduced susceptibility to future energy price volatility and an expression of corporate environmental responsibility. Green/sustainable buildings are those that embody all the sustainability aspects from their design stage. This could be achieved via Integrated Design Process.

RESEARCH METHODOLOGY

This research adopted survey design technique. The sample frame is all the 284 Built environment professionals working under registered construction firms in Yobe state. This includes 40 Architects, 53 Builders, 23 Estate surveyor and valuers, 74 Quantity Surveyors, and 94 Engineers. Using the Krejcie and Morgan (1970) table for determining sample size of known population, a sample size of 162 professionals out of the 284 registered professionals was determined. This sample size (162) was considered sufficient as similar researches like work of Ofori et al., (2015) and Nduka & Ogunsanmi, (2015) respectively determined sample sizes of 100 and 150. To achieve higher response, 180 respondents were selected. To allow for proportional representation across board, stratified random sampling was adopted to generate the subsample from the five groups of professionals which constituted the strata as presented in Table 1..

Table 1 presents the stratification of the sample size of 180 into the various strata that made up the overall sample and questionnaires administered to respondents out of which 162 representing 90 percent were retrieved and were considered adequate for the analysis.

Table 1: Sampling Stratification and Questionnaire administration

Practitioners	Frame	Percentage	Sample Size/ Questionnaires	Nos of Questionnaires Retrieved	Percentage	
Architect	40	14.2	26	24	92	
Builder	53	18.5	33	30	91	
Estate Surveyor	23	8.0	14	14	100	
Quantity Surveyor	74	25.9	47	42	89	
Engineer	94	33.3	60	52	87	
Total	284	100	180	162	90	

Source : Field Survey, 2016

Descriptive data analysis involving Percentage Mean Ranking using SPSS, and inferential statistical analysis of multiple stage regression were employed.

The data cleaning and screening was conducted through identifying and treating the missing values, outliers, non-normal data, and multicollinearity. The missing data were checked at the point of collection and immediately returned to the respondents by the research assistants to fill them. By so doing, the missing data were greatly minimized. Similarly, the reliability assessment was conducted to establish the internal consistency of the measurement instrument. The multivariate outliers were assessed based on the recommendation of Tabachnick and Fidell (2007) that Mahalanobis value is compared with the Chi-square table such that any Mahalanobis distance value above the computed value is considered as multivariate outlier. Accordingly, 6 cases were extremely affected by both univariate and multivariate outliers and were deselected for further statistical analysis. Subsequently, 162 usable cases that are not affected by extreme outliers and missing data were retain for further analysis.

Collinearity test

Multicollinearity exist when the tolerance level is less than 0.1 or when the VIF is greater than 10. Hence, a tolerance level above 0.1 and VIF of less than 10 signify absence of multicollinearity. This criterion is used to assess the collinearity of the research variables as presented in table 2 below.

Table 2: Collinearity assessment

Constructs		Tolerance	VIF
	Frequency of Seminar/Conference attendance	.574	1.741
	Educational Characteristics	.970	1.031
	Concept of sustainability in educational curricula	.498	2.008
	Years of Experience	.492	2.033
	Sustainable Construction policy	.365	2.740
	Firm's commitment to sustainability	.495	2.022
	Sustainable Construction Awareness	Dependent	Variable
		(Construct)	

The tolerance levels range from 0.365 to 0.970 all above the recommended 0.1 minimum. Similarly, the VIFs range from 1.031 to 2.740 all below the recommended minimum of 10 (Table 2). Therefore, the study variables pass the collinearity test and are suitable for multivariate analysis.

The reliability of the research constructs was evaluated using Cronbach's alpha as presented in table 3 below.

Table 3: Reliability test

Constructs	Cronbach's Alpha
Sustainable Construction Awareness	0.916
Factors Influencing Sustainable Construction Awareness	0.831

The result in Table 3 shows that all the constructs have cronbach's alpha value above the recommended 0.7 minimum. Hence all the research constructs are internally consistent and reliable.

ANALYSIS, RESULTS AND DISCUSSION

Extent of Practitioners awareness of sustainable construction

The practitioners were asked to rate the level of awareness of sustainable construction, based on the concepts of environmental sustainability, social

sustainability and the economic sustainability of construction activities. Descriptive data analysis involving Percentage Mean Ranking using SPSS, the extent to which practitioners are aware of sustainable construction was established and presented in Table 4.

Table 4: Extent of Practitioners awareness of sustainable construction

Sustainable construction involves:	Mean	SD	Ranking
Social progress which recognize the need of everyone	3.1296	1.18552	1
Prevention of dust emission	3.0617	1.19882	2
Maintenance of high and stable levels of economic growth	3.0123	1.13108	3
Minimizing energy use renewable energy sources,	2.9321	1.13185	4
Generating profit without compromising future needs	2.9074	1.19941	5
Controlling the pollution that result from the project activities	2.9074	1.14102	6
Enhanced quality of life and customers' satisfaction	2.8951	1.12900	7
Effective protection of the environment	2.8889	1.21584	8
Selecting green materials that are biodegradable and non-toxic for the projects,	2.8765	1.15702	9
Using renewable energy sources	2.8642	1.24863	10
Conserving the natural elements such as trees and waterways	2.8457	1.14518	11
Effective environmental planning, management and control	2.8333	1.14344	12
Prudent use of natural resources	2.8272	1.22895	13
Reduction of solid waste material	2.7469	1.17591	14
Prevention of noise	2.7469	1.17591	15
Improving land protection during clearing activity to reduce problems such as landslides, deforestation and soil erosion	2.7407	1.19292	16
Prevention of dangerous material waste	2.6358	1.13530	17

Creating more green areas by improving landscapes	2.5617	1.16332	18
Reduction of water use	2.5617	1.14176	19
General Sustainable Construction Awareness	2.8408	.73885	

Source: Field Survey, 2016

The result in table 4 indicated that practitioners are moderately aware that sustainable construction involves social progress which recognize the need of everyone; prevention of dust emission; maintenance of high and stable economic growth; minimizing energy use from renewable energy sources; and generating profit without compromising future needs as indicated by 3.13, 3.06, 3.01, 2.93, and 2.91 and are ranked 1st to 5th in the level of awareness of sustainable construction.

Controlling the population that result from the project activities, enhanced quality of life and customers' satisfaction, effective protection of the environment, selecting green material that are biodegradable and non-toxic for the project, using renewable energy sources, and conserving the natural elements such as trees and waterways are elements of sustainable construction that are moderately aware as indicated by 2.91, 2.89, 2.89, 2.88, 2.87, 2.86, 2.85 mean score and ranked 6th to 11th respectively.

Effective environmental planning, management and control, prudent use of natural resources, reduction of solid waste material, prevention of noise, improving land protection during clearing activity to reduce problems such as landslides, deforestation and soil erosion, and prevention of dangerous material are also elements of sustainable construction that the practitioners are moderately aware as indicated by mean values of 2.83, 2.82, 2.75, 2.746, 2.74, and 2.64 and ranked 12th to 17th in the level of awareness of sustainable construction in Yobe state.

However, the practitioners are least aware of creating more green areas by improving landscapes and reduction of water use as components of 2.561 and 2.56 respectively. These elements of sustainable construction are ranked 18th and 19th in the level of awareness of sustainable construction in Yobe state. Aggregately, the practitioners are moderately aware of the concept of sustainability in construction in Yobe state.

Factors Influencing Level of Practitioners' Awareness of Sustainable Construction

To determine the factors influencing the level of practitioners awareness of sustainable construction, detailed inferential statistical analysis that involve correlation and Multiple Regression Analysis (MRA) was carried out. Prior to the analysis, the reliability, as stated earlier, of the two constructs involved, the level of practitioners awareness of sustainable construction and the determining factors, was first assessed and established. The two constructs produced Cronbach's alpha coefficients above the recommended value of 0.7 (Pallant, 2011). Similarly, one of the assumptions of multiple regression analysis is the normality of the variables involved. Accordingly, the normality of the data set was determined using skewness and kurtosis (Pallant, 2011; George & Mallery, 2010). As recommended by George and Mallery (2010), a data set or variable is normally distributed if the skewness and kurtosis values range from $-/+2$ respectively. All the data set of the variables for this study was within the range of -2 and $+2$. Therefore, the data are normally distributed and suitable for Multiple Regression Analysis (MRA).

Prior to the regression analysis, correlation analysis was carried out. In order to avoid the argument of which measurement scale is likert scale and therefore which method of correlation analysis is most suitable, Spearman rank method was employed. The result of the correlation analysis is presented in table 5 below.

Table 5: Spearman Correlation

	1	2	3	4	5	6
Sustainable Construction Awareness (1)						
Conference attendance (2)	.281** .000					
Educational Characteristics (3)	.124 .117	.124 .116				
Concept of sustainability in educational curricula (4)	.367** .000	.522** .000	.105 .182			
Years of Experience (5)	.350** .000	.497** .000	.153 .052	.655** .000		
Sustainable Construction policy (6)	.336**	.624**	.067	.611**	.589**	

	.000	.000	.397	.000	.000	
Firm's commitment to sustainability (7)	.342**	.521**	.091	.511**	.516**	.709**
	.000	.000	.248	.000	.000	.000

Table 5 shows the result of correlation analysis conducted using Spearman's *rho* method. The result shows that there is significant correlational relationship between the level of sustainable construction awareness and frequency of conference attendance, concept of sustainability in educational curricula, sustainable construction policy and firm's commitment to sustainability as indicated by correlation coefficients of 0.281, 0.367, 0.350, 0.336, and 0.342 which were all significant at 0.01 significance level respectively as indicated by 0.000 p-value. The result indicated that the presence of sustainability concept in educational curricula has the highest correlation with the level of practitioners' awareness of sustainable construction in Yobe state. However, there is no significant relationship between the educational characteristics of the practitioners and their level of awareness of sustainable construction in Yobe state.

Since correlational relationship is established between the level of practitioners' awareness of sustainable construction and the determining factors, the causal effect of determining factors on level of practitioners' awareness of sustainable construction is determined using Multiple Regression Analysis (MRA). The enter method was used with level of practitioners' awareness of sustainable construction as the dependent variable while the six (6) determining factors were entered as the independent variable. The regression model was specified to produce the model summary, the analysis of variance (ANOVA) and the coefficient to determine the individual influences of each of the independent variables or predictors on the dependent variable as presented in tables 6 and 7 respectively below.

Table 6: Model Summary and ANOVA

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	F	Sig.
1	.429 ^a	.184	.153	.68009	5.837	.000

Table 6 shows the regression model summary and the ANOVA result. The model produced overall R value of 0.429 and R square value of 0.184 with F-statistics of 5.837 which are significant as indicated by p value of 0.000 far below the recommended maximum of 0.05 (Pallant, 2011). This shows that the

model predicts about 18.4percent of the variation in level of practitioners' awareness of sustainable construction. In other words, about 18.4percent in the changes in level of practitioners' awareness of sustainable construction whether high or low can be explained by changes in the frequency of conference attendance, concept of sustainability in educational curricula, sustainable construction policy and firm's commitment to sustainability.

The individual influence of each of the determining factors on level of practitioners' awareness of sustainable construction is presented by the standardized regression coefficients in table 7.

Table 7: Regression Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
	(Constant)	1.881	.209		9.001	.000
	Conference attendance	.032	.062	.049	.515	.607
	Educational Characteristics	.080	.082	.072	.975	.331
	Concept of sustainability in educational curricula	.130	.067	.199	1.963	.048
	Years of experience	.052	.066	.081	.783	.435
	Sustainable Construction policy	.023	.075	.037	.310	.757
	Firm's commitment to sustainability	.085	.064	.137	1.330	.185

Table 7 shows coefficients of each determining factor in the regression model. The result shows that the only the concept of sustainability in educational curricula that have significant causal influence on the level of practitioners'

awareness of sustainable construction as indicated by unstandardized coefficient of 0.130 and beta coefficient of 0.199 which are significant as indicated by t-value and p-values of 1.963 and 0.048 respectively. However, the other factors, frequency of conference attendance, concept of sustainability in educational curricula, sustainable construction policy and firm's commitment to sustainability., although having significant correlational relationships, do not have significant causal influence on the level of practitioners' awareness of sustainable construction in Yobe state

Conclusion and Recommendation

This study evaluated the level of construction practitioners' awareness on sustainability in construction in Yobe state. The study found that construction practitioners have moderately low level of awareness on sustainability. The study also found that there is no significant difference in the level of awareness on sustainability aspects in construction based on their profession. The result finally found that, although there is correlational relationship between the level of practitioner's awareness of sustainable construction with frequency of conference attendance, concept of sustainability in educational curricula, sustainable construction policy and firm's commitment to sustainability, only the concept of sustainable construction in educational curricula has significant causal effect on the level of sustainable construction awareness. The study therefore recommended that practitioners should acquaint themselves with sustainability in construction through attending seminars, workshops and conferences on sustainable construction. Professional bodies and government should do more in creating awareness on sustainability in construction.

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